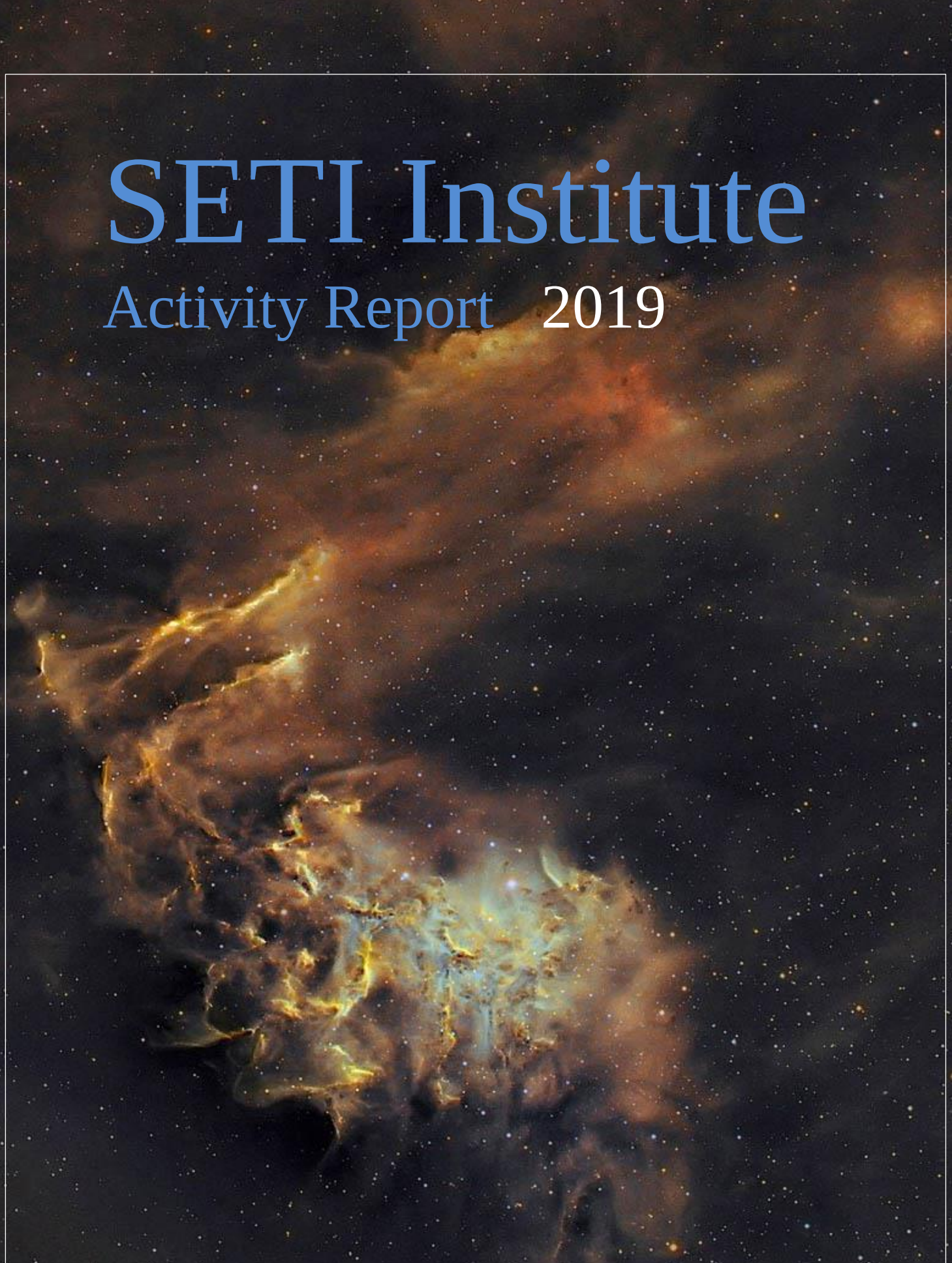
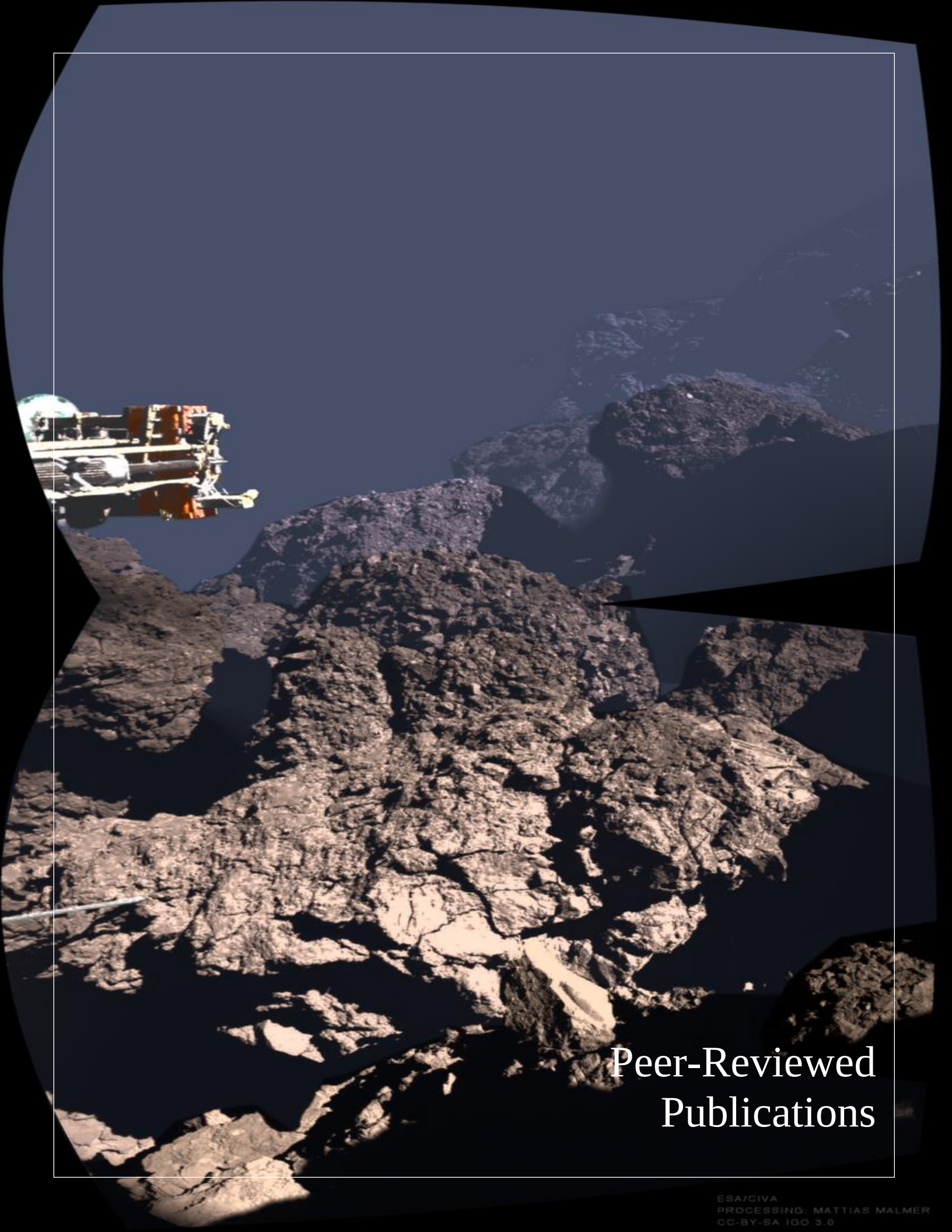
SETI Institute

Activity Report 2019



The SETI Institute: 189 Bernardo Avenue, Suite 200, Mountain View, CA 94043. Phone: (650) 961-6633

Table of Contents



Peer-Reviewed Publications

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. Aleman I., Leal-Rerreira M.L., **Cami J**., Akras S., Ochsendorf et al. including **Peeters E**. (2019) Physical conditions, kinematics and morphology of the planetary nebula Tc1 from VLT X-Shooter observations, MNRAS, 490(2): 2475-2494

5. Aleman I., Leal-Ferreira M.L., **Cami J.**, Akras S., Ochsendorf B., et al., including **Peeters E.**, (2019) "Characterisation of the Planetary Nebula Tc 1 based on VLT X-Shooter Observations", *Monthly Notices of the Royal Astronomical Society*, 490, 2475.

6. Airapetian, V.S., Barnes, R., Cohen, O., Collinson, G.A., Danchi, W.C. et al., including **Jin, M.** (2019), "Impact of Space Weather on Climate and Habitability of Terrestrial Type Exoplanets" Int. J. of Astrobiology, accepted, arXiv:1905.05093.

7. Archinal, B.A., Acton, C.H., Conrad, A., Duxbury, T., Hestroffer, D., Hilton, J.L., Jorda, L., Kirk, R.L., Klioner, S.A., Margot, J-L., Meech, K., Oberst, J., **Paganelli**, **F.**, Ping, J., Seidelmann, P. K., Stark, A., Tholen, D. J., Wang, Y., Williams, I. P. (2019) Errata to: Report of the IAU Working Group on Cartographic Coordinates and Rotational Elements: 2015. Accepted: *Celestial Mechanics and Dynamical Astronomy*.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. Barucci MA, PH Hasselmann, M Fulchignoni, R Honda, Y Yokota et l., including **D. Takir** (2019). Multivariable statistical analysis of spectrophotometry and spectra of (162173) Ryugu as observed by JAXA Hayabusa2 mission.cAstron. Astrophys. 629, id.A13, 10pp.

14. 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.

15. 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.

16. Bera PP, **Huang X**, and Lee TJ (2019) Highly Accurate Quartic Force Field and Rovibrational Spectroscopic Constants for the Azirinyl Cation (c-C2NH2+) and Its Isomers, *The Journal of Physical Chemistry A*, Articles ASAP, published online 12/20/2019. DOI: 10.1021/acs.jpca.9b10290

17. **Beyer RA** et al. including **CB Beddingfield** (2019). The nature and origin of Charon's smooth plains. *Icarus* **323**, p.16-32

18. **Bishop JL,** C Gross, JM Danielsen, M Parente, SL Murchie, B Horgan, JJ Wray, CE Viviano, BL Ehlmann & FP Seelos (2019). Multiple mineral horizons in layered outcrops at Mawrth Vallis, Mars, signify changing geochemical environments on early Mars. *Icarus*.

19. **Bishop JL** (2019). Chapter 4: Visible and near-infrared reflectance spectroscopy of geologic materials. In: *Remote Compositional Analysis: Techniques for Understanding Spectroscopy, Mineralogy, and Geochemistry of Planetary Surfaces* (J.L. Bishop, J.F. Bell III & J.E. Moersch, eds). Cambridge University Press, Cambridge, UK, 68-101.

20. **Beddingfield CB**, **Beyer RA**, Singer KN, McKinnon WB, Runyon K, et al. (2019) Landslides on Charon, *Icarus*, **335**

21. Belikov, R., Barclay, T., Batalha, N. M., Bendek, E., Chakrabarti, S., et al., including **Marchis, F., Turnbull, M.** (2019) Imaging Earth-like Exoplanets with a Small Space Telescope, *Astro2020: Decadal Survey on Astronomy and Astrophysics*, Bulletin of the American Astronomical Society, **51**, 186

22. Belikov, Ruslan; Barclay, Tom; Batalha, Natalie M.; Bendek, Eduardo; Bolcar, Matt; et al.; including **Marchis**, **F**.; (2019/05). Direct Imaging of Exoplanets in Nearby Multi-Star Systems, *Astro2020*: *Decadal Survey, Astronomy and Astrophysics*, Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 517.

23. Bertrand T, F Forget, **OM Umurhan**, JM Moore, LA Young et al. (2019). The CH4 cycles on Pluto over seasonal and astronomical timescales. Icarus 329, 148-165.

24. Bouma, L. G., Winn, J. N., Baxter, et al., including **Twicken, J. D., Wohler, B**. (2019) WASP-4b Arrived Early for the TESS Mission, *The Astronomical Journal*, **157**, 217

25. 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.

26. Brozovic M, **Showalter M**, Jacobson R, French R, Lissauer J, and de Pater I (2019). Orbits and resonances of the regular moons of Neptune. *Icarus*, in press. ICARUS_2019_178_R2.

27. Bruzzone, J. S.; Metchev, S.; Duchene, G.; Millar-Blanchaer, M. A.; Dong, R.; et al. including **Marchis**, **F**.; (11/2019). Imaging the 44 AU Kuiper Belt-analogue debris ring around HD 141569A with GPI polarimetry, *The Astronomical Journal*, 16 pages, eprint arXiv:1911.11814

28. Bryson, S., **Coughlin, J.,** Batalha, N. M., Berger, T., Huber, D., Burke, C., Mullally, S. E. (2019) A Probabilistic Approach to Kepler Completeness and Reliability for Exoplanet Occurrence Rates, arXiv e-prints, arXiv:1906.03575.

29. 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

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

31. **Cabrol, NA,** (2019), 100 Years of the IAU: Beyond the Galileo Experiment, *Nature Astromomy*, **3**:585-587 d.

32. 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.

33. Campante, T. L., Corsaro, E., Lund, M. N., Mosser, B., Serenelli, A., et al., including **Turnbull, M. C**. (2019) TESS Asteroseismology of the Known Red-giant Host Stars HD 212771 and HD 203949, *The Astrophysical Journal*, **885**, 31,

34. Candian A, M Gomes Rachid, H Maclsaac, VN Stariverov, **E Peeters**, and **J Cami** (2019). Searching for Stable Fullerenes in Space with Computational Chemistry, *MNRAS* **485**, 1137-1146. 10.1093/mnras/stz450

35. 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

36. **Cartwright RJ**, B Holler, S Benecchi, R Juanola-Parramon, G Arney et al. (2019). Exploring the Composition of Icy Bodies at the Fringes of the Solar System with Next Generation Space Telescopes, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 132; *BAAS* **51**, id.132

37. **Cartwright, R.J.**, et al., 2019. *Probing the regoliths of the classical Uranian satellites: Are their surfaces mantled by tiny H_2O ice grains?* Icarus

38. Caudill, C.M., Pontefact, A., Osinski, G.R., **Tornabene, L.L.**, and 14 others, (2019) CanMars mission science results and review of optimization for sample selection for Mars Sample Return (MSR) based on science operations and procedures. *Planet. Space Sci.*

39. 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.

40. 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.

41. 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

42. Chontos A, **D Huber**, DW Latham, A Bieryla, V. Van Eylen et al. (2019). The Curious Case of KOI 4: Confirming Kepler's First Exoplanet Detection, AJ 157, id. 192, 14pp.

43. Chornock R, PS Cowperthwaite, R Margutti, D Milisavlijevic, KD Alexander et al., including **J Rho** (2019). Multi-Messenger Astronomy with Extremely Large Telescopes, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 237; *BAAS* **51**, Issue 3, id. 237

44. 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.

45. Cloutier, R., Astudillo-Defru, N., Bonfils, X., Jenkins, J. S., Berdiñas, Z., Ricker, G., et al., including **Morris, R., Smith, J. C., Tenenbaum**. (2019) Characterization of the L 98-59 multi-planetary system with HARPS. Mass characterization of a hot super-Earth, a sub-Neptune, and a mass upper limit on the third planet, *Astronomy and Astrophysics*, **629**, A111

46. Cockell C, S McMahon, D Lim, **J Rummel,** A Stevens, et al. (2019). Sample Collection and Return from Mars: Optimising Sample Collection Based on the Microbial Ecology of Terrestrial Volcanic Environments, *Space Science Reviews*, 215, 44, doi:10.1007/s11214-019-0609-7.

47. Cockell C, S McMahon, D Lim, **J Rummel,** and A.Stevens (2019). A strategy for sample selection on Mars based on the microbial ecology of terrestrial volcanic environments. In, *Role of Sample Return in Addressing Major Questions in Planetary Sciences* (M. Anand et al., eds.), *in press.*

48. Conrad JW, Nimmo F, Schenk PM, McKinnon WB, Moore JM et al. including **Beddingfield C**, **Beyer RA** (2019) An upper bound on Pluto's heat flux from a lack of flexural response of its normal faults, *Icarus*, Volume 328, p. 210-217

49. Cordier M.A., Linnartz H., Cox N.L.J., **Cami J.**, Najarro F., et al. (2019) "Confirming interstellar C_{60}^+ using the Hubble Space Telescope", *The Astrophysical Journal Letters*, 875, L28.

50. Crossfield IJM, W Waalkes, ER Newton, N Narita, P Muirhead et al., including **D Huber, and Kostov, VB** (2019). A Super-Earth and Sub-Neptune transiting the late-type M dwarf LP 791-18. Astrophys. J. Lett. 883, article id.L16, 13pp.

51. Cru-Diaz GA, SE Erickson, EF da Silviera, **A Ricca**, ALF de Barros et al. (2019). PAH products and processing by different energy sources. Astrophys. J. 882, article id. 44, 16pp.

52. Cruikshank, Dale P., **Orkan M. Umurhan**, **Ross A. Beyer**, Bernard Schmitt, James T. Keane, et al. including **Oliver L. White**, **Cristina M. Dalle Ore**, and **Richard J. Cartwright** (2019). Recent cryovolcanism in Virgil Fossae on Pluto, *Icarus* **330**, 155-168, doi:10.1016/j.icarus.2019.04.023.

53. Cruikshank DP, CK Materese, YJ Pendelton, PJ Bolton, WM Grundy et al., including **CM Dalle Ore** (2019). Prebiotic chemistry of Pluto. Astrobiology 19, 831-848.

54. Cuadros J, C Mavris, JR Michalski, JM Nieto, **JL Bishop** & S Fiore (2019). Abundance and composition of kaolinite on Mars: Information from NIR spectra of rocks from acid-alteration environments, Rio Tinto, SE Spain, *Icarus*, **330**, 30-41.

55. **Ćuk, M,** DP Hamilton, ST Stewart, (2019). Early Dynamics of the Lunar Core, *Journal of Geophysical Research: Planets*, **124 (11)**, 2917-2928, doi: 10.1029/2019JE006016.

56. Cukier, W., Kopparapu, R. Kumar, Kane, S. R., Welsh, W., Wolf, E., **Kostov, V.,** Haqq-Misra, J. (2019) Habitable Zone Boundaries for Circumbinary Planets, *Publications of the Astronomical Society of the Pacific*, **131**, 124402

57. 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

58. 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.

59. David, T. J., **Cody, A. M.,** Hedges, C. L., Mamajek, E. E., Hillenbrand, L. A., et al. (2019) A Warm Jupiter-sized Planet Transiting the Pre-main-sequence Star V1298 Tau, *The Astronomical Journal*, **158**, 79

60. Dawson, R. I., Huang, C. X., Lissauer, J. J., Collins, K. A., Sha, L., et al., including **Caldwell, D.** A., **Smith, J. C**. (2019) TOI-216b and TOI-216 c: Two Warm, Large Exoplanets in or Slightly Wide of the 2:1 Orbital Resonance, *The Astronomical Journal*, **158**, 65

61. 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.

62. 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

63. De Rosa, R. J., Esposito, T. M., Hirsch, L. A., Nielsen, E. L., Marley, M. S., **Kalas, P.,** et al. (2019) The Possible Astrometric Signature of a Planetary-mass Companion to the Nearby Young Star TW Piscis Austrini (Fomalhaut B): Constraints from Astrometry, Radial Velocities, and Direct Imaging, *The Astronomical Journal*, **158**, 225

64. De Rosa, Robert J.; Nguyen, Meiji M.; Chilcote, Jeffrey; Macintosh, Bruce; Perrin, Marshall D.; et al. including **Marchis**, **Franck**; (10/2019). Revised Astrometric Calibration of the Gemini Planet Imager, *The Journal of Astronomical Telescopes, Instruments, and Systems*, 35 pages, arXiv:1910.08659

65. De Rosa, R. J., Nielsen, E. L., Rameau, J., Duchêne, G., Greenbaum, A. Z., et al., including **Kalas, P., Marchis, F**. (2019) Detection of a Low-mass Stellar Companion to the Accelerating A2IV Star HR 1645, *The Astronomical Journal*, **158**, 226

66. De Rosa, Robert J.; Nielsen, Eric L.; Wang, Jason J.; Ammons, S. Mark; Duchêne, Gaspard; et al. including **Marchis**, **Franck**; (12/2019). An updated visual orbit of the directly-imaged exoplanet 51 Eridani b and prospects for a dynamical mass measurement with Gaia, *The Astronomical Journal*, 17 pages, arXiv:1910.10169,

67. 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*.

68. Dharawardena T., Kemper F., Srinivasan S., Scicluna P., Marshall J.P., et al., including **Cami J.** (2019) "The Nearby Evolved Stars Survey: I. JCMT/SCUBA-2 sub-millimetre detection of the detached shell of U Antliae", *Monthly Notices of the Royal Astronomical Society*, 489, 3218.

69. Dholakia, S., Dholakia, S., **Cody, A. M.,** Howell, S. B., Johnson, M. C., et al. (2019) A Substellar Companion to a Hot Star in K2's Campaign 0 Field, *Publications of the Astronomical Society of the Pacific*, **131**, 114402

70. 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

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

72. Domagal-Goldman, Shawn; Kiang, Nancy Y.; Parenteau, Niki; Kamakolanu, Uma Gayathri; Finster, Kai; et al.; including **Marchis**, **F**.; (2019/05). Life Beyond the Solar System: Remotely Detectable Biosignatures, *Astro2020*: *Decadal Survey on Astronomy and Astrophysics*, science white papers, no. 528.

73. 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.

74. **Doyle, L.R.,** "The Discovery of 'Tatooine': Kepler-16b" (2019), *New Astronomy Reviews* **84**, 101515.

75. Dragomir, D., Teske, J., Günther, M. N., et al. including **Twicken, J. D., Wohler, B.** (2019) TESS Delivers Its First Earth-sized Planet and a Warm Sub-Neptune, *The Astrophysical Journal*, **875**, L7

76. Dumusque, X., Turner, O., Dorn, C., Eastman, J. D., Allart, R., et al., including **Twicken, J. D.** (2019) Hot, rocky and warm, puffy super-Earths orbiting TOI-402 (HD 15337), *Astronomy and Astrophysics*, **627**, A43

77. Espinoza, N., Brahm, R., Henning, T., Jordán, A., Dorn, C., et al., including **Twicken, J. D., Morris, R. L.** (2019) HD 213885b: A transiting 1-day-period super-Earth with an Earth-like composition around a bright (V = 7.9) star unveiled by TESS, *Monthly Notices of the Royal Astronomical Society*, **2769**

78. 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*

79. Farnocchia D., Chesley S. R., Chodas P. W., Christensen E., Kowalski R. A., Borwn . G., **Jenniskens P**., 2019. The tale of three small impacting asteroids. AAS Division on Dynamical Astronomy meeting #50, id. 200.04. Bull. of the American Astron. Soc. 51, # 5.

80. **Fenton, LK**, Gullikson, AL, Hayward, RK, Charles, H, Titus, TN (2019) The Mars Global Digital Dune Database (MGD^3): Global patterns of mineral composition and bedform stability, *Icarus*

81. Fernández-Martínez, MA., R. dos Santos Severino, M. Moreno Paz, I. Gallardo Carreño, Y. Blanco, **K. Warren-Rhodes,** M. Garcia-Villadangos, M. Ruiz-Bermejo, A. Barberán, D. Wettergreen, **N.A. Cabrol**, and V. Parro. (2019). Prokaryotic community structure and metabolisms in shallow subsurface of Atacama Desert playas and alluvial fans after heavy rains: repairing and preparing for next dry period. *Frontiers in Microbiology, section Extreme Microbiology*, ID: 463848. doi: 10.3389/fmicb.2019.01641

82. 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

83. Fortney, JJ., Lupu, RE., Morley CV, et al. (including **R. Freedman**) (2019). Exploring a Photospheric Radius Correction to Model Secondary Eclipse Spectra for Transiting Exoplanets, The Astrophysical Journal, **880**.

84. 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.

85. Galvez, R., Fouhey, D. F., **Jin, M.,** et al. (2019) A Machine-learning Data Set Prepared from the NASA Solar Dynamics Observatory Mission, *The Astrophysical Journal Supplement Series*, **242**, 7

86. **Glines N.H.** and **Gulick V.C.** (2019). Potential Paleolakes and Channels on the floor of Lyot Crater: Implications for Freeze-Thaw and Recent Surface Water Activity on Mars. Icarus, in review.

87. Goodrich C. A., Zolensky M. E., Fioretti A. M., Shaddad M. H., Downes H., Hiroi T., Kohl I., Young E. D., Kita N. T., Hamilton V. E., Riebe M. E. I., Busemann H., Macke R. J., Fries M., Ross D. K., **Jenniskens P**., 2019. The first samples from Almahata Sitta showing contacs between Ureilitic and chondritic lithologies: Implications for the sturcture and composition of asteroid 2008 TC3. MAPS (accepted).

88. 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.

89. Graham M, D Milisavlijevic, A Rest, JC Wheeler, R Chornock et al., including **J Rho** (2019). Discovery Frontiers of Explosive Transients: An ELT and LSST Perspective, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 339; *BAAS* **51**, Issue 3, id. 339.

90. Greenbaum, Alexandra Z.; Cheetham, Anthony; Sivaramakrishnan, Anand; Rantakyrö, Fredrik T.; Duchêne, Gaspard; et al.; including **Marchis**, **F**.; (2019/06). Performance of the Gemini Planet Imager Non-redundant Mask and Spectroscopy of Two Close-separation Binaries: HR 2690 and HD 142527, *The Astronomical Journal*, **157**, Issue **6**, article id. 249, 17 pp.

91. Guarcello, M. G., Flaccomio, E., Micela, G., Argiroffi, C., Sciortino, S., et al., including **Cody, A. M.** (2019) CSI 2264: Simultaneous optical and X-ray variability in the pre-main sequence stars of NGC 2264. II. Photometric variability, magnetic activity, and rotation in class III objects and stars with transition disks, *Astronomy and Astrophysics*, **628**, A74

92. **Gulick V C., N. Glines**, S. Hart and P. Freeman 2018/2019. Geomorphological Analysis of Gullies on The Central Peak of Lyot Crater, Mars. Geological Society, London, Special Publications, 467, 233265, published online 5 December 2018; published in print January 2019.

93. Günther, M. N., Pozuelos, F. J., Dittmann, J. A., Dragomir, D., Kane, S. R., et al., including **Caldwell, D. A., Twicken**, J. D. (2019) A super-Earth and two sub-Neptunes transiting the nearby and quiet M dwarf TOI-270, *Nature Astronomy*, **420**,

94. Häder, D., and **Cabrol NA**. 2019. Long-term montoring of solar irradiance in the Tropical Andes, Photochem. Photobiol. (in revision).

95. Hales AS, **U Gorti**, JM Carpenter, M Hughes, and K Flaherty (2019). Modeling the Spatial Distribution and Origin of CO Gas in Debris Disks, *ApJ* **878**, id. 113, 18pp.

96. 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.

97. Hanuš, J.; Vernazza, P.; Viikinkoski, M.; Ferrais, M.; Rambaux, N.; et al. including **Marchis**, **F**.; (11/2019). (704) Interamnia: A transitional object between a dwarf planet and a typical irregular-shaped minor body, *Astronomy and Astrophysics*, eprint arXiv:1911.13049

98. Haqq-Misra, J., Wolf, E. T., Welsh, W. F., Kopparapu, R. K., **Kostov, V.,** Kane, S. R. (2019) Constraining the magnitude of climate extremes from time-varying instellation on a circumbinary terrestrial planet, *accepted to JGR Planets*, arXiv e-prints, arXiv:1911.05577.

99. **Hargitai HI**, **Gulick VC, Glines NH** 2019. Evolution of the Navua Valles region: Implications for Mars' paleoclimatic history. Icarus 330 ,

100. 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.

101. 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.

102. Heinz, J., Waajen, A.C., Airo, A., Alibrandi, A., Schrmack, J., and **Schulze-Makuch**, D. (2019) Bacterial growth in chloride and perchlorate brines: Halotolerances and salt stress responses of *Planococcus halocryophilus*. *Astrobiology* 19 (11): 1377-1387

103. Herath, M., Hinse, T. C., Livingston, J. H., Hernández, J., Evans, D. F., et al., including **Tregloan-Reed, J**. (2019) Two temperate sub-Neptunes transiting the star EPIC 212737443, *MNRAS*, **488**, 536-546,

104. HESS Collaboration, including **D Huber** (2019). Upper limits on very-high-energy gamma-ray emission from core-collapse supernovae observed with H.E.S.S., *A&A* **626**, id.A57, 11pp.

105. H. E. S. S. collaboration, including **D Huber** (2019). H. E. S. S. observations of the flaring gravitationally lensed galaxy PKS 1830-211. MNRAS 486, 3886-3891.

106. H. E. S. S. collaboration, including **D Huber** (2019). Constraints on the emission region of 3D 279 during strong flares in 2014 and 2015 through VHE γ-ray observations with H.E.S.S. Astron. Astrophys. 627, id.A159, 19pp

107. H. E. S. S. collaboration, including **D Huber** (2019). H.E.S.S. and Suzaku observations of the Vela X pulsar wind nebula. Astron. Astrophys. 627, id.A100, 16pp.

108. Hey DR, DL Holdsworth, TR Bedding, SJ Murphy, MS Cunha et al., including **D Huber** (2019). Six new rapidly oscillating Ap stars in the Kepler long-cadence data using super-Nyquist asteroseismology. MNRAS 488, 18-36.

109. Hinman, N.W., Henneberger, R.M., Kotler, J.M., Davis, R.E., **Bishop, J., Gulick, V.C.,** Morkner, P., etal. (in review). Habitats and Habitability of Hydrothermally Altered Areas at Washburn Hot Springs, Yellowstone National Park, WY, USA.

110. Hofstadter Mark, Simon A, Atreya S, Banfield D, Fortney JJ, Hayes A, Hedman M, Hospodarsky G, Mandt K, Masters A, **Showalter M**, Soderlund KM, Turrini D, Turtle E, Reh K, Elliott J, Arora N, Petropoulos A, and the Ice Giant Mission Study Team (2019). Uranus and Neptune missions: A study in advance of the next Planetary Science Decadal Survey. Planetary and Space Science, Volume 177, article id. 104680.

