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Activity Report Q1 2019

Image: An artist's impression of GJ 667 Cc, a potentially habitable planet orbiting a red dwarf constituent in a trinary star system. By ESO/L. Calçada - ESO, CC BY 4.0


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Peer-Reviewed Publications (only in press or published)

1. Abdalla H, Aharonian F, Ait Benkhali F, Anguner EO, Arakawa M, et al., including **Huber D** (2019). VHE γ-ray discovery and multiwavelength study of the blazar 1ES 2322-409. MNRAS 482, 3011-3022.

2. Abdalla H, Aharonian F, Ait Benkhali F, Anguner EO, Arakawa M, et al., including **Huber D** (2019). The 2014 TeV γ-Ray Flare of Mrk 501 Seen with H.E.S.S.: Temporal and Spectral Constraints on Lorentz Invariance Violation. Astrophys. J. 870, id.93, 9pp.

3. Abdalla H, Aharonian F, Ait Benkhali F, Anguner EO, Arakawa M, et al., including **Huber D** (2019). Particle transport within the pulsar wind nebula HESS J1825-137. Astron. Astrophys. 621, id.A116, 18pp.

4. Arentoft T, Grundahl F, WhiteTR, Slumstrup D, Handberg R, et al. including **Huber D** (2019). Asteroseismology of the Hyades red giant and planet host ε Tauri⋆. Astron. Astrophys. 622, id.A190, 12pp.

5. Bacalla XL, Linnartz H, Cox NLJ, **Cami J**, Roueff E, et al. (2019). The EDIBLES survey. IV. Cosmic ray ionization rates in diffuse clouds from near-ultraviolet observations of interstellar OH+. Astron. Astropys. 622, id.A31, 12pp.

6. Baldi, R.D., Rodriguez-Zaurin, J., Chiaberge, M., Capetti, A., **Sparks, W.B.,** McHardy, I.M., 2019, ApJ, 870, 53. *Hubble Space Telescope Emission-line Images of Nearby 3CR Radio Galaxies: Two Photoionization, Accretion, and Feedback Modes*, astro-ph/1811.04946.

7. Balmaverde, B., Capetti, A., Baldi, R.D., Baum, S., Chiaberge, M., Gilli, R., Grandi, P., Marconi, A., Meyer, E., Miley, G., O'Dea, C., **Sparks, W**., Torresi, E., Tremblay, G., Venturi, G., 2019, A&A, in press. *The MURALES survey. II. Presentation of the observations and first results;* astro-ph/1903.10768.

8. Banzatti A, Pascucci I, Edwards S, Fang M, **Gorti U**, and Flock M (2019). Kinematic Links and the Coevolution of MHD Winds, Jets, and Inner Disks from a High-resolution Optical [O I] Survey. Astrophys. J. 870, 76.

9. Beaty DW, MM Grady, HY McSween, E Sefton-Nash, BL Carrier, et al., including **JL Bishop**, (2019). The potential science and engineering value of samples delivered to Earth by Mars sample return. **54**, S3-S152.

10. Becker JC, Vanderburg A, Rodriguez JE, Omohundro M, Adams FC, et al., including **Huber D** (2019). A Discrete Set of Possible Transit Ephemerides for Two Long-period Gas Giants Orbiting HIP 41378. Astron. J. 157, id.19, 13pp.

11. **Beyer RA** et al. including **CB Beddingfield** (2019). The nature and origin of Charon's smooth plains. *Icarus* **323**, p.16-32, https://doi.org/10.1016/j.icarus.2018.12.036

12. Bouwman J, Castellanos P, Bulak M, Terwisscha van Scheltinga J, **Cami J,** et al., (2019). Effect of molecular structure on the infrared signatures of astronomically relevant PAHs. Astron. Astrophys. 621, id.A80, 8pp.

13. Burke, C. J., Mullally, F., **Thompson, S. E.**, **Coughlin, J. L**. and Rowe, J. F. (2019) Re-evaluating Small Long-period Confirmed Planets from Kepler, The Astronomical Journal, 157, 143, https://dx.doi.org/10.3847/1538-3881/aafb79

14. Candian A, Gomes Rachid M, MacIsaac H, Staroverov VN, **Peeters E**, Cami J (2019) Searching for stable fullerenes in space with computational chemistry, MNRAS, 485, 1137.

15. Carry, B., Vachier, F., Berthier, J., Marsset, M., Vernazza, et al., including **Marchis, F.** (2019) Homogeneous internal structure of CM-like asteroid (41) Daphne★, Astronomy and Astrophysics, 623, A132, https://dx.doi.org/10.1051/0004-6361/201833898

16. **Cartwright RJ,** Holler B, Benecchi S, Juanola-Parramon R, Arney G, ROberge A, and Hemmel H (2019). Exploring the composition of icy bodies at the fringes of the Solar System with next generation space telescope. White paper for the Astro 2020 decadel survey. arXiv:1903.07691.

17. Chanover N, Wong MH, Greathouse T, Trilling D, Conrad A, et al., including **Cartwright RJ** (2019). Triggered High-Priority Observations of Dynamic Solar System Phenomena. White paper for the Astro 2020 decadel survey. arXiv:1903.08753.

18. Chawner H, Marsh K, Matsuura M, Gomez HL, Cigan P, et al., including **Rho J** (2019). A catalogue of Galactic supernova remnants in the far-infrared: revealing ejecta dust in pulsar wind nebulae. MNRAS 483, 70-118.

19. Chojnacki, M., Banks, M. E., **Fenton, L. K.**, and Urso, A. C. (2019) Boundary condition controls on the high-sand-flux regions of Mars, *Geology*, doi:10.1130/G45793.1

20. Ciarnello M, Filacchione G, D'Aversa E, Capaccioni F, Nicholson PD, et al., including **Dalle Ore CM** (2019). Cassini-VIMS observations of Saturn's main rings: II. A spectrophotometric study by means of Monte Carlo ray-tracing and Hapke's theory. Icarus 317, 242-265.

21. Dalba, P. A., Kane, S. R., Barclay, T., Bean, J. L., Campante, T. L., Pepper, J., Ragozzine, D. and **Turnbull, M. C.** (2019) Predicted Yield of Transits of Known Radial Velocity Exoplanets from the TESS Primary and Extended Missions, Publications of the Astronomical Society of the Pacific, 131, 034401, https://dx.doi.org/10.1088/1538-3873/aaf183

22. David TJ, Hillenbrand LA, Gillen E, **Cody AM**, Howell SB, et al. (2019). Age Determination in Upper Scorpius with Eclipsing Binaries. Astropys. J. 872, id.161, 39pp.

23. Déau E, Dones L, Spilker L, Flandes A, Baillie K, **Pilorz S**, **Showalter M**, El Moutamid M, Colwell JE 2019, Cassini CIRS and ISS opposition effects of Saturn's rings: 1. C ring narrow

or broad surge? *Mon. Notices Royal Astron. Soc.* 2019. https://doi.org/10.1093/mnras/sty2587.

24. De Rosa, R. J. and **Kalas, P.** (2019) A Near-coplanar Stellar Flyby of the Planet Host Star HD 106906, The Astronomical Journal, 157, 125, https://dx.doi.org/10.3847/1538-3881/ab0109

25. de Vera, J.P., Alawi, M., Backhaus, T., Baqué, M., Billi, D., Böttger, U., Berger, T., Cockell, C., Demets, R., de la Torre Noetzel, R., Edwards, H., Elsaesser, A., Fagliarone, C., Fiedler, A:, Foing, B., Foucher, F., Fritz, J., Hanke, F., Herzog, T., Horneck, G., Hübers, H.-W., Huwe, B., Joshi, J., Kozyrovska, N., Kruchten, M., Lasch, P., Lee, N., Leya, T., Lorek, A., Moritz, S., Möller, R., Olsson-Francis, K., Onofri, S., Ott, S., Pacelli, S., Podolich, O., Martínez-Frías, J., Rabbow, E., Reitz, G., Rettberg, P., Reva, O., Rothschild, L., Sancho, L.G., **Schulze-Makuch, D**., Selbmann, L., Serrano, P., Szewzyk, U., Verseux, C., Wagner, D., Westall, F., Wolter, D., and Zucconi, L. Limits of life and the habitability of Mars: The ESA space experiment BIOMEX on the ISS. In press at *Astrobiology*.

26. Dimitriadis, G., Foley, R. J., Rest, A., Kasen, D., Piro, A. L., et al., including **Coughlin, J**. (2019) K2 Observations of SN 2018oh Reveal a Two-component Rising Light Curve for a Type Ia Supernova, The Astrophysical Journal, 870, L1, https://dx.doi.org/10.3847/2041-8213/aaedb0

27. **Dobrovolskis AR** (2019). Classification of Ellipsoids by Shape and Surface Gravity. Icarus 321, 891-928.

28. Dotson, L, G Barentsen, C Hedges, **JL Coughlin**. (2019) "Hundreds More Planets Await Discovery in Kepler's K2 Data Set". Research Notes of the American Astronomical Society, 2019, 3, 23. https://ui.adsabs.harvard.edu/abs/2019RNAAS...3a..23D

29. Fairén, A.G., **Schulze-Makuch, D.**, Whyte, L., Parro, V., Pavlov, A., Gómez-Elvira, J., Azua-Bustos, A., Fink, W., and Baker, V. (2019) Planetary protection and the astrobiological exploration of Mars: Proactive steps in moving forward. *Advances in Space Research*, doi: https://doi.org/10.1016/j.asr.2019.01.011

30. Fétick, R. J., Jorda, L., Vernazza, P., Marsset, M., Drouard, A., Fusco, T., Carry, B., **Marchis, F.,** et al. (2019) Closing the gap between Earth-based and interplanetary mission observations: Vesta seen by VLT/SPHERE, Astronomy and Astrophysics, 623, A6, https://dx.doi.org/10.1051/0004-6361/201834749

31. Galvez, R., Fouhey, D. F., **Jin, M.**, Szenicer, A., Munoz-Jaramillo, A., Cheung, M. C. M., Wright, P.J., Bobra, M. G., Liu, Y., Mason, J., & Thomas, R. The Astrophysical Journal, 2019, in press, arXiv:1903.04538.

32. Gordon KD, Gies DR, Schaefer GH, **Huber D**, and Ireland M (2019). Angular Sizes, Radii, and Effective Temperatures of B-type Stars from Optical Interferometry with the CHARA Array. Astrophys. J. 873, id.91, 13pp.

33. Hanuš, J.; Marsset, M.; Vernazza, P.; Viikinkoski, M.; Drouard, A., including **Marchis, Franck**, (2019). The shape of (7) Iris as evidence of an ancient large impact? eprint arXiv:1902.09242.

34. Harp, G. R., **Richards, J.**, **Jenniskens, P., Shostak, S., Tarter, J. C.,** 2019. Radio SETI observations of the interstellar object 'OUMUAMUA. Acta Astronautica 155, 51–54.

