



2016

Publications and Presentations
of the SETI Institute



Carl Sagan Center

For the Study of Life in the Universe



2016 Publications & Presentations of the SETI Institute

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Director, Carl Sagan Center,
and the
SETI Institute Scientists and Educators



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2016: Publications & Presentations of the Carl Sagan Center of the SETI Institute



The Carl Sagan Center at the SETI Institute is at the heart of the scientific research we do that seeks to answer fundamental questions: How many planets exist that might support life? What is required for life to exist? How does life start? How does it evolve? In short, where did we come from and are we alone?

Our team focuses on disciplines including space and planetary exploration, analogs, and observing and modeling the precursors of life in the depths of outer space. Each Carl Sagan Center research project is related to understanding the origins of life or the extent to which life may be present beyond Earth.

2016 was my first full calendar year as head of the Carl Sagan Center at the SETI Institute. I have to say that I am in complete awe of what our scientists are accomplishing. Whether in the lab, from space- or ground-based observations, in terrestrial extreme environments, in the classroom with children and students, or as part of the space and planetary missions, if it's about searching for life beyond Earth and sharing a passion for knowledge, the SETI Institute team is involved front and center. The body of work presented by the SETI Institute represents more than 500 publications, including peer-reviewed articles, abstracts and proceedings of conferences, and technical reports. Our involvement in education and public outreach is almost as extensive.

2017 will be a year of even more excitement and the SETI Institute will again be at the forefront of new exploration and discovery. We are looking forward to the Great American Eclipse with the Girl Scouts project, a new year of NASA Frontier Development Lab, the Research Experience for Undergraduates program, the continuing down-selection of candidate landing sites for Mars 2020, increased activities of the Biosignature Working Group, and more scientific expeditions in extreme environments. This year will also mark the end of the Cassini mission.

Our quest belongs to all of humanity. We hope you will join us as we continue to tell the story of our work and our Universe.

Nathalie A. Cabrol

Nathalie A. Cabrol

Senior Research Scientist and Director of the Carl Sagan Center
SETI Institute

From the SETI Institute President & CEO



Dear Friends,

The mission of the SETI Institute is to explore, understand, and explain the origin and nature of life in the universe, and to apply the knowledge gained to inform, inspire and guide present and future generations. We have a passion for discovery and for sharing our research and exploration with the world.

The science output of our researchers at the SETI Institute is a source of great pride. This report of the Publications & Presentations of the Carl Sagan Center of the SETI Institute represents the collective work product of our science, education, and research centers during calendar 2016. Their productivity is truly impressive. We are published in such prestigious journals as *Nature* and *Science* as well as the *Astronomical Journal*, *Astrobiology*, *Applied Physics*, *Journal of Chemical Physics*, *Icarus*, *Proceedings of the Royal Society*, *Aeolian Research*, and many more!

Our researchers are referenced in a variety of scientific conference proceedings through hundreds of Abstracts of Conferences. We communicate to the public through dozens of speaking engagements, as well as stories and articles in the popular media.

Telling the story of the SETI Institute, and our wide-ranging research, is an important part of my own personal mission – to let the world know who we are and what we do. The breadth and depth of our science, combined with the impact and reach of our education programs, are truly amazing. I am sure that in surveying this compendium of our work, you will share my admiration for the people who make it all possible.

I have no doubt that our productivity in 2017 will be just as amazing, just as impressive, and just as important to share with the world. Join us on our journey of exploration and discovery and stay on top of the latest developments by visiting us at www.seti.org.

Sincerely,

A handwritten signature in black ink that reads "Bill Diamond". The signature is fluid and cursive, with the first name being more prominent.

Bill Diamond
President and CEO
SETI Institute

1.

Peer-Reviewed
Publications

1. Abdul-Masih, M., Prsa, A., Conroy, K., Bloemen, S., Boyajian, T., **Doyle, L. R.**, et al. (2016). Kepler Eclipsing Binary Stars. VIII. Identification of False Positive Eclipsing Binaries and Re-extraction of New Light Curves. *Astron. J.* <https://arxiv.org/abs/1602.05932>
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3.