111. Hom, Justin; Patience, Jennifer; Esposito, Thomas M.; Duchêne, Gaspard; Worthen, Kadin; et al. including **Marchis**, **Franck**; (2019). First Resolved Scattered-Light Images of Four Debris Disks in Scorpius-Centaurus with the Gemini Planet Imager, *eprint* arXiv:1911.09667

112. Honey MA, Bevan B, Gram W, Hall R, Levy AJ, Manduca, CA, Santo R, Schatz D, **Showalter M**, Sullivan S, Wallace BK, Wei M-Y, Yu J (2019). *NASA's Science Activation Program: Achievements and Opportunities*, Washington, DC: The National Academies Press, doi 10.17226/25569.

113. **Huang X**, DW Schwenke, and TJ Lee (2019), Isotopologue consistency of semi-empirically computed infrared line lists and further improvement for rare isotopologues: CO_2 and SO_2 case studies, *JQSRT*, **230**, 222-246

114. **Huber D**, WJ Chaplin, A Chontos, H Kjeldsen, J Christensen-Dalsgaard et al. (2019). A Hot Saturn Orbiting an Oscillating Late Subgiant Discovered by TESS, *AJ* **157**, id. 245, 14pp.

115. **Huber D**, S Basu, P Beck, TR Bedding, D Buzasi et al. (2019). Stellar Physics and Galactic Archaeology using Asteroseismology in the 2020's, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 488; *BAAS* **51**, Issue 3, id. 488.

116. Isella A, L. Ricci, S Andrews, C Baruteau, JP Berger et al., including **P. R. Estrada** (2019). Observing Planetary Systems in the Making, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 174; *BAAS* **51**, Issue 3, id. 174

117. Jencson, J. E., Kasliwal, M. M., Adams, S. M., Bond, H. E., De, K., et al., including **Cody, A. M**. (2019) The SPIRITS Sample of Luminous Infrared Transients: Uncovering Hidden Supernovae and Dusty Stellar Outbursts in Nearby Galaxies, *The Astrophysical Journal*, **886**, 40,

118. **Jenniskens, P.**, Popova, O. P., Glazachev, D. O., Podobnaya, E. D., Kartashova, A. P., 2019. Tunguska eyewitness accounts, injuries, and casualties. Icarus 327,4–18.

119. **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.

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

121. **Jenniskens P.,** Baggaley, W. J., Aldous P., Crumpton I., 2019. Delta Pavonids 2019. CBET 4617. D. W. E. Green (ed.), Central Bureau for Astronomical Telegrams.

122. **Jenniskens P.,** Lyytinen E., et al., 2019. Alpha Monocerotids 2019. CBET 4699. D.W.E. Green (ed.). Central Bureau for Astronomical Telegrams.

123. **Jenniskens P.,** 2019. Phoenicid meteors 2019. CBET 4698. D.W.E. Green (ed.). Central Bureau for Astronomical Telegrams.

124. **Jenniskens P.,** Lyytinen E., 2019. Alpha Monocerotids 2019. CBET 4692. D.W.E. Green (ed.). Central Bureau for Astronomical Telegrams.

125. **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.

126. **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.

127. Jones, M. I., Brahm, R., Espinoza, N., et al. including **Smith, J. C., Tenenbaum, P.** (2019) HD 2685 b: a hot Jupiter orbiting an early F-type star detected by TESS, *Astronomy and Astrophysics*, **625**, A16

128. Kallinger T, PG Beck, S Hekker, **D Huber**, R Kuschnig et al. (2019). Stellar masses from granulation and oscillations of 23 bright red giants observed by BRITE-Constellation, *A&A* **624**, id.A35, 17pp.

129. Karambelkar VR, SM Adams, PA Whitelock, MM Kasliwal, JE Jencson etal., including **AM Cody** (2019). SPIRITS Catalog of Infrared Variables: Identification of Extremely Luminous Long Period Variables, *ApJ* **877**, id. 110, 16pp.

130. Kitazato K, RE Milliken, T Iwata, M Abe, M Ohtake etal., including **D Takir** (2019). The surface composition of asteroid 162173 Ryugu from Hayabusa2 near-infrared spectroscopy, Science 364, 272-275.

131. Kopparapu, Ravi Kumar; Hebrard, Eric; Belikov, Rus; Batalha, Natalie M.; Mulders, Gijs D.; et al.; including **Marchis**, **F**.; (2019/05). Exoplanet Diversity in the Era of Space-based Direct Imaging Missions, *Astro2020*: *Decadal Survey on Astronomy and Astrophysics*, science white papers, no. 12; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 12.

132. Kossakowski, D., Espinoza, N., Brahm, R., Jordán, A., Henning, T., et al., including **Smith, J. C.** (2019) TOI-150b and TOI-163b: two transiting hot Jupiters, one eccentric and one inflated, revealed by TESS near and at the edge of the JWST CVZ, *Monthly Notices of the Royal Astronomical Society*, **490**, 1094-1110,

133. **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

134. Kostov, V.B., W.F. Welsh, N. Haghighipour, E. Agol, D.C. Fabrycky, B. Quarles, G. Li, S. Mills, **L.R. Doyle,** T. Mazeh, J.A. Orosz, 2020, "Multiple Transits during a Single Conjunction: A New Technique for Identifying Transiting Circumbinary Planetary Candidates," The Astronomical Journal, in press.

135. **Kostov, V. B.**, Schlieder, J. E., Barclay, T., Quintana, E. V., including **Coughlin, J., Tenenbaum, P., Twicken, J. D**. (2019) The L 98-59 System: Three Transiting, Terrestrial-size Planets Orbiting a Nearby M Dwarf, *The Astronomical Journal*, **158**, 32

136. 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 54, 1431–1461.

137. Lane MD & **JL Bishop** (2019). Chapter 3: Mid-infrared (thermal) emission and reflectance spectroscopy. In: *Remote*

Compositional Analysis: Techniques for Understanding Spectroscopy, Mineralogy, and Geochemistry of Planetary Surfaces (J.L. Bishop, J.F. Bell III & J.E. Moersch, eds). Cambridge Univ. Press, Cambridge, UK, 42-67.

138. Lau RM, M Heida, DJ Walton, MM Kasliwal, SM Adams et al., including **AM Cody** (2019). Uncovering Red and Dusty Ultraluminous X-Ray Sources with Spitzer, *ApJ* **878**, id. 71, 32pp.

139. Lauretta D. S., Hergenrother C. W., Chesley S. R., Leonard J. M., Pelgrift J. Y., Adam C. D., Al Asad M., Antreasian P. G., Ballouz R. -L., Becker K. J., Bennett C. A., Bos B. J., Bottke W. F., Brozovic M., Campins H., Connolly Jr. H. C., Daly M. G., Davis A. B., de León J., DellaGiustina D. N., Drouet d'Aubigny C. Y., Dworkin J. P., Emery J. P., Farnoccia D., Glavin D. P., Golish D. R., Hartzell C. M., Jacobson R. A., Jawin E. R., **Jenniskens P.**, Kidd J. N., Lessac-Chenen E. J., Li Y.-Y., Libourel G., Licandro J., Lionis A. J., Maleszeweksi C. K., Manzoni C., May B., McCarthy L., McMahon J. W., Michel P., Molaro J. L., Nelson D. S., Owen J. W. M., Rizk B., Roper H. L., Rozitis B., Sah E. M., Scheeres D. J., Seabrook J. A., Selznick S. H., Takahashi Y., Thuillet F., Tricarico P., Vokrouhlicky D., Wolner C. W. V., 2019. OSIRIS-REx discovery of particle ejection from asteroid (101955) Bennu. Science (in press).

140. Leiner, E., Mathieu, R. D., Vanderburg, A., Gosnell, N. M., **Smith, J. C.** (2019) Blue Lurkers: Hidden Blue Stragglers on the M67 Main Sequence Identified from Their Kepler/K2 Rotation Periods, *The Astrophysical Journal*, **881**, 47,

141. Lendl, M., Bouchy, F., Gill, S., Nielsen, L. D., Turner, O., et al., including **Caldwell, D. A.**, **Morris, R., Twicken, J. D.** (2019) TOI-222: a single-transit TESS candidate revealed to be a 34-day eclipsing binary with CORALIE, EulerCam and NGTS, *Monthly Notices of the Royal Astronomical Society*, **3189**

142. **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

143. 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

144. Li SS, W Zang, A Udalski, Y Shvartzvald, **D Huber** et al. (2019). OGLE-2017-BLG-1186: first application of asteroseismology and Gaussian processes to microlensing. MNRAS 488, 3308-3323.

145. Linnartz H., **Cami J.**, Cordiner M., Cox N.L.J., Ehrenfeund P., Foing B.H., Gatchell M., Scheier P., (2019), "C_{60}^{+} as a diffuse interstellar band carrier; a spectroscopic story in 6 acts", Journal of Molecular Spectroscopy, 367, 111243

146. Lowe DR, **JL Bishop**, D Loizeau, JJ Wray & **RA Beyer** (2019). Deposition of >3.7 Ga clay-rich strata of the Mawrth Vallis Group, Mars, in lacustrine, alluvial, and aeolian environments, *GSA Bulletin*

147. Lucas MP, JP Emery, EM MacLennan, N Pinilla-Alonso, **RJ Cartwright** et al. (2019). Hungaria Asteroid Region Telescopic Spectral Survey (HARTSS) II: Spectral Homogeneity among Hungaria Family Asteroids, *Icarus* **322**, 227-250.

148. Luque, R., Pallé, E., Kossakowski, D., Dreizler, S., Kemmer, J., et al., including **Caldwell, D. A., Twicken, J. D., Wohler, B**. (2019) Planetary system around the nearby M dwarf GJ 357 including a transiting, hot, Earth-sized planet optimal for atmospheric characterization, *Astronomy and Astrophysics*, **628**, A39

149. Lyra W, T Haworth, B Bitsch, S Casassus, N Cuello et al., including **OM Umurhan** (2019). Planet formation — The case for large efforts on the computational side, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 129; *BAAS* **51**, Issue 3, id. 129.

150. Lyra W, **OM Umurhan** (2019). The initial conditions for planet formation: Turbulence driven by hydrodynamic instabilities in disks around young stars. PASP 131, 32pp. doi:10.1088/1538-3873/aaf5ff

151. Maksimova, A. A., Unsalan, O., Chukin, A. V., Karabanalov, M. S., **Jenniskens, P.**, Felner, I., Semionkin, V. A., Oshtrakh, M. I., 2019. The interior and the fusion crust in Sariçiçek howardite: Study using X-ray diffraction, magnetization measurements and Mössbauer spectroscopy. Spectrochimica Acta, Part A (in press).

152. Mancini, L., Southworth, J., Mollière, P., **Tregloan-Reed, J.,** et al. (2019) Physical properties and transmission spectrum of the WASP-74 planetary system from multiband photometry, *Monthly Notices of the Royal Astronomical Society*, **485**, 5168-5179

153. **Marchis**, **F**; et al.; (10/2019). Focus on an earlier research paper: "Unistellar eVscopes: Smart, portable, and easy-to-use telescopes for exploration, interactive learning, and citizen astronomy" in Acta Astronautica, Volume 166, Pages 23-28, doi.org/10.1016/j.actaastro.2019.09.028.

154. 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.

155. Matsuura M, C Inserra, M Meixner, L Armus, A Bevan et al., including **J Rho** (2019). Dust in supernovae: — Do supernovae produce the first dust in the Universe? Are supernovae the key dust producers of galaxies? Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 573; *BAAS* **51**, Issue 3, id. 573.

156. Maus, D. Heinz, J., Schirmack, J., Airo, A., Kounaves, S.P., Wagner, D., and **Schulze-Makuch, D.** (2019, in press) Methanogenic archaea can produce methane in deliquescence-driven Mars analog environments. *Scientific Reports 10*, #6, doi.org/10.1038/s41598-019-56267-4

157. Merrelli, A., **Turnbull, M. C.**, L'Ecuyer, T. S. (2019) Terran World Spectral Simulator, *Publications of the Astronomical Society of the Pacific*, **131**, 054502

158. Meyer MA, C Bakermans, DW Beaty, DE Bernard, PJ Boston, et al., including **JD Rummel,** (2019). Report of the joint workshop on induced special regions. *Life Sciences in Space Research, in press.*

159. Meza, E.; Sicardy, B.; Assafin, M.; Ortiz, J. L.; Bertrand, T. et al.; including **Marchis, F**. (2019/05). Lower atmosphere and pressure evolution on Pluto from ground-based stellar occultations, 1988-2016. *Astronomy & Astrophysics*, Volume 625, id. A42, 21 pp.

160. Milisavlijevic D, R Margutti, R Chornock, A Rest, M Graham et al., including **J. Rho** (2019). Achieving Transformative Understanding of Extreme Stellar Explosions with ELT-enabled Late-time Spectroscopy, Astro2020: Decadal Survey

on Astronomy and Astrophysics, science white papers, no. 481; *BAAS* **51**, Issue 3, id. 481

161. 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.*

162. Milam S, H Hammel, JM Bauer, M Brozovic, T Grav et al., including **D Takir** (2019). Emerging Capabilities for Detection and Characterization of Near-Earth Objects (NEOs), Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 327; *BAAS* **51**, Issue 3, id. 327

163. Monnier J, G Rau, EK Baines, J Sanchez-Bermudez, M Elvis et al., including **D Huber** (2019). The Future of Exoplanet Direct Detection, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, *BAAS* **51**, Issue 3, id. 514

164. Monnier J, G. Rau, J Sanchez-Bermudez, S Ragland, R Akeson et al., including **D Huber** (2019). Imaging the Key Stages of Planet Formation, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, *BAAS* **51**, Issue 3, id. 498.

165. Montgomery, W., Jaramillo, E.A., Royle, S.H., Kounaves, S.P., **Schulze-Makuch, D.,** and Sephton, M.A. (2019) Effects of Oxygen-Containing Salts on the Detection of Organic Biomarkers on Mars and in Terrestrial Analog Soils. *Astrobiology 19*, doi: 10.1089/ast.2018.1888.

166. Morgan JW, **X Huang,** HF Schaefer, and TJ Lee (2018), Astrophysical sulfur in diffuse and dark clouds: The fundamental vibrational frequencies and spectroscopic constants of hydrogen sulfide cation (H2S+), *MNRAS*, **480(3)**, 3483-3490

167. Morley, C. V., Skemer, A. J., Miles, B. E., Line, M. R., Lopez, E. D., Brogi, M., **Freedman, R. S.**, Marley, M. S. (2019) Measuring the D/H Ratios of Exoplanets and Brown Dwarfs, *ApJ*, **882**, L29

168. Moskovitz, Nicholas; Benson, Conor; Scheeres, Daniel; Endicott, Thomas; Polishook, David; et al. including **Marchis**, **F**; (11/2019). Observational Investigation of the 2013 Near-Earth Encounter by Asteroid (367943) Duende, *Icarus*, 50 pages, arXiv:1911.00609,

169. Murchie SL, JP Bibring, RE Arvidson, **JL Bishop**, J Carter, et al. (2019). Chapter 23. Visible to short-wave Infrared spectral analyses of Mars from orbit using CRISM and OMEGA. In: *Remote Compositional Analysis: Techniques for Understanding Spectroscopy, Mineralogy, and Geochemistry of Planetary Surfaces* (J.L. Bishop, J.E. Moersch & J.F. Bell III, eds). Cambridge University Press, Cambridge, UK, 453-483.

170. Neuberg, B., Bose, S., Salvatelli, V., dos Santos, L. F. G., Cheung, M. C. M., including **Jin, M.,** (2019) "Auto-Calibration of Remote Sensing Solar Telescopes with Deep Learning", *NeurIPS 2019 Workshop ML4PS*, arXiv:1911.04008

171. Neveu M, G Arney, **RJ Cartwright**, H Hammel, AB Hendrix and KE Mandt (2019). Investigating the Solar System's Ocean Worlds with Next-generation Space Telescopes, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, *BAAS* **51**, id.65

172. Newton, E. R., Mann, A. W., Tofflemire, B. M., Pearce, L., Rizzuto, A. C., et al., including **Li, J., Morris, R. L.** (2019) TESS Hunt for Young and Maturing Exoplanets (THYME): A Planet in the 45 Myr Tucana–Horologium Association, *The Astrophysical Journal*, **880**, L17

173. 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

174. Nielsen, Eric L.; De Rosa, Robert J.; Macintosh, Bruce; Wang, Jason J.; Ruffio, Jean-Baptiste; et al., including **Marchis, F**.; (2019/07). The Gemini Planet Imager Exoplanet Survey: Giant Planet and Brown Dwarf Demographics from 10 to 100 au, *The Astronomical Journal*, **158** (**1**), article id. 13, 44 pp. DOI:10.3847/1538-3881/ab16e9.

175. 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 219, 206–224.

176. Pandey, S., Clarke, J., Nema, P., **Bonaccorsi, R.**, & 16 others, 2019 *Ladakh: Diverse, High-Altitude Extreme Environments for Off-Earth Analogue and Astrobiology Research*" International Journal of Astrobiology 1–21.

177. Parro, V., I. Gallardo-Carreño, **N. A. Cabrol**, V. C. Tilot, F. Puente-Sánchez, C. Thompson, E. Smith, **P. Sobrón**, Y. Blanco López, M. García-Villadangos, C. Tambley, C. S Demergasso, A. Echeverría, M. Moreno-Paz, A. G Fairén (2019), Benthic microbiology and nitrogen cycle of a glacial oligotrophic Andean lake as analogue for planetary exploration, Frontiers in Microbiology.

178. Parro V, Puente-Sánchez F, **Cabrol NA,** Gallardo-Carreño I, Moreno-Paz M, Blanco Y, García- Villadangos M, Tambley C, Tilot VC, Thompson C, Smith E, Sobrón P, Demergasso CS, Echeverría- Vega A, Fernández-Martínez MÁ, Whyte LG, Fairén AG. Microbiology and Nitrogen Cycle in the Benthic Sediments of a Glacial Oligotrophic Deep Andean Lake as Analog of Ancient Martian Lake-Beds. Front Microbiol. 2019 May 3;10:929. doi: 10.3389/fmicb.2019.00929.

179. Pope BJS, GR Davies, K Hawkins, TR White, A Stokholm et al, including D. **Caldwell, D Huber** (2019). The Kepler smear campaign: Light curves for 102 very bright stars. Astrophys. J. Supp. 244, article id.18, 19pp.

180. Pravec, P., Fatka, P., Vokrouhlický, D., Scheirich, P., Ďurech, J., et al., including **Marchis, F.** (2019) Asteroid pairs: A complex picture, Icarus, 333, 429-463

181. Primm KM, Stillman DE, **Michaels TI** (2019). Investigating the hysteretic behavior of Mars-relevant chlorides, Icarus

182. Quinn, S. N., Becker, J. C., Rodriguez, J. E., Hadden, S., Huang, C. X., et al., including **Twicken, J. D.** (2019) Near-resonance in a System of Sub-Neptunes from TESS, *The Astronomical Journal*, **158**, 177

183. Rafkin, S, **TI Michaels** (2019). The Mars Regional Atmospheric Modeling System (MRAMS): Current Status and Future Directions, *Atmosphere, 10*

184. Reddy, V., and 69 colleagues, including **Busch, M.W.** (2019). *Near-Earth asteroid 2012 TC4 campaign: results from global planetary defense exercise*, Icarus 326, 133-150.

185. Ren, B., Choquet, É., Perrin, M. D., Duchêne, G., Debes, J. H., et al., including **Marchis, F.,** (2019) An Exo–Kuiper Belt with an Extended Halo around HD 191089 in Scattered Light, *ApJ*, **882**, 64

186. **Rho J**, D Milisavlijevic, A Sarangi, RMargutti, R Chornock et al. (2019). Are Supernovae the Dust Producer in the Early Universe? Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 351; *BAAS* **51**, Issue 3, id. 351.

187. **Ricca A, JE Roser**, E Peeters, C Boersma (2019). Polycyclic Aromatic Hydrocarbons with Armchair Edges: Potential Emitters in Class B Sources. *The Astrophysical Journal*, 882, 56.

188. Richards et al, (including **S. Rosner**) (2019).“SOFIA - HIRMES: Looking forward to the HIgh-Resolution Mid-infrarEd Spectrometer”, Journal of Astrophysical Instrumentation (JAI), Special SOFIA Issue, Vol. 7, No. 4, 1840015-1 – 16.

189. Risacher C. et al, (including **S. Rosner**). “The upGREAT dual frequency heterodyne arrays for SOFIA”, Journal of Astrophysical Instrumentation (JAI), Special SOFIA Issue, Vol. **7**, No. 4, 1840014-1 – 16.

190. 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.

191. Rodriguez, J. E., Quinn, S. N., Huang, C. X., et al. including **Morris, R. L., Wohler, B.** (2019) An Eccentric Massive Jupiter Orbiting a Subgiant on a 9.5-day Period Discovered in the Transiting Exoplanet Survey Satellite Full Frame Images, *The Astronomical Journal*, **157**, 191

192. Ruaud, M., **Gorti, U.** 2019. A Three-phase Approach to Grain Surface Chemistry in Protoplanetary Disks: Gas, Ice Surfaces, and Ice Mantles of Dust Grains. The Astrophysical Journal 885, 146.

193. **Rummel JD** (2019). From Planetary Quarantine to Planetary Protection: a NASA and international story. *Astrobiology*, [Fast Track]

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

195. Rymer A, K Mandt, D Hurly, C Lisse, N Izenberg et al., including **PR Estrada** (2019). Solar System Ice Giants: Exoplanets in our Backyard, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 176; *BAAS* **51**, id.176

196. Sáenz, J.S., Airo, A., **Schulze-Makuch, D**., Schloter, M., and Vestergard, G. (2019) Functional traits co-occurring with mobile genetic elements in the microbiome of the Atacama Desert. *Diversity* 11, # 205, doi:10.3390/d11110205 .

197. Sager C, Airo A., Arens FL, Rabethge C., and **Schulze-Makuch D.** (2019). New types of boulder accumulations in the hyperarid Atacama desert. *Geomorphology* (in press).

198. Salvatelli, V., Bose, S., Neuberg, B., dos Santos, L. F. G., Cheung, M. C. M., including **Jin, M.**, (2019) “Using U-Nets to Create High-Fidelity Virtual Observations of the Solar Corona”, *NeurIPS 2019 Workshop ML4PS*, arXiv:1911.04006.

199. 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

200. Savin, D. W., Babb, J. F., Barklem, P., Bellan, P. M., Betancourt-Martinez, G., et al., including g **Freedman, R**. (2019) State of the Profession Considerations for Laboratory Astrophysics, Astro2020: Decadal Survey on Astronomy and Astrophysics, Bulletin of the *Am. Astron. Soc*., **51**, 7

201. 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.

202. **Schulze-Makuch, D.**, Haque, S., Beckles, D., Schmitt-Kopplin, P., Harir, M., Schneider, B., Stumpp, C. and Wagner, D. (2019, in press) A chemical and microbial characterization of selected mud volcanoes reveals pathogens introduced by surficial water and rain water. *Science of the Total Environment* 707: #136087.

203. **Schulze-Makuch, D.,** and Bains, W. (2019) Das Lebendige Universum: Komplexes Leben auf vielen Planeten, Springer Publ. (Translation of „The Cosmic Zoo: Complex Life on Many Worlds)“ into German language.

204. **Schulze-Makuch, D.** (2019). The naked mole-rat: An unusual organism with an unexpected latent potential for advanced intelligence? *Life* **9**: 76, doi:10.3390/life9030076.

205. Seo YM, PF Goldsmith, CK Walker, **DJ Hollenbach**, MG Wolfire et al. (2019). Probing ISM Structure in Trumpler 14 and Carina I Using the Stratospheric Terahertz Observatory 2, *ApJ* **878**, id. 120, 25pp.

206. Sepúlveda M, Pozzi-Escot D, Angeles Falcón R, Bermeo N, Lebon M, Moulhérat C, **Sarrazin P**, Walter P. (2020) Unraveling the polychromy and antiquity of the Pachacamac Idol, Pacific coast, Peru. PLOS ONE 15(1): e0226244.

207. 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

208. **Showalter MR**, de Pater I, Lissauer JJ, **French RS**, The seventh inner moon of Neptune, *Nature* 566, 350-353, 2019.

209. **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.

210. 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.

211. **Sobron P.,** Misra A., Rull F., and Sansano A. (2019) Raman Spectroscopy: Field Measurements. In: Remote Compositional Analysis: Techniques for Understanding Spectroscopy, Mineralogy, and Geochemistry of Planetary Surfaces, edited by CU Presss, pp In Press.

212. Southworth, J., Dominik, M., Jørgensen, U. G., Andersen, M. I., Bozza, V., et al., including **Tregloan-Reed, J.** (2019) Transit timing variations in the WASP-4 planetary system, *Monthly Notices of the Royal Astronomical Society*, **490**, 4230-4236

213. **Sparks, W.B.,** Germer, T.A., Sparks, R.M. 2019, PASP, 131, 075002, Classical polarimetry with a twist: a compact geometric approach; doi:10.1088/1538-3873/ab1933

214. **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.

215. Stern SA, HA Weaver, JR Spencer, CB Olkin, GR Gladstone et al., including **CM Dalle Ore**, **OM Umurhan, O. White** (2019). Initial Results from the New Horizons Exploration of 2014 MU_{69}, a Small Kuiper Belt Object, *Science* **364**, id. aaw9771

216. Stillman, DE, BD Bue, KL Wagstaff, KM Primm, **TI Michaels** et al. (2020). Evaluation of wet and dry recurring slope lineae (RSL) formation mechanisms based on quantitative mapping of RSL in Garni Crater, Valles Marineris, Mars, *Icarus*, *335*

217. Szalai T, J Vinko, R Konyves-Toth, AP Nagy, KA Bostroem et al., including **J Rho** (2019). The Type II-P Supernova 2017eaw: From Explosion to the Nebular Phase, *ApJ* **876**, id. 19, 24pp.

218. Szenicer, A., Fouhey, D. F., Munoz-Jaramillo, A., Wright, P. J., Thomas et al., including **Jin, M.**, (2019) "A deep learning virtual instrument for monitoring extreme UV solar spectral irradiance", *Science Advances*, **Vol. 5**, no. 10, eaaw6548

219. Taylor, G. J., L. M.V.Martel, P. G.Lucey, J. J.Gillis-Davis, D. F.Blake, **P. Sarrazin**, Modal Analyses of Lunar Soils by Quantitative X-Ray Diffraction Analysis, Geochimica et Cosmochimica Acta, AUG 2019

220. Tilot, V.C., **N.A. Cabrol**, V.G. Parro, A.G. Fairén, R.F.G. Ormond, E. Moreno-Ostos, N. Lopez-Gonzalez, F.A. Figueroa Rebolle, I. Gallardo Carreño, E.P Smith, **P. Sobron**, C. Demergasso, C. Tambley, J. Robidart (2019), A test in a high altitude lake of a multi-parametric rapid methodology for assessing life in liquid environments on planetary bodies, together with the provisional report of a new freshwater polychaete tubeworm community. *Frontiers in Environmental Science, section Microbiological Chemistry and Geomicrobiology*, ms ID: 441309.

221. 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.

222. **Tiscareno MS** and 24 co-authors (2019). Close-range remote sensing of Saturn's rings during Cassini's ring-grazing orbits and Grand Finale. *Science* **364,** aau1017.

223. **Tornabene, L. L.,** et al., (2019) An orbit-based remote sensing geological assessment of the CanMars Mars Sample Return Analogue Deployment (MSRAD) landing site situated in the Henry Mountains Basin, near Hanksville, Utah**,***Planet. Space Sci*

224. Trilling D, MH Wong, T Greathouse, **RJ Cartwright**, N Chanover et al. (2019). Origins Survey of Primordial Relics: ELTs Reveal Compositional Variation across the Solar System, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 519; *BAAS* **51**, id.519.

225. Unsalan, O., **Jenniskens, P**., Qing-zhu, Yin, Kaygisiz, E., Albers, J., Clark, D. L, Granvik, M., Demirkol, I., Edrogan, I .Y., BEngu, A. S. Özel, M. E., Terzioglu, Z., Gi, N., Brown, P. Yalcinkaya, E., Temel, T., Prabhu, D. K., Robertson, D. K., Boslough, M., Ostrowski, D. R., Kimberley, J., Er, S., Rowland, D. J., Bryson, K. L., Altunayar-Unsalan, C., Ranguelov, B., Karamoanov, A., Tatchev, D., Kocahan, O., Ostrakh, M. I., Maksimova, A. A., Karabanalov, M. S., Verosub, K. L., Levin, E., Uysal, I., Hoffmann, V., Hiroi, T., Reddy, V., Ildiz, G. O., Bolukbasi, O., Zolensky, M. E., Hochleitner, R., Kaliwoda, M., Ongen, S., Fausto, R., Nogueira, B. A., Chukin, A. V., Karashanova, D., Semionkin, V. A., Yesiltas, M., Glotch, T., Yilmaz, A., Friedrich, J.M., Sanborn, M.E., Huyskens, M., Ziegler, K., Williams, C. D., Schönbächler, M., Bauer, K., Meier, M. M. M., Maden, C., Busemann, H., Welten, K. C., Caffee, M. W., Laubenstein, M., Zhou, Q., Li, Q.-L., Li, X.-H., Liu, Y., Tang, G.-Q., Sears, D. W> G., McLain, H. L., Dworkin, J. P., Elsila, J. E., Glavine, D. P., Schmitt-Kopplin, P., Ruf, A., Le Corre, L., Schmedemann, N., 2018. Howardite fall in Turkey: Source crater of HED meteorites on Vesta and impact risk of Vestoids. MAPS 54, 953–1008.

226. Vanderburg, A., Huang, C. X., Rodriguez, J. E., Becker, J. C., Ricker, G. R., et al., including **Caldwell, D. A., Smith**, J. C. (2019) TESS Spots a Compact System of Super-Earths around the Naked-eye Star HR 858, *The Astrophysical Journal*, **881**, L19

227. 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

228. Vernazza, P.; Jorda, L.; Ševeček, P.; Brož, M.; Viikinkoski, M.; et al. including **Marchis**, **Franck**; (10/2019). A basin-free spherical shape as an outcome of a giant impact on asteroid Hygiea, *Nature: Astronomy*, doi: 10.1038/s41550-019-0915-8

229. 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.