35. Hedges C, Saunders N, **Coughlin JL,** Barentsen G, Gully-Santiago M, et al., including **Cody AM** (2019). A Transiting Hot Jupiter Candidate toward the Galactic Center Identified in the Kepler/K2 Campaign 9 Microlensing Survey. RNAAS 3, article id.18. https://ui.adsabs.harvard.edu/abs/2019RNAAS...3a..18H/abstract

36. **Jenniskens, P.**, Popova, O. P., Glazachev, D. O., Podobnaya, E. D., Kartashova, A. P., 2019. Tunguska eyewitness accounts, injuries, and casualties. Icarus (in press).

37. **Jenniskens P.,** Utas J., Qing-zhu Yin, et al. 2018. The Creston, California, meteorite fall and the origin of L chondrites. MAPS 54, 699–720.

38. **Kostov, V. B., Mullally, S. E.,** Quintana, E. V., **Coughlin, J. L.**, Mullally, F., et al. (2019) Discovery and Vetting of Exoplanets. I. Benchmarking K2 Vetting Tools, The Astronomical Journal, 157, 124, https://dx.doi.org/10.3847/1538-3881/ab0110

39. Langbroek, M., **Jenniskens, P.,** Kriegsman, L. M., Nieuwenhuis, H., De Kort, N., Kuiper, J., Van Westrenen, W., ZOlensky, M. E., Ziegeler, K., Yin, Q.-Z., Sanborn, M. E., Wimpenny, J., Kamakawa, A., de Vet, S. J., Meier, M. M. M., Welten, K. C., Nishiizumi, K., Burton, A. S., Dworkin, J. P., Glavin, D. P., Wu, Q., Zare, R. N., Ruf, A., Harir, M., Schmitt-Kopplin, P., (The Diepenveen Meteorite Consortium), 2019. The CM carbonaceous chondrite regolith Diepenveen. MAPS (in press).

40. **Li, J.**, **Tenenbaum, P.**, **Twicken, J. D.,** Burke, C. J., Jenkins, J. M., Quintana, E. V., Rowe, J. F. and Seader, S. E. (2019) Kepler Data Validation II-Transit Model Fitting and Multiple-planet Search, Publications of the Astronomical Society of the Pacific, 131, 024506, https://dx.doi.org/10.1088/1538-3873/aaf44d

41. Li, W., Wang, X., Vinkó, J., Mo, J., Hosseinzadeh, G., et al., including **Coughlin, J.** (2019) Photometric and Spectroscopic Properties of Type Ia Supernova 2018oh with Early Excess Emission from the Kepler 2 Observations, The Astrophysical Journal, 870, 12, https://dx.doi.org/10.3847/1538-4357/aaec74

42. Lyra W, Haworth T, Bitsch B, Casassus S, Cuello N, et al., including **Umurhan OM** (2019). Planet formation: The case for large efforts on the computational side. White paper submitted to the Astro2020 decadal survey. arXiv:1903.04546

43. Matsuura M, DeBuizer JM, Arendt RG, Dwek E, Barlow MJ, et al., including **Rho J** (2019). SOFIA mid-infrared observations of Supernova 1987A in 2016 - forward shocks and possible dust re-formation in the post-shocked region. MNRAS 482, 1715-1723.

44. Meza, E.; Sicardy, B.; Assafin, M.; et al. March 2019, including **Marchis, Franck**, eprint arXiv:1903.02315M, (2019) Pluto's lower atmosphere and pressure evolution from ground-based stellar occultations, 1988-2016.

45. Montgomery, W., Oberlin, E.A., Kounaves, S.P., **Schulze-Makuch, D.**, and Sephton, M-A- (2019) Detection of organic biosignatures in oxyanion salt-rich Mars analogues. In press at *Astrobiology.*

46. Nielsen, L. D., Bouchy, F., Turner, O., Giles, H., Mascareño, A. S., et al., including **Caldwell, D. A., Wohler, B.** (2019) A Jovian planet in an eccentric 11.5 day orbit around HD 1397 discovered by TESS, Astronomy and Astrophysics, 623, A100, https://dx.doi.org/10.1051/0004-6361/201834577

47. Oshtrakh, M. I., Maksimova, A. A., Chukin, A. V., Petrova, E. V., **Jenniskens, P.,** Kuzmann, E., Grokhovksy, V. I., Homonnay, Z., Semionkin, V. A., 2019. Variability of Chelyabinsk meteoroid stones studied by Mössbauer spectroscopy and X-ray diffraction. Spectrochimica Acta, Part A (in press).

48. Pandey, S. & al., including **Bonaccorsi, R** (2019). Ladakh: Diverse, High-Altitude Extreme Environments for Off-Earth Analogue and Astrobiology Research. International J. of Astrobiology (accepted).

49. Pravec, P., Fatka, P., Vokrouhlický, D., Scheirich, P., Ďurech, J., including **Marchis, Franck**, (2019). Asteroid pairs: a complex picture, eprint arXiv:1901.05492.

50. Robbins SJ**, Beyer RA,** Spencer JR, Grundy WM, **White OL**, et al., including **Dalle Ore CM** and **Umurhan OM** (2019). Geologic Landforms and Chronostratigraphic History of Charon as Revealed by a Hemispheric Geologic Map. J. Geophys. Res. Planets 124, 155-174.

51. **Rummel JD** (2019). From Planetary Quarantine to Planetary Protection: a NASA and international story. *Astrobiology*, [Fast Track] https://doi.org/10.1089/ast.2018.1944

52. **Rummel JD** (2019). Planetary Protection in Planetary Exploration Missions. *Planetary Astrobiology*, (Victoria Meadows, *ed.*) Space Science Series, Lunar and Planetary Institute, Houston, Texas, in press.

53. Sánchez-Garcia, L., M. Fernández, M. García-Villadangos, Y. López-Blanco, S. Cady, N. Hinman, M. Bowden, S. Pointing, K. Lee, **K. Warren-Rhodes**, D. Lacap-Bugler, N. Cabrol, V. Parro, and D. Carrizo. (2019). Microbial biomarker transition in high altitude sinter mounds from El Tatio (Chile) through different stages of hydrothermal activity. Frontiers in Microbiology 9, p. 3350. https://doi.org/10.3389/fmicb.2018.03350 .

54. Schofield M, Chaplin WJ, **Huber D**, Campante TL, Davies GR, et al. (2019). The Asteroseismic Target List for Solar-like Oscillators Observed in 2 minute Cadence with the Transiting Exoplanet Survey Satellite. Astrophys. J. Supp. 241, id.12, 10pp.

55. Shappee, B. J., Holoien, T. W.-S., Drout, M. R., Auchettl, K., Stritzinger, M.D., et al., including **Coughlin, J.** (2019) Seeing Double: ASASSN-18bt Exhibits a Two-component Rise in the Early-time K2 Light Curve, The Astrophysical Journal, 870, 13, https://dx.doi.org/10.3847/1538-4357/aaec79

56. **Showalter MR**, de Pater I, Lissauer JJ, **French RS**, The seventh inner moon of Neptune, *Nature* 566, 350-353, 2019. https://www.nature.com/articles/s41586-019-0909-9.

57. **Simpson JP** (2019). Erratum: "Spitzer Infrared Spectrograph Observations of the Galactic Center: Quantifying the Extreme Ultraviolet/Soft X-Ray Fluxes". Astrophys. J. 870, id.140, 8pp.

58. Singer KN et al. including **RA Beyer**, (2019) Impact craters on Pluto and Charon indicate a deficit of small Kuiper belt objects. *Science* **363**, Issue 6430, pp. 955-959. https://doi.org/10.1126/science.aap8628

59. **Sparks, WB.** We completed our analysis and documentation of a new method for polarimetry, requiring no moving parts in a compact design which acquires full Stokes spectropolarimetry on a single data frame. This enables time variable or moving targets to be observed, and is very sensitive to the circular polarization which may be used in life detection. A paper describing the work has been accepted by PASP, in press.

60. **Sparks, W.B.**, Germer, T.A., Sparks, R.M. 2019, PASP, in press, Classical polarimetry with *a twist: a compact geometric approach*.

61. **Sparks, W. B.,** Richter, M., de Witt, C., Montiel, E., Dello Russo, N., Grunsfeld, J., McGrath, M. A., Weaver, H., Hand, K.P., Bergeron, E., Reach, W., 2019, ApJL, 871, L5, *A Search for Water Vapor Plumes on Europa using SOFIA*, astro-ph/1901.00086.

62. Stern SA and 204 other authors including **Beddingfield CB**, **Beyer RA**, **Chavez CL**, **Dalle Ore CM**, **Scipioni F**, **Showalter MR**, **Umurhan OM**, **White OL**, Initial results from the first spacecraft exploration of a small Kuiper Belt Object: 2014 MU69. *Science*, in press.

63. Tinyanont S, Kasliwal MM, Krafton K, Lau R, **Rho J**, et al. (2019). Supernova 2017eaw: Molecule and Dust Formation from Infrared Observations. Astrophys. J. 873, id.127, 15pp.

64. Unsalan, O., Jenniskens, P., Qing-zhu, Yin, et al., 2018. Howardite fall in Turkey: Source crater of HED meteorites on Vesta and impact risk of Vestoids. MAPS (in press).

65. Vanderspek, R., Huang, C. X., Vanderburg, A., Ricker, G. R., Latham, D. W., et al., including **Twicken, J. D.** (2019) TESS Discovery of an Ultra-short-period Planet around the Nearby M Dwarf LHS 3844, The Astrophysical Journal, 871, L24, https://dx.doi.org/10.3847/2041-8213/aafb7a

66. Wade GA, Smoker JV, Evans CJ, Howarth ID, Cox NLJ, et al., including **Cami J** (2019). A remarkable change of the spectrum of the magnetic Of?p star HD 148937 reveals evidence of an eccentric, high-mass binary. MNRAS 483, 2581-2591.

67. Wang, S., Jones, M., Shporer, A., Fulton, B. J., Paredes, L. A., et al., including **Morris, R.** (2019) HD 202772A b: A Transiting Hot Jupiter around a Bright, Mildly Evolved Star in a Visual Binary Discovered by TESS, The Astronomical Journal, 157, 51, https://dx.doi.org/10.3847/1538-3881/aaf1b7

68. **Warren-Rhodes, K.**, K. Lee, S. Archer, L. Ng Boyle, **N. Cabrol,** D. Wettergreen, K. Zacny. C. Demargasso, J. Moersch, G. Chong, S. Vijayrangan, C. Tebes, M. Wagner, K. Tanaka, T. Hare, C. Gayle Tate, A. Wang, J. Wei, G. Foil, N. and Pointing, S. (2019). Subsurface microbial habitats in an extreme desert Mars-analogue environment. Frontiers in Microbiology, 10, 69, doi:10.3389/fmich.2019.00069.

69. **Warren-Rhodes, K., Cabrol, N., Wettergreen,** D., Pointing, S**.** Clues to Martian Life Found in Chilean Desert. Frontiers Science News, Feb 28, 2019.