Technical Reports &
Releases

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484. **Caldwell, D.** (2016). *Kepler Data Characteristics Handbook, KSCI-19040-005*, edited by Jeffrey Van Cleve. Delivered to MAST Archive 15 Dec 2016. This is the final documentation from the project describing the detailed characteristics of the original Kepler Mission Data after the final pipeline processing. http://archive.stsci.edu/kepler/manuals/Data_Characteristics.pdf
485. **Caldwell, D.** (2016). *K2 Campaign-10 Data Release Notes*, published 18 Jan 2017: <https://keplergo.arc.nasa.gov/k2-data-release-notes.html#k2-campaign-10>
486. **Caldwell, D.**, co-author on *Kepler Data Processing Handbook, KSCI-19081-002* (version 2), edited by Jon Jenkins. Delivered to MAST Archive 27 Jan 2017. It will appear under Kepler Documentation shortly: http://archive.stsci.edu/kepler/manuals/KSCI-19081-002_Data_Processing_Handbook.pdf
This is the final documentation from the project describing in detail the pipeline used for the final Kepler Mission data processing.
487. **Caldwell, D.** (2016) participated to the *Data Release Notes for K2 Campaign C8*, along with *Data Release Note updates for C3, C4, and C5*.
488. **Caldwell, D** & J. E. Van Cleve (2016). Global Erratum for Kepler Q0-Q17 & K2 C0-C5 Short-Cadence Data, *Technical Report KSCI-19080-002*, NASA Ames Research Center Kepler/K2 Mission, March 2016
<https://archive.stsci.edu/kepler/KSCI-19080-002.pdf> (the report details a calibration error that has been in place since launch affecting some Kepler/K2 1-minute cadence data. We describe the issue, identify the affected targets, and lay out the plan for providing properly calibrated data).
489. **Gillum, E., and G. Harp** (2016). *Optical SETI Workshop Report*, submitted to the Breakthrough Foundation, for the Breakthrough Listen Initiative, Oct 5.
490. **Gordon, M. K.**, Guinness, E., and Padams, J., Eds. (2016). *PDS4 Geometry Dictionary*, Version 1.3.1.0. July 2016.
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492. **Jenniskens, P.**, Baggaley (2016). Volantid meteor shower outburst on new year's eve 2015. *CBET 4261*. D. W. E. Green (ed.). IAU Central Bureau for Astronomical Telegrams.
493. Joyner, R., **Gordon, M. K.**, and Simpson, R., Eds. (2016). *Data Providers' Handbook - Archiving Guide to the PDS4 Data Standards*, Version 1.4.1. February, 2016.
494. **Kepler Team** (2016). Completed review of final *Transiting Planet Search (TPS) and Data Validation (DV) runs of Kepler Mission Pipeline (for primary mission Q1-Q17 with SOC 9.3 codebase)*. Approved export of results to NASA Exoplanet Archive at NEXSci.
495. **Kepler Team** (2016). Continuing to write TCE paper describing Threshold Crossing Events (TCEs) identified in the TPS/DV runs above. Draft of paper is nominally due on 4/1. It is these TCEs that after vetting become the Kepler planet catalog.
496. **Kepler Team** (2016). Continuing to develop the Photometric Analysis (PA) software component for the TESS Mission Pipeline. This will be released with SPOC 2.0 later this spring/summer. PA performs cosmic ray removal, background estimation/subtraction, photometry, centroiding, mapping between sky/pixels, and computation of photometric performance metrics.
497. Slavney, S., Joyner, R., **Gordon, M. K.**, and Simpson, R., Eds. (2016). *Planetary Data System Standards Reference, Version 1.7.0*. September, 2016.
498. **Tarter, J.** Report from Subcommittee B – New Approaches to SETI (August 19-20, 2016 workshop) submitted to the Breakthrough Foundation, for the Breakthrough Listen Initiative, Oct 5.
499. **TESS**: The TESS Science Processing Operation Center successfully completed Verification & Validation (V&V) of the science algorithm software for the front end of the science pipeline for the software version 2 release. This includes calibration of raw pixel data (CAL), generation of photometric light curves (PA) and conditioning of the light curves for preparation for the planet search (PDC). Work continues completing the data handling infrastructure for the front end in preparation for the imminent TESS-mission-wide Ground Segment Integration Test 2 (GSIT 2) which should occur very soon. In parallel to the GSIT preparation work, the SETI Data Scientists are moving forward beginning development work for the pipeline back-end, which includes the Transiting Planet Search (TPS), Data Validation (DV) and Photometer Performance Assessment (PPA). We are on schedule to finish development of the pipeline back-end algorithms by the end of summer 2017.
500. **Thompson, S. E., D. A. Caldwell**, eds. (2016). *Kepler Data Release 25 Notes Q0-Q17*, Technical Report KSCI-19065-002 [Final Kepler data release], NASA Ames Research Center Kepler Mission, Aug 2016.
501. **Thompson, S. E.**, D. Fraquelli, J. E. van Cleve, and **D. A. Caldwell** (2016). *Kepler Archive Manual, Technical Report KDMC-10008-006*, NASA Ames Research Center Kepler Mission, May 2016.
502. Van Cleve, J. E. & **D. A. Caldwell**. (2016). *Kepler Instrument Handbook, Technical Report KSCI-19033-002*, NASA Ames Research Center Kepler Mission, April 2016.
503. Van Cleve, J. E., J. L. Christiansen, J. M. Jenkins, **D. A. Caldwell**, T. Barclay, **S. T. Bryson**, **C. J. Burke**, **J. Campbell**, **J. Catanzarite**, **B. D. Clarke**, **J. L. Coughlin**, F. Girouard, M. R. Haas, T. C. Klaus, J. J. Kolodziejczak, J. Li, S. D. McCauliff, **R. L. Morris**, **F. Mullally**, E. V. Quintana, J. Rowe, A. Sabale, S. Seader, **J. C. Smith**, M. D. Still, **P. G. Tenenbaum**, **S. E. Thompson**, **J. D. Twicken**, A. K. Uddin, and K. Zamudio, (2016). *Kepler Data Characteristics Handbook*, Technical Report KSCI - 19040 - 005, NASA Ames Research Center, Dec 2016