230. Wagner, N. Y., A. S. Hahn, **D. Andersen**, M. B. Wilhelm, C. Morgan-Lang, M. Vanderwilt, and S. S. Johnson (2019), Draft Genome Sequence from a Putative New Genus and Species in the Family Methanoregulaceae Isolated from the Anoxic Basin of Lake Untersee in East Antarctica, Microb. Res. Announcements, **8** (18), e00271-00219, doi:10.1128/mra.00271-19.

231. 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

232. **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.

233. Weisleitner, K., A. Perras, C. Moissl-Eichinger, **D. T. Andersen**, and B. Sattler (2019), Source Environments of the Microbiome in Perennially Ice-Covered Lake Untersee, Antarctica, Frontiers in Microbiology, **10** (1019),q doi:10.3389/fmicb.2019.01019.

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

235. **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.

236. 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.

237. Wong MH, A Otarola, KR de Kleer, SH Cook, A Hendrix et al, including **RJ Cartwright** (2019). Solar System Deep Time-Surveys of Atmospheres, Surfaces, and Rings, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 541; *BAAS* **51**, id.541.

238. Winters, J. G., Medina, A. A., Irwin, J. M., Charbonneau, D., Astudillo-Defru, N., et al., including **Twicken, J. D., Tenenbaum, P.** (2019) Three Red Suns in the Sky: A Transiting, Terrestrial Planet in a Triple M-dwarf System at 6.9 pc, *The Astronomical Journal*, **158**, 152

239. Yoshida, S., Grunblatt, S., Hermes, J. J., Armstrong, J. D., **Coughlin, J.,** Gully-Santiago, M. (2019) Eclipsing Binary and White Dwarf Features Associated with K2 Target EPIC251248385, *Research Notes of the American Astronomical Society*, **3**, 174

240. Zang R.X., **Peeters E.**, Boersma C. (2019) Tying spatial variation in Polycyclic Aromatic Hydrocarbon (PAH) emission to a changing PAH population in the reflection nebula NGC2023, ApJ, 887, 46

241. Zhan, Z., Günther, M. N., Rappaport, S., et al. including **Caldwell, D. A.**, **Smith, J. C.** (2019) Complex Rotational Modulation of Rapidly Rotating M Stars Observed with TESS, *The Astrophysical Journal*, **876**, 127

242. Zinn JC, MH Pinsonneault, **D Huber**, and D Stello (2019). Confirmation of the Gaia DR2 Parallax Zero-point Offset Using Asteroseismology and Spectroscopy in the Kepler Field, *ApJ* **878**, id. 136, 14pp.

Abstracts & Conference Proceedings

1. Ahrens CJ, **OM Umurhan**, V Chevrier (2019). Overview of thermal and rheological properties of ices on Pluto and other bodies of the outer solar system. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7033.

2. Airapetian, V., Adibekyan, V., Ansdell, M., et al. including **Kalas, P**., (2019) Reconstructing Extreme Space Weather From Planet Hosting Stars, *Bulletin of the American Astronomical Society*, 51, 564.

3. Airapetian, V., Lynch, B., **Jin, M.**, Kazachenko M., Lueftinger T. et al. "Global Corona, Superflares and Super CMEs from the Young Sun", *AOGS 2019*, Singapore, July 28-Aug 2, 2019.

4. Airo A., Arens FL, and **Schulze-Makuch D.** (2019). Strategies when searching for microbial life in the Atacama desert, Chile. *4th Workshop of the German Astrobiological Society*, Vienna, Austria, 26-27 September 2019.

5. Alibrandi A., **Schulze-Makuch D.**, Airo A., and Schirmack J. (2019). Experimental approaches for studying the interactions between metanotrophs and methane hydrates. *4th Workshop of the German Astrobiological Soc.*, Vienna, Austria, 26-27 September 2019.

6. Andrews H, **E Peeters**, AGGM Tielens, and Y Okada (2019). Characterizing IC59 and IC63 through IR observations, *Exploring the infrared universe: the promise of SPICA*.

7. Apai, D., Banzatti, A., Ballering, et al., including **Kalas, P.** (2019) Planetary Habitability Informed by Planet Formation and Exoplanet Demographics, *Bulletin of the American Astronomical Society*, 51, 475.

8. Archinal, B. and the IAU Working Group on Cartographic Coordinates and Rotational Elements (**WGCCRE**). 2019 Planetary Coordinate System Recommendations by the IAU Working Group on Cartographic Coordinates and Rotational Elements. International Union of Geodesy and Geophysics (IUGG) General Assembly 2019. Abstract#, 8-18 July 2019, Montreal, CA.

9. Arens FL., Airo A., Neumann T., Pannekens M. Meckenstock R., Scharfe M., Kaupenjohann M., and **Schulze-Makuch D.** (2019). Identifying new soil microhabitats in the hyperarid Atacama desert, Chile. *European Astrobiology Network Association (EANA)Conference*, Orleans, France, 2-6 September 2019.

10. Aye K-M, Portyankina G, Hansen CJ, **Michaels TI**, Schwamb ME (2019). Geophysical CO2 gas modeling: Initial set-up, *Ninth International Conference on Mars*, Abstract #6214. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6214.pdf

11. Backman, DE, Clark C, Harman P, (2019) NASA's Airborne Astronomy Ambassadors Program: Evaluation of Student Outcomes, AGU Fall Meeting, abstract ED32B-11 https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/599020

12. Banks ME, **Fenton LK**, Chojnacki M, Silvestro S, Runyon KD, Zimbelman JR, Geissler PE (2019) Global database of aeolian bedform activity on Mars, *Geol. Society of America Meeting*, 22-25 Sept, Phoenix, AZ, USA, Abst. #219-8. https://gsa.confex.com/gsa/2019AM/meetingapp.cgi/Paper/341126

13. Barge L. M., Jones J.-**P., Sobron** P., Perl S., and Chin K. (2019) Studying Habitability of Redox Active Hydrothermal Systems on Earth and Ocean Worlds, Goldschmidt Abstracts. pp 2019 194. (from NAI DDF collaboration between the SETI Institute and JPL CAN 7 teams).

14. Baqué M., Sager C., Airo A., **Schulze-Makuch D.**, and de Vera JP (2019). Effect of solar radiation on the distribution of Raman biosignatures in salt nodules from the Atacama desert, *European Astrobiology Network Association (EANA) Conference*, Orleans, France, 2-6 September 2019.

15. Baqué M., Sager C., Airo A., **Schulze-Makuch D.**, and de Vera JP (2019). Effect of solar radiation on the distribution of Raman biosignatures in salt nodules from the Atacama desert, *4th Workshop of the German Astrobiological Society*, Vienna, Austria, 26-27 September 2019.

16. 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.

17. Bauer, A., Lundgren, B., O'Mullane, W., Corlies, L., Schwamb, M. E., et al., including **Caldwell, D. A.** (2019) A Need for Dedicated Outreach Expertise and Online Programming, Astro2020: Decadal Survey on Astronomy and Astrophysics, Bulletin of the American Astronomical Society, **51**, 130.

18. Beddingfield CB, **RJ Cartwright** (2019). Hidden tectonism on Miranda's Elsinore Corona revealed by polygonal impact craters. OPAG poster (and lightning talk), August 2019.

19. Belikov, Ruslan; Barclay, Tom; Batalha, Natalie M.; Bendek, Eduardo; Bolcar, Matt et al.; including **Marchis, F**. (2019/05). Direct Imaging of Exoplanets in Nearby Multi-Star Systems. Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 517; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 517.

20. Benner, L.A.M., Brozović, M., Giorgini, J.D., Taylor, P.A., Nolan, M.C., Howell, E.S., **Busch, M.W.**, Margot, J.L., Naidu, S.P., Magri, C. (2019). *Arecibo and Goldstone radar observations of binary near-Earth asteroid and Janus mission target (175706) 1996 FG3*, Binary Asteroids 5, Fort Collins, Colorado, USA.

21. **Beyer RA**, Schenk P, Moore J, **Beddingfield C**, **White O**, et al. (2019) High-Resolution Pixel-Scale Topography of Pluto and Charon. Pluto System After New Horizons, LPI Contribution No. 2133, 2019, id.7042.

22. **Beyer RA**, Spencer J, Robbins S, Singer K, **Beddingfield C**, et al. (2019) Geology of Charon. Pluto System After New Horizons, LPI Contribution No. 2133, 2019, id.7035.

23. **Beyer RA**, SB Porter, PM Schenk, JR Spencer, **C Beddingfield** et al. including **OM Umurhan** (2019) Stereo Topography of KBO (486958) 2014 MU69. EPSC-DPS Joint Meeting, Geneva, Switzerland.

24. 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.

25. 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.

26. 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.

27. **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.

28. **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.

29. **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.

30. **Bishop JL,** C Koeberl, PAJ Englert, JD Toner, **VC Gulick**, ZFM Burton, EK Gibson & AS McEwen (2019). Martian near-surface S and Cl brines in fractured and porous regolith could trigger microscale soil collapse and cause Recurring Slope Lineae. AGU fall meeting, Abstract #P43B-10.

31. **Bishop JL**, J Flahaut, C Gross, S Perrin, **JM Danielsen**, et al., including J Miura, G Usabal, **K Warren-Rhodes** & **NA Cabrol** (2019). Identifying environmental change and seeking potentially habitable sites on Mars at Mawrth Vallis through correlation with analog expeditions on Earth. *Astrobiology Science Conf.*, Abstract #479407.

32. **Bishop, JL,** Flahaut, J., Gross, C., Saranathan, AM., Danielsen, JM, Usabal, GS., Miura, J., Itoh, Y., & Parente, M. 2019, Salty residues on Mars mark changing geochemical environments. *9th Int'l Conf. on Mars*., Abstract #6148.

33. **Bishop J.L.** (2019) Characterizing the surface of Mars through remote spectral identification of minerals. *9th European Conf. on Mineralogy and Spectroscopy*.

34. **Bishop J.L.,** Gross C., Danielsen J.M., **Perrin S.L., Miura J.K., Usabal G.S.,** Sessa A.M. & Wray J.J. (2019) Multiple mineral horizons at Mawrth Vallis, Mars, represent changing environmental conditions. *EPSC-DPS Joint Meeting*, Abs. #1175.

35. **Bishop J.L.,** Flahaut J. & Perrin S.L. (2019) Characterizing environments containing complex phyllosilicate-sulfate assemblages as analogs for Mars. *EPSC-DPS Joint Meeting*, Abs. #1258.

36. **Bishop JL**, J Flahaut, C Gross, SL Perrin, **JM Danielsen**, **JK Miura**, **GS Usabal**, AM Sessa, JJ Wray, K Warren-Rhodes, N Hinman & NA Cabrol (2019). Identifying environmental change and seeking potentially habitable sites on Mars at Mawrth Vallis through correlation with analog expeditions on Earth. *Astrobiology Science Conf.*, Abstract #479407.

37. **Bishop JL**, CM Weitz, J Flahaut, C Gross, AM Saranathan, **JM Danielsen**, **GS Usabal**, **JK Miura**, Y Itoh & M Parente (2019). Salty residues on Mars mark changing geochemical environments. *9th International Conf. on Mars*, Abs. #6148.

38. **Bishop JL** (2019). Characterizing the surface of Mars through remote spectral identification of minerals. *9th European Conf. on Mineralogy and Spectroscopy*, p. 5.

39. **Bishop JL**, C Gross, **JM Danielsen**, **SL Perrin**, **JK Miura**, **GS Usabal**, AM Sessa & JJ Wray (2019). Multiple mineral horizons at Mawrth Vallis, Mars, represent changing environmental conditions. *EPSC-DPS Joint Meeting*, Abs. #1175.

40. **Bishop JL**, J Flahaut & SL Perrin (2019). Characterizing environments containing complex phyllosilicate-sulfate assemblages as analogs for Mars. *EPSC-DPS Joint Meeting*, Abs. #1258.

41. **Bishop JL**, C Gross, JM Danielsen, JK Miura, GS Usabal, SL Perrin, Y Itoh, AM Saranathan, M Parente, AM Sessa & JJ Wray (2019). Changes in geochemical environment detected at Mawrth Vallis, Mars, through changes in the mineralogic record observed in orbital imagery. *GSA Annual Meeting*, Abstract #295-2.

42. **Bishop, J**., C. Koeberl, P. Englert, J. Toner, **V. Gulick**, Z. Burton, E. Gibson, A. McEwen. 2019. Martian Near-Surface S and Cl Brines in Fractured and Porous Regolith Could Trigger Microscale Soil Collapse and Cause Recurring Slope Lineae. AGU Fall Meeting 2019 Abstract # 521064. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/521064

43. **Bonaccorsi, R.,** Willson, D., Gold, R., Adams, E.Y., and McKay, C.P., 2019, Small, Fast, and Cold!: Enceladus Plume Analog Simulation Experiments, Paper #402-5 AbSciCon Seattle, Washington, June 24-28, 2019

44. **Bonaccorsi, R.,** Willson, D. , Baker, L., and McKay, C.P. (2020) Exploring the Mars-like Ubehebe Volcanic Field: Past, Present, and Future. Submitted to: 2nd Death Valley Science Conference, June 6-8, 2020

45. **Bonaccorsi, R.,** Bishop, J. L., and Burton, F. M. (2020) Salty Clay Sites in the Mojave Desert as Analogues for Mars: VNIR Spectroscopy Investigations of Fluvio-Lacustrine Volcaniclastic Deposits. Submitted to the 51th Lunar and Planetary Science Conference (LPSC), the woodlands, The Woodlands, Texas, March 16–20, 2020

46. **Bonaccorsi, R.,** McKay, C.P., and Cockell, C., 2020, Strategies for life detection in underground Permian and Modern Evaporites from the Boulby Mine (UK)., Astrobiology Jamboree, NASA Ames, March 21, 2019.

47. **Bonaccorsi, R.,** McKay, C.P., and Willson, D., 2019, 2011-2018: Engaging the Public with MarsFest Events in Death Valley National Park, Paper #407-6 AbSciCon Seattle, Washington, June 24-28, 2019.

48. **Bonaccorsi, R.,** McKay, C.P., and Willson, D., 2020, Beat the Odds into the Unknown: Strategies for Life Detection on Europa and Other Ocean Worlds. Submitted to Workshop, Pasadena April 28-30, 2020.

49. Brozović, M., Benner, L.A.M., Nolan, M.C., Giorgini, J.D., Naidu, S.P., Taylor, P.A., **Busch, M.W.**, Farnocchia, D. (2019). *Goldstone and Arecibo radar observations of (99942) Apophis in 2021 and 2029*, 6th IAA Planetary Defense Conference, Washington, DC USA.

50. Brozović, M., and 13 colleagues including **Busch, M.W.** (2019). *Radar and lightcurve observations of binary near-Earth asteroid 2018 EB*, 2019 EPSC-DPS Joint Meeting, Geneva, Switzerland.

51. Brozovic M, **Showalter M**, Jacobson R, **French R,** Lissauer J, and de Pater I (2019). Resonant moons of Neptune. EPSC-DPS2019-901. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-901-1.pdf

52. Brozovic M, **Showalter M**, Jacobson R, **French R**, Lissauer J, de Pater I (2019). Orbits and resonances of the regular

moons of Neptune. Orbits and resonances of the regular moons of Neptune. AAS Division on Dynamical Astronomy meeting #50, id. 102.06. Bulletin of the American Astronomical Society, Vol. 51, No. 5. https://baas.aas.org/wp-content/uploads/2019/06/dda50_abstracts.pdf#abs102.06

53. Bryson, S., **Coughlin, J.,** Batalha, N., Burke, C., Christiansen, J., Mullally, S. (2019) A New Kepler Occurrence Rate Using DR25 Completeness and Reliabilty, *American Astronomical Society* Meeting Abstracts, 51, 113.05

54. 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/

55. 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.

56. **Bywaters**, **K.,** H. Schmidt, D. Deamer, A.R. Hawkins, Z. Panchal, Y. Li, Md. Rahman, R. C. Quinn, W. Vercoutere, and C. P. McKay (2019) Development of Solid-State Nanopore Life Detection Technology. 236th Electrochemical Society, Atlanta, GA Abstract #Z04-2476

57. **Cabrol, N. A.** The changing nature of planetary exploration. *Explorer Magazine*, 2019 Issue. The SETI Institute.

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

59. **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.

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

61. 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.

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

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

64. **Cami J**, and **E Peeters** (2019). Spitzer's View of the Aromatic Universe, *AAS Meeting #234*, id. 213.02

65. 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.

66. Cheung, M. C. M., dos Santos, L. F. G., Bose, S., Neuberg, B., Salvatelli, V., including **Jin, M.** (2019) "Auto-calibration and reconstruction of SDO's Atmospheric Imaging Assembly channels with Deep Learning", AGU Fall Meeting 2019, NG31A-0836

67. Chiavassa A, WD Apel, JC Arteaga-Velazquez, K Bekk, M Bertaina et al., including **D Huber** (2019). Summary of the main results of the KASCADE and KASCADE-Grande experiments, *International Symposium on Very High Energy Cosmic Ray Interactions (ISVHECRI 2018), Nagoya, Aichi, Japan, Edited by Pattison, B.; Itow, Y.; Sako, T.; Menjo, H.; EPJ Web of Conferences*, Volume 208, id.03002.

68. Chojnacki, M, Edgar LA, **Fenton L**, Edwards CS, Weintraub AR (2019) Paleodune deposits exposed on the floor of Melas Chasma, Mars, *Geol. Society of America Meeting*, 22-25

69. Chojnacki M, Edgar L., **Fenton L**, Edwards C.S., and Weintraub A.R. 2019. Paleodune Deposits Exposed On The Floor Of Melas Chasma, Mars. Sept, Phoenix, AZ, USA, Abst. #86-9. https://gsa.confex.com/gsa/2019AM/meetingapp.cgi/Paper/337776

70. 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).

71. Clautice, Devon; Perlman, Eric S.; and additional coauthors including **Sparks, William B.**, 2020, AAS, 235, 304.27, *HST polarimetry of Quasar Jets*, AGU Fall Meeting 2019 (San Francisco)

72. Conrad, A., Archinal, B. and the IAU Working Group on Cartographic Coordinates and Rotational Elements (**WGCCRE**). Update for 2019 from the IAU Working Group on Cartographic Coordinates and Rotational Elements. 50th Lunar and Planetary Science Conference (LPSC) 2019. Abstract #, 18-22 March 2019, The Woodlands, TX (https://www.hou.usra.edu/meetings/lpsc2019/pdf/2110.pdf).

73. 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.

74. Cook JC, S Protopapa, DP Cruikshank, **CM Dalle Ore**, WM Grundy (2019). Charon's surface composition. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7049.

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

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

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

78. **Coughlin, J.** (2019) Lessons Learned and Fascinating Finds from a Manual Vetting of Conflicted KOIs, *American Astronomical Society Meeting Abstracts*, 51, 113.01

79. Crawford, I.A., **Schulze-Makuch, D**., Patel, M., Schirmack, J., Jentzsch, L.,, and Sylvest, M. Implications of an early lunar atmosphere. European Lunar Symposium, Manchester, UK, 20-23 May 2019.

80. 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.

81. Cruikshank, DP, **Umurhan OM**, **Beyer RA**, Schmitt B, Keane, JT, et al. including **White OL**, **Dalle Ore CM**, and **Scipioni F** (2019) Cryovolcanism on Pluto. Pluto System After New Horizons, LPI Contribution No. 2133, 2019, id.7020.

82. **Ćuk, M,** (2019). Lunar Tidal Evolution and the Canonical Giant Impact, On The Moon: A workshop in astrophysics & the history of science, October 14-17, 2019, American University of Beirut, Lebanon.

83. **Ćuk, M,** M El Moutamid, **MS Tiscareno** (2019) Orbital Evolution of the Uranian Satellites, Abstract #02, Bay Area Planetary Science Meeting, November 22, 2019, Stanford University.

84. **Cuk M**, M El Moutamid, and MS Tiscareno (2019). Dynamical History of the Uranian Satellites, *DDA Meeting #50*, id. 102.05,

85. **Cuk M**, D Hamilton, S Stewart (2019). Angular momentum loss from planet-satellite systems: Implications for early Venus. EPSC-DPS Joint Meeting 2019, held 15-20 September, Geneva, Switzerland, no. 1239.

86. **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.

87. **Dalle Ore CM**, DP Cruikshank, S Protopapa, WM Grundy, CB Olkin et al. (2019). Pluto dark refractory material: A close look at composition and origin. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7073.

88. **Dalle Ore CM**, MA Barucci, S Fornasier, DP Cruikshank, WM Grundy, S Protopapa (2019). Pluto data before and after New Horizons: The takeaway for future observations. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7040.

89. 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.

90. David, T., **Cody, A. M**., Hedges, C., Mamajek, E., Hillenbrand, L., et al. (2019) A Family of Newborn Planets Transiting a Young Solar Analog at 20-30 Myr, AAS/Division for Extreme Solar Systems Abstracts, **51**, 203.01.

91. Debes, J., Choquet, E., Faramaz, V. C., Duchene, et al, including **Kalas, P**. (2019) Cold Debris Disks as Strategic Targets for the 2020s, Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, arXiv e-prints, arXiv:1906.02129.

92. Debes, J., Bailey, V., Kasdin, J., Lewis, N., Macintosh, B., et al., including **Turnbull, M**. (2019) The WFIRST Coronagraphic Instrument's Role in the Direct Imaging of Planetary Systems, AAS/Division for Extreme Solar Systems Abstracts, **51**, 330.19.

93. DE Stillman, RE Grimm, K Primm, **TI Michaels** (2019). Geophysical Techniques to Differentiate Between RSL (Recurring Slope Lineae) Formation Mechanisms, *American Geophysical Union Fall Meeting*, Abstract #P41C-3453, San Francisco, California, USA, https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/559509

94. Detweiler A, **B Lafuente,** RM Keller, T Bristow, N Stone et al., including **MD Kubo** (2019). Enhancing Data Sharing, Discovery, and Analysis in the Astrobiology Community, *Astrobiology Science Conf.*, Abstract #319-213.

95. 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.

96. Diniega S, Ewing R, Banfield D, Burr D, **Fenton L**, Gough R, Jackson B, Newman C, Soto A, Sullivan R, Swann C (2019) The importance of martian aeolian and meteorological investigations, *9th International Conference on Mars*, 22-25 July, Pasadena, CA, USA, Abst. #6152. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6152.pdf

97. Dong, C.F., **Jin, M.**, Lingam, M. (2019) "How Flares regulate Atmospheric Losses from the TRAPPIST-1 planets", American Astronomical Society Meeting #234, id. 113.02. Bulletin of the Am. Astronomical Society, Vol. 51, No. 4.

98. Dong, C., **Jin, M.,** Lingam, M., France, K. (2019) How Stellar Flares and Storms Regulate Atmospheric Losses from the TRAPPIST-1 Planets, AAS/Division for Extreme Solar Systems Abstracts, **51**, 319.01.

99. 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

100. 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.

101. **Doyle, L.** Workshop on application of Animal Communications to SETI, Bodega Marine Laboratory, Bodega Bay, CA, November 12-14, 2019.

102. **Doyle, L.** (2019). Quantum SETI, *Foundational Questions in Physics Meeting*, July 2019, Tuscany Italy.

103. Dupuy T, A Kraus, KM Kratter, A Rizzuto, A Mann, M Ireland, **D Huber** (2019). Planetary-stellar orbit alignment in binary systems. AAS, Extreme Solar Systems 4, held in August, Reykjavik, Iceland, id. 316.10.

104. Earle AM, RP Binzel, LA Young, T Bertrand, F Forget et al., including **OM Umurhan** (2019). Volatile and climate cycles on short and long timescales. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7044.

105. El Moutamid M, **M Cuk**, and MS Tiscareno (2019). The Orbital Connection between Mimas and Enceladus, *DDA Meeting #50*, id. 102.04.

106. 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.

107. **Ertem G**, SP Kounaves, RP Volpe & CP McKay (2019). Protective Role of Martian Analogue Minerals for Bio-Organic Molecules Against the Effects of Galactic Cosmic Radiation. *Astrobiology Science Conf.*, Abstract #481359.

108. Esposito, T. M., **Kalas, P.,** Fitzgerald, M. P., Millar-Blanchaer, M. A., Chen, C., Perrin, M. D., et al. (2019) Polarizing Planetary Systems: New Debris Disks Resolved on Solar System Scales by GPIES, AAS/Division for Extreme Solar Systems Abstracts, **51**, 501.05

109. **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.

110. **Estrada PR**, RH Durisen (2019). Evolution of Saturn's rings due to combined viscous spreading and micrometeoroid bombardment. EPSC-DPS Joint Meeting 2019, held 15-20 September, Geneva, Switzerland, no. 1301.

111. Farnocchia D., Chesley S. R., Chodas P. W., Christensen E., Kowalski R. A., Borwn . G**., Jenniskens P**., 2019. The tale of three small impacting asteroids. AAS Division on Dynamical Astronomy meeting #50, id. 200.04. Bull. of the American Astron. Soc. 51, No. 5.

112. **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.

113. **Fenton LK**, Metzger S, Scheidt SP, Michaels TI, Dorn TC, Cole B, Sprau O (2019) Details in the devils: Using convective vortices to measure planetary boundary layer conditions on Earth and Mars, *Geological Society of America Meeting*, 22-25 Sept, Phoenix, AZ, USA, Session 66 T98, Abst. #66-7. https://gsa.confex.com/gsa/2019AM/meetingapp.cgi/Paper/340986

114. Fornasier S, MA Barucci, **CM Dalle Ore** (2019). The Kuiper belt as the context of Pluto. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7012.

115. Fortney, J., Robinson, T. D., Domagal-Goldman, S., et al. including **Freedman, R**. v(2019) The Need for Laboratory Measurements and Ab Initio Studies to Aid Understanding of Exoplanetary Atmospheres, Astro2020: Decadal Survey on Astronomy and Astrophysics, 2020, 146.

116. **French RS,** Stopp DJ, Chang YJ**, Showalter MR, Gordon MK, Tiscareno MS, Evans MW** (2019). OPUS 3.0: The New and Improved Outer Planets Unified Search Tool—10th Anniversary Edition. *4th Planetary Data Workshop*, Abstract #7046 https://www.hou.usra.edu/meetings/planetdata2019/pdf/7046.pdf

117. Gaspar, A., Apai, D., Augereau, J.-C., et al., including **Kalas, P. G.** (2019) Modeling Debris Disk Evolution, *Bulletin of the American Astronomical Society*, 51, 69.

118. **Glines N.H.** and **Gulick V.C.** (2019). Potential Freeze-Thaw Paleolakes and Channels on the Floor of Lyot Crater, Mars. AGU Fall Meeting 2019 Abstract # 605161. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/605161

119. **Gordon MK, Showalter MR, Nedervold E, Tiscareno MS,** Kolokolova L, Barnes T**, Evans MW, French RS (2019).** Data into the Planetary Data System: When Data Systems Collide. *EPSC-DPS Joint Meeting 2019*, id. EPSC-DPS2019-926. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-926-1.pdf

120. **Gordon M**, **Showalter M**, **Nedervold E**, **Tiscareno M**, Kolokolova L, Barnes T, **Evans M**, and **French R** (2019). Integrating Hubble Data into the Planetary Data System: When Data Systems Collide. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-926. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-926-1.pdf

121. Greco, C., **D. T. Andersen**, M. Yallop, G. Barker, and A.-D. Jungblut (2020), Under the ice: Microbial mats of Lake Untersee, Antarctica, in *68th British Phycological Society Annual Meeting*, edited, Plymouth, UK.

122. 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.

123. Grimm, RE, **Michaels, TI**, Stillman, DE (2019). Multiphase Thermal Modeling of Martian Recurring Slope Lineae, *Lunar and Planetary Science Conference*, 18-22 March, The Woodlands, TX, USA, Abst. #1737, https://www.hou.usra.edu/meetings/lpsc2019/pdf/1737.pdf

124. 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.

125. Grunblatt S, **D Huber**, E Gaidos (2019). Transiting planets around red giant stars. AAS, Extreme Solar Systems 4, held in August, Reykjavik, Iceland, id. 309.04.

126. 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.

127. 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.

128. **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.

129. **Gulick V.C.** and **Glines N.H.** (2019). Morphologic, Slope, and Volume Studies of Several Martian Gully Systems: Implications for Paleoenvironmental Settings. AGU Fall Meeting 2019 Abstract # 634007. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/634007

130. **Gulick V.C.** and **Glines N.H.** (2019). Gully Formation on the Central Peak of Lyot Crater: Implications for A Late Paleo Microclimate. *Ninth International Conference on Mars* (LPI Contrib. No. 2089), abstract # 6440. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6440.pdf .

131. **Gulick V.C.** and **Glines N.H.**, (2019). Morphologic, Slope, and Volume Studies of Several Martian Gully Systems. Vol. 13, *EPSC-DPS Joint Meeting*, Abs. #1913. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1913.pdf

132. **Gulick V. and D. Summers**. *Mid-IR and Raman spectroscopy of perchlorates.* Poster #117-006.

133. Hanuš, J.; Marsset, M.; Vernazza, P.; Viikinkoski, M.; Drouard, A. et al.; including **Marchis, F**. (2019/04). *Astronomy & Astrophysics*, Volume 624, id.A121, 17 pp. eprint arXiv:1902.09242.

134. **Harman PK**, Chen, W, et al (2019) Reaching For The Stars: Bringing Space Science to Young Women, AGU Fall Meeting, abstract ED44A-0 https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/557904

135. **Harman PK**, Chen, W, et al NASA SciAct Annual Meeting, (2019) Reaching for the Stars: Engaging Girl Scouts, Volunteers and Families in NASA Science: Daisies, Brownie, Juniors Earn Over 68,000 Space Science Badges * poster

136. **Marchis, F**, Arbouch, E, Peluso, D, **Harman, PK**, Malvache, A, Bertin, E, Zellem, R and Veres, P (2019) Citizen Science Astronomy with the Unistellar Network: From Planetary Defense to Exoplanet Transits AGU Fall Meeting, abstract ED14A03 https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/500017

137. **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 **.**

138. Harman, C., Airapetian, V., Apai, D., et al., including **Kalas, P**. (2019) A Balancing Act: Biosignature and Anti-Biosignature Studies in the Next Decade and Beyond, *Bulletin of the American Astronomical Society*, 51, 414.