70. Weitz C M & **Bishop JL** (2019) Formation of clays, ferrihydrite, and possible salts in Hydrae Chasma, Mars. *Icarus*, **319**, 392-406.

71. **White, O.** JM Moore, AD. Howard, WB. McKinnon, JT Keane, KN Singer, T. Bertrand, SJ. Robbins, PM Shenk, B. Schmitt, BJ. Buratti, SA. Stern, K. Ennico, CB. Olkin, HA. Weaver, LA Young, and the New Horizons Geology, Geophysics, and Imaging Theme Team (2019). Washboard and flutted terrains on Pluto as evidence for ancient glaciation. *Nature Astronomy*, **3,** 63-68. https://www.nature.com/articles/s41550-018-0592-z

72. Winters, M. W., McDaniel, R. D., Chen, Y. K., Saunders, D, **Jenniskens, P**., 2019. Radiation modeling for reentry of Hayabusa Sample Return Capsule. Journal of Spacecraft and Rockets 56, 13 pp. (in press).

73. Wong MH**, Cartwright RJ**, Chanover N, Sayanagi K, Greathouse T, et al. (2019). Solar system Deep Time-Surveys of atmospheres, surfaces, and rings. White paper for the Astro 2020 decadel survey. arXiv:1903.06321

Conferences: Abstracts and Proceedings

1. Barentsen G, Hedges CL, De Miranda Cardoso JV, Saunders N, Gully-Santiago M, et al., including **Cody AM** (2019). TESS Data Analysis using the community-developed Lightkurve Python Package. AAS Meeting #233, id.#109.08.

2. Bierson CJ, **Umurhan OM**, Robbins SJ, Lisse C, Nimmo F, et al. (2019). Limb Topography of 2014 MU69: First Results from the New Horizons Flyby. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1944.

3. Binzel RP, Earle AM, Grundy WM, Moore JM, Stern SA, et al., including **Umurhan OM** (2019). Highly Localized Seasonal Cold-Trapping in the Neck of 2014 MU69 'Ultima Thule'. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2933.

4. Birch SPD, Hayes AG, **Umurhan OM**, Tang Y, Vincent JB, et al. (2019). Migrating Scarps on Comet 67P. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2106.

5. **Bishop, J.,** Flahaut, J., Gross, C., Perrin, S., Danielsen, J., Miura, J., Isabal, G., Sessa, A., Wray, J., **Warren-Rhodes, K.**, Hinman, N., **Cabrol, N.** (2019) Identifying Environmental Change and Seeking Potentially Habitable Sites on Mars at Mawrth Vallis Through Correlation with Analog Expeditions on Earth. *Astrobiology Science Conference 2019*, Seattle, 24-29 June, 2019.

6. **Bishop JL**, NW Hinman, JM Danielsen, LL Baker, TJ Jeute, et al. (2019). Spectral properties of hydrated poorly crystalline materials for spectral analysis of the Moon and Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #2288.

7. **Bishop JL**, JD Toner, P Englert, VC Gulick, AS McEwen, et al. (2019). Salty solution to slipping soils on martian slopes. *Lunar Planet. Sci. Conf. XLX*, Abstract #1188.

8. **Bonaccorsi, R.** Signal-to-Noise Ratio Enhancement for In-Situ, ATP-Based Life Detection in Terrestrial Analogs of Planetary Evaporitic Environments, Poster presented, April 9 2019.

9. Bryson, S., **Coughlin, J., Mullally, S. E.**, Christiansen, J. and Batalha, N. M. (2019) Using Kepler DR25 Products to Compute Exoplanet Occurrence Rates, American Astronomical Society Meeting Abstracts #233, 233, 445.05, https://dx.doi.org/

10. Burton ZFM, **JL Bishop**, P Englert, C Koeberl & EK Gibson (2019). Salts and clays beneath surface sediments in Antarctica provide clues to weathering and geochemistry of Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #1766.

11. **Cabrol, N. A.** The changing nature of planetary exploration. *Explorer Magazine*, 2019 Issue. The SETI Institute (in press).

12. **Cabrol, N. A.**, Searching for life beyond Earth and the reframing of planetary exploration. *AbSciCon Conf.* Seattle, WA. # 478146, (Invited), June 2019.

13. **Cabrol, N. A.,** The Changing Nature of Planetary Exploration: A Personal Perspective on the Role of the NAI. *AbSciCon Conf.* Seattle, WA. # 481531, (Invited), June 2019.

14. **Cady, S. L.**, D. Carrizo, **P. Sobron,** S. M. Perl, C. Demergasso, S. L. Kendall, A. J. Celestian, **N. A. Cabrol**, and G. Chong. The significance of hydrothermal spherules in astrobiological exploration of rocky planets. *AbSciCon Conf.* Seattle, WA. # (Invited), June 2019.

15. **Caldwell, D.** (2019) The Kepler photometer: nearing 10 years and still going strong, American Astronomical Society Meeting Abstracts #233, 233, 445.07.

16. **Caldwell, D.** (2019) Tracking the TESS Pipeline, American Astronomical Society Meeting Abstracts #233, 233, 140.02.

17. Clautice, Devon; Perlman, Eric S.; and additional coauthors including **Sparks, William B**., 2019, AAS, 233, 243.33, *Unraveling the physics of quasar jets using polarimetry*

18. Cantillo DC, Reddy V, Pearson N, Sanchez JA, **Takir D**, et al. (2019). Constraining Exogenic Carbonaceous Material Abundance on (16) Psyche from Laboratory Spectral Measurements. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1703.

19. Chopra, A, A. Bell, W. Fawcett, R. Talebi, D. Angehausen, A. Günes Baydin, A. Berea, **N. A. Cabrol**, C. P. Kempes, M. Mascaro. EXO-ATMOS: A scalable grid of hypothetical atmospheres. *AbSciCon Conf.* Seattle, WA. # (Invited), June 2019.

20. **Cotera A**, and **Simpson JP** (2019). SOFIA FORCAST Observations of the Warm Dust in Sgr B1. AAS Meeting #233, id.#256.10.

21. Cook JC, **Dalle Ore CM**, Scipioni F, Cruikshank DP, Grundy WM, et al. (2019). Comparison of Near Infrared Spectra Between Pluto-System Objects and 486958 2014 MU69: Analysis of New Horizons Spectral Images. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2818.

22. **Coughlin, J.** (2019) The K2 Mission Global Uniform Reprocessing Effort, American Astronomical Society Meeting Abstracts #233, 233, 445.06.

23. **Coughlin, JL**. "Lessons Learned and Fascinating Finds from a Uniform Vetting of Conflicted KOIs". Poster. Kepler & K2 Science Conference V. March 2019.

24. Cruikshank DP, Grundy WM, Britt DT, Quirico E, Schmitt B, et al., including **Dalle Ore CM** (2019). The Colors of 486958 2014 MU69 ("Ultima Thule"): The Role of Synthetic Organic Solids (Tholins). 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2051.

25. **Dalle Ore CM**, Cruikshank DP, Scipioni F, **Cartwright RJ,** Binzel RP, et al. (2019). Color and Albedo of Ultima Thule: A Comparison to TNOs and Centaurs. 50th LPSC Meeting, held 18-22 March, The Woodlands, TX, id.2770.

26. Danielsen JM, **JL Bishop**, GS Usabal, JK Miura, AM Sessa, JJ Wray, et al. (2019). Characterization of outcrops containing "doublet" spectra at Mawrth Vallis, Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #3017.

27. Dhingra RD, White OL, **Umurhan OM**, Banks ME, Morre JM, et al. (2019). Kuiper Belt Object 2014 MU69: Correlation Between Albedo and Landforms. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2697.

28. Dotson, J. L., Barentsen, G., Hedges, C. and **Coughlin, J. L.** (2019) Hundreds More Planets Await Discovery in Kepler's K2 Data Set, Research Notes of the American Astronomical Society, 3, 23, https://dx.doi.org/10.3847/2515-5172/ab01c6

29. Dotson J, Barentsen G, Hedges CL, Gully-Santiago M, **Cody AM**, et al. (2019). Lightkurve v1.0: Kepler, K2, and TESS time series analysis in Python. AAS Meeting #233, id.#445.01.

30. Englert P, **JL Bishop**, ZFM Burton, EK Gibson, C Koeberl, et al. (2019). Near surface geochemistry and mineralogy at the McMurdo Dry Valleys, Antarctica, serves as an analog for some near surface sites on Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #2252.

31. **Estrada PR**, Durisen RH, and Charnoz S (2019). Inward Radial Drift of Material from Angular Momentum Loss Due to Ballistic Transport in Saturn's Rings: Implications for Observed Mass Loss Rates and Remaining Ring Lifetime. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.3236.

32. **Fenton, L. K.**, Gullikson, A. L., Hayward, R. K., Charles, H., Titus, T. N. (2019). The Mars Global Digital Dune Database (MGD^3): Composition and stability, *Lunar and Planetary Science Conference L*, 18-22 March, The Woodlands, TX, USA, Abst. #1115, https://www.hou.usra.edu/meetings/lpsc2019/eposter/1115.pdf.

33. Greer, J., Heck, P. R., Boesenberg, J., Bouvier, A., Caffee, M. W., Cassata, W., Corrigan, C., Davis, A. M., Davis, D., Fries, M., Hankey, M., **Jenniskens, P.,** Schmitt-Kopplin, P., Sheu, S., Trappitsch, R., Velbel, M., Weller, B., Welten, K., Yin, Q.-Z., Sanborn, M. E., Ziegler, K., Rowland, D., Verosub, K. L., Zhou, Q., Lin Y., Tang, G. Q., Li, Q.-L., Li, X.-H., 2019. Hamburg: A pristine H4 chondrite fall. LPSC Abstract i.d. #1638.

34. Grunblatt S, **Huber D**, Gaidos E, and Lopez ED (2019). Planetary Archaeology: A Search for Transiting Planets Orbiting Evolved Stars with K2. AAS Meeting #233, id.#327.02.

35. Gross C, **JL Bishop**, J Carter, B Horgan, D Loizeau, et al. (2019). Investigating fractured phyllosilicate-rich deposits at Mawrth Vallis, Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #1517.

36. Grundy WM, Binzel RP, Britt DT, Buie MW, Cook JC, et al., including **Dalle Ore CM** (2019). 486958 2014 MU69 Ultima Thule Surface Composition Overview. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2473.

37. **Gulick V.C.** and **Glines N.H.** 2019. Gully Formation on the Central Peak of Lyot Crater: Implication for a Late Paleo Microclimate. NASA Ames Space Science and Astrobiology Seventh Annual Jamboree, April 9, 2019, abstract # PS.3, pg.44.

38. **Harman, PK,** Chen, W, Friedman, W et al, (2019 Girl Scout Space Science Badges for Daisies, Brownies and Juniors, *233rd AAS Meeting,* abstract 147.10 **.**

39. Hartlep T, Cuzzi JN, and **Umurhan OM** (2019). Planetesimal Formation in the Outer Nebula in the Presence of Turbulence. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.3044.