4.



Popular Publications,
Interviews, Education &
Outreach

504. **Backman, D.** SOFIA presentation to NASA Ames college interns, Moffett Field, CA, Nov. 4, 2016.
505. **Backman, D.** Participation in NASA panel for 50 high school science students from Idaho visiting NASA Ames, Moffett Field, July 26, 2016.
506. **Backman, D.** *NASA SOFIA and IR Astronomy*, Infrared astronomy inquiry based presentations to 6 groups of middle school children, teachers, and parents (total about 100) visiting the AAS Exhibit Hall, San Diego, CA, June 14, 2016.
507. **Backman, D.** *NASA's SOFIA and IR Astronomy*, California Associated for the Gifted (CAG) education conference, invited plenary SOFIA talk to 138 teachers, Palm Springs, Feb. 28, 2016.
508. **Backman, D.** SOFIA Mission presentation at Sunrise Middle School, 70 students, 2 teachers, San Jose, CA, Jan. 22, 2016.
509. **Beyer, R.** Participated in DPS New Horizons Press, Oct. 2016, including: <http://aasnova.org/2016/10/19/48th-dps11th-epsc-meeting-day-2/> <http://www.space.com/34443-landslides-on-pluto-moon-charon.html> <http://www.natureworldnews.com/articles/30447/20161021/scientists-discover-landslides-pluto-s-moon-charon.htm> <http://www.universetoday.com/131492/latest-results-new-horizons-clouds-pluto-landslides-charon/>
510. **Beyer, R.** Worked with Astronomy magazine to help them create the first-ever Pluto globe.
511. **Bishop, J.** Contributed to *Microbes living on Mars*. The article was published on Jan. 30, 2017. <http://www.seeker.com/mars-microbes-rocks-biology-life-astrobiology-iron-sunscreen-2225424742.html>
512. **Bonaccorsi, R.** (Media Interview). High Road Documentary (TATA Motors sponsored).
513. **Bonaccorsi, R.** (Media Interview). Rajya Sabha Television (India Govt. TV channel). Science monitor 08-14-16 news.
514. **Bonaccorsi, R.** (TV). aired on RAI GULP (Kid's network) on December 18, 2016, special on Mars.
515. **Busch, M.** Overview of asteroid radar astronomy for the NASA Frontier Development Lab (Web Story), July 2016.
516. **Busch, M.** Lectures for Margaret Race's class at the Osher Lifelong Learning Institute (OLLI), Santa Clara University, April 14 and 21, 2016.
517. **Busch, M.** Public outreach session and star party, Pasadena, during the DPS and EPSC.
518. **Cabrol, N. A.** *Searching for life on Mars through a new lens --- Ancient life organized around oases*, http://www.dailygalaxy.com/my_weblog/2016/12/the-search-for-life-on-mars-needs-a-new-approach-ancient-life-organized-around-oasis.html#more
519. **Cabrol, N. A.** Interview by "La Recherche" for the introduction to their special issue on SETI and Astrobiology (November 2016).
520. **Cabrol, N. A.** Interview by Mark Kauffman. *SETI reconceived and broadened: A call for community proposal*. <http://www.manyworlds.space/index.php/2016/11/21/seti-reconceived-and-broadened/>
521. **Cabrol, N. A.** Helen Macdonald participate in the field expedition to the Andes for 3 weeks to write a story about Cabrol for the New York Times (to be published in the first quarter of 2017).
522. **Cabrol, N. A.** Interview with *La Recherche* magazine (France) about the Search for Extraterrestrial Intelligence, Aug. 31, 2016.