139. **Harman, PK, Clark, C**. *Exploring Visible and Invisible Light and Energy in a Three-Dimensional Learning Setting*, NSTA, St. Louis, MO.

140. **Harman, PK.** Engineering activity for elementary students, Science Is Elementary, Belle Haven Elementary School, Menlo Park, CA.

141. 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.

142. 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

143. 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.

144. Heinz, J., Waajen, A., Airo, A. **Schulze-Makuch, D**., and Schirmack, J. Microbial survival in brines and its relevance to the near-surface habitability of Mars. Astrobiology Science Conference, Seattle, USA, 24-28 June 2019.

145. Heinz J., Waajen AC., Airo A., Alibrandi A., Schirmack J. and **Schulze-Makuch D.** (2019). Are perchlorate brines habitable? *European Astrobiology Network Association (EANA) Conference*, Orleans, France, 2-6 September 2019.

146. Hildebrandt, S. R., Shaklan, S., **Turnbull, M. C.,** Cady, E. (2019) SISTER: Starshade Imaging Simulation Toolkit for Exoplanet Reconnaissance, *American Astronomical Society Meeting Abstracts*, 51, 129.01

147. Hinman N. et al. (including **Cabrol, NA, Warren-Rhodes, K., Sobron** P), Deciphering biosignatures as substances, objects and patterns. Poster #117-005.

148. **Hinson DP** and Wilson RJ (2019). Baroclinic waves in the northern hemisphere of Mars as observed by the MRO Mars Climate Sounder, *2019 Fall AGU Meeting*, Abstract No. P43A-02. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/553415

149. **Hinson D.** et al., Transient eddies, water ice clouds, and nocturnal mixed layers at high northern latitudes in early summer. Abstract 6032, 9th International Conference on Mars, Pasadena, CA, 22-25 July 2019. (see also highlights for a QR).

150. 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.

151. 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.

152. 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.

153. Huang, R., **Gulick, V.C.,** and **Glines N.H.** (2019). Analysis of Gully Systems in Two High-Northern Latitude Craters on Mars" AGU Fall Meeting 2019, Abstract #623841. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/623841

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

155. 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.

156. Indyk, **Sobron P.,** and K. Zacky. Autonomous airborne surface sample collection and return. Poster #139-144

157. Jacobson RA, Brozovic M, **Showalter M**, Verbiscer A, Buie M, Helfenstein P (2019). The Orbits and Masses of Pluto's Satellites. Pluto System After New Horizons, held 14-18 July, 2019 in Laurel, Maryland. LPI Contribution No. 2133, 2019, id.7031. https://www.hou.usra.edu/meetings/plutosystem2019/pdf/7031.pdf

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

159. Jentzsch L., Schirmack J., Crawford IA., Patel M., Sylvest M., Billi D., Fagliarone C., and **Schulze-Makuch D.** (2019). A potentially brief habitable period of our Moon 3.5 Ga years ago. *4th Workshop of the German Astrobiol. Soc.*, Vienna, Austria, 26-27 September 2019.

160. **Jin, M.,** Liu, W., Cheung, M., Nitta, N., Manchester, W.B. et al. (2019) "Global Magnetohydrodynamics Simulation of

EUV Waves and Shocks from the X8.2 Eruptive Flare on 2017 September 10", AGU Fall Meeting 2019, SH32A-01 (Invited)

161. **Jin, M.** & Petrosian, V. (2019) "Combined Treatment of Particle Acceleration in Solar Flares and Associated CME Shocks", AGU Fall Meeting 2019, SH13D-3415

162. **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*

163. **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", *AOGS 2019*, Singapore, July 28-August 2, 2019.

164. **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.*

165. **Jin, M.**, Cheung, M. C. M., DeRosa, M. L., Nariaki V. N., Schrijver, C., France K., Kowalski, A., Mason, J., Osten, R. (2019) "Coronal Dimming as a Proxy for Stellar CMEs", IAU Symposium 354, Copiapo, Chile, June 30 – July 6, 2019

166. **Johnsen T.K.** and **Gulick V.C.** (2019). Artificial Intelligence to Classify Minerals and Rocks with Raman Spectra and Image Analysis. AGU Fall Meeting 2019 Abstract ID# 624340. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/624340

167. **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.

168. **Kalas, P.,** De Rosa, R. (2019) A young planetary system modified by a near-coplanar stellar flyby, AAS/Division for Extreme Solar Systems Abstracts, **51**, 320.06

169. Kang D, WD Apel, JC Arteaga-Velazquez, K Bekk, M Bertaina et al, including **D Huber** (2019). Recent results from the KASCADE-Grande data analysis, *International Symposium on Very High Energy Cosmic Ray Interactions (ISVHECRI 2018), Nagoya, Aichi, Japan, Edited by Pattison, B.; Itow, Y.; Sako, T.; Menjo, H.; EPJ Web of Conferences*, Volume 208, id.04005.

170. Keane J, Umurhan O, Porter S, Beyer R, Bierson C, Lisse C, **Showalter M**, Stansberry J, Moore J, McKinnon W, Hamilton D, Verbiscer A, Parker J, Olkin C, Weaver H, Spencer J, and Stern A (2019). The Geophysical Environment of (486958) 2014 MU69. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-922. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-922-1.pdf

171. Keller RM, DF Blake, T Bristow, G Cooper, CE Dateo et al., including **B Lafuente, MD Kubo** (2019). ARMS: A Developing Metadata Standard for Describing Astrobiology Research Products, *Astrobiology Science Conf.*, Abstract #319-213.

172. Kenworthy, M., Zwintz, K., Mellon, S., Guillot, T., **Kalas, P**., et al. (2019) Results from the Beta Pictoris b Hill Sphere Transit Campaign, AAS/Division for Extreme Solar Systems Abstracts, **51**, 322.06

173. Kitazato K, R Milliken, T Iwata, M Abe, M Ohtake et al., including **D Takir** (2019). Asteroid 162173 Ryugu: Surface composition as observed by Hayabusa2/NIRS3. EPSC-DPS Joint Meeting 2019, held 15-20 September, Geneva, Switzerland, no. 1376.

174. Kite, ES, KW Lewis, J Sneed, L Steele, DP Mayer, et al., including **TI Michaels** (2019). Curiosity's Climb in Global Context: Evolution of Major Sedimentary Mounds on Mars. *American Geophysical Union Fall Meeting*, Abstract #P33B-08, San Francisco, California, USA, https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/630222

175. Kite, E, K Lewis, J Sneed, L Steele, D Mayer, et al., including **TI Michaels** (2019). Evolution of Major Sedimentary Mounds on Mars, *EPSC-DPS Joint Meeting 2019*, Abstract #179-3, Geneva, Switzerland, https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-179-3.pdf

176. Knight C., **Peeters E**., Tielens A., Stock D. (2019) "Tracing PAH size in prominent nearby mid-infrared environments" at "WorkPlaNS II: Workshop for Planetary Nebula observations", at Leiden, The Netherlands, Dec 16-20, 2019 (poster)

177. Kopparapu, Ravi Kumar; Hebrard, Eric; Belikov, Rus; Batalha, Natalie M.; Mulders, Gijs D. et al.; including **Marchis, F**. (2019/05). Exoplanet Diversity in the Era of Space-based Direct Imaging Missions. Astro2020: Decadal Survey on Astronomy and Astrophysics, science white papers, no. 12; Bulletin of the American Astronomical Society, Vol. 51, Issue 3, id. 12 (2019), eprint arXiv:1803.03812.

178. 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.

179. **Kostov VB**. (2019). The L 98-59 System: Three Transiting, Terrestrial-size Planets Orbiting a Nearby M Dwarf, *Extreme Solar System IV Conf.*

180. 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.

181. **Lafuente B**, Detweiler A, Keller R, Stone N, Bristow T, Parenteau M, Dateo C (2019) The Astrobiology Habitable Environments Database (AHED) and the Astrobiology Resource Metadata Standard (ARMS): community-driven tools for astrobiological data. AGU Fall Meeting. Abstract #P21E-3423.

182. Lane MD, D Tirsch, **JL Bishop**, CE Viviano, D Loizeau, LL Tornabene & R Jaumann (2019). Identifying olivine in Libya Montes and Tyrrhena Terra, Mars. *9th Int'l Conf. on Mars*, Abs. #6422.

183. Langenkamp, T.R., **Gulick, V.C.** and **Glines N.H.** 2019. Geomorphic Analysis of Martian Gullies in Western Asimov Crater. LPSC, Abstract # 3224. https://www.hou.usra.edu/meetings/lpsc2019/pdf/3224.pdf

184. Langenkamp T.R., **Gulick V.C., and Glines N.H.** 2019. Geomorphic Analysis of Martian Gullies in Western Asimov Crater. NASA Ames Space Science and Astrobiology Seventh Annual Jamboree, April 9, 2019, abstract # PS..4, pgs. 45-46.

185. Lapotre MGA, Bridges NT, Ehlman BL, Rampe EB, Ewing RC, Johnson JR, Ayoub F, Baker MM, Banham SG, Chojnacki M, Cousin A, Day MD, Diniega S, Duran Vinent O, Edwards CS, **Fenton LK**, Gabriel TSJ, Golombek MP, Kerber L, Kok JF, Lamb MP, Lasue J, Newman CE, O'Connell-Cooper CD, Rubin DM, Silvestro S, Stern JC, Sullivan RJ, Vasavada AR, Vaz DA, Weitz CM, Yizhaq H, Zimbelman JR (2019). Martian eolian science since the Eighth International Conference on Mars: Summary of advances and remaining questions, *9th International Conference on Mars*, 22-25 July, Pasadena, CA, USA, Abst. #6201. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6201.pdf

186. Lauer TR, Throop HB, **Showalter MR**, Weaver HA, Stern SA, Spencer JR, Buie MW, Hamilton DP, Porter SB, Verbiscer AJ, Young LA, Olkin CB, Ennico K (2019). The New Horizons and Hubble Space Telescope Search for Rings, Dust, and Debris in the Pluto/Charon System. Pluto System After New Horizons, held 14-18 July, 2019 in Laurel, Maryland. LPI Contribution No. 2133, 2019, id.7041. https://www.hou.usra.edu/meetings/plutosystem2019/pdf/7041.pdf

187. Li, Z., Kane, S., **Turnbull, M.** (2019) Analysis of Exoplanetary Systems as WFIRST Targets, AAS/Division for Extreme Solar Systems Abstracts, **51**, 303.08

188. Line, M., Quanz, S. P., Schwieterman, et al. including **Caldwell, D. A.** (2019) The Importance of Thermal Emission Spectroscopy for Understanding Terrestrial Exoplanets, *Bulletin of the American Astronomical Society*, 51, 271.

189. 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.

190. Lisse CM, LA Young, DP Cruikshank, SA Stern, JT Keane et al., including **OM Umurhan** (2019). Pluto's hypervolatile surface ices sourced from KBO amorphous water ice composites. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7037.

191. Liu, W., **Jin, M.**, Ofman, L., DeRosa, M. L. (2019) "The Global EUV Wave Associated with the SOL2017-09-10 X8.2 Flare: SDO/AIA Observations and Data-constrained MHD Simulations", American Astronomical Society Meeting #234, id. 307.01. Bulletin of the American Astronomical Society, Vol. 51, No. 4.

192. Liu, Y., Jeraldo, P**., Schulze-Makuch, D**., de Vera, J.-P., Cockell, C., Leya, T., Baque, M., and Walther-Antonio, M. Single cell whole genome amplification in optofluidic platform and sequencing assessment from the Biology and Mars Experiment (BIOMEX). Astrobiology Science Conference, Seattle, USA, 24-28 June 2019.

193. 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.

194. 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.

195. Lucchetti A, M Pajola, **CM Dalle Ore**, V Galluzzi, K Stephan et al. (2019). Multidisciplinary analysis of Ganymede's Melkart impact crater. EPSC-DPS Joint Meeting 2019, held 15-20 September, Geneva, Switzerland, no. 1411.

196. Madurowicz, A., Macintosh, B., Bailey, V. P., Chilcote, J., Perrin, M., et al., including **Kalas, P., Marchis, F**. (2019) Asymmetries in adaptive optics point spread functions, *JATIS*, arXiv e-prints, arXiv:1909.12981.

197. Manchester W. B., van der Holst, B., **Jin, M.**, and Kasper, J. C. (2019) "AWSoM Simulation of waves, turbulence and shocks associated with the September 10, 2014 CME/ICME", AGU Fall Meeting 2019, SH41A-04

198. Manchester, W. B., Sun, H., Chen, Y., Liu, Y., **Jin, M.** "Applying Machine Learning and Numerical Simulations to Understanding the Physical Processes of Solar Flare Onset", *SHINE 2019*, Boulder, CO, August 5-9, 2019.

199. Mandt, K. E., Rymer, A., Kalirai, J., Allen, R., Cocoros, A., et al., including **Turnbull, M. C.** (2019) Advancing Space Science Requires NASA Support for Coordination Between the Science Mission Directorate Communities, *Astro2020: Decadal Survey on Astronomy and Astrophysics*, Bulletin of the American Astronomical Society, **51**, 158.

200. Mangelsdorf K., Wagner D., Karger C., and **Schulze-Makuch D.** (2019). Signatures of microbial life in the Atacama desert. *24th International Symposium on Environmental Biogeochemistry*, Postdam, Germany, 22-27 September 2019.

201. Mangelsdorf K., Wagner D., Karger C., and **Schulze-Makuch D.** (2019). Microbial life signatures in one of the driest areas on Earth – the Atacama desert. *29th International Meeting on Organic Geochemistry* 2019, Gotenborg, Sweden, 1-6 September 2019.

202. **Marchis**, **F**; et al.; (12/2019). ED14A-03: "Citizen Science Astronomy with the Unistellar Network: From Planetary Defense to Exoplanet Transits" at American Geophysical Union (AGU) Fall 2019 Conference in San Francisco CA, Session ID: 500017, https://agu.confex.com/agu/fm19/webprogrampreliminary/Paper500017.html

203. **Marchis**, **F**; (10/2019). IAC-19.A7.2.1: "High Contrast Observations: The Alpha Centauri System And Several Shortcuts To Image Another Pale Blue Dot" at 70th International Astronautical Congress (IAC), IAC-19, http://iafastro.org/wp-content/uploads/2019/10/IAC-2019-Technical-Programme-online.pdf

204. **Marchis**, **F.**; **Caldwell, D.**; et al.; (12/2019). P013: "Finding, Exploring, and Characterizing Terrestrial Exoplanets: The Next Frontier" at *American Geophysical Union* (*AGU*) Fall 2019 Conference in San Francisco CA, Session ID: 75474, https://agu.confex.com/agu/fm19/webprogrampreliminary/Session75474.html

205. Marley, M., Lewis, N., Arney, G., et al., inclduding **Freedman, R**. (2019) Imaging Cool Giant Planets in Reflected Light: Science Investigations and Synergy with Habitable Planets, *Bulletin of the American Astronomical Society*, 51, 345.

206. **Marshall, J.**, **Fenton, L.**, Farrell, W., Smith, J., **Beddingfield, C.** (2019) Granular transport on Solar System bodies: Bay Area Studies, *Bay Area Planetary Science Meeting*, 22 Nov, Palo Alto, CA, Abst. 13. https://drive.google.com/file/d/18RXYmb9GFaRQiblhUzsQ1g31R_kDU_DD/view

207. 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.

208. Maus D., Heinz J., Schirmack J., Airo A., Kounaves S., Wagner, D., and **Schulze-Makuch D.** (2019). The process of deliquescence might allow methanogenic archaea to metabolize on Mars. *European Astrobiology Network Association* (EANA) Conference, Orleans, France 2-6 September 2019.

209. McGhee-French C, French RG, **Gordon MK** (2019). Planned archive of Uranus ring occultation observations on NASA's Planetary Data System, *American Astronomical Society, DDA meeting #50*, id. 3220370.

210. 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.

211. McKinnon WB, Keane JT, Nesvorný D, Richardson DC, Hamilton DP, Lauer TR, Lisse CM, Mao X, Marohnic J, Parker AH, Porter SB, **Showalter MR**, **Umurhan OM**, Spencer JR, Grundy WM, Moore JM, Stern SA, Weaver HA, Olkin CB, and New Horizons Science Team (2019). On the Origin of the Remarkable Contact Binary (486958) 2014 MU69 ("Ultima Thule"). EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-1387. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1387-7.pdf

212. **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.

213. 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.

214. 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.

215. Morley, CV, Skemer, AJ., Miles, BE et al. (including **R. Freedman**) (2019). Measuring the D/H Ratios of Exoplanets and Brown Dwarfs. State of the Profession Considerations for Laboratory Astrophysics, *Bulletin of the American Astronomical Society*. 09/01/2019

216. **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

217. 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.

218. Muller JP, Tao Y, **Beyer RA**, Alexandrov O, and McMichael S. (2019) CASP-GO: 3D Imaging Open Source Software for Processing Planetary Multi-Angle Data into 3D Images from Laptops to Cloud Computers. 4th Planetary Data Workshop, LPI Contribution No. 2151, id.7072.

219. Naidu, S.P., Margot, J.L., Benner, L.A.M., Taylor, P.A., Nolan, M.C., Magri, C., Brozović, M., **Busch, M.W.**, Giorgini, J.D., (2019). *Radar observations and characterization of binary near-Earth asteroid (35107) 1991 VH, a flyby target for the proposed Janus mission*, Binary Asteroids 5, Fort Collins, Colorado, USA.

220. Naidu, S.P., and 10 colleagues including **Busch, M.W.** (2019). *Radar observations and characterization of (436724) 2011 UW158*, 2019 EPSC-DPS Joint Meeting, Geneva, Switzerland.

221. 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.

222. 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, abs PS.6, pg. 48.

223. Naor, R., **Gulick, V.C., Glines, N.H.** (2019). Subsurface volume loss and collapse due to surface infiltration of Osuga Valles' catastrophic floods, Mars. Vol. 13, *EPSC-DPS Joint Meeting*, Abs. #1443. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1443.pdf .

224. Newman, C., Diniega, S., Ewing, R., Banfield, D. J., Burr, D. M., **Fenton, L. K.**, Gough, R. V., Jackson, B., Soto, A., Sullivan, R. J., Swann, C. (2019) The next-generation Planetary Aeolian and Meteorological Investigation (PAMI) mission concept, Abstract P33D-14, presented at 2019 Fall Meeting, American Geophysical Union, San Francisco, CA, 9-13 Dec. https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/617408

225. **Obbard**, **RW.,** P. Sarrazin, N. Vo, K. Zacny, S. Byrne. Seventh International Conference on Mars Polar Science and Exploration. Ushuaia, Tierra del Fuego, Argentina. January 13–17, 2020.

226. Omodei, N., Pesce-Rollins, M., Longo, F., Petrosian, V., Liu, W., and **Jin, M.** (12/2019) "High-energy Observations of Solar Flares During Solar Cycle 24th with the Fermi Large Area Telescope", AGU Fall Meeting 2019, SH12B-02 (**Invited**).

227. Palomba E, M D'Amore, A Galiano, A Zinzi, F Dirri et al., including **D Takir** (2019). Ryugu spectral surface regions via unsupervised machine learning classification of NIRS3 data. EPSC-DPS Joint Meeting 2019, held 15-20 September, Geneva, Switzerland, no. 641.

228. 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.

229. Patience, J., Hom, J., Esposito, T. M., **Kalas, P.,** Perrin, M. D., et al. (2019) A survey for resolved debris disks in the Sco-Cen association with the Gemini Planet Imager, AAS/Division for Extreme Solar Systems Abstracts, **51**, 325.04

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

231. 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*

232. 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.

233. 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.

234. 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.

235. **Pilorz S**, Colwell JE, **Showalter M**, Spilker L, Altobelli N, Brooks S, and Ferrari C (2019). The Far-IR Emissivity of Saturn's Rings Observed with Cassini CIRS. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-1227. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1227-1.pdf

236. 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.

237. Porter S, Beyer R, Keane J, Umurhan O, Bierson C, Grundy W, Buie M, **Showalter M**, Spencer J, Stern A, Weaver H, Olkin C, Parker J, Verbiscer A, and the New Horizons Geology, Geophysics, and Imaging (GGI) Team (2019). The Shape and Pole of (486958) 2014 MU69. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-311. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-311-1.pdf

238. Porter SB, **Showalter MR**, Weaver HA, Spencer JR, Lauer TR, Verbiscer AJ, Grundy WM, Stern SA, Young LA, Olkin CB, Ennico K (2019). The Shapes and Poles of Nix and Hydra from New Horizons. Pluto System After New Horizons, held 14-18 July, 2019 in Laurel, Maryland. LPI Contribution No. 2133, 2019, id.7038. https://www.hou.usra.edu/meetings/plutosystem2019/pdf/7038.pdf

239. Portyankina G, Aye K-M, Schwamb ME, Hansen CJ, **Michaels TI** (2019). Planet Four pursuit of studying seasonal activity and spring atmosphere with citizen science, *Ninth International Conference on Mars*, Abstract #6158. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6158.pdf

240. Primm, K, D Stillman, **TI Michaels**. (2019). Quantifying Daily Brine Phase-Evolution on Mars using Thermochemical Modeling, *Astrobiology Science Conference.* https://agu.confex.com/agu/fm19/meetingapp.cgi/Paper/588597

241. Primm KM, Stillman DE, **Michaels TI** (2019). A new Mars chamber and salt kinetics model to better understand martian surface water uptake, *Ninth International Conference on Mars*, Abstract #6271. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6271.pdf

242. 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.

243. 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.

244. Quinn RC, AJ Ricco, N Bramail, J Forgione, L Timucin, et al. including **KF Bywaters** (2019). Europa Luminescence Microscope, *Astrobiology Science Conf.*, Abstract #408-8.

245. **Race MS** (2019)**.** Sample Return Planning and Biocontainment Needs for Robotic and Human Mars Missions. *Astrobiology Science Conf.*, Abstract # 483116.

246. Radebaugh J, Telfer MW, Parteli EJR, **Beyer RA**, Kirk, RL (2019). The Shapes and Distributions of Dunes on Pluto. Pluto System After New Horizons, LPI Contribution No. 2133, 2019, id.7069.

247. Radosevich LA, AJ Ricco, RC Quinn, T Boone, M Chin, et al. including **KF Bywaters** (2019). SPLIce: A Microfluidic Sample Processor to Enable the Search for Life on Icy Worlds, *Astrobiology Science Conf.*, Abstract #107-4.

248. **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.

249. **Rho, J.** A Twin of SN1987A: Progenitor and CO formation in SN2018hna, Hot-Wiring the Transient Universem Northwestern University (Aug. 19-22).

250. **Ricca A, JE Roser**, **E Peeters**, and C Boersma (2019). Zigzag and armchair PAH subpopulations as probes of the local radiation environment, *Laboratory Astrophysics: From Observations to Interpretation, IAU Symposium* No. S350, April 2019 (poster).

251. Riekeles M., Schirmack J., and **Schulze-Makuch D.** (2019). Microbial motility as a fundamental biosognature and means for its automated detection and analysis. *4th Workshop of the German Astrobiological Society*, Vienna, Austria, 26-27 September 2019.

252. 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.

253. 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.

254. Robinson JM and **Tiscareno MS**(9/19). Photometry of giant propellers in Saturn's rings from close-range Cassini

images. *AAS Division for Planetary Sciences* (Geneva, Switzerland) **51,** 1212.

255. **Roser JE**, **A Ricca** (2019). PAH Clusters as Interstellar Very Small Grains. *Proc. IAU Symp. S350*, Abs.

256. **Rosner S.** et al, "Testing of a Closed-Cycle Cryocooler Compressor for Deployment Aboard SOFIA Aircraft", Proceedings of the 19th International Cryocooler Conference, 273-279

257. Rozek A, **Busch MW**, Marshall SE, Young GC, Cobb AD, Raissi C, Gal Y, Benner LAM, Taylor PA, Lowry SC (2019). *Machine learning tools to develop 3D shape models of near-Earth asteroids from radar observations*, EPSC-DPS Joint Meeting, Geneva, Switzerland - https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-2074.pdf (to be also presented at the 2019 AGU Fall Meeting, San Francisco, California USA).

258. **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.

259. **Rummel JD** (2019). Mars! and the 5 W's [who, what, where, when, and why]. *3rd COSPAR International Workshop on Refining Planetary Protection Requirements for Human Missions.* Lunar and Planetary Institute, Houston, TX.

260. **Rummel JD** (2019). The Worm Ouroboros: Harmful Contamination and Planetary Protection in the Outer Space Treaty (for Astrobiology). Astrobiology Science Conf.

261. **Rummel JD,** C. Coward (2019). From Contamination to Sterilization to Quarantine To Protection: The Significance Of Terminology On An Interplanetary Scale. *IAC 2019*, Washington, DC.

262. Sager, C., Airo A., Arens F., and **Schulze-Makuch D.** (2019). Polygenated soils in the hyperarid Atacama desert and their relevance and the periglacial areas on Earth and to patterned grounds on Mars. *4th Workshop of the German Astrobiological Society*, Vienna, Austria, 26-27 September 2019.

263. **Sarrazin, P.**, D. Blake, R. Walroth, M. Gailhanou, F. Marchis, C. Chalumeau, K. Thompson, J. Chen, T. Bristow, P. Walter, and E. Schyns, *Full-field XRF with square pore micro-channel plate optic.*, Denver X-ray conference (Aug 2019):

264. **Sarrazin, P.,** T. Bristow, D. Blake, M. Gailhanou, J. Chen4, K. Zacny, *Planetary XRD/XRF beyond CheMin: new developments toward smaller instruments*, Denver X-ray conference (Aug 2019).

265. **Sarrazin, P., R. Obbard**, N. Vo, K. Zacny, *in-situ microCT instrument for planetary exploration*, Congress on X-ray Optics and Microanalysis, ICXOM (Aug 2019)

266. **Sarrazin P.** DXC (08/19): "Full-field XRF with square pore micro-channel plate optic".

267. **Sarrazin P.** DXC (Aug 2019): "Planetary XRD/XRF beyond chemin: new developments toward smaller instruments.".

268. **Sarrazin P.** Abscicon (May 2019): "Planetary in-situ microCT analysis of rock samples".

269. **Sarrazin P.** Abscicon (May 2019): "Machine Learning Approaches to Data Reduction from the MapX "

270. **Sarrazin P.** Abscicon (May 2019): "X-ray Fluorescence Instrument for Detection of Biosignatures and Habitable Planetary Environments"

271. **Sarrazin P.** Abscicon (May 2019): "The Relevance of Hydrothermal Spherules in Astrobiological Exploration of Rocky Planets".

272. **Sarrazin P.** Abscicon (May 2019): "CheMin-V: A Definitive Mineralogy Instrument for the Venera-D Mission".

273. **Sarrazin P.** 9th Conf on Mars (Jun 2019): "A MINIATURIZED CHEMIN XRD/XRF FOR FUTURE MARS EXPLORATION https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6230.pdf

274. **Sarrazin P.** *Poster presentation a the 9th Conf on Mars (Jun 2019): "*MAPX: A FULL-FIELD X-RAY FLUORESCENCE IMAGER FOR IN-SITU HABITABILITY AND BIOSIGNATURE INVESTIGATIONS https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6329.pdf

275. **Sarrazin P.** *9th Conf on Mars (Jun 2019): "*IN-SITU ANALYSIS OF ROCK CORES USING ON-BOARD MICRO-CT AND RADIOGRAPHY *https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6246.pdf*

276. **Sarrazin P.** *LPSC (Mar 2019): "CHEMINX: A NEXT GENERATION XRD/XRF FOR MARS EXPLORATION." https://www.hou.usra.edu/meetings/lpsc2019/pdf/2236.pdf*

277. **Sarrazin P.** *LPSC (Mar 2019): "*MapX: An in-situ Mapping X-ray Fluorescence Instrument for Detection of Biosignatures and Habitable Planetary Environments." *https://www.hou.usra.edu/meetings/lpsc2019/pdf/1616.pdf*

278. 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.

279. Savin, D. W., Babb, J. F., Bellan, et al. including **Freedman, R.** (2019) Astrophysical Science enabled by Laboratory Astrophysics Studies in Atomic, Molecular, and Optical (AMO) Physics, *Bulletin of the American Astronomical Society*, 51, 96.

280. 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.

281. Schenk, P, et al. including **White O**, **Beyer RA** (2019). Impact Craters on Pluto: Size-Frequency Distributions, Morphologies, Terrain Ages. Pluto System After New Horizons, LPI Contribution No. 2133, 2019, id.7043.

282. Schirmack J., **Schulze-Makuch D.**, Kounaves S., Clark M., Amro MM., Freese C., Moeller R., Schmitt-Kppplin P., and Uhl J. (2019). Comparison of different sterilization methods embedded in a Mars regolith analog. *4th Workshop of the German Astrobiological Society*, Vienna, Austria, 26-27 September 2019.

283. **Schulze-Makuch**, **D**. The last outpost of life in the Atacama Desert and what it means for the search for life on Mars. Invited abstract/keynote talk at ASA-CSSA-SSSA International Annual Soil Science Meeting, San Antonio, USA, 10-13 Nov 2019.

284. **Schulze-Makuch, D.** The case for a robotic in-situ life detection mission to explore potential habitats on Mars. Extant Life on Mars Workshop, Carlsbad, New Mexico, USA, 5-8 Nov 2019.

285. **Schulze-Makuch, D**. and Bains, W. Evolution of complex genetics. Astrobiology Science Conference, Seattle, USA, 24-28 June 2019.

286. **Schulze-Makuch D.,** and R. Heller (2019). Searching for an exoplanet more habitable than Earth. *4th Workshop of the German Astrobiological Society*, Vienna, Austria, 26-27 September 2019.

287. 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.