40. Hedges, C., Saunders, N., **Coughlin, J. L.**, Barentsen, G., Gully-Santiago, M., Cody, A. M., Cardoso, J. V. de M. and Dotson, J. (2019) A Transiting Hot Jupiter Candidate toward the Galactic Center Identified in the Kepler/K2 Campaign 9 Microlensing Survey, Research Notes of the American Astronomical Society, 3, 18, https://dx.doi.org/10.3847/2515-5172/aaff6f

41. Hedges CL, Barentsen G, Dotson J, Gully-Santiago M, **Cody AM**, and Saunders N (2019). Are there any more planets in the Kepler / K2 data? AAS Meeting #233, id.#405.02.

42. Hiroi T, Milliken R, Robertsen KM, Kaiden H, Misawa K, et al., including **Takir D** (2019). Gaussian Deconvolution of the 2.7-Micron Band of Hayabusa2/NIRS3 Spectrum of Asteroid Ryugu - Possibly a Heavily Space-Weathered CM Chondrite Body. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1129.

43. Honniball CI, Lucey PG, Kaluna HM, LI S, **Takir D**, et al. (2019). Diurnal Variations of Lunar Surface Water from Groundbased Telescopic Observations. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2076.

44. Horst SM, Parker AH, Howett CA, and **Ryan EL** (2019). Monitoring Titan's Atmospheric Activity with Kepler/K2. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.3152.

45. **Huber D** (2019). What is left to learn about Kepler/K2 planet host stars? AAS Meeting #233, id.#405.03.

46. Iglesias-Marzoa, R., Arévalo, M. J., López-Morales, M., Torres, G., Lázaro, C. and **Coughlin, J.** (2019) Physical parameters of the low-mass eclipsing binary NSVS 10653195, Highlights on Spanish Astrophysics X, 411-411.

47. **Jenniskens, P., 2019.** Review of asteroid-family and meteorite-type links. In: A century of asteroid families. J. Masseido, ed., IAU Transactions (in press).

48. **Jin, M.,** Liu, W., Cheung, M., Nitta, N., Manchester, W.B. et al. "Global Magnetohydrodynamics Simulation of EUV Waves and Shocks from the X8.2 Eruptive Flare on 2017 September 10", *Flux Emergence Workshop, Tokyo, Japan, March 18-22, 2019*

49. **Jin, M.**, Petrosian, V., Liu, W., Nitta, N. V., Omodei, N., Rubio da Costa, F., Effenberger, F., Li, G., Pesce-Rollins, M., Allafort, A., & Manchester, W. B. "Probing the Puzzle of Behind-the-Limb Gamma-ray Flares: Data-driven Simulations of Magnetic Connectivity and CME-driven Shock Evolution", *SWMF Users Meeting, Ann Arbor, MI, March 4-6, 2019.*

50. **Johnsen T.K**. and **Gulick V.C.** 2019. Artificial Intelligence to Classify Minerals and Rocks with Raman and Infrared Spectra and Image Analysis. NASA Ames Space Science and Astrobiology Seventh Annual Jamboree, April 9, 2019, abstract # PS.5, pg. 47.

51. Korycanksy DG and **Umurhan OM** (2019). Convection in Titan Lakes: Flux-Driven with Time-Dependent Upper Boundary Condition. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1688.

52. Kraus AL, Dupuy T, Ireland M, Mann A, **Huber D**, and Rizzuto AC (2019). The Perilous Lives of Planets in Binary Star Systems. AAS Meeting #233, id.#247.29.

53. Langenkamp, T.R., **Gulick, V.C.** and **Glines N.H.** 2019. Geomorphic Analysis of Martian Gullies in Western Asimov Crater. LPSC, Abstract # 3224.

54. Lisse CM, Singer KN, Fernandez YR, Bauer JM, Protopapa S, et al., including **Umurhan OM** (2019). Comets Sourced by KBOs - Comparison of SFDs Derived from Spitzer/Wise JFC Imaging and Pluto and Charon KBO Cratering Rates. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2865.

55. Lopez-Oquendo AJ, Rivera-Valentin EG, **Dalle Ore CM**, Kirchoff MR, Nichols-Fleming F, and Long CJ (2019). Constraints on Crater Formation Ages on Dione from Cassini VIMS and ISS. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2435.

56. Lucchetti A, Pajola M, **Dalle Ore CM**, Galluzzi V, Stephan K, et al. (2019). Geological and Compositional Analysis of Ganymede's Melkart Impact Crater. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2324.

57. Matsuoka M, Nakamura T, Hiroi T, Kitazako K, Iwata T, et al., including **Takir D** (2019). Infrared Spectra of Asteroid Ryugu: Comparison to Laboratory-Measured Carbonaceous Chondrites. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1534.

58. McKinnon WB, Stern SA, Weaver HA, Spencer JR, Buie MW, et al., including **Umurhan OM** (2019). A Pristine "Contact Binary" in the Kuiper Belt: Implications from the New Horizons Encounter with 2014 MU69 ("Ultima Thule"). 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2767.

59. **Mighell, K**. and **Coughlin, J.** (2019) A Data Visualization and Manipulation Tool to Improve the Scientific Return of Kepler/K2 Short-Cadence Light Curves, American Astronomical Society Meeting Abstracts #233, 233, 445.04.

60. Miura JK, **JL Bishop**, JM Danielsen, AM Sessa, Y Itoh, M Parente, JJ Wray & GA Swayze (2019). Spectral properties of alunite-kaolinite mixtures and detection of these minerals at Mawrth Vallis. *Lunar Planet. Sci. Conf. XLX*, Abstract #2576.

61. Moore JM, McKinnon WB, Spencer JR, Stern SA, Binzel RP, et al., including **Umurhan OM** (2019). The Geology of 2014 MU69 ("Ultima Thule"): Initial Results from The New Horizons Encounter. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2152.

62. **Mullally, S. E.,** Kostov, V., Quintana, E., **Coughlin, J.,** Mullally, F., Barclay, T., Schlieder, J., Burke, C. and Colon, K. (2019) A Uniformly Vetted Catalog of K2 Transit Signals with DAVE, American Astronomical Society Meeting Abstracts #233, 233, 405.08

63. Mullally, F., **Coughlin, J**., **Mullally, S.,** Barclay, T., Barentsen, G., Burke, C. J., Colón, K. D. and Quintana, E. V. (2019) DAVE: Discovery And Vetting of K2 Exoplanets, Astrophysics Source Code Library, ascl:1903.012.

64. Nakamura T, Matsuoka M, Amano K, Kobayashi S, Mita H, et al., including **Takir D** (2019). ossible Interpretations of Visible/Near-Infrared Spectra of Asteroid Ryugu Obtained by the Hayabusa2 Mission. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1681.

65. Naor R., **Gulick V.**, and **Glines N.** 2019. Subsurface Volume Loss and Collapse Due to Surface Infiltration of Catastrophic Floods, The Case of Osuga Cavi, Mars. NASA Ames Space Science and Astrobiology Seventh Annual Jamboree, April 9, 2019, abstract # PS.6, pg. 48.

66. Pascucci I, Banzatti A, Fang M, Edwards S, and **Gorti U** (2019). Mass loss rates and MHD-driven disk winds traced by optical forbidden lines. American Astronomical Society Meeting Abstracts #233 233, #317.01.

67. Peeters E, Andrews H, Tielens AGGM, and Okada Y (2019). Whipping IC63/IC59. AAS Meeting #233, id.#466.03.

68. Perlman, E.S., Clautice, D., Cara, M. and additional coauthors including **Sparks, W.B**., 2019, AAS HEAD meeting, 17, 106.24, *Unraveling the physics of quasar jets using HST polarimetry*

69. Perrin SL, **JL Bishop** & AM Sessa (2019). Analysis of unique martian sulfate outcrops based on samples from the Painted Desert Sulfate Hill analog site and lab mixtures. *Lunar Planet. Sci. Conf. XLX*, Abstract #1903.

70. Perrin SL, **JL Bishop** & L Gruendler (2019). Investigation of altered volcanic material from the Polihua Trail site on Lāna'i as an analog for Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #3158.

71. Phillips, M., Moersch, J., **Cabrol, N., Warren-Rhodes, K.**, Hinman, N. (2019). Habitat Detection and Identification at Salar de Pajonales, a Mars Analog Environment. *Goldschmidt 2019 Conference*, Barcelona, 18-23 August, 2019.

72. Porter SB, Bierson CJ, **Umurhan OM**, Beyer RA, Lauer TA, et al. (2019). A Contact Binary in the Kuiper Belt: The Shape and Pole of (486958) 2014 MU69. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1611.

73. Primm, K, D Stillman, **TI Michaels**. (2019). Quantifying Daily Brine Phase-Evolution on Mars using Thermochemical Modeling, *Astrobiology Science Conference.*

74. Prtopapa S, Grundy WM, Olkin CB, Howett CJA, Parker AH, et al., including **Dalle Ore CM** (2019). Comparing Ultima Thule with Comet Nuclei: Colors and Composition. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2732.

75. Putzig, N. E., Diniega, S., Byrne, S., Calvin, W. M., Dundas, C. M., **Fenton, L. K.**, Hayne, P. O., Hollibaugh Baker, D. M., Holt, J. W., Hvidberg, C. S., Kahre, M. A., Mischna, M. A., Morgan, G. A., Oehler, D. Z., Portyankina, G., Rogers, A. D., Sizemore, H. G., Smith, I. B., Soto, A., Tamppari, L. K., Titus, T. N., Webster, C. R. (2019). Results from the Ice and Climate Evolution Science Analysis Group (ICE-SAG), *Lunar and Planetary Science Conference L,* 18-22 March, The Woodlands, TX, USA, Abst. #2035, https://www.hou.usra.edu/meetings/lpsc2019/eposter/2035.pdf.

76. **Rho J**, Beball T, Banerjee D, Dessart L, Evans N, and Joshi V (2019). Near-Infrared Spectroscopy Of Sn 2017eaw: Carbon Monoxide And Dust Formation In A Type Ii-P Supernova. Aas Meeting #233, Id.#335.02.

77. Riu L, Kitazako K, Milliken R, Abe M, Ohtake M, et al., including **Takir D** (2019). Global View of the Mineralogy and Surface Properties of the Asteroid Ryugu Using NIRS3 Near-Infrared Spectrometer on Board Hayabusa2. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1154.

78. Rivera-Valentin, EG, and 13 colleagues including **Busch, MW**, 2019. Radar and near-infrared characterization of near-Earth asteroid (163899) 2003 SD220. LPSC, Abstract #3016.

79. **Rummel, JD** (2019). Selling Lunar Resources for Fun, Profit, and Export: A Test That the OST Cannot Pass? Microsymposium 60, The Woodlands, Texas, 16 March 2019.

80. Saunders N, Barentsen G, Hedges CL, Gully-Santiago M, **Cody AM**, and Dotson J (2019). Exoplanet Science with the Lightkurve Python Package. AAS Meeting #233, id.#445.02.