523. **Cabrol, N. A.** Phone interview with a Canadian radio about the article *Alien Mindscapes* published in *Astrobiology*, Aug. 23, 2016.
524. **Cabrol, N. A.** Interview by Joseph Brean, *National Post*, about the article *Alien Mindscapes*, Aug. 12, 2016.
525. **Cabrol, N. A.**: Abundant coverage (PR and interviews from July to December) of the *Astrobiology* article *Alien Mindscapes*. On the high-impact list since publication on Open Access.
526. **Cabrol, N. A.** Interview with Mark Kauffman about the article published by *Astrobiology: Alien Mindscapes*.
527. **Cabrol, N. A.** Interview with Irish radio about the article published by *Astrobiology: Alien Mindscapes* and SETI.
528. **Cabrol, N. A.** *SETI calls for new tools in the search for extraterrestrial intelligence*, <https://phys.org/news/2016-07-seti-tools-extraterrestrial-intelligence.html>
529. **Cabrol, N. A.**: From Viking to Mars 2020 – Searching for Habitability and Life on Mars (40th anniversary of Viking landing on Mars, Web Story).
530. **Cabrol, N. A.** Pre-field season, phone interview with Helen Macdonald, writer, New York Times, May 4, 2016.
531. **Cabrol, N. A.** Interview, La Tercera, Chile, March 17, 2016.
532. **Cabrol, N. A.** Interview, CCTV, Los Angeles, March 2, 2016.
533. **Clark, C.** SOFIA exhibit at the Bay Area Science Festival, San Francisco, Nov. 5, 2016.
534. **Clark, C.** Presentation at NASA Ames fir 24 pre-service teachers, Moffett Field, July 28, 2016.
535. **Clark, C.** Presentation on space sciences & NGSS during the ASP's Summer Astronomy Institute, San Francisco. Jul. 25, 2016.
536. **Clark, C.** SOFIA presentation to 100 6-8 grade students from Palmdale Learning Plaza visiting NASA AFRC SOFIA Facility, Palmdale, CA, March 11, 2016.
537. **Clark, C., and D. Backman.** SOFIA Exhibit at NASA Ames, *Take your Child to Work Day Street Fair*, ~300 visitors to booth, Moffett Field, April 28, 2016.
538. **Clark, C.** NASA Ames Space Science Jamboree, SOFIA Exhibit, over 500 attendance, Moffett Field, March 8, 2016. https://spacescience.arc.nasa.gov/media/SS%202016%20JAMBOREE%20BOOKLET_0.pdf
539. **Coughlin, J.** was interviewed and quoted for two *Popular Mechanics* articles:
- Earth-Like Planet Found Orbiting the Nearest Star to the Sun: <http://www.popularmechanics.com/space/deep-space/news/a22522/nearest-planet-proxima-b/>
 - How Will We Travel to That Promising New Planet?: <http://www.popularmechanics.com/space/deep-space/a22567/interstellar-travel-proxima-b/>
540. **DeVore, E.** *Panel presentation regarding STEM Careers at Girl Scout Career Day*, Mountain View, Nov. 5, 2016.
541. **DeVore, E., and P. Harman.** *When I Grow Up!* Girl Scout Day at NASA Ames, Hands-on activity for Girl Scouts, Nov. 5.
542. **DeVore, E., and P. Harman.** Girl Scout Bridging Day-Ling Event, Crissy Field, San Francisco. Hands-on activities for Girl Scouts, April 30.
543. **DeVore, E.** A Legacy of Astronomical Discovery, *Astrobiology and Searching for ET*, Osher Life Long Learning (OLLI) Program, March 28, 2016. (Margaret Race as lead instructor.)