288. Seager, S., Kasdin, N. J., Booth, J., Greenhouse, M., Lisman, D., et al., including **Turnbull, M**. (2019) Starshade Rendezvous Probe Mission, Astro2020: Decadal Survey on Astronomy and Astrophysics, Bulletin of the American Astronomical Society, **51**, 106

289. **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

290. **Showalter MR**, Porter SB, Verbiscer AJ, Buie MW, Helfenstein P (2019). Rotation States of Pluto's Small Moons and the Search for Spin-Orbit Resonances. Pluto System After New Horizons, held 14-18 July, 2019 in Laurel, Maryland. LPI Contribution No. 2133, 2019, id.7052. https://www.hou.usra.edu/meetings/plutosystem2019/pdf/7052.pdf

291. **Showalter M**, Porter SB, Verbiscer AJ, Buie MW, and Helfenstein P (2019). Rotation States of Pluto's Small Moons and the Search for Spin-Orbit Resonances. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-1025. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1025-1.pdf

292. **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.

293. 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.

294. Slater, G., **D. T. Andersen**, and A. Brady (2019),*Isotopic Depletion of Methanotroph Biomarker Lipids in Lacustrine Systems*, in*2019 Astrobiology Science Conference*,Seattle, Washington.

295. **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.

296. **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.

297. **Spark, W.** Lorentz Center workshop "Directly Imaging Exoplanets in Polarized Light with ELTs", Leiden, The Netherlands (invited).

298. **Spark, W.** Meyer, E., Georganopoulos, M., Lister, M., Sparks, W., Chiaberge, M., Perlman, E., Van der Marel, R., Anderson, J., 2020, AAS, 235, 436.03, *Proper Motions of Jets on kpc Scales with HST and the VLA*, AGU Fall Meeting 2019 (San Francisco)

299. **Spry JA, MS Race,** LM Pratt, B Siegel, A Cousstenis & G Kminek (2019). Before You Go ... Information Needed for the Safe and Productive Astrobiological Exploration of Mars by Crewed Missions, *Astrobiology Science Conf.*, Abstract #479801.

300. **Spry JA, MS Race,** G Kminek, B Siegel, & C Conley (2019). Planetary Protection Knowledge Gaps for Future Mars Human Missions: Stepwise Progress in Identifying and Integrating Science and Technology Needs. *ICES meeting*.

301. Stillman D E, Bue BD, Wagstaff KL, Primm KM, **Michaels TI**, Grimm RE (2019). Quantitative mapping and evaluation of wet and dry formation mechanisms of recurring slope lineae (RSL) in Garni Crater, Valles Marineris, Mars, *Ninth International Conference on Mars*, Abstract #6098. https://www.hou.usra.edu/meetings/ninthmars2019/pdf/6098.pdf

302. Stoker, C., N. Batista Do Nascimento Jr., **K. Bywaters** (2019) What Happens to Life in an Ocean World Plume? NASA Ames Research and Technology Showcase.

303. **Stucky TR,** D Gentry, J Koehne, D Mauro, A Schramm (2019). Investigation of Statistical Classification to Inform Life Detection Mission Evaluation, *Astrobiology Science Conf.*, Abstract #319-214.

304. **Stucky, TR** , D Gentry, J Koehne, D Mauro, A Schramm (2019). Investigating Classification of Life Detection Data for Mission Evaluation, *AbSciCon 2019*.

305. **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.

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

307. **Summers DP** & T Boone (2019). Microbial Contamination Detection at Low Levels by ^{125}I Radiolabeling, *Astrobiology Science Conf.*, Abstract #319-274.

308. **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. 2019.

309. **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.

310. **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.

311. **Takir D**, K Kitazaro, RE Milliken, T Iwata, M Abe et al. (2019). Spectral characteristics of asteroid (162173) Ryugu with Hayabusa2 NIRS3. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.6096.

312. **Takir D**, W Neumann, SN Raymond, JP Emery (2019). 3-μm reflectance spectroscopy of outer main belt asteroids: Context and implications. EPSC-DPS Joint Meeting 2019, held 15-20 September, Geneva, Switzerland, no. 352.

313. 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.

314. **Tebes** et al., (including **Cabrol NA and K. Warren-Rhodes**) Pajonales: *Microbial contribution to the formation and preservation of gypsum structures from Salar de Pajonales, northern Chile*. Poster #262.

315. 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.

316. Throop H, Lauer L, Spencer J, **Showalter M**, Buie M, Porter S, Grundy W, Weaver H, Stern, SA, Hamilton D, Kaufmann D, Verbiscer A, Zangari A, Olkin C, and Parker J (2019). Limits on Rings and Debris Around 2014 MU69 from New Horizons. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-1196 https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1196-1.pdf

317. 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.

318. **Tiscareno MS** and Modesto J (9/19). Radial distribution of textures in Saturn's main rings. *AAS Division for Planetary Sciences* (Geneva, Switzerland) **51,** 442.

319. **Tornabene, L. L.**, et al. (2019) Colour and Stereo Surface Imaging System (CaSSIS) on the ExoMars Trace Gas Orbiter (TGO): Potential Colour Data Products and Their Use for Scientific Investigations. (Abstract #6293) *Mars 9 Conference*. Pasadena, California, July 2019, (Poster).

320. **Tornabene, L. L.**, et al. (2019) Continuous ejecta deposits observed beyond layered ejecta ramparts on Mars. (Abstract #6354) *Mars 9 Conference*. Pasadena, California, July 2019, (Abstract Only)

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

322. **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.

323. **Twicken, J.D**., J.M. Jenkins, **D.A. Caldwell**, **R.L. Morris**, M.E. Rose, J.C. **Smith, P. Tenenbaum,** E.B. Ting, C.J. Burke, M. Fausnaugh, R. Vanderspek, (2019) First Year Threshold Crossing Events in the TESS SPOC Transit Search, *TESS Science Conference I*, Cambridge, MA

324. **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.

325. **Umurhan OM,** DP Cruikshank (2019). Cryovolcanism on Pluto: Various theoretical considerations. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7066.

326. 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.

327. Van Dam, D., Kenworthy, M., David, T., Mamajek, E., Hillenbrand, L., **Cody, A. M.,** et al. (2019) Deep Asymmetric Eclipse of V928 Tau, AAS/Division for Extreme Solar Systems Abstracts, **51**, 322.10

328. Vanderwilt, M., N. Wagner, **D. T. Andersen**, and S. S. Johnson (2019),*Soil Microbial Communities in an Antarctic Water Track: Identifying Potential Ecological Optimums in a Hyperarid Mars-analog Environment* in*2019 Astrobiology Science Conference*, Seattle, Washington. Poster.

329. 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.

330. 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.

331. Verbiscer A, **Showalter M**, Helfenstein P, and Buie M (2019). The Pluto System at True Opposition. EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland. EPSC-DPS2019-1261. https://meetingorganizer.copernicus.org/EPSC-DPS2019/EPSC-DPS2019-1261-1.pdf

332. Verbiscer AJ, **Showalter MR**, Buie MW, Helfenstein P (2019). The Pluto System at True Opposition. Pluto System After New Horizons, held 14-18 July, 2019 in Laurel, Maryland. LPI Contribution No. 2133, 2019, id.7050. https://www.hou.usra.edu/meetings/plutosystem2019/pdf/7050.pdf

333. Vercoutere WA, **Z Panchal, KF Bywaters,** H Schmidt, SY Li et al. (2019). Development of Nanopore Detector, Detecting Signs of Life, *Astrobiology Sci. Conf.*, Abstract #118-007.

334. Vercoutere, C. McKay, C. Stoker and **K. Bywaters** (2019) Upcycling through Integration: New Flight Hardware for Monitoring Microbial Growth. NASA Ames Research and Technology Showcase.

335. 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.

336. Vorobiev, D., Irwin, A., Ninkov, Z., Donlon, K., **Caldwell, D.,** Mochnacki, S. (2019) Direct measurement of the Kepler Space Telescope CCD's intra-pixel response function, *SPIE Journal of Astronomical Telescopes, Instruments, and Systems*, arXiv e-prints, arXiv:1909.12248.

337. Wagner, N., A. Hahn, **D. T. Andersen**, C. Roy, M. Vanderwilt, M. B. Wilhelm, and S. S. Johnson (2019),*Metagenomic and Metatranscriptomic Profiling of the*

Methane-Rich Anoxic Basin of the Antarctic Lake Untersee as an Ocean Worlds Analog, in*2019 Astrobiology Science Conference*, Seattle, Washington. Poster.

338. Wagner, N. Y., A. S. Hahn, **D. T. Andersen**, C. Roy, M. B. Wilhelm, M. Vanderwilt, and S. S. Johnson (2019),*Metagenomic Profiling of the Methane-Rich Anoxic Waters of Lake Untersee as an Ocean Worlds Analog*, in*Ocean Worlds 4*, edited, p. Abstract #6025, Lunar and Planetary Institute, Columbia, MD. Poster

339. 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.

340. Walroth, R. C., Blake, D. F., Sarrazin, P., **Marchis, F.**, Thompson, K., (2019). MapX: An In-Situ Mapping X-Ray Fluorescence Instrument for Detection of Biosignatures and Habitable Planetary Environments, *50th Lunar and Planetary Science Conference*, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1616.

341. Walroth, R. C.; Sarrazin, P.; Blake, D. F.; Thompson, K.; Gailhanou, M.; et al.; including **Marchis**. **F**.; (2019/07). MapX: A Full-Field X-Ray Fluourescence Imager for In-Situ Habitability and Biosignature Investigations, *Ninth International Conference on Mars*, held 22-25 July, 2019 in Pasadena, California. LPI Contribution No. 2089, id.6329.

342. **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.

343. **Warren-Rhodes et al., (including Cabrol NA, Sobron P).** Landscape ecology of microbial communities in the Mars analog Salar de Pajonales. 2019 AbScicon Conference, Seattle, Poster #141-169.

344. 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.

345. Weaver HA, Porter SB, Buie MW, Cook JC, Grundy WM, Verbiscer AJ, Hamilton DP, Lauer TR, **Showalter MR**, Spencer JR, Stern SA, Ennico K, Olkin CB, Young LA, and the New Horizons Science Team (2019). Pluto's Small Satellites. Pluto System After New Horizons, held 14-18 July, 2019 in Laurel, Maryland. LPI Contribution No. 2133, 2019, id.7028. https://www.hou.usra.edu/meetings/plutosystem2019/pdf/7028.pdf

346. 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.

347. Weitz C.M., **Bishop J.L.,** Flahaut J., Gross C., Saranathan A.M., Itoh Y. & Parente M. (2019) Evidence for Hesperian acidic alteration in Ius Chasma. *9th Int'l Conf. on Mars*, Abs. #6240.

348. **White O.** (2019). Washboard and Fluted Terrains on Pluto as Evidence for Ancient Glaciation", Pluto System After New Horizons conference at the Applied Physics Laboratory, MD, July 14-18: "Washboard and Fluted Terrains on Pluto as Evidence for Ancient Glaciation", Abstract #7008.

349. **White O.** The Geology and Formation of the Kuiper Belt Object 2014 MU69", Abstract P42C-01. American Geophysical Union Fall meeting in San Francisco, December 9th-13th

350. **White O.** Presented at the 2019 Planetary Mappers Meeting in Flagstaff, AZ, June 12th-14th: "A Forthcoming Geologic Map of Pluto", Abstract #7001.

351. **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.

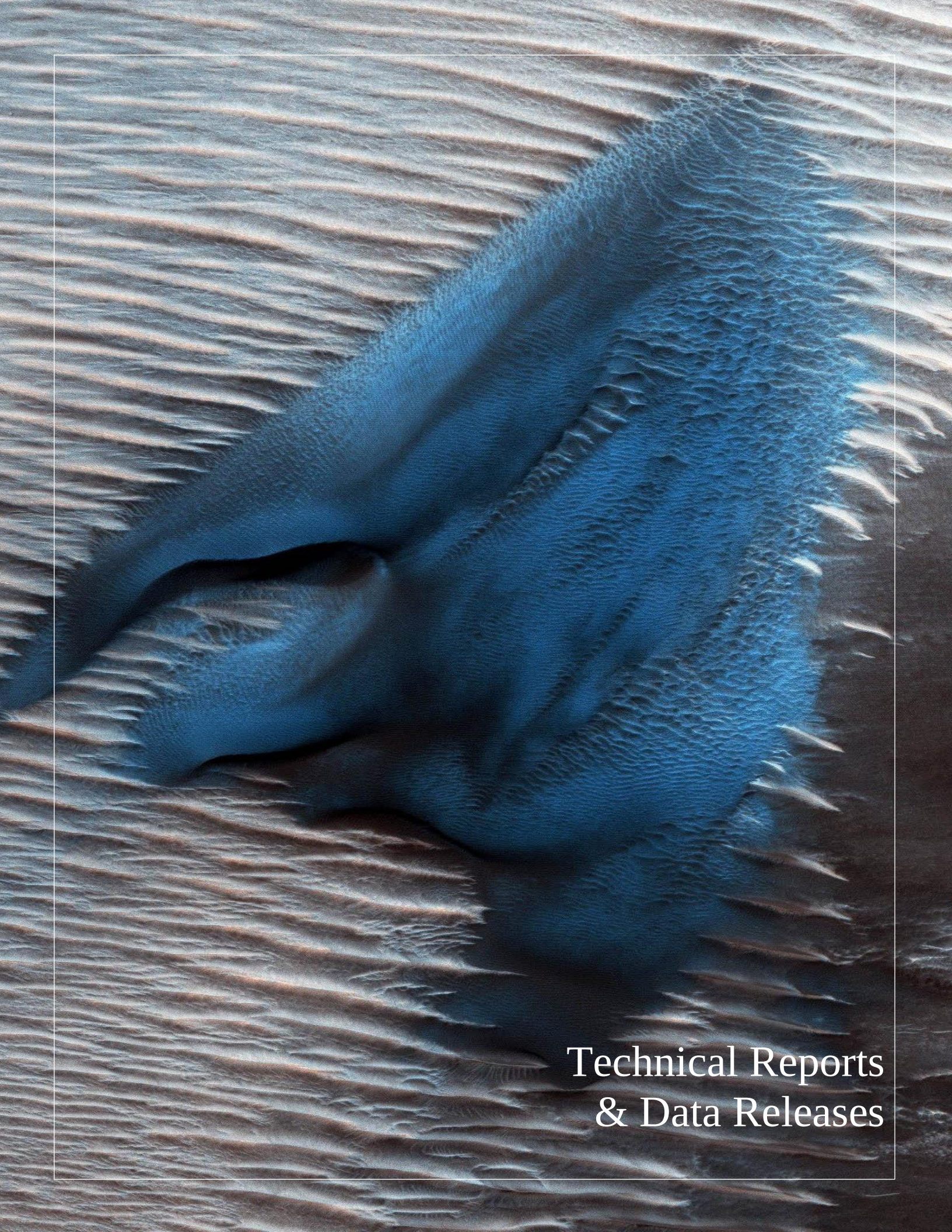
352. Zangari AM, Beddington CB, Benecchi SD, Beyer RA, Bierson CJ, et al., including **Umurhan OM** (2019). The Mysterious Missing Light Curve of (486958) 2014 MU69, a Bi-Lobate Contact Binary Visited by New Horizons. 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands,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

353. Young LA, SP Tan, LM Trafton, JA Stansberry, WB Grundy et al., including **OM Umurhan** (2019). On the disequilibrium of Pluto's volatiles. Pluto System After New Horizons, held 14-18 July, in Laurel, Maryland. LPI contribution no. 2133, id.7039.

354. Youngblood, A., France, K., Koskinen, T., et al. including **Jin, M.** (2019) EUV influences on exoplanet atmospheric stability and evolution, *Bulletin of the American Astronomical Society*, 51, 320.

355. Youngblood, A., Drake, J., Mason, J., Osten, R., **Jin, M.,** et al. (2019) EUV observations of cool dwarf stars, *Bulletin of the American Astronomical Society*, 51, 300.

356. Zhu, B., Liu, Y. D., Kwon, R., **Jin, M.**, and Yang, Z. (2019) "Characteristics of the 2017 Sept.10 GLE event in relation to shock properties", *AGU Fall Meeting* 2019, SH23C-3361



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. Barentsen, G., Colon, K., Barclay, T., Debie, D., O'Leary, E., **Cody, A. M., Coughlin, J., Caldwell, D**. (2019) KeplerGO/KeplerScienceWebsite: source code release: https://github.com/KeplerGO/KeplerScienceWebsite, v20190409, Zenodo, https://dx.doi.org/10.5281/zenodo.593417

3. 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

4. **Bonaccorsi, R.,** 2019 activity Research Permit at the Ubehebe Volcanic October 2018 – December 2019: Data release to DEVA.

5. 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.

6. 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

7. 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. (1 May 2019) TESS Data Release Notes: Sectors 1-6, DR12, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_multisector_01_06_drn12_v03.pdf

8. 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. (5 Dec 2018) TESS Data Release Notes: Sectors 1-9, DR15, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_multisector_01_09_drn15_v03.pdf

9. **Cami J., Peeters E.**, Houde M., Mandy M., Plume R., et al. (2019) "Molecular Astrophysics and Astrochemistry", White Paper submitted for the Canadian Astronomical Society's Long-Range Plan (LRP 2020) process.

10. 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.

11. Chontos A, **D Huber**, DW Latham, A Bieryla, V van Eylen et al. (2019). *VizieR Online Data Catalog: Radial velocities and transit times for KOI 4 (Chontos+, 2019)*, VizieR On-line Data Catalog: J/AJ/157/192.

12. **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.

13. Cooray, A., Bradford, C., Ressler, M. et al. including **Gorti, U.** 2019. A NASA-led US Contribution to the ESA/JAXA SPICA Mission: Unveiling the Dust Obscured Universe. Bulletin of the American Astronomical Society 51, 87.

14. Eadie G., Bahramian A., Barmby, P., Craiu R., Bingham, et al. including **Cami J.**, (2019), "LRP2020: Astrostatistics in Canada", White Paper submitted for the Canadian Astronomical Society's Long-Range Plan (LRP 2020) process.

30. 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

9. Fausnaugh, M. M., Burke, C. J., **Caldwell, D. A**., Jenkins, J. M., **Smith, J. C**., **Twicken, J. D**., Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (5 Dec 2018) TESS Data Release Notes: Sector 11, DR16, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_sector_11_drn16_v01.pdf

10. Fausnaugh, M. M., Burke, C. J., **Caldwell, D. A**., Jenkins, J. M., **Smith, J. C**., **Twicken, J. D**., Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (16 July 2019) TESS Data Release Notes: Sector 12, DR17, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_sector_12_drn17_v02.pdf

11. Fausnaugh, M. M., Burke, C. J., **Caldwell, D. A**., Jenkins, J. M., **Smith, J. C**., **Twicken, J. D**., Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (14 Aug 2019) TESS Data Release Notes: Sector 13, DR18, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_sector_13_drn18_v02.pdf

12. Fausnaugh, M. M., Burke, C. J., **Caldwell, D. A**., Jenkins, J. M., **Smith, J. C**., **Twicken, J. D**., Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (8 May 2019) TESS Data Release Notes: Sector 9, DR11, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_sector_09_drn11_v03.pdf

13. Fausnaugh, M. M., Burke, C. J., **Caldwell, D. A**., Jenkins, J. M., **Smith, J. C**., **Twicken, J. D**., Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (6 June 2018) TESS Data Release Notes: Sector 10, DR14, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_sector_10_drn14_v02.pdf

14. Fausnaugh, M. M., Burke, C. J., **Caldwell, D. A**., Jenkins, J. M., **Smith, J. C**., **Twicken, J. D**., Vanderspek, R., Doty, J. P., Ting, E. B., Villasenor, J. S. (19 Sep 2019) TESS Data Release Notes: Sector 14, DR19, https://archive.stsci.edu/missions/tess/doc/tess_drn/tess_sector_14_drn19_v02.pdf

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

16. Furlan E, DR Ciardi, WD Cochran, ME Everett, DW Latham et al., including **D Huber** (2019). *VizieR Online Data Catalog: Kepler Follow-up Observation Program. II. Spectro. (Furlan+, 2018)*, VizieR On-line Data Catalog: J/ApJ/861/149.

17. Hill A.S., **Cami J.**, Fissel L., Foster T., Joncas G., et al. (2019), "Canadian Investigations of the Interstellar Medium", White Paper submitted for the Canadian Astronomical Society's Long-Range Plan (LRP 2020) process.

18. **Huber D** (2019). *Evolstate: Assign-simple evolutionary states to stars*, Astrophysics Source Code Library, record ascl:1905.003.

19. **Huber D**, WJ Chaplin, A Chontos, H Kjeldsen, J Christensen-Dalsgaard et al. (2019). *VizieR Online Data Catalog: High-precision radial velocities for HD 221416 (Huber+, 2019)*, VizieR On-line Data Catalog: J/AJ/157/245.

20. iMOST. *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.

21. Jencson JE, MM Kasliwal, SM Adams, D Cook, S Tinyanont et al., including **AM Cody** (2019). *SPIRITS discoveries of 8 Infrared Transients and Eruptive Variables with Spitzer/IRAC*, The Astronomer's Telegram, no. 12675.

22. **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.

23. **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.

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

25. 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

26. 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.

27. 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.

28. **Race MS, JA Spry,** B Siegel, C Conley, and G Kminek (Report of 2018 COSPAR meeting). 2nd COSPAR Workshop on Planetary Protection Requirements for Human Missions and COSPAR Work Meeting on Addressing Planetary Protection Gaps on Natural Transport of Contaminants on Mars. Released online 2019 at: https://sma.nasa.gov/docs/default-source/sma-disciplines-and-programs/planetary-protection/cospar-2019-2nd-workshop-on-refining-planetary-protection-requirements-for-human-missions-and-work-meeting-on-developing-payload-requirements-for-addressing-planetary-protection-gaps-on-nat.pdf?sfvrsn=507ff8f8_4

29. **Rho J**, M Shahbandeh, E Hsiao, S Davis, P Brown et al. (2019). *ATel 12897: UV, optical and near-IR observations of Type II-peculiar SN2018hna in the metal-poor galaxy UGC7534*, The Astronomer's Telegram, no. 12897.

30. Savin D.W., Babb J.F., Barklem, P., Bellan P. M., Betancourt-Martinez G., et al., including **Cami J.**, (2019), "State of the Profession Considerations for Laboratory Astrophysics", white paper submitted for Astro2020: Decadal Survey on Astronomy and Astrophysics, APC white papers, no. 7; Bulletin of the American Astronomical Society, Vol. 51, Issue 7, id. 7

31. 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.*

32. **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.

33. Stassun KG, RJ Oelkers, J Peppar, M Paegert, N. de Lee et al., including **D Huber** (2019). *VizieR Online Data Catalog: The TESS Input Catalog and Candidate Target List (Stassun+, 2018)*, VizieR On-line Data Catalog: J/AJ/156/102.

34. 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.

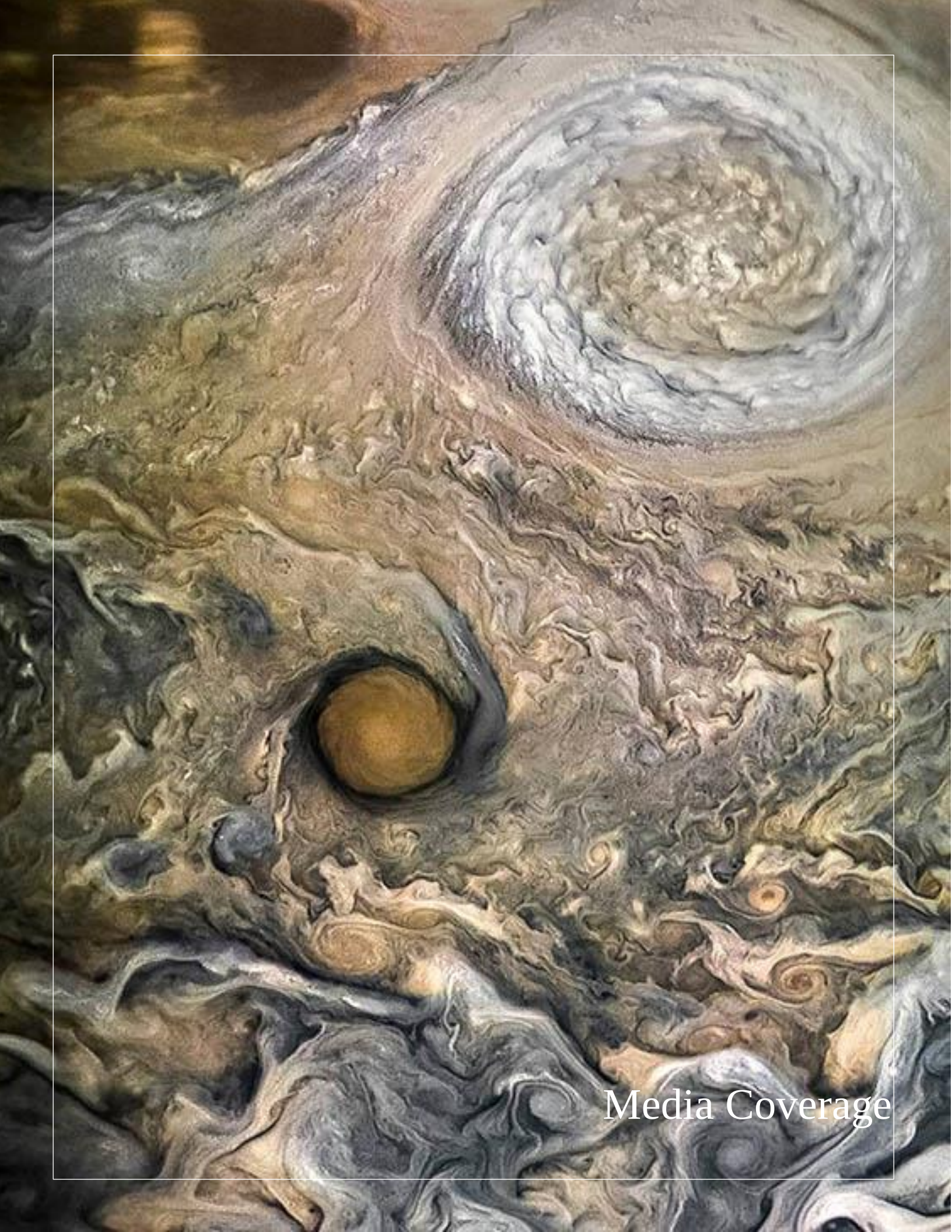
35. Taylor, P.A., and 23 colleagues including **Busch, M.W** (2019). *Planetary radar astronomy with ground-based astrophysical assets*, white paper submitted to the 2020 Astronomy Decadal Survey. 10 pages.

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

37. 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/

38. 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

39. Ziegler C, NM Law, C Baranec, T Moorton, R Riddle et al., including **D Huber** (2019). *VizieR Online Data Catalog: Robo-AO detected close binaries in Gaia DR2 (Ziegler+, 2018)*, VizieR On-line Data Catalog: J/AJ/156/259.



Media Coverage

1. Ansdell, M.; **Marchis, F**.; Waldman, A. (06/24). Adam Savage's Tested: *What Exoplanets Look Like in Film vs. Reality*, Offworld Episode 23; discussion of exoplanet imaging and what we know about planets astronomers have detected so far.

2. **Beyer RA** (Jan/23). *NASA discovers fresh 'blast pattern' on Mars*, Web story picked up from an image caption I wrote.

3. **Beyer RA** (Feb/05). *Charon's icy surface erupted from an underground ocean*, story based on my recent paper.

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

5. **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.

6. **Bonaccorsi R.** (August 6) featured ChileNautas, interview by Andrea Obaid

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

8. **Busch, M.W.** and Springmann, A. were interviewed by the popular science program *Tested* about asteroids in reality and in science fiction. Interview on 2019 May 22; show to be released in July.

9. **Bywaters,** K (Nov/19) Weekly Space Hangout. YouTube.

10. **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.

11. **Cabrol, NA.** Feb. 25. The Journey of a Lifetime to the Red Planet (about the end of the MER mission):

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

13. **Cabrol, NA.** March 10. In: *Who is Out There?* National Geographic March issue.

14. **Cabrol, NA, K. Warren-Rhodes**. March 11. Rover digs on Earth for clues to life on Mars, Space.com, Phys.org, WRAL.com, MIT Technology Revoew, Breitbart.

15. **Cabrol, NA.** March 13. Meeting with Marina Kohen, the Atlantic.

16. **Cabrol, NA.** April 10. Wall Street Journal: *A Researcher's Hunt for Extraterrestrial Intelligence*.

17. **Cabrol, N.A.** The changing nature of planetary exploration. *Explorer Magazine*, 2019 Issue. The SETI Institute.

18. **Cabrol, N.A.** Interviews during the Puerto de Idea "Festival de Ciencia" in Antofagasta: Vida más allá de la Tierra: la astrobióloga de la NASA que se tomará el debate en Puerto de Ideas.

    a. El Mostrador: https://m.elmostrador.cl/cultura/2019/03/26/astrobiologa-colaboradora-de-la-nasa-si-tuvieramos-contacto-con-vida-extraterrestre-seria-el-principio-de-un-increible-capitulo-en-la-historia-de-la-ciencia/

    b. https://www.theclinic.cl/2019/04/10/nathalie-cabrol-astrobiologa-de-la-nasa-y-directora-del-instituto-carl-seagan-si-el-de-cosmos-la-tierra-no-esta-en-riesgo-de-extincion-la-especie-humana-si/

    c. http://www.diariodecultura.com.ar/costumbres-y-tendencias/la-cientifica-que-investiga-en-los-andes-la-vida-extraterrestre/

    d. https://www.elmostrador.cl/cultura/2019/04/09/la-ascendencia-marciana-de-nathalie-cabrol/

    e. https://culturizarte.cl/imperdibles-del-festival-de-ciencia-puerta-de-ideas-antofagasta/

    f. https://www.eltiempo.com/vida/ciencia/el-desierto-de-atacama-sirve-para-buscar-formas-de-vida-microscopicas-en-marte-337378

    g. https://www.norteyenergia.cl/antofagasta-sera-el-epicentro-cientifico-junto-al-festival-de-ciencia-puerto-de-ideas-2019/

    h. https://canal95.cl/2019/03/22/la-ciencia-en-femenino-las-mujeres-se-toman-el-puerto-de-ideas-2019/

    i. http://heureka-online.com/puerto-ideas-antofagasta/10811

    j. http://tierramarillano.cl/2019/03/28/el-universo-y-sus-misterios-se-revelan-en-el-festival-de-ciencia-puerto-de-ideas/

    k. https://www.adprensa.cl/cronica/big-data-inteligencia-artificial-y-astronomia-seran-los-temas-principales-en-el-cierre-del-festival-de-ciencia/

    l. http://www.antofacity.com/imperdibles-del-festival-de-ciencia-puerto-de-ideas-antofagasta-un-apasionante-fin-de-semana-de-conocimiento-experiencia-y-pensamiento-cientifico/

    m. https://cncmedios.cl/teatro-municipal-sera-la-sede-principal-del-festival-de-ciencia-puerto-de-ideas/

    n. https://www.infobae.com/america/ciencia-america/2019/04/13/antofagasta-epicentro-de-la-ciencia-y-la-cultura-con-puerto-de-ideas/

    o. http://www.economiaynegocios.cl/noticias/noticias.asp?id=551505

    p. …and more

19. **Cabrol NA,** NASA Astrobiology Institute on the *Beyond the Galileo Experiment:*

20. **Cabrol NA,** Interview for the French scientific magazine *"Science & Avenir"* published June 26, 2019.