81. Scipioni F, **Dalle Ore CM**, Grundy WM, Cruikshank DP, Cook JC, et al. (2019). Ultima Thule, TNOs ,and the Irregular Satellites of the Outer Planets: Spectroscopic and Color Comparison. 50th LPSC Meeting, held 18-22 March, The Woodlands, TX, id.2843.

82. Schenk P, Beyer RA, Beddingfleid CB, Bierson CJ, Moore JM, et al., including **Umurhan OM** (2019). Topography of Ultima Thule (2014 MU69) at Local Scales: Surface Evolution of a Small Primitive Body. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2934.

83. **Showalter MR** et al. Potential Implications of the Shape of 2014 MU69 for Interpreting Other KBO Lightcurves. 50th Lunar and Planetary Science Conference, LPI Contribution No. 2132, id. 2132, 2019. https://www.hou.usra.edu/meetings/lpsc2019/pdf/2132.pdf

84. **Simpson JP**, Kaufman M, Colgan S, **Cotera A**, and Stolovy S (2019). SOFIA FIFI-LS Observations of the PDR in Sgr B1. AAS Meeting #233, id.#256.09.

85. Singer KN, McKinnon WB, Spencer JR, Weaver HA, Lauer TR, et al., including **Umurhan OM** (2019). Impact Craters on 2014 MU69: Implications for the Geologic History of MU69 and Kuiper Belt Population Size-Frequency Distributions. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2239.

86. **Sobron P.**, Fahey M., Krainak M., Misra A., Rehnmark F., Wang A., Yu A., Zacny K., and Zeigler R. A. (2019) Redeployable Sensor Probe for In-situ Lunar Resource Mapping from Small Landers. In: Lunar Planet. Sci. Conf. XLX, Abstract #2749.

87. **Sobron P.**, Barge L. M., Davila A., Fahey M., Krainak M., Rehnmark F., Yu A., and Zacny K. (2019) Programmable Raman Sensing for In-Situ Planetary Exploration. In: Lunar Planet. Sci. Conf. XLX, Abstract #2760.

88. **Summers, DP.**, A. Ricco, A. Colaprete, and N. Bramall (2019). Development of a Digital Micromirror Device Array for IR Spectrometers for Planetary Missions. The Sixth Annual ARC Space Science & Astrobiology Jamboree.

89. **Summers, DP.,** R. C. Quinn, V. C. Gulick and Jason Angell. Mid-IR Spectroscopy of Perchlorates. The Sixth Annual ARC Space Science & Astrobiology Jamboree.

90. **Takir D**, Neumann W, Emery JP, and Raymond SN (2019). 3-μm Reflectance Spectroscopy of Outer Main Belt Asteroids: Context and Implications. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2906.

91. **Takir D**, Stockstill-cahill KR, Hibbitts CA, and Nakauchi Y (2019). 3-μm Reflectance Spectroscopy of Carbonaceous Chondrites Under Asteroid-Like Conditions. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2056.

92. Tebes-Cayo, C., Rodriguez, C., Demergasso, C.. Chong, G., Parro, V., Sánchez-García, L., Carrizo, D., Hinman, N., **Warren-Rhodes, K**., **Cabrol, N.** (2019). Microbial Participation on the Formation and Preservation of Gypsum Structures from Salar de Pajonales, Northern Chile, *Astrobiology Science Conference 2019*, Seattle, 24-29 June, 2019.

93. Teodoro LFA, Kegerreis JA, **Estrada PR**, Cuzzi JN, Eke V, Massey RJ and **Cuk M** (2019). The Origin of Saturn's Rings Revisited. 50th LPSC Meeting, held 18-22 March, The Woodlands, TX, id.2802.

94. Tirsch D, **JL Bishop**, CE Viviano, D Loizeau, LL Tornabene, et al. (2019). The effects of aqueous processes and impacts on mineral alteration and weathering in Libya Montes and Tyrrhena Terra, Mars. *Lunar Planet. Sci. Conf. XLX*, Abstract #1532.

95. Turtelboom E and **Cody AM** (2019). Stellar Rotation in the M35 Open Cluster Using K2 Data. AAS Meeting #233, id.#249.10.

96. **Twicken**, **J.D., D.A. Caldwell**, M.D. Davies, J.M. Jenkins, **J. Li, R.L. Morris**, M.E. Rose, **J.C. Smith**, **P. Tenenbaum**, E.B. Ting, **B. Wohler**, (2019) TESS SPOC Pipeline Data Validation Products: Now Available at MAST", AAS Meeting #233, 140.03.

97. **Umurhan OM**, Kavelaars JJ, Cuzzi JN, McKinnon WB, Lyra W, et al., including **Estrada PR** (2019). Ultima Thule: Possible Gravitational Collapse Scenarios for its Origin. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2809.

98. Usabal GS, **JL Bishop**, JM Danielsen, Y Itoh, M Parente et al. (2019). Characterization of jarosite-bearing outcrops northwest of Mawrth Valles. *Lunar Planet. Sci. Conf. XLX*, Abstract #2234.

99. Vaquero M, Senent J, and **Tiscareno MS** (2019). A Titan gravity-assist technique for ballistic tours skimming over the rings of Saturn. 29th AAS/AIAA Space Flight Mechanics Meeting, Ka'anapali HI.

100. Verbiscer AJ, Porter SB, Benecchi SD, Kavelaars JJ, Weaver JA, et al., including **Dalle Ore CM** (2019). New Horizons Observations of Distant Kuiper Belt Objects: Rotational and Solar Phase Curves of (486958) 2014 MU69 and Other Cold Classical KBOs. 50th LPSC Meeting, held 18-22 March, The Woodlands, TX, id.2959.

101. Vernazza, Pierre, Carry, Benoit, Marsset, Michael, Hanus, Josef, Viikinkoski, Matti, including **Marchis, Franck**, (2019). ESO/VLT/SPHERE Survey of D>100km Asteroids (2017-2019): First Results, *American Astronomical Society*, DPS meeting #50, id.404.05.

102. Walroth, R. C., Blake, D. F., Sarrazin, P., **Marchis, F**. and Thompson, K. (2019) MapX: An In-Situ Mapping X-Ray Fluorescence Instrument for Detection of Biosignatures and Habitable Planetary Environments, Lunar and Planetary Science Conference, 1616

103. **Warren-Rhodes, K., Cabrol, N.,** Hinman, N., Tebes-Cayo, C., Rodriguez, C., Phillips, M. Demergasso, C., Chong, G., Moersch, J., Cady, S., Sobron, P., and the **SETI NAI Team** (2019). Landscape Ecology of Photosynthetic Communities in the Mars Analog Salar de Pajonales, Chile. *Astrobiology Science Conference 2019*, Seattle, 24-29 June, 2019.

104. Weaver HA, Stern SA, Britt DT, Buratti BJ, Cheng AF, et al., including **Umurhan OM** (2019). Comparing (486958) 2014 MU69 to Cometary Nuclei: Shapes and Surfaces. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2982.

105. Weitz CM, **JL Bishop** & JA Grant (2019). Analysis of clay deposits in and around Ladon Basin and Ladon Valles. *Lunar Planet. Sci. Conf. XLX*, Abstract #1929.

106. Zangari AM, Beddington CB, Benecchi SD, Beyer RA, Bierson CJ, et al., including **Umurhan OM** (2019). The Mysterious Missing Light Curve of (486958) 2014 MU69, a Bi-Lobate Contact Binary Visited by New Horizons. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.3007.

Technical Reports & Data Releases

1. Airapetian, V. S., Adibekyan, V., Ansdell, M., Alexander, D., Bastian, T., et al., including **Jin, M**., **Kalas, P**. (2019) Reconstructing Extreme Space Weather from Planet Hosting Stars, Science white paper submitted to the Astro 2020 Decadal Survey on Astronomy and Astrophysics arXiv e-prints, https://arxiv.org/abs/1903.06853

2. Bennett, D. P., Akeson, R., Alibert, Y., Anderson, J., Bachelet, E., et al., including **Mullally, S**. (2019) Wide-Orbit Exoplanet Demographics, Science white paper submitted to the Astro 2020 Decadal Survey on Astronomy and Astrophysics, arXiv e-prints, https://arxiv.org/abs/1903.08187

3. Bretch, A., T. Bristow, DJ. Des Marais, E. Noe Dobrae, R. Elphic, J. Heldmann, J. Hollingsworth, M. Kahre, A. Kling, J. Moore, K. Steakley, C. Stoker, **O. Umurhan**, and **O. White** (2019). White Paper: *Planet Modeling: Atmospheres, Climate, and Landforms Strategic Plan Update*, NASA Ames.

4. Carry, B.; Vachier, F.; Berthier, J.; et al. , including **Marchis, Franck**, March 2019, *VizieR On-line Data Catalog*: J/A+A/623/A132. Originally published in: 2019A&A...623A.132C, (2019).

5. **Cody AM** and Hillenbrand LA (2019). VizieR Online Data Catalog: K2 Campaign 2: young disk-bearing stars in Sco & Oph (Cody+, 2018). VizieR On-line Data Catalog: J/AJ/156/71.

6. Fausnaugh, M., CJ. Burke, **DA. Caldwell**, JM. Jenkins, **JC. Smith**, **Joseph D. Twicken**, R. Vanderspek, JP. Doty, **J. Li**, Eric B. Ting, and JS. Villasenor (2019). TESS Data Release Notes:
   DRN2, Sector 2, NASA/TM—2018–220057, March 27, 2019
   DRN3, Sectors 1-2, NASA/TM—2019–220168, February 6, 2019
   DRN4, Sector 3, NASA/TM—2018–220181, February 4, 2019
   DRN5, Sector 4, NASA/TM—2018–220167, February 6, 2019
   DRN6, Sectors 1-3, NASA/TM—2019–220180, February 4, 2019
   DRN7, Sector 5, NASA/TM—2019–220048, February 27, 2019
   DRN8, Sector 6, NASA/TM—2019–220166, February 27, 2019
   DRN9, Sector 7, NASA/TM—2019–220170, March 11, 2019

7. Fetick, R. J.; Jorda, L.; Vernazza, P.; et al. including **Marchis, Franck**, February 2019. *VizieR On-line Data Catalog*: J/A+A/623/A6. Originally published in: 2019A&A...623A...6F, (2019).

8. iMOST (2018). *The Potential Science and Engineering Value of Samples Delivered to Earth by Mars Sample Return*, (co-chairs DW Beaty, MM Grady, HY McSween, E Sefton-Nash; documentarian BL Carrier; plus 66 co-authors including **JL Bishop, JA Spry**), 186 p. White Paper. Posted August, 2018 by MEPAG at https://mepag.jpl.nasa.gov/reports.cfm.