544. **DeVore, E., and P. Harman.** *Girls Go to Mars* Workshop for Girl Scout Representatives, Alameda, Feb. 23-24, 2016. <http://nautil.us/blog/dolphins-are-helping-us-hunt-for-aliens>
545. **Doyle, L.** Invited article about animal communication and SETI, *Nautilus* magazine, April 17, 2016.
546. **Estrada, P.:** *Life in Outer Space*, a 2-episode documentary to be aired soon on Discovery USA, and featuring interviews with a number of SETI Institute scientists.
547. **Estrada, P.** Interviewed by Christopher Crockett of *Science News* about his DPS presentation on the new constraints on the age of Saturn's rings. The article appeared on Oct. 20, 2016, at: <https://www.sciencenews.org/article/experts-dont-agree-age-saturn-rings?tgt=nr>
548. **Fenton, L.** mentored high school student Helen Carson on a project using the NASA Ames Mars Global Climate Model to simulate wind patterns in Meridiani Planum over the past ~200 ka, Oct. 2016.
549. **Gulick, V., and N. Glines.** Organized and hosted the yearly visit of 7th and 8th graders and their teacher Mr. Dennis Mitchell from Evergreen Middle School, Cottonwood, CA.
550. **Harp, G.** Interview and significant article, *El Diario*, http://www.eldiario.es/hojaderouter/ciencia/vida_inteligente-extraterrestres-ciencia-descubrimiento-protocolo_0_528797334.html, June 20, 2016.
551. **Jenniskens, P.** CAMS detection of P-R evolved cm-sized meteoroids (Web Stories, February 2016).
552. **Harman, P.** *NASA SOFIA and IR Astronomy*, Infrared astronomy inquiry based presentation during the AAS Student event, 113 attendance, San Diego, CA, June 14, 2016.
553. **Harman, P.** *NASA SOFIA and IR Astronomy*, SOFIA presentation to 35 5th graders and 2 teachers, Lafayette Elementary School, San Francisco, CA, April 29, 2016.
554. **Harman, P.** *NASA SOFIA and IR Astronomy*, inquiry based presentation during the AAS Student event, 118 attendance, Kissimee, Florida, Jan 5, 2016.
555. **Lee, P.** Interview, CCTV, Los Angeles, March 2016.
556. **Lee, P.** *Passage to Mars*. Before humans make it to Mars, he must conquer the Arctic. Passage to Mars is the incredible true story of Pascal's team who embarks on a treacherous, 2,000-mile journey across the forbidding tundra of the Northwest Passage-an alien voyage on planet Earth designed to prepare NASA astronauts for an eventual mission to Mars. Sept. 30, 2016. The documentary was co-written by **P. Lee**. <https://vimeo.com/133185152>
- 31 May – 5 June 2016: Advance screening in Los Angeles.
 - 30 Sept. 2016: Premiere in NYC, NY, and select theaters nationwide.
 - 10 Dec 2016: Awarded *Best Non-Fiction Feature Film* at RAW Science Film Festival in Hollywood. Pascal present to accept the award on behalf of the film team.
 - Jan 24, 2017: DVD Release.