21. **Cabrol NA**, Interview for the *Wall Street Journal* on April 10, 2019: A Researcher's Hunt for Extraterrestrial Intelligence: Nathalie Cabrol of the SETI Institute, a nonprofit working with NASA and others, on the new tools helping us discover life in the universe

22. **Cabrol NA**, **Tarter J.** NBC Bay Area Revelation – Exploring Space. TV interview for the 50th Anniversary of the first landing on the Moon.

23. **Cabrol NA.** Interview for the French Magazine "Le Point" entitled "Et si là-bas se trouvait le secret de la vie sur Terre. Article by P. Ducousso and G. Grallet. See here:

24. **Cabrol, NA.** *Le Point*. "Cette Astrobiologiste va vous étonner!", December Issue, 87-89.

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

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

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

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

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

30. **Cabrol, NA.** Daily postings on Planetary Landscapes:

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

32. Deneau, L., Thomas, C.; **Marchis, F**. (05/01). IAA: *Planetary Defense Conference*; Facebook discussion about NEAs, DART, ATLAS and more ways to defend our planet against asteroid impacts.

33. **Doyle LR.,** Photo with caption in *National Geographic Magazine*, March 2019, pp. 70

34. **Doyle LR.,** Interview for "Moon Shot" TV series

35. **Doyle, L.** Interview for series "How the Universe Works".

36. GPI press releases describing the mid-course survey paper involving **Marchis, F. and Nielsen, E.:**

   a. SETI Institute PR: https://www.seti.org/gemini-planet-imager-planet-search-shows-giant-planets-orbiting-sun-stars-may-be-rare

   b. Gemini PR: Gemini: https://www.gemini.edu/node/21206

   c. Stanford PR: https://news.stanford.edu/press-releases/2019/06/12/gemini-planet-imalyzes-300-stars/

   d. UC Berkeley PR: https://news.berkeley.edu/2019/06/12/jupiter-like-exoplanets-found-in-sweet-spot-in-most-planetary-systems/

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

38. **Harman, PK**. NASA AAA Cycle 7 selection announcement, Press Release and news

39. **Harman, PK**.https://www.seti.org/high-school-science-teachers-named-airborne-astronomy-ambassadors-will-fly-nasas-sofia-aircraft

40. **Harman, PK** https://www.nasa.gov/feature/high-school-science-teachers-will-fly-on-sofia

41. **Harman, PK** 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

42. **Harman, PK** https://mynews4.com/news/local/two-wcsd-teachers-chosen-to-become-nasa-airborne-astronomy-ambassadors

43. **Harman, PK** https://www.kolotv.com/content/misc/Two-WCSD-teachers-selected-for-NASA-program-507301671.html

44. **Harman, PK** https://www.kolotv.com/video?vid=507233372

45. **Harman, PK** https://www.kolotv.com/content/news/Two-WCSD-teachers-selected-for-NASA-program-507219731.html

46. **Harman, PK** http://www.ktvn.com/clip/14784508/nasa-teachers

47. **Harman, PK** http://www.ktvn.com/story/40144732/two-wcsd-teachers-chosen-to-become-nasa-airborne-astronomy-ambassadors

48. **Harman, PK** https://www.washoeschools.net/site/default.aspx?PageType=3&ModuleInstanceID=2000&ViewID=7b97f7ed-8e5e-4120-848f-a8b4987d588f&RenderLoc=0&FlexDataID=31583&PageID=1

49. **Harman, PK** http://www.cobbk12.org/Wheeler/High%20School%20Science%20Teachers%20Named%20Airborne%20Astronomy%20Ambassadors%20%20Will%20Fly%20on%20NASAs%20SOFIA%20Aircraft.pdf

50. **Harman, PK** https://www.eastcobbnews.com/wheeler-science-teacher-named-nasa-airborne-astronomy-ambassador/

51. **Harman, PK** http://cobbcast.cobbk12.org/?p=26952

52. **Harman, PK** https://www.ajc.com/news/local/cobb-teachers-named-nasa-astronomy-ambassadors/zSbz4Un70OAucGVAQAwwMO/

53. **Harman, PK** www.gpb.org/blogs/education-matters/2019/02/28/georgia-high-school-science-teachers-will-fly-on-sofia

54. **Harman, PK** http://www.wtvm.com/2019/03/01/two-columbus-teachers-names-nasa-ambassadors/

55. **Harman, PK** https://muscogee.k12.ga.us/News/Article/2194/District_Partners_with_SETI_Institute_Two_teachers_named

56. **Harman, PK** https://www.kentuckyteacher.org/bulletin-board/announcements/2019/03/two-fayette-teachers-selected-for-nasas-airborne-astronomy-program/

57. **Harman, PK** https://www.seti.org/2019-airborne-astronomy-ambassador-high-school-teachers-go-nasa

58. **Harman, PK** https://issuu.com/mantecausd/docs/mark_highlights_march_2019

59. **Harman, PK** 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

60. **Harman, PK** https://twitter.com/NISD/status/1100450080312696832?s=09

61. **Harman, PK** https://twitter.com/NISDSTEVENS/status/1100756723806150656?s=09

62. **Harman, PK** https://twitter.com/CipressaSATX/status/1100458400259940352?s=09

63. **Harman, PK** https://www.facebook.com/68268644725/posts/10157206755879726/?sfnsn=mo

64. **Harman, PK** https://m.facebook.com/story.php?story_fbid=10101410214450864&id=13301640&sfnsn=mo

65. **Harman, PK** https://nisd.net/news/articles/79481

66. **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

   c. Girl Scout 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/

p. https://southingtonobserver.com/2019/08/05/girl-scouts-offer-new-badge-opportunities/

q. https://www.goodmorningamerica.com/living/story/girl-scouts-reveal-42-badges-girls-control-64294186

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

s. https://www.abc12.com/content/news/512843062.html

t. https://www.wsj.com/articles/meet-the-rocket-scientist-propelling-girl-scouts-into-digital-age-11572433205

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

68. **Jenniskens, P.** https://www.seti.org/southern-hemisphere-meteor-outburst

69. **Jenniskens, P** https://www.newscientist.com/article/2199519-nasa-traced-a-meteorite-

70. **Jenniskens, P_back-to-its-original-home-in-deep-space/**

71. **Jenniskens, P** https://www.seti.org/julian-nott-1944-2019

72. **Jenniskens, P** https://www.seti.org/press-release/turkish-meteorite-traced-impact-crater-asteroid-vesta

73. **Kostov VB**. Interview, New Hong Kong Television for L 98-59.

74. **Marchis, F.** (June 2019) "Small Scope, Large Capability," *SETI Institute Explorer Magazine*, p. 32.

75. **Marchis, F.** Revealing the true Nature of Asteroids
As the Shutdown Persists, Here Are 5 Ways It Will Impact Science

76. **Marchis, F.** https://www.scientificamerican.com/article/as-the-shutdown-persists-here-are-5-ways-it-will-impact-science/

77. **Marchis, F.** Calling Exogeophysicists to Solve the Mystery of Super-Earths

78. **Marchis, F.** SETI Institute signs MOU with Unistellar to develop and enhance a citizen science network

79. **Marchis, F.** Unistellar Raises €2.1 Million For Its Revolutionary Digital Telescope

80. **Marchis**, **Franck**; et al.; (12/09). Web story: "*The eVscope – A new era in Astronomy for Light Polluted Skies*" from Dodecahedron Books, t.co/6Omnl8HnzD,

81. **Marchis**, **Franck**; (12/05). Web story: "*The Exoplanet Beta Pictoris B, and Yet it Moves*" review of the published article arXiv:1911.11273, t.co/JDlZoWwaW2,

82. **Marchis**, **Franck**; et al.; (11/15). *A completely new public telescope from Unistellar landing in Japan where anyone can experience the beauty of the night sky and the excitement of astronomical discoveries*! press release and interview in web story format via ZdNet Japan, t.co/LOA6mKVApt,

83. **Marchis**, **Franck**; et al.; (10/28). Science release: ESO Telescope Reveals What Could be the Smallest Dwarf Planet yet in the Solar System, *eso1918*, t.co/nQCuE2ADJS,

84. **Marchis**, **Franck**; (10/09). Focus on an earlier article: *Unistellar Consumer Telescope Will Help Astronomers Probe Exoplanets*; eVscope, press release, SETI Institute; seti.org/press-release/unistellar-consumer-telescope-will-help-astronomers-probe-exoplanet.

85. **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. (07/21). *TMT Controversy*: *I Vote For Healing*, CosmicDiary Blog.

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

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

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

88. **Schulze-Makuch, D**. Blogs on the Smithsonian Site:

89. **SETI Institute:** 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
Gillum E April 3, 2019 Laser SETI (interviewed by **Diamond B**)
Lee P April 4, 2019 Mapping Ice Cave in Iceland with a Drone (interviewed by **Tiscareno MS**)
Marchis F April 8, 2019 interviewed Emily Lakdawalla of the Planetary Society
Marchis F April 18, 2019 interviewed Ariel Waldman
Cabrol N April 25, 2019 Marsquakes (interviewed by **Diamond B**)
Marchis F May 1, 2019 Live from the Planetary Defense Conference
Fenton L May 2, 2019 Dust Devil Formation (interviewed by **Diamond B)**
Shostak S May 8, 2019 interview with Drake Award recipient Jason Wright
Beyer R, White, O, Umurhan O May 23, 2019, Ultima Thule (interviewed by **Shostak S**)
Dalle Ore C June 6, 2019 Detection of Ammonia on Pluto (interviewed by **Shostak S**)
Tiscareno MS June 13, 2019 Cassini Data and Saturn's Rings (interviewed by **Shostak S)**
Shostak S June 19, 2019 interview with Breakthrough Listen Researchers
Diamond B June 25, 2019 Live from AbSciCon
FDL Moon for Good team July 11, 2019
Harman P and **Steel S**: July 16, 2019 New Girl Scout Science Badges
FDL Living with Our Star teams, July 18, 2019
FDL Earth Observation team, July 25, 2019
FDL Astronaut Health team, August 8, 2019
Jenkins J and Marchis F: August 14, 2019 TESS Spacecraft 1year after the beginning
Busch M and Marchis F: August 22, 2019 Asteroid 2006 QV89 Will Not Hit Earth This Year
Sobron P and Steel S: August 28, 2019 InVADER Mission, Exploring Hydrothermal Vents
Summers D and Shostak S: September 12, 2019 Planetary Protection
Busch M and Shostak S: September 19, 2019 A Visitor from Interstellar Space
Bishop J and Steel S: October 3, 2019 Mars Rocks
Cabrol N and Steel S: October 10, 2019 Looking for Life in All the Wrong Places
Doyle L Marino L and **Shostak S:** October 17, 2019 What is Intelligence?
Steel S: October 23, 2019 What it's like to fly on SOFIA
Diamond B: October 31, 2019 Interview with Lucianne Walkowicz
Steel S and Bennett J: November 7, 2019 Global Warming Demystified
Backman D, Clark C and Harman P: November 14, 2019 Teachers in the Stratosphere
Lee P and Steel S: November 21, 2019 Astronauts on the Moon and Mars
Lindsay C, Shostak S: December 2, 2019 Science and Art at the SETI Institute
Showalter M and Shostak S: December 12, 2019 Moons of Neptune
Marchis F and Steel S: December 19, 2019 Hygiea Identity Crisis
Diamond B: December 24, 2019 Seasons Greetings from the SETI Instiute

90. 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.

91. **Shostak, S.** "Why our galaxy probably isn't full of alien civilizations killed off by climate change," NBC News, Jan 9, 2019.

92. **Shostak, S.** "Zoo Hypothesis may explain why we haven't seen any space aliens," NBC News, March 31, 2019.

93. **Shostak S. (Talks):** "Why Alien Megastructures May Hold Key to Making Contact with Extraterrestrials," NBC News, April 20, 2019,

94. **Shostak S.** "Space Aliens are Breeding with Humans, University Instructor Says. Scientists Say Otherwise." NBC News, May 25, 2019.

95. **Shostak S.** "Extraterrestrial life is out there and SETI is busy looking for it," Metro, U.K. Jun 12, 2019.

96. **Shostak S.** "Why alien moons might be a great place to find extraterrestrial life," NBC News, June 15, 2019.

97. **Shostak S.** "Search for space aliens comes up empty, but extraterrestrial life could still be out there," NBC News, June 26, 2019.

98. **Shostak S.** Apr 1, interview for "Midnight in the Desert" podcast

99. **Shostak S.** Apr 2, interview for podcast by Josh Clark, U.K.

100. **Shostak S.** April 11, by Colorado University radio podcast.

101. **Shostak S.** Apr 17, interview by Rod Pyle, U.K. radio show

102. **Shostak S.** Apr 25, interview on "Signal Hunters" podcast

103. **Shostak S.** Apr 26, KGO radio, San Francisco on Navy's new protocols

104. **Shostak S.** Apr 26, Denise Chow, NBC Universal re Navy's new protocols for UFOs

105. **Shostak S.** May 1, Interview by Paul Sonne, Pentagon reporter for Washington Post about new Navy protocols

106. **Shostak S.** May 2, John Burke, TV shoot

107. **Shostak S.** May 2, Laura Geggel, Associate Editor, Live Science, regarding new Navy protocols

108. **Shostak S.** May 4, Interview at Zipcode Wilmington event by for local publication

109. **Shostak S.** May 8, Quotes for Tom Metcalfe about Hubble deep field photo, NBC Mach.

110. **Shostak S.** May 9, Interview with WLS radio, Chicago about SETI

111. **Shostak S.** May 16, Interview by Mićo Tatalović for BBC magazine.

112. **Shostak S.** May 22, Ben Lindbergh, writer for The Ringer, doing story about SETI@home

113. **Shostak S.** May 23, Adam Hadhazy, "Aerospace America," about Navy UFO guidelines.

114. **Shostak S.** May 24, Phone interview with Mark Medley, Toronto writer, working on project about long-term projects

115. **Shostak S.** May 28, CBS radio interview, Jon Schlosburg

116. **Shostak S.** Jun 5, Trace Dominquez video podcast interview

117. **Shostak S.** Jun 6, Interview for article Christophe Plummer, Switzerland

118. **Shostak S.** Jun 11, X Zone radio interview, Canada

119. **Shostak S.** Jun 11, Radio interview from Helsinki magazine writer, Markus Hotakainen

120. **Shostak S.** Jun 12, KPPC radio interview

121. **Shostak S.** Jun 14, Elizabeth Fernandez, contributing editor to Forbes.com, for article

122. **Shostak S.** Jun 16, Howard Hughes radio interview, U.K.

123. **Shostak S.** Ju 17. Kelly Kowalski, TV maker, for discussion of SETIsodes, etc.

124. **Shostak S.** Jun 18, Florian Schmitt, on-line magazine, from Bavaria, Germany for article

125. **Shostak S.** Jun 19, Miriam Kramer, Axios, interview for print

126. **Shostak S.** June 20, 2019. Rob Breakenridge, Alberta radio, 15 minute interview about Breakthrough Listen SETI presser. CHQR, Calgary.

127. **Shostak S.**

    a. "The Moon is a Stepping Stone to the Rest of the Cosmos," The Week (India), Sep 14, 2019

    b. "We Keep Looking for Space Aliens. Are They Looking for Us?" NBC News, Sep 18, 2019.

    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.

    d. "Newsworthy Extraterrestrials," SETI Institute web site, September 21, 2019

    e. "Why Humans will Outlive Climate Change and Nuclear War, No Matter How Bad it gets," Quartz, September 26, 2019.

128. **Shostak S.** "We May be Closing In on the Discovery of Alien Life. Are We Prepared?" NBC News, October 4, 2019

129. **Shostak, S. "**How a Discovery that Earned the Nobel Prize in Physics Transformed the Hunt for Alien Life," NBC News, October 9, 2019

130. 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:

    a) NASA press release, https://solarsystem.nasa.gov/news/854/tiny-neptune-moon-may-have-broken-from-larger-moon/

    b) Sarah Kaplan, Washington Post, https://www.washingtonpost.com/science/2019/02/20/tiny-new-moon-discovered-around-neptune/?utm_term=.eec83bae26bc

    c) Shannon Hall, New York Times, https://www.nytimes.com/2019/02/20/science/neptune-moon-hippocamp.html

    d) Marcia Dunn, Associated Press, https://www.apnews.com/a5666e12f86745468877d42e5965683a

    e) Nadia Drake, National Geographic, https://www.nationalgeographic.com/science/2019/02/meet-hippocamp-newest-known-moon-neptune-hubble-space

    f) Lisa Grossman, New Scientist, https://www.newscientist.com/article/2194049-neptunes-smallest-moon-keeps-getting-smashed-up-and-resurrected-again/

    g) Kelly Beatty, Sky and Telescope, https://www.skyandtelescope.com/astronomy-news/meet-hippocamp-neptunes-smallest-moon/

    h) Teresa Serafim, Publico (Portuguese newspaper), https://www.publico.pt/2019/02/20/ciencia/noticia/hipocampo-lua-neptuno-1862687

    i) John Wenz, Popular Mechanics, https://www.popularmechanics.com/space/solar-system/a26395367/new-moon-neptune-hubble-hippocamp/

    j) Loren Grush, The Verge, https://www.theverge.com/2019/2/20/18233029/neptune-moon-hippocamp-proteus-hubble-space-telescope

    k) Mohamed Mansour, Egyptian science journalist

    l) 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

    m) Ian Sample, The Guardian, https://www.theguardian.com/science/2019/feb/20/scientists-build-picture-of-super-fast-mini-moon-of-neptune

    n) Michael Wall, Space.com, https://www.space.com/neptune-smallest-moon-hippocamp-named.html

    o) Korey Haynes, Discover Magazine, http://blogs.discovermagazine.com/d-brief/2019/02/20/meet-neptunes-new-moon-hippocamp/#.XLik0C-ZPUI

    p) Deborah Netburn, LA Times, https://www.latimes.com/science/sciencenow/la-sci-sn-new-neptune-moon-20190220-story.html

    q) Ashley Strickland, CNN, https://www.cnn.com/2019/02/20/world/neptune-new-moon/index.html

    r) George Dvorsky, Gizmodo, https://gizmodo.com/unknown-moon-detected-in-orbit-around-neptune-1832755887

    s) Harry Pettit, The Sun

    t) Russell Kahn, News-O-Matic, the Daily News Just for Kids

    u) Ganzalo López Sánchez, ABC Spanish newspaper, https://www.abc.es/ciencia/abci-descubren-hipocampo-nueva-luna-planeta-neptuno-201902201945_noticia.html

    v) Genell Weule, Australian Broadcasting Corp, https://www.abc.net.au/news/science/2019-02-21/hippocamp-neptunes-14th-moon-confirmed/10824936

    w) Adam Rosser, Radio 5 UK, on-air interview

    x) Amado Herrero, El Mundo, Spanish newspaper

    y) David Freeman, NBC News, https://www.nbcnews.com/mach/science/new-moon-discovered-circling-neptune-spotlights-solar-system-s-violent-ncna973941

    z) Alec Forssmann, National Geographic Spain, https://www.nationalgeographic.com.es/ciencia/actualidad/hipocampo-pequena-luna-neptuno-es-antiguo-fragmento-luna-proteo_13923

aa) Else Velasco, La Vanguardia, Spain, https://www.lavanguardia.com/ciencia/fisica-espacio/20190220/465990629 20/descubierta-extrana-luna-neptuno-hipocampo-hubble.html

bb) Andy Roberts, YouTube science videos, https://youtu.be/Qu72xUGxOxg

131. **Showalter MR** was interviewed by The Guardian about his participation in the SETI Artist In Residence program. The article appeared on November 21. https://www.theguardian.com/artanddesign/2019/nov/21/were-all-earthlings-the-scientists-using-art-to-explore-the-cosmos

132. **Showalter MR** was interviewed on November 14 by *Sky & Telescope* about his role in the formal naming of Arrokoth, the New Horizons flyby target (previously nicknamed "Ultima Thule"). https://www.skyandtelescope.com/astronomy-news/new-horizons-flyby-target-receives-official-name/

133. **Showalter MR** participated in a NASA press release on November 14 about the unusual "dance of avoidance" of two of Neptune's moons. https://www.jpl.nasa.gov/news/news.php?feature=7540

134. **Showalter MR** also also did numerous interviews for the story. The story received wide coverage in the news media, including appearing in an article in the New York Times. https://www.nytimes.com/2019/11/21/science/neptune-moons-orbit.html?searchResultPosition=6

135. **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.

136. **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".

137. **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.

138. **Stucky TS** (09/19). *NASA is Testing a Drill to Search for Life on Mars – On Its Own*

139. **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.

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

141. **Tiscareno MS** was interviewed for and quoted (with reference to the 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.

142. **Tiscareno MS** was interviewed for and quoted (with reference to the 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.

143. **Tiscareno MS** 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. The show will premiere at the AMNH on 1/15/20.

144. **Tiscareno MS** 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.

145. **Tiscareno MS** was mentioned (with reference to the institute) in an article profiling his student Jakayla Robinson, entitled "Student explores mysterious shapes in Saturn's rings," which appeared on 4/10/19 in the newspaper of Robinson's institution, the University of Alabama at Birmingham.

146. **Tiscareno MS** was interviewed for and quoted (with reference to the institute) in the article "Skimming Saturn's rings," which appeared on *Axios*on 4/30/19.

147. **Tiscareno MS** helped to prepare and was quoted (with reference to the institute) in a NASA/JPL press release entitled "NASA's Cassini reveals new sculpting in Saturn's rings," which appeared 6/13/19. A companion SETI Institute press release appeared the same day. Many media outlets picked up the story.

148. **Tiscareno MS** was interviewed for and quoted (with reference to the institute) in the article "The past and promise of Cassini's legacy," which appeared in *Cosmos Magazine* on 6/13/19.

149. **Tiscareno MS** was interviewed for and quoted (with reference to the institute) in the article "Saturn's rings — and their propellers, waves, speckles and secrets — come into focus with Cassini's final images," which appeared on the Australian Broadcasting Corporation website on 6/13/19.

150. **Tiscareno MS** was interviewed for and quoted (with reference to the institute) in the article "Saturn's moons may have 'sculpted' its famous rings, new study suggests," which appeared in *USA Today*on 6/13/19.

151. **Tiscareno MS** was "interviewed" by Reddit users in an Ask Me Anything segmenton 7/10/19.

152. **Twicken, J. D.,** (June 2019) "On the Hunt for Planets, with TESS," *SETI Institute Explorer Magazine*, p.22.

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

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

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

156. **Warren-Rhodes, K., Cabrol, N.,** Wettergreen, D., Pointing, S. Simulated Mission in Chilean Desert Shows How a Rover Could Detect Life on Mars. Gizmodo, Feb 28, 2019.

157. **Warren-Rhodes, K.,** "Astrobiology" in *Scientific American-China* magazine, June 2019. Interview in Mandarin about Astrobiology, Mars and research in extreme environments.

158. **White O.** Interviewed by Ryan Mandelbaum of Gizmodo in early June on geological diversity across Pluto.

159. **White, O., R. Beyer and O. Umurhan** participated in a SETI Facebook Live event on discoveries at MU69, along with Ross Beyer and Orkan Umurhan.

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

161. Wood, C.; featuring **Marchis, F**; (10/31). Interview: *This spherical asteroid might be our solar system's tiniest dwarf planet*, Popular Science, popsci.com/spherical-asteroid-smallest-dwarf-planet/

Speaking Engagements

1. **Andersen, D. T.** (2019), Invited Lecture: *Lake Untersee, An Oasis in a Frozen Desert*, 30 May, 2019, Shimoda Ocean Research Center, Tsukuba University, Shimoda City, Tokyo.

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

3. **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.

4. **Bishop JL** (April/4). *Coordinated Analyses of Lab, Field and Remote Observations for Understanding Surface Processes on Mars.* Planetary Geoscience Institute Brown Bag Lunch Seminar, Department of Earth and Planetary Sciences, University of Tennessee, Knoxville.

5. **Bishop JL** (April/4). *Clues about the Early Martian Climate from the Phyllosilicate Record: How Warm is Warm?* Klepser Seminar Series, Department of Earth and Planetary Sciences, University of Tennessee, Knoxville, TN.

6. **Bishop JL** (April/9). *The Places You'll Go…The Things You Can Do: Planning Missions to Mars.* Presentation and demonstration to 5th grade students at Alto International School about the planet Mars, Menlo Park, CA.

7. **Bishop JL** (April/23). *Constraints on the Climate of Early Mars from the Phyllosilicate Record.* Colloquium, Department of Geology and Geophysics, Louisiana State University, Baton Rouge.

8. **Bishop JL** (April/29). *Exploring Mars Using a Rover*. Presentation and demonstration to 7th grade students at Alto International School about martian rovers, Menlo Park, CA.

9. **Bishop JL** (June/13). *The Surface of Mars: Mineralogy as an indicator of water, geochemistry and surface processes*, Presentation to the SETI Institute REU Program, Mountain View, CA.

10. **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.

11. **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.

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

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

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

15. **Bonaccorsi, R.,** Willson, D.., Baker, L., and McKay, C.P. (2020) Exploring the Mars-like Ubehebe Volcanic Field: Past, Present, and Future. 2nd Death Valley Science Conference, June 6-8, 2020.

16. **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/

17. **Bonaccorsi R** (July 31 2009). *Field Science Expeditions to Planetary Analogs*, Astronomy on Tap South Bay #11, San Jose' California. 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.

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

19. **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 .

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

21. **Bywaters, K** (Sept/19) Life Detection and Viruses as Biosignatures. Astrovirology Workshop, NASA Ames, Moffett Field, CA

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

23. **Cabrol, NA.** Abscicon: Searching for life beyond Earth and the reframing of planetary exploration. *AbSciCon Conf.* Seattle, WA. # 478146, (Invited).

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

25. **Cabrol NA** was invited in Antofagasta, Chile (April 13-15) as a keynote lecturer at the Puerto de Ideas science festival. Presentation Title: *Searching for Life Beyond Earth.* About 500 people attended the talk

26. **Cabrol NA**. Two invited talks at the 2019 AbSciCon conference in Seatlle: (a) 20th Anniversary of the NASA Astrobiology Institute and (b) Terrestrial Analog Sessions.

27. **Cabrol NA.** (6/21) Presentation to the 2019 REU Students at the SETI Institute: *Astrobiology: Habitability & Life Beyond Earth*.

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

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

30. **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).

31. **Cami J**., "EDIBLES news, status and updates", talk at the EDIBLES Science workshop, Amsterdam, Nov 6—8, 2019.

32. **Cami J.,** "Are the Carriers of the DIBs and the ERE the same?", contributed talk at the EDIBLES Science workshop, Amsterdam Nov 6—8, 2019.

33. **Cami J.,** "Astronomical Observations of Cosmic Fullerenes", invited review talk at the International Conference on Infrared Astronomy and Astrophyical Dust", Pune, India, Oct 22—25, 2019.

34. **Cami J.,** "You're the Inspiration!", prize lecture at the General Assembly of the Canadian Astronomical Society (CASCA), Montreal, Jun 18, 2019.

35. **Cami J.,** "Multi-Messenger Astronomy: what have we learned from gravitational waves?", public lecture at the Cronyn Observatory, Jun 15, 2019.

36. **Cami J.,** "The Cronyn Observatory: A popular astronomy hub developed by passion", invited talk at the General Assembly of the Royal Astronomical Society, York University, Jun 14, 2019.

37. **Cami J., Peeters E.**, "Spitzer's View of the Aromatic Universe", invited review talk at the 234th meeting of the American Astronomical Society (AAS), Saint-Louis, MO, June 9—13, 2019.

38. **Cami J.,** "The Science Of Firework Colours", public lecture at Science Rendezvous festival, London, ON, May 11, 2019

39. **Cami J.**, "Are We Alone?", public lecture for the Local 27 Retirees Chapter, London ON, Apr 3, 2019.

40. **Cartwright, R.,** American Geophysical Union, December 2019. *Probing the regoliths of the classical Uranian satellites using near-infrared telescope observations: CO_2 ice deposits mantled by a veneer of tiny H_2O ice grains?* (talk).

41. **Cartwright, R.,** Bay Area Planetary Science Meeting, November 2019. *The dark and volatile-rich surface of Callisto: Modified by radiolysis and dust impacts* (talk).

42. **Cartwright RJ** (06/27). *The Dark and Icy Surfaces of the Large Moons of Uranus: Modified by System-wide Processes?* Goleta, CA, Las Cumbres Observatory seminar.

43. **Cartwright RJ** (04/11). *Radiative Transfer Modeling of Icy Satellite Regoliths: Evidence for Compositional Stratification*. Pasadena, CA, Jet Propulsion Laboratory SVCP seminar.

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

45. **Ćuk, M,** (10/25) Early Dynamics of the Moon's Core, IGPP Seminar, Department of Earth and Planetary Sciences, University of California Santa Cruz.

46. **Ćuk, M,** (11/20) Origin and Tidal Evolution of the Moon. Astronomy on Tap South Bay #13, Uproar Brewing Co, San Jose.