9. Marley, M., Lewis, N., Arney, G., Bailey, V., Batalha, N., et al., including **Freedman, R.** (2019) Imaging Cool Giant Planets in Reflected Light: Science Investigations and Synergy with Habitable Planets, Science white paper submitted to the Astro 2020 Decadal Survey on Astronomy and Astrophysics. arXiv e-prints, https://arxiv.org/abs/1903.09322

10. Pinsonneault MH, Elsworth YP, Tayar J, Serenelli A, Stello D, et al., including **Huber D** (2019). VizieR Online Data Catalog: APOKASC-2 catalog of Kepler evolved stars (Pinsonneault+, 2018). VizieR On-line Data Catalog: J/ApJS/239/32.

11. **Simpson JP** (2019). VizieR Online Data Catalog: Spitzer/IRS observations of the Galactic Center (Simpson, 2018). VizieR On-line Data Catalog: J/ApJ/857/59.

12. Youngblood, A., France, K., Koskinen, T., Fossati, L., Amerstorfer, U., et al., including **Jin, M.** (2019) EUV influences on exoplanet atmospheric stability and evolution, Science white paper submitted to the Astro 2020 Decadal Survey on Astronomy and Astrophysics arXiv e-prints, arXiv:1903.05718, https://dx.doi.org/

13. Youngblood, A., Drake, J., Mason, J., Osten, R., **Jin, M.,** et al. (2019) EUV observations of cool dwarf stars, Science white paper submitted to the Astro 2020 Decadal Survey on Astronomy and Astrophysics , arXiv e-prints, https://arxiv.org/abs/1903.05719

Popular Articles/Web Stories/ Other Media / Interviews

1. **Beyer RA** (Jan/23). *NASA discovers fresh 'blast pattern' on Mars*, Web story picked up from an image caption I wrote. https://www.cnet.com/news/nasa-discovers-fresh-blast-pattern-on-mars/

Also:
https://www.foxnews.com/tech/mars-blast-stunning-new-impact-crater-spotted-on-the-red-planet
https://www.ibtimes.com/nasa-captures-stunning-new-impact-crater-mars-amid-mars-mission-announcements-photos-2756575

2. **Beyer RA** (Feb/05). *Charon's icy surface erupted from an underground ocean*, story based on my recent paper. http://www.astronomy.com/news/2019/02/charons-icy-surface-erupted-from-an-underground-ocean

   Also:
   http://blogs.discovermagazine.com/d-brief/2019/02/05/charons-underground-ocean-flooded-into-ancient-plains/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A%20DiscoverBlogs%20%28Discover%20Blogs%29#.XL4ihRIrLqg

3. **Busch MW** (2019 April 3). Interview with Marina Koren, staff writer at *The Atlantic*, as part of Koren's visit to the Institute (other SETI Institute staff also interviewed) – article pending.

4. **Cabrol, NA.** Feb. 21. Interview with Guillaume Grallet of the French Magazine *Le Point* in preparation of an article and a portrait to be published mid-April.

5. **Cabrol, NA.** Feb. 25. The Journey of a Lifetime to the Red Planet (about the end of the MER mission): https://www.seti.org/journey-lifetime-red-planet

6. **Cabrol, NA.** March 5. Interview with *El Mercurio* (Chile) in preparation for the Puerto de Ideas Festival in Antofagasta (April 12-15, 2019).

7. **Cabrol, NA., Doyle, L., Richards, J., Shostak, S., Siemion, A.** March 10. In: Who is Out There? *National Geographic* March issue. https://www.nationalgeographic.com/magazine/2019/03/extraterrestrial-life-probably-exists-how-do-we-search-for-aliens/

8. **Cabrol, NA, K. Warren-Rhodes**. March 11. Rover digs on Earth for clues to life on Mars, Space.com, Phys.org, CNN, MIT Technology Review, Breitbart/UPI.

   https://phys.org/news/2019-02-clues-martian-life-chilean.html
   https://edition.cnn.com/2019/02/28/world/nasa-rovers-atacama-desert-scn/index.html
   https://www.technologyreview.com/s/613047/the-discovery-of-desert-dead-zones-desert-could-help-find-life-on-mars/

   https://www.upi.com/Science_News/2019/02/28/NASA-rover-finds-life-in-subsurface-soil-collected-from-Mars-like-Atacama-

desert/4221551384071/?upi_ss=nathalie+cabrol
https://www.space.com/digging-mars-life-strategy-atacama-desert.html

9. **Cabrol, NA.** March 13. Meeting with Marina Koren, *The Atlantic* – article pending.

10. **Cabrol, NA.** April 10. *Wall Street Journal*: A Researcher's Hunt for Extraterrestrial Intelligence. https://www.wsj.com/articles/a-researchers-hunt-for-extraterrestrial-intelligence-11554907706?mod=searchresults&page=1&pos=1

11. **Harman, P.** AAA Evaluation web feature https://www.seti.org/seti-institutes-airborne-astronomy-ambassadors-program-enhances-stem-learning-engagement-high

12. **Harman, PK**. NASA AAA Cycle 7 selection announcement, Press Release and news
    - https://www.seti.org/high-school-science-teachers-named-airborne-astronomy-ambassadors-will-fly-nasas-sofia-aircraft
    - https://www.nasa.gov/feature/high-school-science-teachers-will-fly-on-sofia
    - https://www.fcps.net/site/default.aspx?PageType=3&DomainID=4&ModuleInstanceID=7575&ViewID=6446EE88-D30C-497E-9316-3F8874B3E108&RenderLoc=0&FlexDataID=32793&PageID=1
    - https://mynews4.com/news/local/two-wcsd-teachers-chosen-to-become-nasa-airborne-astronomy-ambassadors
    - https://www.kolotv.com/content/misc/Two-WCSD-teachers-selected-for-NASA-program-507301671.html
    - https://www.kolotv.com/video?vid=507233372
    - https://www.kolotv.com/content/news/Two-WCSD-teachers-selected-for-NASA-program-507219731.html
    - http://www.ktvn.com/clip/14784508/nasa-teachers
    - http://www.ktvn.com/story/40144732/two-wcsd-teachers-chosen-to-become-nasa-airborne-astronomy-ambassadors
    - https://www.washoeschools.net/site/default.aspx?PageType=3&ModuleInstanceID=2000&ViewID=7b97f7ed-8e5e-4120-848f-a8b4987d588f&RenderLoc=0&FlexDataID=31583&PageID=1
    - http://www.cobbk12.org/Wheeler/High%20School%20Science%20Teachers%20Named%20Airborne%20Astronomy%20Ambassadors%20%20Will%20Fly%20on%20NASAs%20SOFIA%20Aircraft.pdf
    - https://www.eastcobbnews.com/wheeler-science-teacher-named-nasa-airborne-astronomy-ambassador/
    - http://cobbcast.cobbk12.org/?p=26952
    - https://www.ajc.com/news/local/cobb-teachers-named-nasa-astronomy-ambassadors/zSbz4Un70OAucGVAQAwwMO/
    - www.gpb.org/blogs/education-matters/2019/02/28/georgia-high-school-science-teachers-will-fly-on-sofia

- http://www.wtvm.com/2019/03/01/two-columbus-teachers-names-nasa-ambassadors/
- https://muscogee.k12.ga.us/News/Article/2194/District_Partners_with_SETI_Institute_Two_teachers_named
- https://www.kentuckyteacher.org/bulletin-board/announcements/2019/03/two-fayette-teachers-selected-for-nasas-airborne-astronomy-program/
- https://www.fcps.net/site/default.aspx?PageType=3&DomainID=4&ModuleInstanceID=7575&ViewID=6446EE88-D30C-497E-9316-3F8874B3E108&RenderLoc=0&FlexDataID=32793&PageID=1
- https://twitter.com/NISD/status/1100450080312696832?s=09
- https://twitter.com/NISDSTEVENS/status/1100756723806150656?s=09
- https://twitter.com/CipressaSATX/status/1100458400259940352?s=09
- https://www.facebook.com/68268644725/posts/10157206755879726/?sfnsn=mo
- https://m.facebook.com/story.php?story_fbid=10101410214450864&id=13301640&sfnsn=mo
- https://nisd.net/news/articles/79481

13. **Jenniskens, P.**

- Dark Skies for 2019's Quadrantid Meteors: *EarthSky* https://earthsky.org/astronomy-essentials/everything-you-need-to-know-quadrantid-meteor-shower
- Southern Hemisphere Meteor Outburst: https://www.seti.org/southern-hemisphere-meteor-outburst
- NASA Traced a Meteorite Back to its Original Home in Deep Space: *New Scientist* https://www.newscientist.com/article/2199519-nasa-traced-a-meteorite-back-to-its-original-home-in-deep-space/
- Meteorite Source in Asteroid Belt Not a Single Debris Field: *Phys.org* https://phys.org/news/2019-02-meteorite-source-asteroid-belt-debris.html
- Julian Nott (1944-2019): https://www.seti.org/julian-nott-1944-2019
- Turkish Meteorite Traced to Impact Crater on Asteroid Vesta: https://www.seti.org/press-release/turkish-meteorite-traced-impact-crater-asteroid-vesta
- Turkish Meteorite Traced to Impact Crater on Vesta: *Space Daily* http://www.spacedaily.com/reports/Turkish_Meteorite_Traced_to_Impact_Crater_on_Vesta_999.html

14. **Marchis, F.**

- Revealing the true Nature of Asteroids https://www.eso.org/public/switzerland fr/blog/true-nature-of-asteroids/?lang

- As the Shutdown Persists, Here Are 5 Ways It Will Impact Science: *Scientific American* https://www.scientificamerican.com/article/as-the-shutdown-persists-here-are-5-ways-it-will-impact-science/
- Astronomers Traverse the Globe to Shadow "Lucky Stars": *Scientific American* https://www.scientificamerican.com/article/astronomers-traverse-the-globe-to-shadow-lucky-stars/
- Calling Exogeophysicists to Solve the Mystery of Super-Earths https://seti.org/calling-exogeophysicists-solve-mystery-super-earths
- SETI Institute signs MOU with Unistellar to develop and enhance a citizen science network https://www.seti.org/press-release/seti-institute-signs-mou-unistellar-develop-and-enhance-citizen-science-network
- Unistellar Raises €2.1 Million For Its Revolutionary Digital Telescope https://unistellaroptics.com/unistellar-raises-e2-1-million-for-its-revolutionary-digital-telescope/
- 2019 SPIE Startup Challenge Semi-Finalists to Showcase Photonics Innovations in Healthcare, Lasers, Wearables, IoT: AP

15. **Schultze-Makuch, D.**: *Smithonian* https://www.airspacemag.com/author/dirk-schulze-makuch/

16. SETI Institute and Wettergreen, D., **Cabrol, N.**, **Warren-Rhodes, K.** CMU's Zöe Rover Shows Robots Can Find Subterranean Organisms. SETI Institute News Release, March 1 2019. https://www.seti.org/cmus-zoe-rover-shows-robots-can-find-subterranean-organisms