 - Jan 29, 2017: Nominated for Golden Reel Award for Best Sound Editing in Documentary Feature Film Category.
557. **Lee, P.** Talk, Bishop Elementary School, Sunnyvale, CA, Dec. 5., 2016.
558. **Lee, P.** National Geographic's MARS, Bookstore, Corte Madera, CA, Oct. 30, 2016.
559. **Lee, P.** Talk, Marymount School – Santa Barbara, Oct. 4, 2016.
560. **Lee, P.** Talk, Ocean Innovation Conference Youth Center – Iqaluit, Canada, Oct. 3, 2016.
561. **Lee, P.** (TV) NASA's Unexplained Files – Season 5 episode filming, Oct. 1, 2016.
562. **Lee, P.** (Interview) Voice of America Radio Interview, Sept. 6, 2016.
563. **Lee, P.** NASA Ames STEM talk, June 24, 2016.
564. **Lee, P.** Talk, Innovation Norway Students, Moffett Field, June 23, 2016.
565. **Lee, P.** Talk, REU Students Program, the SETI Institute, Mountain, CA, June 22, 2016.
566. **Lee, P.** Talk, Cupertino Middle School, Cupertino, CA, May 20, 2016.
567. **Lee, P.** NASA's Unexplained Files – Season 3 episode filming, May 17, 2016.
568. **Lee, P.** Talk, MESA- NASA Ames, N245, CA, May 16, 2016.
569. **Lee, P.** Talk, Bishop Elementary School, Sunnyvale, CA, May 13, 2016.
570. **Lee, P.** The Space Show Radio Interview, May 5, 2016.
571. **Lee, P.** Ames Child Care Center, Moffett Field, CA, April 20.
572. **Lee, P.** Academy Antics, talk, San Jose, CA, April 16, 2016.
573. **Lee, P.** Talk, Riverview Middle School, Bay Point, CA, March 10, 2016.
574. **Lee, P.** Talk, Monta Loma Elementary School, Mountain View, CA, March 4, 2016.
575. **Lee, P.** NASA's Unexplained Files – Season 4 episode filming, Feb. 21, 2016.
576. **Lee, P.** Talk, Princeton Elementary School, Delano, CA, Feb. 2, 2016.
577. **Lee, P.** CCTV Interview – Jan. 27, Aired/Released May 28, 2016.
578. **Lee, P.** IHMC STEM-Talk Interview, Jan. 22 – Aired/Released Aug. 17, 2016.
579. **Lee, P.** Stanford Hispanic Broadcasting radio interview, Jan. 19, 2016.
580. **Marchis, F.** (Interview): *La Recherche*, special issue on SETI and Astrobiology (November 2016).
581. **Marchis, F.** *Une Nouvelle Terre Proche de Nous?* *La Recherche*, 519, (L'Année de la Physique, p. 58).
582. **Marchis, F.** (Interview): *SETI is hopeful yet skeptical that Russians found aliens*, *Venture Beat* <http://venturebeat.com/2016/08/30/seti-is-hopeful-yet-skeptical-that-we-found-aliens/>
583. **Marchis, F.** (Interview): *Did SETI scientists discover aliens? Not so fast* - *Daily Dot* <http://www.dailydot.com/parsec/astronomer-seti-signal/>
584. **Marchis, F.** (Interview): *Non, SETI n'a pas encore détecté de signal E.T* - *Ciel et Espace* <https://www.cieletespace.fr/actualites/non-seti-n-a-pas-encore-detecte-de-signal-e-t>
585. **Marchis, F.** (Interview): *In The Search For Alien Life, An All-Too-Human Communication Failure* - *Fast Company* by Cale Wissman