47. **Doyle, L.** SETI Series Lecture at SRI on "Intelligence" with Lori Marino, October 2019.

48. **Els Peeters**, Invited review talk on "The photochemical evolution of the interstellar PAH family," at International Conference on Infrared Astronomy and Astrophysical Dust (IRAAD 2019) at IUCAA, Pune, India, Oct 22-25, 2019

49. **Els Peeters**, Invited review talk on "How can planetary nebulae contribute to our understanding of PAHs?," at "WorkPlaNS II: Workshop for Planetary Nebula observations", at Leiden, The Netherlands, Dec 16-20, 2019

50. **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.

51. **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.

52. **Gulick, V.C.** (11/21). New Evidence for Aqueous Paleo Environments on Mars, Stanford University, Physics of the Solar System graduate class (GeolSci 122/222).

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

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

55. **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

56. **Jin, M,** (12/2019) "Global MHD Simulation of EUV Waves and Shocks from the X8.2 Eruptive Flare on 2017 September 10", AGU Fall Meeting, SH32A-01, December 2019.

57. **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.

58. **Jin, M.** (April 11, 2019) Public talk at Stockton Astronomical Society, "Heliophysics: Science for Living with a Star"

59. **Lafuente B** (Dec/9-13). The Astrobiology Habitable Environments Database (AHED) and the Astrobiology Resource Metadata Standard (ARMS): community-driven tools for astrobiological data. Invited speaker, AGU Fall Meeting. San Francisco.

60. **Marchis, F.**

    a) 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/

    b) Another Pale Blue Dot: Inside SETI Institute's Exoplanet Search https://www.sfaa-astronomy.org/monthly_lectures/randall/

    c) 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

    d) Stars & Stardust, Unistellar demo during CES 2019 at the Neon Museum https://www.youtube.com/watch?v=ciVPlxvhkNA&t=

    e) Selection and Finalist at the SPIE Startup Challenge for Unistellar http://spie.org/x130278.xml

    f) http://www.spie.org/industry-resources/industry-events/spie-startup-challenge/2019-winners?SSO=1

    g) 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/

    h) Invited to present Exotopia at the San Jose Museum of Arts https://sjmusart.org/event/third-thursday-exotopia

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

61. **Marchis**, **F.** (11/2019). Citizen Science Astronomy with the Unistellar Network: From Planetary Defense to Exoplanet Transits, *Earth Life Science Institute* (*ELSI*), 2019-043,

62. **Marchis**, **F.** (11/2019). "*Citizen Science Astronomy with the Unistellar Network*: *From Planetary Defense to Exoplanet Transits*" talk and instrument demonstration at National Astronomical Observatory of Japan (NOAJ), talk includes an overview of 25 years of advanced optics (AO) in planetary science,

63. **Marchis**, **F.**; (11/2019). *Citizen Science Astronomy with the Unistellar Network*: *From Planetary Defense to Exoplanet Transits*" Talk and eVscope demonstration at JAXA Institute of Space and Astronautical Science (ISAS),

64. **Marchis**, **F.** (10/2019). *Another Pale Blue Dot*: *The SETI Institute's Search for Exoplanets*, Lowell Observatory, inauguration of the Giovale Open Deck Observatory in Flagstaff AZ,

65. **Marchis**, **F.** (11/2019). *Citizen Science Astronomy with the Unistellar Network*: *From Planetary Defense to Exoplanet Transits*" Talk and eVscope demonstration at Lowell Observatory, AZ

66. **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.

67. **Marchis, F**. (06/29). *Studying Other Blue Dots and the Heart of Exoplanet Research*, Star's Up event in Meudon, France; talk about exoplanet research at SETI Institute.

68. **Marchis, F**. (05/17). StartOut, Demo Day, Unistellar eVscope, San Francisco, CA

69. **Marchis, F**. (05/09). NightLife in Space: *Other Earths*, California Academy of Sciences (CAS); talk on what is involved in detecting and characterizing exoplanets.

70. **Marchis, F**. (04/15). Rose City Astronomy (RCA) General Meeting: *Another Pale Blue Dot — Inside the SETI Institute's Search for Exoplanets*, Rose City Oregon; event discussion of new and sophisticated projects which aim to image exoplanets directly, followed by a scientific demonstration of SETI Institute partner Unistellar eVscope technology.

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

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

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

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

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

76. **Race MS** (Sept.). *Exploration & Space-themed Panel*. Menlo Park Library, Menlo Park, CA.

77. **Race MS** (Oct./4). *Behind the Scenes Planning for missions to the Moon and Beyond --What Goes into Mission Planning.* Chabot Space and Science Center, Oakland, CA.

78. **Race MS (**Oct.). *Understanding Our Place in the Universe: Planning a Trip to Mars and Looking for ET*, Springhill School, Lafayette, CA.

79. **Race MS** (April 4, 2019). *Astrobiology and Missions to Mars*. Invited speaker at Super Stars Literacy Program, Palo Alto, CA.

80. **Race MS** (May/10 and June/7). *Moderator of two programs on Space Exploration featuring ISS Astronaut Daniel Bursch*. The Pleasant Hill and Danville Libraries, Contra Costa County, CA.

81. **Race MS** (June/14). *Our Place in the Universe—and Searching for ET*. Speaker in After-School Astronomy Program, Burkhalter School, East Oakland, CA.

82. **Rummel JD** (Nov./14). *Exobiology Before Astrobiology:A Personal History—and Scenes from Days Gone By....* Invited speaker at the *NASA Astrobiology Science Forum: Origin, Evolution, Distribution, and Future of Astrobiology*, NASA Ames Research Center, USA.

83. **Schulze-Makuch, D**. Exploring the Limits of Life on Earth and Some Thoughts about their Relevance to the Search for Life in the Universe. Invited Talk at the University of Bremen, Bremen, Germany, 11 December 2019.

84. **Schulze-Makuch, D**. Exploring Deserts for the Dry Limit of Life on Earth and Beyond. Invited Talk at the University of Texas at El Paso, El Paso, USA, 4 November 2019.

85. **Schulze-Makuch, D**. Exploring the Limits of Life on Earth and Some Thoughts about their Relevance to the Search for Life in the Universe. Invited Talk at the IGB Müggelsee, Berlin, Germany, 24 October 2019.

86. **Schulze-Makuch D.** Ancient Life on the Moon? Invited Talk at the Seattle Museum of Flight, Seattle, Washington State, USA; 29 June 2019.

87. **SETI Institute:** Big Picture Science
Handling the Holidays
Waste Not
Skeptic Check: Betting on Pseudoscience
Stopping Ebola
Supercomputer Showdown
Nobel Efforts
Battline Bacteria
Headed for Trouble
For Good Measure

Skeptic Check: Data Bias
Granting Immunity
Let's Stick Together
Math's Paths
Nailing the Moon Landing
Animals Like Us
Skeptic Check: Worrier Mentality
Is Life Inevitable?
Rethinking Chernobyl
Gained in Translation
Skeptic Check: Astrology Ascending

88. **SETI Institute:** SETI Talks
Bywaters K, Lee P, Marchis F: December 2019 Are We About to Find Life on Mars?
Tarter J, Meadows V and **Bentley M:** November 2019 Technosignatures vs. Biosignatures: Which Will Succeed First?
Doyle L, Marino L and **Bentley M:** October 2019 Intelligence: Mundane or a Miracle
Keating B, Filippenko A and **Shostak S:** September 2019 Nobel Prize: Blessing or Curse?
Caldwell D, Lee P, Pittman B and **Diamond B:** July 2019 Back to the Moon for Science and Exploration
Schmidt G, Sims M and Morrison D: June 2019 Back to the Moon: This Time to Stay?
Deamer D, Damer B, Rothschild L and **Bentley M:** April 2019 Where is the Origin of Life on Earth?
Stern A, **Showalter M, R Beyer and Bentley M:** March 2019 Exploring Ultima Thule: Humanity's Next Frontier
Dressing C, Ennico Smith K, Gaudi S and **Diamond B:** February 2019 Next Generation NASA Space Telescopes
Mackey T, Roopnarine P, Waldman A **and Shostak S:** January 2019 Snowball Earth and Faraway Worlds: Antarctica as Time Machine

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

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

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

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

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

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

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

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

97. **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 18, Moderator, "SETI Talks," SRI, Menlo Park, CA

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

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

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

g. 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.

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

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

j. Sep 10, Moderator, "SETI Talks," SRI, Menlo Park, CA

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

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

98. **Shostak, S.** Oct 3, "SETI Research," Yale Club, Wilson Sonsini, Palo Alto

99. **Shostak, S** Oct 12, "Looking for Artifacts," Peninsula Astronomical Society, Los Altos, CA

100. **Shostak, S** Oct 14, Science Hunts for Life," Sunnyvale Library, Sunnyvale, CA

101. **Shostak, S** Oct 19, "We're Not Being Visited," CFIcon, Las Vegas, Nevada

102. **Shostak, S** Oct 22, "Are Aliens Nearby?" Capital Club, San Jose,

103. **Shostak, S** Oct 26, Debate with Nick Pope, Jasper Dark Sky Festival, Jasper, Alberta (Canada)

104. **Shostak, S** Nov 7 – 8, Two talks, one panel on life beyond Earth, Day of Spaceflight, Neubrandenburg, Germany.

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

106. **Shostak S.** Apr 9-13, eight panels, various topics, Conference on World Affairs, Boulder, CO

107. **Shostak S.** Apr 20-21, two talks on SETI, Querencia, Cabo, Mexico

108. **Shostak S.** May 6-7, four talks on SETI, Wilmington, Delaware

109. **Shostak S.** May 13, talk for Explorer Scouts, San Jose, CA

110. **Shostak S.** May 16, talk for Nightlife, California Acad Sciences

111. **Shostak S.** May 20, talk on SETI for Priory School, Woodside, CA

112. **Shostak S.** Jun 22-23, three talks at AlienCon, Los Angeles, CA

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

114. **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

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

116. **Showalter MR** (6/17/19 to 7/6/19), was the invited lecturer on a tour of Chile in association with the July 2 eclipse. He gave lectures about SETI news, the giant planets, the New Horizons mission, and the eclipse.

117. Slater, G., **D. T. Andersen**, and A. Brady (2019), *Isotopic Depletion of Methanotroph Biomarker Lipids in Lacustrine Systems*, in *2019 Astrobiology Science Conference*, Seattle.

118. **Smith, J. C.,** (06/15) "Exploring Beyond Earth's Atmosphere with Human-Machine Teams," GEOINT 2019 conference, San Antonio, TX.

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

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

121. **Spark, W.** Invitation received to present seminar to Center for Space and Habitability (CSH) at the University of Bern, Switzerland, during 2020.

122. 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

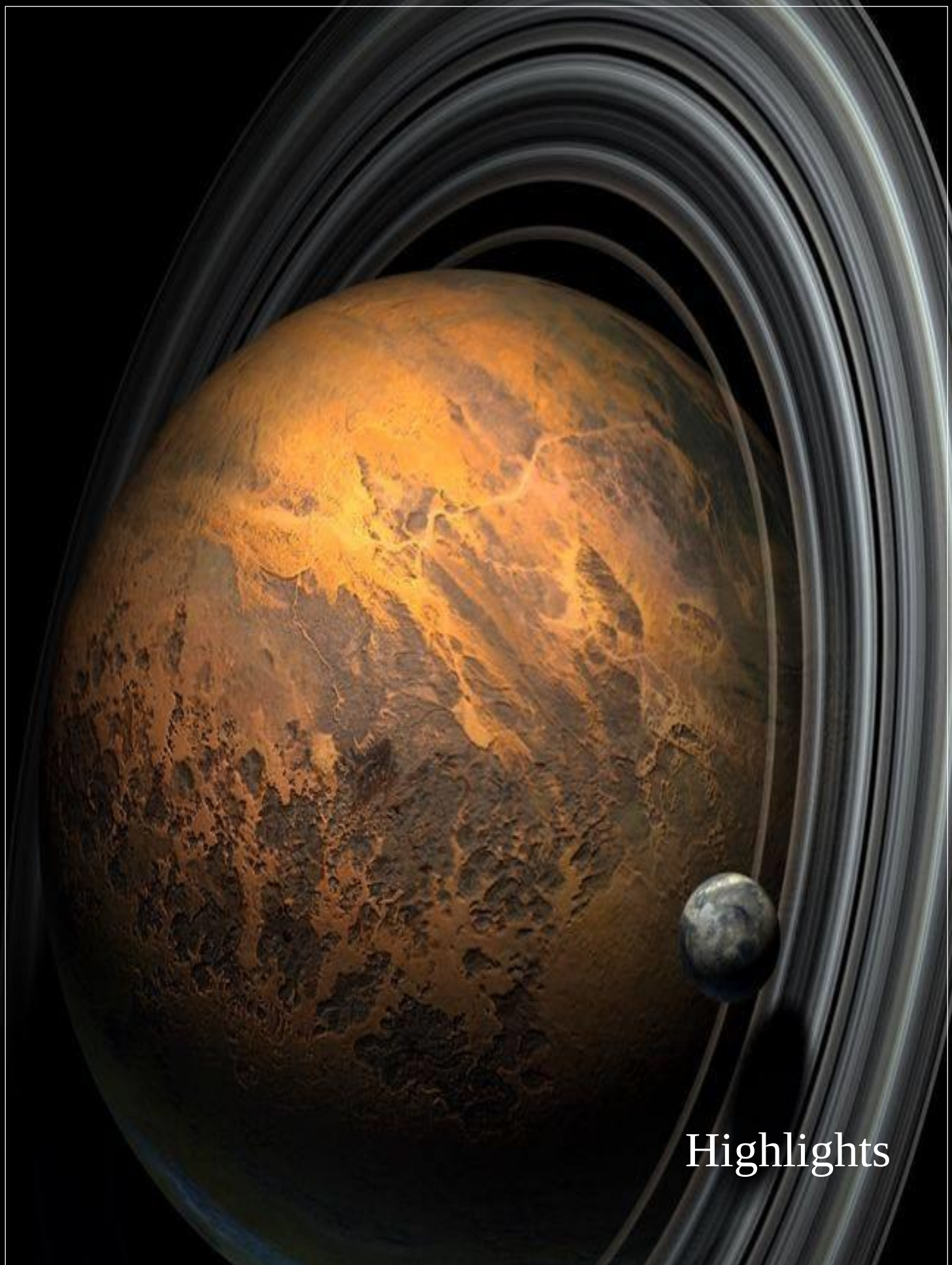
123. **Tiscareno MS** (7/13/19) Cassini as the Wonderfest speaker at Mount Tamalpais State Park in Mill Valley.

124. Vanderwilt, M., N. Wagner, **D. T. Andersen**, and S. S. Johnson (2019), *Soil Microbial Communities in an Antarctic Water Track: Identifying Potential Ecological Optimums in a Hyperarid Mars-analog Environment* in *2019 Astrobiology Science Conference*, Seattle, Washington. Poster.

125. **White, O**. Europa and the Europa Clipper. San Francisco Amateur Astronomers (12/18/19).

126. **White O.** Interviewed by Ryan Mandelbaum of Gizmodo in early June on geological diversity across Pluto.

127. **White O.** Invited to speak at the Geological Society of America 2019 meeting in Phoenix, AZ on comparative geology of Pluto, Charon, and MU69, and at the 2019 AGU Fall Meeting in San Francisco, CA on the geology of MU69.



Highlights

1. **Backman, DE Clark, C, Harman, PK,** (4/11 – 13) *NASA SciAct Exhibit, AAA Recruitment*, NSTA, St. Louis, MO.
2. **Backman, DE, Clark, C, Harman, PK,** NASA AAA Cycle 7 webinar series concluding sessions on August 13 and 14.
3. **Backman, DE Clark, C, Harman, PK,** (9/22 – 27) and 9/29 – 10/4) NASA AAA cycle 7 Flight Weeks, Palmdale, CA.
4. Barsugli, Joseph; Keisling, Benjamin; **Marchis**, **Franck**; et al.; (12/12). Panel chair of discussion: "*One Hundred Years of LGBTQ+ Geoscientists*: *Contributions, Barriers to Participation, and Ways Forward*" at American Geophysical Union (AGU) Fall 2019 Conference in San Francisco CA, t.co/MSx9Wk1mQh,
5. **Bywaters, KF** Upcycling through Integration: New Flight Hardware for Monitoring Microbial Growth Innovation Fair, NASA Ames, 8/8/2019
6. **Cabrol, NA., and the Carl Sagan Science Council:** Close SC Meetings, Feb. 4 and March 27, 2019. SETI Institute HQ in Mountain View.
7. **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.
8. **Cabrol NA and the SI Science Council**. The SI Science Council was helf on 09/10 at the Institute's HQ in Mountain View.
9. **Cabrol NA**. The NV "Beyond the Galileo Experiment" published by *Nature Astronomy* on July 5, 2019 remains in the top 5% of all research outputs scored by Altmetric.
10. **Caldwell, D., Lee, P.,** Pittman, B. (07/18). Back to the Moon: For Science and Exploration, panel discussion at SRI
11. **Cami J.** was the main organizer for Science Rendezvous at Western University, May 11 2019.
12. **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).
13. **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).
14. **Cartwright R.** Observed moons of Uranus with NASA's IRTF and Discovery Channel Telescope (DCT) in October and November 2019.
15. Castillo, J., **Marchis**, **Franck**; et al.; (12/2019). P007: "Comparative Planetology: Large Planetesimals and Dwarf Planets Throughout the Solar System" at *American Geophysical Union* (*AGU*) Fall 2019 Conference in San Francisco CA, Session ID: 82009, https://agu.confex.com/agu/fm19/webprogrampreliminary/Session82009.html
16. **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.
17. **Gulick, V.C. and Glines, N.H.** (09/9-11). Organized an MRO HiRISE team meeting at NASA Ames and field trip to the PInnacles National Park.
18. **Gorti U** (07-09). Co-I on various ALMA observing projects.
19. **Gorti U.** served on the SOFIA Time Allocation Committee, October 2019.
20. **Harman, P,** (1/9) Solar System Scale Model, *233rd AAS Meeting*, Student Event.
21. **Harman, P**, (2/9-10) *Girl Scout Stars Space Science Badge Symposium*, Morehead Planetarium, Chapel Hill, NC .
22. **Harman, PK**, *SETI Institute Education*, NISE Net Conference SciAct Showcase, Tempe, AZ.
23. **Harman, PK**, *Education* Girl Scout Volunteer and Staff Astronomy Training May 9 – 12, Tucson, AZ
24. **Harman, PK**, *Education* Girl Scout Astronomy Club Training June 10 – 14, GSFC, MD
25. **Harman, PK**, July 23 – August 4, Girl Scout Astronomy Destination Camp Director.
26. **Jin, M.,** FDL 2019 Domain Mentor for Space Weather SDO team
27. **Marchis**, **Franck**; et al.; (12/11). Outreach: SETI Talk "*Technosignatures vs. Biosignatures*: *Which Will Succeed First*?" release of video from event at SRI, t.co/v4UTlfBCIY,
28. **Marchis**, **Franck**; et al.; (12/09-13). participant, visiting speaker, demonstrations and outreach with public at American Geophysical Union (AGU) Fall 2019 Conference in San Francisco CA,
29. **Marchis**, **Franck**; (11/20-21). Instrument demonstration at Yoyogi Park in Tokyo Japan,
30. **Marchis**, **Franck**; (11/18). Instrument demonstration with The Planetary Society of Japan (TPSJ) and the Science Museum of Osaka Japan,
31. **Marchis**, **Franck**; et al.; (11/18). Instrument demonstration with public at Umekita Plaza in Tokyo Japan,
32. **Marchis**, **Franck**; (11/17). Unistellar eVscope, demonstration and outreach with public at South DiverCity Plaza in Tokyo Japan,
33. **Marchis**, **Franck**; (11/16). Unistellar eVscope, demonstration and outreach at Ebisu Mitsukoshi with public in Tokyo Japan,
34. **Marchis**, **Franck**; (11/15). Unistellar eVscope, demonstration and outreach with public at Yebisu Garden Palace in Tokyo Japan,
35. **Marchis**, **Franck**; (11/14). Unistellar eVscope, demonstration and outreach with public at Roppongi Hills observation deck (city view) in Tokyo Japan,
36. **Marchis**, **Franck**; Peluso, Daniel; (11/11). Unistellar eVscope, transit of Mercury observation(s) in San Francisco CA,
37. **Marchis**, **Franck**; Peluso, Daniel; (11/09). Unistellar eVscope, instrument demonstration and outreach with public in San Francisco CA,
38. **Marchis**, **Franck**; Peluso, Daniel; (10/29). Unistellar eVscope, instrument demonstration and outreach with public at Google Star Party event,
39. **Marchis**, **Franck**; (10/24). Yuri's Night event: Unistellar eVscope, instrument demonstration and outreach with public at 70th International Astronautical Congress (IAC2019DC) in Washington DC, party.yurisnight.net/iac2019,

40. **Marchis**, **Franck**; (10/19). Unistellar eVscope, instrument demonstration and outreach with public at Science Hack Day in San Francisco CA,

41. **Marchis**, **Franck**; (10/17). Unistellar eVscope, demonstration and outreach with public at CalAcademy in San Francisco CA,

42. **Marchis**, **Franck**; (10/08). Unistellar eVscope, demonstration and interview at Delores Park in San Francisco CA,

43. **Marchis**, **Franck**; (10/04). Unistellar eVscope, demonstration and observations at Lowell Observatory following a talk and presentation at inauguration of the Giovale Open Deck Observatory in Flagstaff AZ,

44. **Marchis**, **Franck**; et al.; (11/14). Talk and instrument demonstration at JAXA Institute of Space and Astronautical Science (ISAS),

45. **Marchis**, **Franck**; et al.; (11/06). Outreach: *SETI Talk* "*Technosignatures vs. Biosignatures*: *Which Will Succeed First*?" event at SRI,

46. **Marchis**, **Franck**; et al.; (10/21-25). Event: *70*th *International Astronautical Congress* (IAC2019DC) demonstration and event participation at booth 124 in Washington DC,

47. **Marchis**, **Franck**; (10/18). Instrument demonstration at ASP 2019: "*Earth to Space*, *Celebrating a Century of Astronomy*" presented by Astronomical Society of the Pacific, t.co/jm4wndg59n,

48. **Marchis, F**. (07/10 – 07/11). NASA iTech: *Initiative to Find Innovative Ideas*; scientific demonstration of SETI Institute partner Unistellar eVscope technology and Cycle I Semifinalist recipient.

49. **Marchis, F**. (06/28 – 06/29). *Star's Up* event in Meudon France; scientific demonstration of SETI Institute partner Unistellar eVscope technology.

50. **Marchis, F**. (05/11). California Academy of Sciences: *Astronomy Day 2019*; scientific demonstration of both VR2 Planets and SETI Institute partner Unistellar eVscope technology.

51. **Marchis, F**. (05/08). SETI Institute: *2019 Drake Awards*; event celebrates exemplary contributions to astrobiology through scientific research and exploration of space.

52. **Marchis, F**. (04/29 – 05/03). IAA: *Planetary Defense Conference*; event on the discussion of the threat posed by asteroids and comets and actions that might be taken to deflect a threatening object from Earth.

53. **Marchis**, **F**.

- (09/15-20) EPC-DPS 2019 Conference, Geneva, Switzerland
- (09/10) *SETI Talks*: *Winning the Nobel Prize*, *Blessing or Curse*?, panel discussion with Alex Filippenko and Brian Keating at SRI.
- (09/01). 38th European Symposium on Occultation Projects (ESOP) in Paris, France.
- (08/15) NASA FDL Results Showcase at Google Cloud with SETI Institute.
- (08/05-09) Association for Astronomy at Macquarie University (MQAAAstro), Sydney, Australia.
- (07/31) Astronomy on Tap, San Jose CA.
- (07/03-07) World Conference of Science Journalists (WCSF2019) at Musée de l'Elysée, Lausanne, Switzerland.

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

55. **Race MS** (March). *Invited Presenter*. NASA Ames Strategic Planning Retreat - Space Science and Astrobiology Division. Provided summary information on COSPAR and NASA workshop series and strategic knowledge gaps in Planetary Protection.

56. **Race MS** (Nov/26). Science blog featuring accomplishments that led to awarding of *Fellow of AAAS*. https://www.seti.org/margaret-race-named-aaas-fellow .

57. **Race MS, S Shostak, JL Bishop, P Lee, F Marchis & M Busch** (Mondays, April 1-29, 2019). Adult Education Course: *Astrobiology: The Search for Life in the Universe- It's More than Science Fiction.* Osher Lifelong Learning Institute, Santa Clara University, Santa Clara, CA.

58. **Race MS, & JA Spry,** LM Pratt and G Kminek (May 14-16, 2019). Organized session at 3rd COSPAR Iinternational Workshop on Refining Planetary Protection Requirements for Human Missions. Houston TX.

59. **Race, M, Busch, M, Shostak, S, Bishop, J** (4/1, 8, 15, 22, and 29)*Astrobiology: The Search for Life in the Universe- It's More than Science Fiction*, Osher Lifelong Learning Institute, Santa Clara, CA.

60. **Race, M,** STAR Program Mentorship, June 10 – August 9, Mountain View, CA.

61. Ricca A, **J Roser**, E Peeters & C Boersma 2019. Co-author of contributed poster, *Zigzag and armchair PAH subpopulations as probes of the local radiation environment*, Seventh Annual Jamboree, NASA-Ames Space Science and Astrobiology Division.

62. **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.

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

64. **Roser J**, A Ricca, C Dalle Ore & D Cruikshank 2019. Contributed poster, *Ammonia Ices in the Outer Solar System and Laboratory Complex Index of Refraction Determinations*, Seventh Annual Jamboree, NASA-Ames Space Science and Astrobiology Division.

65. **Rummel JD, MS Race,** and B McCauley-Rench (2019). Convened session P33E entitled: Mars Sample Return: Balancing the Benefits of a New Phase of Mars Exploration Against Potential Risks to Earth, While Communicating Both to the Public**.** *AGU fall meeting*, San Francisco, CA.

66. **Rummel JD**, R Mogul, R McCauley, T Errigo & JA Spry (2019). Planetary Protection for Astrobiology: Progress and Challenges in Science and Policy. *Primary Organizer, Oral and Poster Sessions* in AbSciCon 2019, Bellevue, WA.

67. **Schulze-Makuch D.** Invited Attendee at Breakthrough Discussion Meeting of the Breakthrough Initiative in Berkeley, CA, April 11-12, 2019.

68. 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.

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

70. **Sobron P.** attended international planetary libs meeting with NASA, ESA, JAXA, and Chinese Space - discussed astrobiology applications of Libs, manuscripts and EPSC abstract being drafted.

71. **Sparks W.** Participated in the AbSciCon 2019, useful as a forum for nurturing collaboration and staying abreast of develepments in the field.

72. **Sparks W.** We continued programs to seek plumes on Europa using the Hubble Space Telescope (HST), and SOFIA. Our SOFIA flight took place in April 2019, and executed flawlessly. We obtained high resolution mid infrared spectroscopy of Europa with the goal of detecting or placing useful limits on the strength of water vapor molecular vibrational emission lines, and hence on the quantitative parameters for plumes on Europa. The Jupiter opposition period was May-July 2019, hence there was substantial work planning and executing the HST observations. Each visit required individual treatment, since complex moving target specifications and timing are needed. The observations completed successfully. 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 began the process of consolidating the results and bringing the work to publication.

73. **Sparks W.** Analysis of data received from HST on Europa plume observations is ongoing, and in-depth statistical characterization of images has begun. A draft paper describing laboratory measurements of the circular polarization properties of anoxygenic phototrophs is in development. We carried out hardware repairs and recalibration recently and aim to incorporate this into the paper. Our goal is to assess the degree to which measurements of this type can be used as a biosignature. Progress has been made in advancing a new type of compact, static polarimeter. We have submitted and application for a patent describing the method and are working towards assembly of prototype instrumentation. The polarimeter has the advantages of being compact, robust, sensitive to circular polarization and uses static optics. International Application No. PCT/US2019/060506 "METHOD AND SYSTEM FOR POLARIMETRY USING STATIC GEOMETRIC POLARIZATION MANIPULATION"

74. **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.

75. **The PDS Ring-Moon Systems Node** (Showalter MR, French RS, Stopp DJ, Chang YJ, Gordon MK, Tiscareno MS, Evans MW) released OPUS 3.0, a major update to our popular on-line search engine. See https://pds-rings.seti.org/search.

76. **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.

77. **Tiscareno MS** confirmed a lineup of science mentors for the Summer 2020 program of Research Experience for Undergraduates (REU) at the SETI Institute. He is overseeing the application process. Applications will be received 2/1/20, and selections will be made starting 3/1/20.

78. **Tiscareno MS, Evans M**, **French R**, **Gordon, M**, together with the rest of the PDS Ring-Moon Systems Node team based at the SETI Institute and led by **Showalter MR**, is developing the node's proposal (due 2/17/20) and presentation (3/30/20) for the PDS Senior Review.

79. **Tiscareno, M,** Research Experience for Undergraduates, June 10 – August 16, Mountain View, CA.

80. **Twicken, J. D.** (4/29.2019) Organized tour of NASA/Ames Research Center for Hillsdale High School GATE program on 4/29/19. There were 27 students and two adults in attendance. The tour included: (1) Unitary Wind Tunnel (11'x11' transonic wind tunnel), (2) NASA Advanced Supercomputing division Pleiades supercomputer and Hyperwall, and (3) MicroGravity Test Facility and Astrobee robot

81. Yesilbas M. was awarded an NPP Fellowship to become a postdoc with **Janice Bishop** at the SETI Institute on Mars remote sensing and lab spectral analyses supporting the NAI project.


Fieldwork

1. **Andersen D.** and his research team returned from another field season in the mountains Antarctica, successfully carrying out a number of scientific investigations aimed and better understanding the structure and function of perennially ice-covered Lake Untersee's microbial ecosystem, the Quaternary history of the lake basin, and local climate. Scientific diving beneath the 3-4 meter thick ice-cover enabled the recovery of select samples of cyanobacterial mats and sediments from the lake bottom which will be used for additional studies in laboratories in the US, Russia, UK and Canada.

2. **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.

3. **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.