17. **Shostak, S.** "Why our galaxy probably isn't full of alien civilizations killed off by climate change," NBC News, Jan 9, 2019. https://www.nbcnews.com/mach/science/why-our-galaxy-probably-isn-t-full-alien-civilizations-killed-ncna956096

18. **Shostak, S.** "Zoo Hypothesis may explain why we haven't seen any space aliens," NBC News, March 31, 2019. https://www.nbcnews.com/mach/science/zoo-hypothesis-may-explain-why-we-haven-t-seen-any-ncna988946

19. **Showalter MR** (2/20) was interviewed for numerous stories about the Nature article discussing the discovery of Hippocamp, Neptune's 7th inner moon. More than 300 news articles covered the result, and the story was read by more than 300 million people according to the web metrics compiled by Space Telescope Science Institute. Here is a list of the interviews:
    - NASA press release, https://solarsystem.nasa.gov/news/854/tiny-neptune-moon-may-have-broken-from-larger-moon/
    - Sarah Kaplan, Washington Post, https://www.washingtonpost.com/science/2019/02/20/tiny-new-moon-discovered-around-neptune/?utm_term=.eec83bae26bc
    - Shannon Hall, New York Times, https://www.nytimes.com/2019/02/20/science/neptune-moon-hippocamp.html

- Marcia Dunn, Associated Press, https://www.apnews.com/a5666e12f86745468877d42e5965683a
- Nadia Drake, National Geographic, https://www.nationalgeographic.com/science/2019/02/meet-hippocamp-newest-known-moon-neptune-hubble-space
- Lisa Grossman, New Scientist, https://www.newscientist.com/article/2194049-neptunes-smallest-moon-keeps-getting-smashed-up-and-resurrected-again/
- Kelly Beatty, Sky and Telescope, https://www.skyandtelescope.com/astronomy-news/meet-hippocamp-neptunes-smallest-moon/
- Teresa Serafim, Publico (Portuguese newspaper), https://www.publico.pt/2019/02/20/ciencia/noticia/hipocampo-lua-neptuno-1862687
- John Wenz, Popular Mechanics, https://www.popularmechanics.com/space/solar-system/a26395367/new-moon-neptune-hubble-hippocamp/
- Loren Grush, The Verge, https://www.theverge.com/2019/2/20/18233029/neptune-moon-hippocamp-proteus-hubble-space-telescope
- Mohamed Mansour, Egyptian science journalist
- Liam Mannix, Sydney Morning Herald, https://www.smh.com.au/national/it-s-black-tiny-and-far-away-how-was-neptune-s-phoenix-moon-found-20190220-p50z11.html
- Ian Sample, The Guardian, https://www.theguardian.com/science/2019/feb/20/scientists-build-picture-of-super-fast-mini-moon-of-neptune
- Michael Wall, Space.com, https://www.space.com/neptune-smallest-moon-hippocamp-named.html
- Korey Haynes, Discover Magazine, http://blogs.discovermagazine.com/d-brief/2019/02/20/meet-neptunes-new-moon-hippocamp/#.XLik0C-ZPUI
- Deborah Netburn, LA Times, https://www.latimes.com/science/sciencenow/la-sci-sn-new-neptune-moon-20190220-story.html
- Ashley Strickland, CNN, https://www.cnn.com/2019/02/20/world/neptune-new-moon/index.html
- George Dvorsky, Gizmodo, https://gizmodo.com/unknown-moon-detected-in-orbit-around-neptune-1832755887
- Harry Pettit, The Sun
- Russell Kahn, News-O-Matic, the Daily News Just for Kids
- Ganzalo López Sánchez, ABC Spanish newspaper, https://www.abc.es/ciencia/abci-descubren-hipocampo-nueva-luna-planeta-neptuno-201902201945_noticia.html
- Genell Weule, Australian Broadcasting Corp, https://www.abc.net.au/news/science/2019-02-21/hippocamp-neptunes-14th-moon-confirmed/10824936
- Adam Rosser, Radio 5 UK, on-air interview
- Amado Herrero, El Mundo, Spanish newspaper

- David Freeman, NBC News, https://www.nbcnews.com/mach/science/new-moon-discovered-circling-neptune-spotlights-solar-system-s-violent-ncna973941
- Alec Forssmann, National Geographic Spain, https://www.nationalgeographic.com.es/ciencia/actualidad/hipocampo-pequena-luna-neptuno-es-antiguo-fragmento-luna-proteo_13923
- Else Velasco, La Vanguardia, Spain, https://www.lavanguardia.com/ciencia/fisica-espacio/20190220/46599062920/descubierta-extrana-luna-neptuno-hipocampo-hubble.html
- Andy Roberts, YouTube science videos, https://youtu.be/Qu72xUGxOxg

20. **Tiscareno MS** was interviewed for and quoted (with reference to the SETI Institute) in the article "How long is a day on Saturn? Astronomers just found out," which appeared in National Geographic on 1/24/19.

21. **Tiscareno MS** was interviewed for and quoted (with reference to the SETI Institute) in the article "A crew of mini-moons that sculpts Saturn's rings," which appeared in the New York Times on 3/28/19.

22. **Tiscareno MS** was interviewed for and quoted (with reference to the SETI Institute) in the article "Saturn's innermost moons are red ravioli, thanks to its rings," which appeared on the PBS Nova website on 3/28/19.

23. **Warren-Rhodes, K., Cabrol, N., Wettergreen**, D., Pointing, S. How rovers are searching for alien life in the desert. CNN, Feb 28, 2019.

Other Outreach Activities

1. **Cabrol, NA.** Jan. 8. Support to the California Academy of Sciences new IMAX Planetarium movie: Input about Mars analogs to landing sites for Mars 2020.

2. **Facebook Live**
Diamond, B. (1/9/19): Live from American Astronomical Society annual conference
Showalter, M.R. (1/15/19): New Horizons and Ultima Thule
Diamond, B. (1/24/19): Field Expeditions to Antarctica with Chris MacKey
Richards, J. (1/31/19): SETI
Siemion, A. (2/5/19): Fast Radio Bursts
Bishop, J., Bonaccorsi R., Cabrol, N., Harman, P., Race, M., Tarter, J. (2/11/19): Women in Astronomy and Science
Showalter M.R., Tiscareno, M. (2/21/19): Hippocamp
Cabrol, N. (2/18/19) Mars Exploration Rover
Busch, M., **Diamond, B.** (3/7/19): Arecibo
Jenniskens, P. Meteorites (3/21/19): Discovered in Turkey and the Asteroid Vesta
Harman, P., **Skok, J.R.** (3/28/19): AstroReality and the Solar System

3. **SETI Talks**
Shostak, S. (moderator); Mackey, T.; Roopnarine, P.; Waldman, A. (January 16, 2019)

Antarctica as Time Machine
Diamond, B. (moderator); Dressing, C.; Ennico Smith, K., Gaudi, S. (February 13, 2019)
The Future of NASA Space Telescopes
Bentley, M. (moderator); Stern, A.; **Showalter, M.; Beyer, R** (March 13, 2019)
Exploring Ultima Thule

4. **Big Picture Science**
   Shostak S.; Bentley, M
   Episodes:
   Sci-Fi from the Future (January 7, 2019)
   True Grit (January 14, 2019)
   Rip Van Winkle Worm (January 21, 2019)
   Skeptic Check: Astrology Ascending (Feburary 4, 2019)
   Keeping Humans in the Loop (February 11, 2019)
   Radical Cosmology (February 18, 2019)

Invitation to Speak (Professional and Public)

1. **Backman, DE,** (3/27) *Airborne Astronomy Ambassadors: High School Teachers Onboard a NASA Flying Observatory,* Astronomy on Tap, Uproar Brewing Company, San Jose, CA.

2. **Bishop JL** (February/5). *Why is the Sky Blue and the Sunset Red?* Presentation and demonstration to first grade students at Alto International School about the wavelengths of sunlight and how that affects the colors we see.

3. **Bonaccorsi, R.** Willson, D., Gold, R. McKay, C., Adams, E. Small, Fast, and Cold: Enceladus Plume analog simulation at the ARC Vertical Gun Range, NASA Ames Astrobiology Jamboree April 9, 2019.

4. **Bonaccorsi, R.**, Interview on Life Detection with Antofagasta New Media, March 25, 2019.

5. **Bonaccorsi, R.** , Death Valley Natl. Park: Public outreach booth organized for Dark Sky Event, March 1-3, 2019.

6. **Bonaccorsi, R.** , Guided Talk; Ubehebe Crater: A journey into the Crater, March 3, 2019.

7. **Busch MW** (2019 March), five talks with primary & secondary school classes as part of the "Skype A Scientist" project - https://www.skypeascientist.com/ .

8. **Cabrol, NA.** Puerto de Ideas Science Festival, Antofagasta Chile (April 12-15). Keynote Lecture: *Searching for Life Beyond Earth.*

9. **Cabrol, NA.** Abscicon:

a. Searching for life beyond Earth and the reframing of planetary exploration. *AbSciCon Conf.* Seattle, WA. # 478146, (Invited).

b. The Changing Nature of Planetary Exploration: A Personal Perspective on the Role of the NAI. *AbSciCon Conf.* Seattle, WA. # 481531, (Invited).

10. **Clark, C,** (1/18) STEM SME presentation at Challenger Learning Center at Heartland Community College's "Mars Science Academy" program, two sessions for 6th grade students from Eureka Middle School, Chicago, IL.

11. **Harman, PK**, (1/17) *Space Science Badges Overview,* Girl Scouts Norther California Webinar, Alameda, CA.

12. **Harman, PK,** (2/15) *Resources and Strategies for Engaging Girls* Panel at NISE Net Conference, Tempe, AZ.

13. **Gordon MK** (1/25). *Galaxies – Sizes, Shapes, and Colors*. Gave a brief talk and assisted in one of the hands-on activities, for groups of elementary students during the annual "Space Night" event at the k-8 Davenport School of the Arts, Davenport, Florida.

14. **Marchis, F.**
    - Another Pale Blue Dot: Inside SETI Institute's Exoplanet Search https://www.aaa.org/eyepiece/another-pale-blue-dot-inside-seti-institutes-exoplanet-search-with-dr-franck-marchis/
    - Another Pale Blue Dot: Inside SETI Institute's Exoplanet Search https://www.sfaa-astronomy.org/monthly_lectures/randall/
    - Another Pale Blue Dot: The Search for Exoplanets California Academy of Sciences, Benjamin Dean Astronomy Lectures https://research.calacademy.org/events/benjamin-dean-astronomy-lectures/another-pale-blue-dot-the-seti-institute%E2%80%99s-search-for
    - Stars & Stardust, Unistellar demo during CES 2019 at the Neon Museum https://www.youtube.com/watch?v=ciVPlxvhkNA&t=
    - Selection and Finalist at the SPIE Startup Challenge for Unistellar http://spie.org/x130278.xml
    - http://www.spie.org/industry-resources/industry-events/spie-startup-challenge/2019-winners?SSO=1
    - Selection for the Innovation Award at SXSW https://unistellaroptics.com/unistellar-brings-the-wonders-of-outer-space-to-sxsw-with-the-first-worldwide-citizen-astronomy-network/
    - Invited to present Exotopia at the San Jose Museum of Arts https://sjmusart.org/event/third-thursday-exotopia

- Invitation to speak at Simulation #299 Dr. Franck Marchis - Imaging The Cosmos https://youtu.be/1OWViakIDg0

15. **Race MS (**March/6). *Women in STEM—Astrobiology and Interdisciplinary Science*, Orinda Library, Orinda CA.