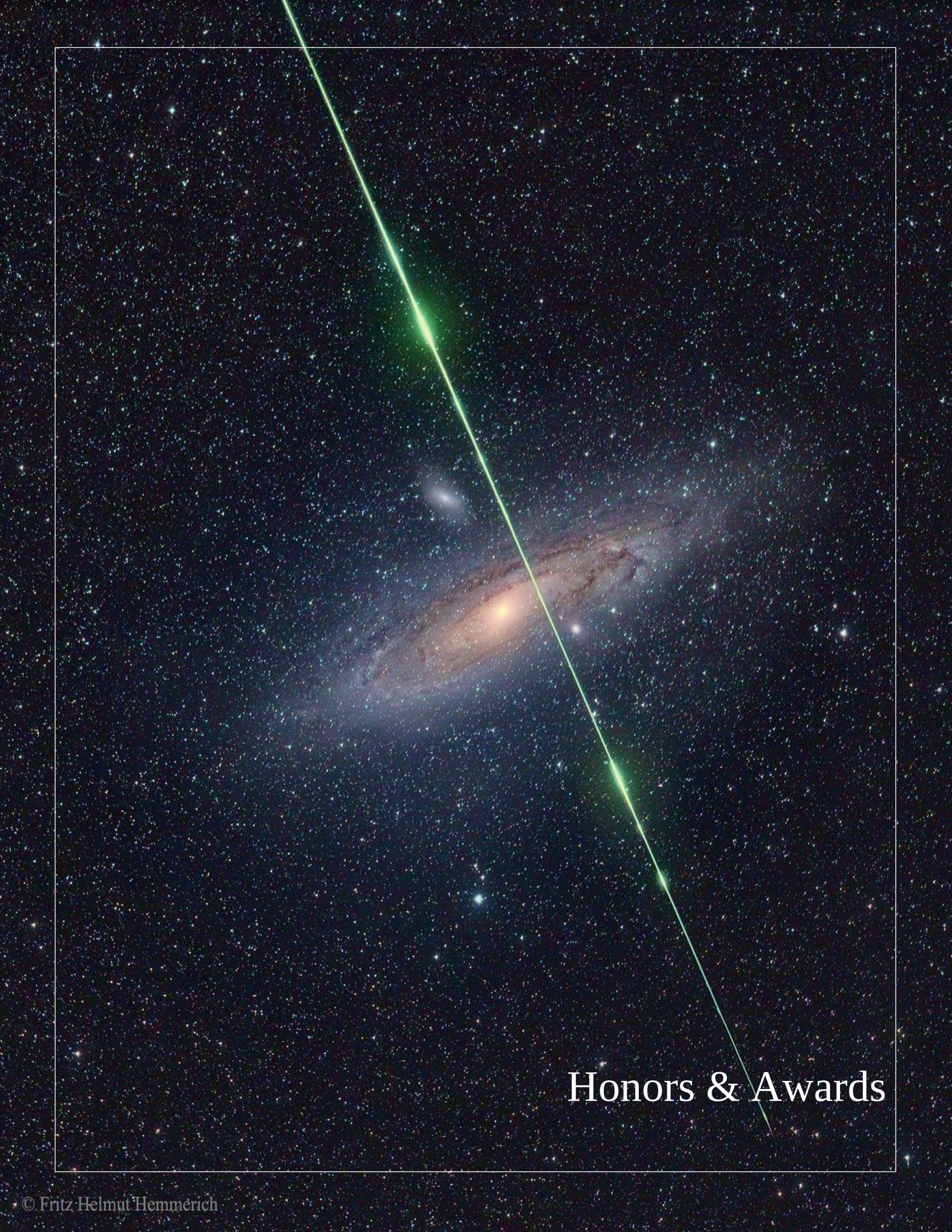
4. **Bonaccorsi, R** . Field Campaign. March 24-30, 2019. Joined ARADS team PI Brian Glass during expedition. Worked on drill and sample handling and contamination mitigation and bioburden monitoring using in-situ real time hand-held ATP Luminometry device. Contamination sample transfer control. Collaboration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

5. **Bonaccorsi R.** was in the Mojave Desert and the Death Valley Natl. Park. In collaboration with Janice Bishop Bonaccorsi collect lake sediemnt samples for spectroscopic analyses as a pilot study in support of Habitable World proposal to NASA. In Death Valley Bonaccorsi performed routine management of two rain gauges located in the Ubehebe Volcanic field for long-term climate monitoring in collaboration with Death Valley Natl. Park. More than 300 mm-rain were measured in 2 single high-intensity rainfall events impacting several of the Park infrastructures.

6. **Cabrol NA, McDonald R., Sobron P. Warren-Rhodes K.** (Oct.-Nov. 2019): **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.

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

8. **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.



Honors & Awards

1. **Beyer RA (May/31). Outstanding** Recognized: AGU https://eos.org/agu-news/in-appreciation-of-agus-outstanding-reviewers-of-2018

2. **Cabrol NA** was invited by the Editor-in-Chief of Nature, May Chiao, to write a commentary in Nature Astronomy on the Sagan et al.(1993) Nature paper entitled A Search for Life on Earth from the Galileo Spacecraft.

3. **Caldwell, D.** Web of Science Group/Clarivate Analytics Highly Cited Researcher for 2019

4. **Cami J.** was awarded the 2019 Qilak Award for astronomy, communications, public education and outreach of the Canadian Astronomical Society (CASCA).

5. **Cartwright R.** was awarded more DCT time in 2020A to observe Uranian and Galilean moons in January and June 2020, respectively.

6. **Marchis F**. (2019). South by Southwest: 2019 Interactive Innovation Award Finalist, scientific demonstration of SETI Institute partner Unistellar eVscope technology.

7. **Race MS** (October). *Elected Fellow of the American Association for the Advancement of Science (AAAS) by the Section on Societal Impacts of Science and Engineering*, Dr. Race was awarded the status of Fellow for contributions to the science underlying planetary protection as well as her contributions to risk communication in exobiology and solar system exploration. Published in *Science*, **366** (6469) 1086-1089.

8. **Rosner, S**:

- *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).

- *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

- *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).

9. **Showalter MR**'s discovery of Hippocamp, 14th known moon of Neptune, appeared on *Astronomy* magazine's list of the top-ten space stories of 2019. The discovery paper appeared in *Nature* in February 2019, with **French RS** as a coauthor. (The article is on the newsstands but not yet available online.)

10. The New Horizons science team, of which **Showalter MR** is a member, received the Arthur C. Clarke Space Achievement Award for 2019, which is given by the British Interplanetary Society. http://pluto.jhuapl.edu/News-Center/News-Article.php?page=20191126

11. **Sparks W.** 2019 AURA outstanding achievement award (team) for TESS Data Management and Archive (W. Sparks was TESS project lead at STScI for the development and implementation of the TESS data archive, which is located at STScI. The award is to the entire team).

12. **Sparks W.** 2019 NASA Silver Achievement Medal: TESS Team.

13. **Twicken, J.** Web of Science Group/Clarivate Analytics Highly Cited Researcher for 2019

14. **Beyer RA, Hinson D, Umurhan O, and White O (July 11, 2018). Asteroids named!** For service to the New Horizons mission the asteroids (141995) Rossbeyer, (164536) Davehinson, (196411) Umurhan, and (201019) Oliverwhite were named for these SETI Institute scientists. Minor Planet Circular: https://minorplanetcenter.net/iau/ECS/MPCArchive/2018/MPC_20180711.pdf

15. **Bishop JL** (November/22). *MSA Fellow*, Elected Fellow of the Mineralogical Society of America for outstanding contributions to the fields of mineralogy, crystallography, geochemistry, and petrology.

16. **Bishop JL.,** was elected as a Fellow to the Geological Society of America (GSA) at the spring GSA Council meeting, in recognition of their distinguished contributions to the geosciences through such avenues as publications, applied research, teaching, administration of geological programs, contributing to the public awareness of geology, leadership of professional organizations, and taking on editorial, bibliographic, and library responsibilities."

17. **Cami, J.** was awarded the Faculty of Science Outreach Award at the University of Western Ontario in July 2018 (award ceremony December 12, 2018).

18. **Freund FT**: Research Professor, Stanford Medical School, Division of Sleep Epidemiology.

19. **Freund FT**: NASA Ames Associate

20. **Kepler and K2 Teams** (November/2). Anna G. Eshoo U.S. Representative from California's 18th Congressional District, paid tribute on the House floor in honor of NASA's Kepler Space Telescope and as part of the Congressional Record, citing all the partners on the Kepler and K2 teams, including the SETI Institute (November 2, 2018).

21. **Race MS** (May/15). *Community Appreciation Award*, Given by Mayor and City Council for service as Library Commissioner from 2016 to 2018, City of Menlo Park, CA.

22. **Roser J.** Ames Safety Award for outstanding actions and accomplishments in improving health and safety conditions at Ames in 2018.

23. **SETI Institute** (November/1). Anna G. Eshoo, U.S. Representative from California's 18th Congressional District, presented the SETI Institute with a Certificate of Special Congressional Recognition for outstanding and invaluable service to the community.

24. Stoker, C.R., (PI)., **Bywaters, K.F**., (Co-I) **Bonaccorsi, R**. (Co-I) (June 2018). ***2018 Ames Research Innovation Award (ARIA).***What Happens to Life in an Ocean World Plume? Experimental study of cellular survival in simulated Enceladus-like plume. One-week REU Summer camp at the HCRO/ SETI Institute facility. RB has been is the REU Astrobiolgy Fieldtrip Director since 2013.

25. **Stucky TR**, *et al* (Sept/13th). *Group Achievement Award*, In recognition of a 2018 NASA Group Achievement Award for

outstanding technical collaboration in developing a fully-automated drilling and sampling lander.

26. **Stucky TR**, *et al* (Sept/13th). *Group Achievement Award,* For superior dedication and performance in rapidly developing a simulation capability for a wide range of piloted and/or autonomous vehicles in support of emerging aviation.

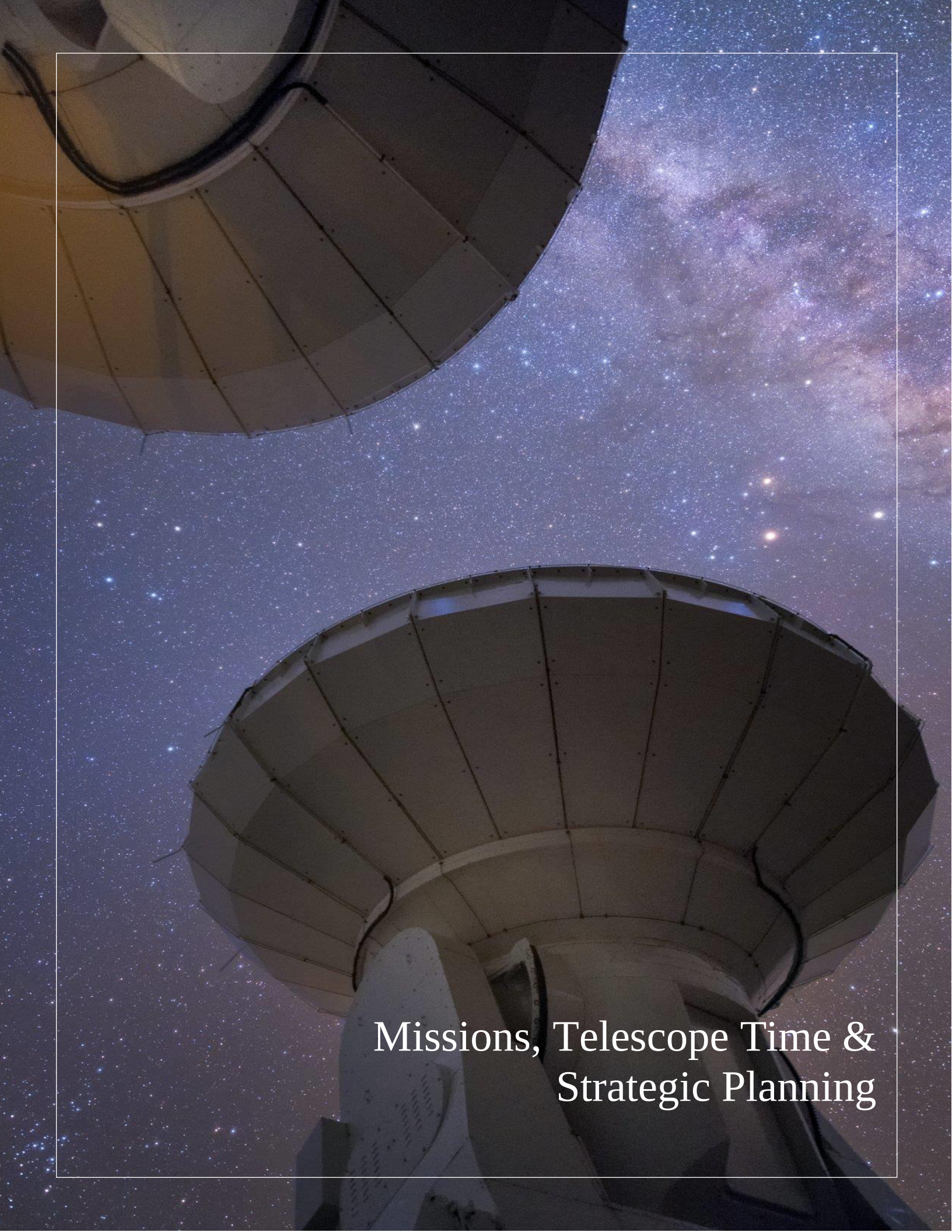
27. **TESS Science Processing Operations Center** (SPOC) Commissioning Team (Oct 18,2019), NASA Group Achievement Award, "For outstanding technical achievement and professionalism in implementing and integrating the Focal Plane Geometry and Pixel Response Function commissioning tools."

28. **Tiscareno (PI), Bonaccorsi (Co-I)**, **Proposal REU/NFS:** Focus REU Site: Life in the Universe – Astronomy and Planetary Science at the SETI Institute. Award will support FY 18 and FY 19 SETI REU activities including the one-week REU Summer camp at the HCRO/ SETI Institute facility. RB has been is the REU Astrobiology Fieldtrip Director since 2013.

29. **Race MS** (March 2018) Invited to Join the *Astrobiology and Society in Europe White Paper Advisory Board*.

30. **Race MS** (January 2018) recipient of NASA JSC Director's Innovation *Group Achievement Award As A Member Of The Human Forward Contamination Research Team* "For innovative contribution to understanding potential human forward contamination issues as NASA prepares to send humans to explore other worlds."

31. **Rummel JD** (February/26). Appointed to the Senior Editorial Board of *Astrobiology.*



Missions, Telescope Time & Strategic Planning

Contribution to Ongoing and/or 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. **Bonaccorsi R.** planned and executed experiments to simulate hypervelocity impacts of micrometer-sized ice particles on sampling collection systems during flybys across Enceladus' plume(s). Enceladus Plume Analog Simulation Experiments were performed at the NASA Ames Vertical Gun Range facility in support of planned flyby missions to detect sign of life in the Enceladus' plume environment (ELSAH mission planning). These simulations have been conducted since 2017 in collaboration with the APL. This is a key step to test fly hardware and its efficiency in collecting samples.
3. **Clark, C.** Member of the NASA SciAct Education Technology Working Group
4. **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.
5. **Harman, P.K**.. Member of the NASA SciAct Women in STEM Affinity Group
6. **Jin, M.** Served as a Co-I in a NASA Astrophysics SMEX mission proposal (submitted in August, 2019)
7. **Kagawa H.** Synthetic biology.
8. **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.
9. MRO HiRISE: **Ginny Gulick, Ross Beyer, J. Bishop, Livio Tornabene**
10. New Horizons: **Mark Showalter**, **Ross Beyer**, **Cristina Dalle Ore**, **Oliver White**, **Orkan Umurhan**, and **Chloe Beddingfield**
11. OSIRIS-REx: **John Marshall, Chloe Beddingfield**
12. **Sarrazin, P.** MSL CheMin science team. Non-operation support
13. **Sobron P.** (ongoing). NASA Mars 2020 rover mission Science Team member, SHERLOC and SuperCam Co-Investigator, instrument development and operation.
14. **Sobron P.** (ongoing). ExoMars 2020 rover mission Science Team member, RLS Co-Investigator, instrument development and operation.
15. **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.
16. **Tornabene L.** ExoMars Trace Gas Orbiter
17. **Twicken, J., Tenenbaum, P., Caldwell, D**. Attended TESS Science Team Meeting #18, December, 2019, MIT (Cambridge, MA)

Mission Planning/Design

1. **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.
2. **Bonaccorsi R**. Laboratory simulation of Enceladus' plumes (hypervelocity production of -200 C ice grains) in support of the ELSAH mission planning.
3. **Cabrol, NA.** Science Operation Center design for NASA Lunar CLPS missions/Orbit Beyond.
4. **Cabrol, NA.** Mars mission concept design.
5. **Jin, M.** Served as a Co-I in a NASA Heliophysics MIDEX mission proposal (submitted in September, 2019).
6. **Jin, M.,** Co-I for a SMEX mission planning for submission in 2019
7. **Kostov VB**. Contributed to mission concept "Pandora: Multiwavelength Characterization of Exoplanets and their Host Stars", to be submitted in response to NNH17ZDA004O.
8. **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.
9. **Showalter MR**, **Beyer RA**, and **Tiscareno MS** are participating in a Discovery Mission proposal for a centaur reconnaissance mission.
10. **Sparks, W.** (see Scowen et al., 2019) technical report.
11. **Tiscareno MS** and **Showalter MR** are part of two groups developing observation plans for the James Webb Space Telescope (JWST).
12. **Tiscareno MS** (continuing) leads the Saturn Ring Skimmer team, which is seeking to develop a spacecraft mission concept that would investigate the interfaces between Saturn's rings, magnetosphere, and atmosphere, and would directly observe individual ring particles and their behavior for the first time. The team is currently developing a white paper for the Planetary Science Decadal Survey.

Telescope 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. **Cartwright RJ** (09). Observing time. Remote observing of classical Uranian moons with the Discovery Channel Telescope and the VIS spectrograph DeVeny.

4. **Cartwright RJ** (06, 3 nights). Observing time. Remote observing of Callisto with the DeVeny spectrograph on the Discovery Channel telescopes.

5. **Cartwright RJ** (05, 2 nights). Queue mode observing of Callisto with the Near-Infrared Integral Field spectrograph on Gemini North.

6. **Marchis, F**. (05/29), Unistellar eVscope, observation attempt of UCAC4-363-062477 in constellation of Corvus and successful observation of M67 in constellation of Cancer with the Unistellar eVscope

7. **Rho. J.** Telescope Observing Time: Polarization observations of the supernova remnant Cas A with SOFIA HAWC+ (7 flights in September, 2019).

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

9. **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.

10. **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, for completion in July 2019. A major effort for observational planning at phase 2 was undertaken in preparation for this high profile data acquisition phase, and basic data processing of the new observations is underway. All observations were completed successfully following a rescheduled visit lost to a guide star acquisition problem. We acquired observations of Europa using EXES on SOFIA, flight "SUSAN" April 24/25 to seek direct evidence of water vapor from plumes, targeting mid infrared water vapor molecular vibrational emission lines, with the very high spectral resolution offered by EXES. Sparks participated in the flight. All data were successfully acquired and have been processed using the SOFIA pipeline. However, customized treatment of the observations is required in order to generate spectra with optimal sensitivity, yet to be carried out.

11. 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.

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

Strategic Planning/Committees

1. **Beyer R.** MAPSIT Steering Committee (continuing)

2. **Beyer R.** PS Publications Subcommittee Chair (continuing):

3. **Bywaters KB** (ongoing). *NOW RNC*, Research Coordination Network.

4. **Cabrol, NA.** Science Advisory Board member, OrbitBeyond (NASA/CLPS company).

5. **Cabrol, NA**. Chair, Biosignature Working Group, NASA Astrobiology Institute.

6. **Cabrol, NA**. Fellow, California Academy of Sciences.

7. **Cabrol NA.** Steering Committee Member, Network for Life Detection (NFoLD) Astrobiology Research Coordination Network (RCN).

8. **Cabrol, NA.** Member of the NASA OPAG Roadmap to Ocean Worlds (ROW).

9. **Cabrol, NA**. Member of the MEPAG Science Analysis Group (SAG) *Scientific Objectives for the Human Exploration of Mars* (HSO-SAG) since March 2015.

10. **Clark, C**. Member of the NASA SciAct Education Technology Working Group.

11. Crampton, D.; Christou, J.; Andersen, D.; Davies, R.; Marois, C. et al.; including **Marchis, F**.; (June/19-21), Gemini North Adaptive Optics (GNAO), workshop to discuss advanced optics progress and potential applications at Gemini North with future planned meetings.

12. **Fenton, L**. ICE-SAG (Ice and Climate Evolution Science Analysis Group, formed by the MEPAG Executive Committee).

13. **Harman, P.K**.. Member of the NASA SciAct Women in STEM Affinity Group

14. **Marchis**, **F**. (10/2019 became IAA SETI Permanent Committee (PC) member. At the the International Astronautical Congress (IAC 2019) event in Washington D.C.

15. **Marcu O** (April-ongoing). Speakers Committee, Palo Alto Rotary Club, purpose is to provide community engagement of business and professional advocates.

16. **Paganelli F.** WGCCRE - Member (continuing)

17. **Paganelli** F. served in NRA in an Astrophysics

18. **Race MS** (ongoing). *International Encyclopedia of Astrobiology*, Editor, 3rd Edition, Planetary Protection Section.

19. **Race MS** (ongoing). *Astrobiology in the Real World.* Assoc. Editor, Astrobiology journal, Commentary section.

20. **Race MS and JA Spry** (Jun-Dec 2019) Co-organizers (with G Kminek & B Siegel) of the 4th COSPAR-NASA Workshop on Refining the Planetary Protection Requirements for Human Extraterrestrial Missions, to be held in Houston TX in May, 2020.

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

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

23. **Showalter M.** National Academies study of NASA/SMD's Science Activation Program.

24. **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.

25. **Sobron P (ongoing)** Member, NFOLD (Network for Life Detection) Research Coordination Network Steering Committee

26. **Sobron P (ongoing)** Member, NOW (Network for Ocean Worlds) Research Coordination Network Steering Committee

27. **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.

28. **Sparks W.** Various decadal survey white papers requested input.

29. **Sparks W.** Panel member for PDS Rosetta Science Archive Review – polarimetric data

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

31. **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.

32. **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).

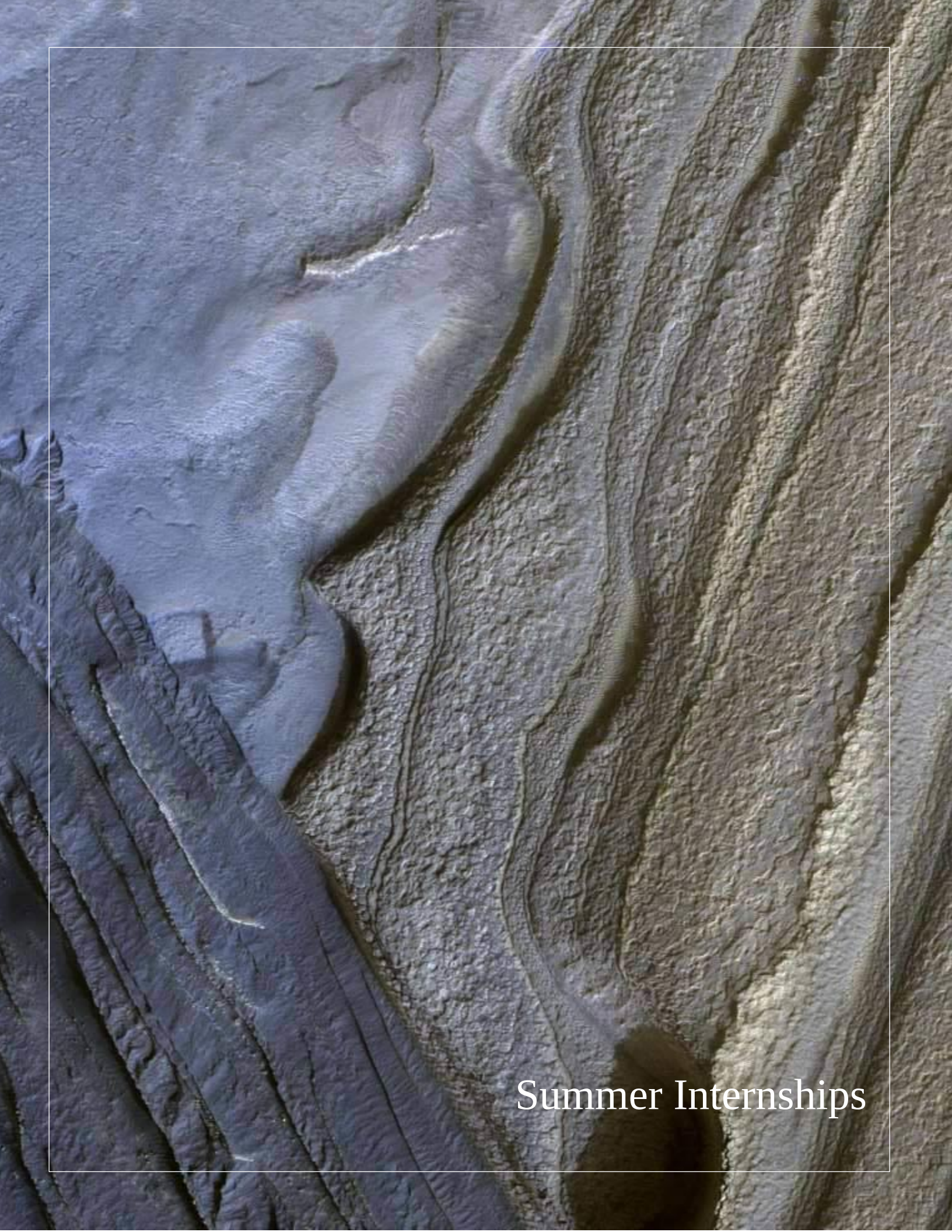
33. **Spry JA** (Nov 2018 - ongoing) Participant/Executive Secretary in the Planetary Protection Technology Brainstorm Group.

34. **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.

35. **Spry JA** (June 2018 – ongoing); Member – MSR Sterilization Working Group.

36. **Tiscareno MS** 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.

37. **Tiscareno MS** is a member of the Equity, Diversity, and Inclusion Working Group (EDIWoG), which has been chartered by the Outer Planets Assessment Group and other NASA community forums to develop white papers on EDI topics for the Planetary Science Decadal Survey.


Summer Internships

1. **Bishop JL & JR Skok** (June, 2019) Organizing and processing spectral library files for archives at the SETI Institute, Brown University's RELAB, and NASA's Planetary Data Server with interns Z Brandt, K Gruendler, M Gruendler, and M Stone. (Work to continue through August).

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

4. **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.

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

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

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

8. **Race MS** and STAR intern K Duenas (June, 2019) Updated and developed new website materials for NASA Planetary Protection Office and NASA Office of Safety and Mission Assurance. Began work on a Middle School book on Astrobiology and Mission Planning linked with Next Generation Science Standards (Work to continue through August).

9. **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. Interns and (mentors):

   - Olivia Durrett (Andrew Siemion)
   - Kevin Fillhouer (Pascal Lee)
   - Madeline Garner (Kathryn Bywaters)
   - Noah Goldman (Uma Gorti)
   - Rowan Huang (Virginia Gulick)
   - Mikayla Hudak (David Summers)
   - Lauren Little (Friedemann Freund)
   - Eli Metzler-Winslow (Ann Marie Cody)
   - Cameron Moye (Pascal Lee)
   - Jakayla Robinson (Matt Tiscareno)
   - Brian Szutu (Peter Jenniskens)

Acknowledgments

Contributors to this annual report include:

1. Andersen, DT.
2. Backman, DE.
3. Beddingfield, CB.
4. Beyer, RA.
5. Bishop, JL.
6. Bonaccorsi, R.
7. Busch, MW.
8. Bywaters, K
9. Cabrol, NA.
10. Caldwell, DA.
11. Cartwright, RJ.
12. Cami, J.
13. Chang, YJ.
14. Clark, C.
15. Cody, AM.
16. Cotera, A.
17. Coughlin, J.
18. Ćuk, M.
19. Dalle Ore, CM.
20. Danielsen, JM.
21. Dobrovolskis, AR.
22. Doyle, LR.
23. Ertem, G.
24. Estrada, PR.
25. Evans, MW.
26. Fenton, LK.
27. Freedman, R.
28. French, RS.
29. Freund, FT.
30. Glines, NH.
31. Gordon, MK.
32. Gorti U.
33. Gulick, VC.
34. Hargitai, HI.
35. Harman, PK.
36. Hinson DP.
37. Hollenbach, DJ.
38. Huang, X.
39. Huber, D
40. Jenniskens, P.
41. Jin, M.
42. Johnsen, TK
43. Kagawa H.
44. Kalas, P.
45. Kostov, VB.
46. Kubo, MD.
47. Lee, P.
48. Lafuente, B.
49. Marchis, F.
50. Marcu, O.
51. Marshall, J.
52. Michaels, TI.
53. Mighell, K
54. Miura, JK.
55. Morris, R.
56. Nedervold, E.
57. Nielsen, E.
58. Obbard, RW.
59. Paganelli, F.
60. Peeters, E
61. Pilorz, S.
62. Race, MS.
63. Ricca, A.
64. Rho, J.
65. Roser, JE.
66. Rosner, S.
67. Rummel, JD.
68. Ryan, EL.
69. Sarrazin, P.
70. Schulze-Makuch, D.
71. Scipioni, F.
72. Shostak S.
73. Showalter, M.
74. Simpson, JP.
75. Skok, JR.
76. Smith, JC.
77. Sobron, P.
78. Sparks, WB.
79. Spry, JA.
80. Stopp DJ.
81. Stucky, TR
82. Summers, D.
83. Takir, D.
84. Tenenbaum, JC.
85. Thompson, SE.
86. Tiscareno, MS.
87. Tornabene, LL.
88. Tregloan-Reed, J.
89. Turnbull, M.
90. Twicken, JD.
91. Umurhan, OM.
92. Usabal, GS.
93. Warren-Rhodes, K.
94. White, OL.
95. Wohler, B.