16. **Race MS (**March/6). *Thinking About Space: Understanding Our Place in the Universe*, (2 classes) Stevenson School, Mountain View CA, Visiting Lecturer.

17. **Race MS (**March/23). *Women in STEAM in Space*, Speaker and Panel Facilitator. Chabot Space and Science Center, Oakland CA.

18. **Race MS (**March/27). *Women in STEAM—Astrobiology …From Mudflats to Mars*, Lafayette Library and Learning Center, Lafayette CA.

19. **Shostak, S.** Jan 9, "Puzzles in Astronomy," Wonders of Science course, Fromm Institute, Univ. of San Francisco

20. **Shostak, S.** Jan 31, "Life in the Universe," keynote presentation, Technical Users Group, Copenhagen, Denmark.

21. **Shostak, S.** Feb 11, "SETI Today," Morrison Planetarium, Calif. Academy of Sciences, San Francisco

22. **Shostak, S.** Feb 20, "Looking for Life in Space," Crystal Cruise Lines, February, 2019, South Pacific

23. **Shostak, S.** Feb 22, "Is Earth Being Visited?" Crystal Cruise Lines, February, 2019, South Pacific

24. **Shostak, S.** Mar 15, "SETI," Miroir Salon, San Francisco

25. **Shostak, S.** Mar 22, "How the 21st Century Will Fundamentally Change Humanity," Future of the Sciences conference, Cambridge Philosophical Society, Cambridge, U.K.

26. **Shostak, S.** Apr 1, "Introduction to Life in Space," OLLI course, Santa Clara University, Santa Clara, CA.

27. **Showalter MR** (2/7/19), NASA's exploration of Pluto and Beyond, Aboard a cruise ship to Antarctica.

28. **Showalter MR** (2/26/19), Exploring New Horizons: NASA's Epic Voyage to Pluto and the Kuiper Belt, Oshman Jewish Community Center, Palo Alto. https://www.paloaltojcc.org/Events/exploring-new-horizons-nasas-epic-voyage-to-pluto-and-the-kuiper-belt

29. **Showalter MR** (3/7/19), Exploring New Horizons: NASA's Epic Voyage to Pluto and the Kuiper Belt, Apple Computer, Sunnyvale.

30. **Showalter MR**, **Beyer RA**, Stern SA (3/13/19), Exploring Ultima Thule–Humanity's Next Frontier, SETI Talks. https://www.eventbrite.com/e/exploring-ultima-thule-humanitys-next-frontier-tickets-56359127668#

31. **Sobron P** (March/12). *Advanced Planetary Sensing – Technology Opportunities for Mine and Mineral Industries*. Invited talk at Autonoma University of Pachuca. Pachuca, Mexico.

32. **Sobron P** (March/12). *Missions To Planetary Analogs: Science and Technology that Enables Robotic Exploration*. Invited talk at Polytechnic University of Pachuca. Pachuca, Mexico.

33. **Sparks, WB.** Participated on the opposition committee for the PhD defense ceremony of Lucas Patty at the Vrije Universiteit, Amsterdam "Circular spectropolarimetric sensing of life".

34. **Spry JA** Panelist at the IAC 2018 Special Session Panel - New Challenges for Planetary Protection, moderated by James Green (Chief Scientist, NASA). Last-minute alternate for Kasthuri Venkateswaran (NASA JPL), presenting on "Instrumentations and Capabilities for "Omics in Space" that are Required for Human Missions", together with Athena Coustenis, Chair, COSPAR Panel on Planetary Protection, France; Yang Hong, Chief Designer, China Academy of Space Technology, China; **JD Rummel**, Senior Scientist, SETI Institute; Eric Stallmer, President, Commercial Spaceflight Federation, USA.

35. Stern SA, **Showalter MR**, Young LA, Protopapa S, Shenk P (1/3/19), NASA Press Briefing: New Horizons Kuiper Belt Extended Mission - The Ultima Thule Flyby. http://pluto.jhuapl.edu/News-Center/Press-Conferences/index.php?page=2019-01-03

Highlights/ Significant Events and Activities

1. **Bonaccorsi, R** . Field Campaign. March 24-30, 2019. Joined ARADS team PI Brian Glass during expedition. Worked on drill and sample handling and contamination mitigation and bioburden monitoring using in-situ real time hand-held ATP Luminometry device. Contamination sample transfer control. Collaboration with Luis Caceres of University of Antofagasta on fog collection devices. Life detection in collected fog.

2. **Cabrol, NA., and the Carl Sagan Science Council:** Close SC Meetings, Feb. 4 and March 27, 2019. SETI Institute HQ in Mountain View.

3. **Cartwright RJ** (2019). Became the composition team lead on a mission concept proposal for a Uranus orbiter called the Uranus Magnetosphere and Moon Investigator (UMaMI). Proposal PI: Catherine Elder (JPL).

4. **Cartwright RJ** (2019). Became a Co-I on a mission concept proposal to design a spectrograph for observing the outer Solar System on the proposed space telescope LUVOIR. Instrument called the Outer Planets Imaging Spectrograph (OPIS). Proposal PI: Aki Roberge (GSFC).

5. **Harman, P,** (1/9) Solar System Scale Model, *233rd AAS Meeting*, Student Event.

6. **Harman, P**, (2/9-10) *Girl Scout Stars Space Science Badge Symposium*, Morehead Planetarium, Chapel Hill, NC .

7. **Harman, PK**, *SETI Institute Education,* NISE Net Conference SciAct Showcase, Tempe, AZ.

8. **Race MS (**Feb/12). *Invited* ***Science Fair Judge***, Ravenswood Middle School, East Menlo Park, CA.

9. **Roser JE**. Led the Ames Code SS Division's "Laboratory Astrophysics and Astrochemistry Tiger Team" to produce a strategic plan year in review update document.

10. **Roser JE**. Gave the Laboratory Astrophysics and Astrochemistry Tiger Team presentation at a Code SS Division retreat.

11. **Tiscareno MS** (continuing) is a member of the AAS DPS Subcommittee on Professional Culture and Climate, which works towards making the community of planetary scientists an environment in which professional merit is the only criterion that determines each person's success.

12. **Tiscareno MS** (10/29/18) continued to advise filmmakers from the American Museum of Natural History (AMNH) in New York NY, on the planning of their next major planetarium show.

Field Work

Bonaccorsi, R. and Stucky TS (March/24-March/31). In the Atacama Desert, supported field tests of LITMS, a Goddard built laser desorption mass spectrometer. Performed drilling operations using a flight-like autonomous drill designed for the Martian environment to retrieve meters deep signs of life.

Observing Time

1. **Busch MW** - Ongoing radar observations of near-Earth asteroids and other bodies with the Goldstone Solar System Radar, the Arecibo Observatory, the Green Bank Telescope, and the Very Long Baseline Array. Schedules at https://echo.jpl.nasa.gov/asteroids/goldstone_asteroid_schedule.html , http://www.naic.edu/~pradar/ . These are ongoing projects which are regularly awarded new observing time; so perhaps this entry need not be repeated each quarter.

2. **Cartwright RJ** (2019). Awarded time on DCT to observe Callisto in the VIS with the DeVeny spectrograph (3 partial nights in May and June).

3. **Sparks WB.** Our campaign to observe transits of Europa across the face of Jupiter using far ultraviolet time resolved imaging with the Hubble Space Telescope continued, HST GO#15424, as part of a major campaign targeted at Europa's plumes. Observational planning at phase 2 was undertaken in preparation for the upcoming opposition period later in 2019. Preparations were also made for an upcoming SOFIA run in April.

Contribution to ongoing/planned missions

1. **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.

2. **Coughlin, JL (Q1 2019).** Our team delivered the Campaign 19 data, and reprocessed campaign 5 and 11 data, and accompanying release notes. We delivered the final update to the K2 stellar parameters (C0 and C19) and the final version of the documentation. We have planned out our project close-out activities and have begun to execute. We are planning for a project gate review in May.

3. **ExoMars Trace Gas Orbiter** Livio Tornabene

4. **ExoMars** Pablo Sobron (Raman LIBs)

5. **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.

6. **Mars 2020** Pablo Sobron (Raman LIBs)

7. **MRO HiRISE**: Ginny Gulick, Ross Beyer, Livio Tornabene

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

9. **OSIRIS-REx:** John Marshall, Chloe Beddingfield

10. **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.

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

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

Contribution to mission planning/concepts

1. **Cabrol, NA.** Science Operation Center design for NASA Lunar CLPS missions/Orbit Beyond.
2. **Cabrol, NA.** Mars mission concept design.
3. **Marcu O.** (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.
4. **Showalter MR** and **Beyer RA** are participating in a Discovery Mission proposal for a centaur reconnaissance mission.

Strategic Planning/Official Committees/Working Groups your group belongs to.

1. **Beyer, R**. DPS Publications Subcommittee Chair (ongoing).
2. **Beyer, R.** MAPSIT Steering Committee (ongoing)
3. **Cabrol, NA.** Science Advisory Board member, OrbitBeyond (NASA/CLPS company).
4. **Cabrol, NA**. Chair, Biosignature Working Group, NASA Astrobiology Institute.
5. **Cabrol, NA**. Fellow, California Academy of Sciences.
6. **Clark, C**. Member of the NASA SciAct Education Technology Working Group.
7. **Fenton, L**. ICE-SAG (Ice and Climate Evolution Science Analysis Group, formed by the MEPAG Executive Committee).
8. **Harman, P.K**.. Member of the NASA SciAct Women in STEM Affinity Group
9. **Marcu O** (April-ongoing). Speakers Committee, Palo Alto Rotary Club, purpose is to provide community engagement of business and professional advocates.
10. **Race MS** (ongoing). *International Encyclopedia of Astrobiology*, Editor, 3rd Edition, Planetary Protection Section.
11. **Race MS** (ongoing). *Astrobiology in the Real World.* Assoc. Editor, Astrobiology journal, Commentary section.

12. **Rummel JD** (2017-Present). The Hague International Space Resources Governance Working Group. *Leiden, The Netherlands* (COSPAR Representative).

13. **Rummel JD** (2016-Present). Chair, Science Advisory Board, SETI Institute.

14. **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.

15. **Sobron P** (ongoing). NASA's Network For Life Detection (NFoLD) Research Coordination Network.

16. **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.

17. **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).

18. **Spry JA** (Nov 2018 - ongoing) Participant/Executive Secretary in the Planetary Protection Technology Brainstorm Group.

19. **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.