586. **Marchis, F.** Worked with the California Academy of Sciences on a documentary called “Incoming!”, and a 10-min. documentary for the Hohfeld Hall Program on Extrasolar Planet Formation.
587. **Race, M.** Course Lead and Lecturer – *Astrobiology & Searching for ET*, Osher Life Long Learning (OLLI) Program, March 28, April 7, 14, 21, and 28, 2016).
588. **Race, M.** Interview (Spanish) on *Response to Discoveries of ET Signals or Phenomena*.
http://www.eldiario.es/hojaderouter/ciencia/vida_inteligente-extraterrestres-ciencia-descubrimiento-protocolo_0_528797334.htm
589. **Richards, J.** Interview, KXLR Radio, Redding, CA., Oct. 22, 2016. YouTube video using the audio and pictures:
<https://youtu.be/uX0Cpvp2utk>
590. **Richards, J.** Story published in:
<https://www.amazon.com/Science-Fiction-Scientists-Anthology-Stories/dp/3319411012>
591. **Richards, J.** KIXE Public TV interview, Nov. 24/26, 2016:
<https://youtu.be/XXKDKXEWXY>
592. **Richards, J.** Interview at the ATA for Durbania.
<https://youtu.be/VUmVz3Bw4LY>
593. **Shostak, S.** Radio Interview, Radio 5, BBC, *Hillary Clinton and Area 51*. March 2016.
594. **Shostak, S.** Radio Interview, SETI and SETI Science, *Midnight in the Desert*. March 2016.
595. **Shostak, S.** Radio Interview, SETI, *Dark Thirty Radio*, March 2016.
596. **Shostak, S.** TV Interview at the ATA for Prometheus Productions, March 2016.
597. **Shostak, S.** “Drone’s Eye View of Mars,” *Huffington Post*, May 16, 2016. http://www.huffingtonpost.com/seth-shostak/drones-eye-view-of-mars_b_9990872.html
598. **Shostak, S.** How to Take Stellar Night Shots of Stars,” *Shutterbug*, June 2016, p. 30.
599. **Shostak, S.** Looking for ET, *Sky’s Up*, Summer 2016.
<https://www.joomag.com/magazine/skys-up-summer-2016/0694333001461966596>
600. **Shostak, S.** The Other Way to Find Life Out There, *Huffington Post*, June 3, 2016. http://www.huffingtonpost.com/seth-shostak/the-other-way-to-find-lif_b_10283870.html
601. **Shostak, S.** Seth Shostak, July 5, Independence Day: Core Values, *Huffington Post*, http://www.huffingtonpost.com/seth-shostak/independence-day-core-val_b_10813464.html
602. **Shostak, S.** 9/8 Host of two episodes of Neil deGrasse Tyson’s radio show.
603. **Shostak, S.** 9/10 Panelist on life in space, Northeast Fall Astronomy Festival, Durham, NH.
604. **Shostak, S.** 9/12 Video interview by Joel Achenbach, Washington Post, in Washington, DC.
605. **Shostak, S.** 9/15 Inverview on Ronn Owens radio show, KGO, San Francis
606. **Shostak, S.** Interview on “Science Friday” (NPR radio) 10/7/2016.
607. **Shostak, S.** Interviews radio and TV CBC, Edmonton, Canada 10/17 and 18/2016
608. **Shostak, S.** Interview by Czech science radio show, Aug. 4, 2016.
609. **Shostak, S.** Interview about KIC 8462852, Pat Thurston, KGO Radio, San Francisco (ISDN).
610. **Shostak, S.** Interview by “Amy on the Radio” (Skype).
611. **Shostak, S.** Interview by BBC5 on Schiaparelli lander (radio) 10/19/16.
612. **Shostak, S.** Guest on “Coast to Coast AM”, two hours (radio) 10/25/16.
613. **Shostak, S.** 5 Things We Know to be True: No Credible Evidence of Alien Visitation Exists,” *Scientific American*, November 2016.
614. **Shostak, S.** Arrival: Squid Pro Quo,” *Huffington Post*, November 10, 2016. http://www.huffingtonpost.com/seth-shostak/arrival-squid-pro-quo_b_12897656.html
615. **Shostak, S.** “If ET Exists, We’ll Find Him in the Next 20 Years,” *Nautilus/Cosmos*, November 2016.
<http://cosmos.nautil.us/short/56/if-et-exists-well-find-him-in-the-next-20-years>
616. **Shostak, S.** Drake Equation: 55 Years Old,” *SETI Institute*, November 16, 2016. <http://www.seti.org/seti-institute/Drake-Equation-55-Years-Old>
617. **Shostak, S.** “John Glenn 1921-2016,” *SETI Institute*, November 9, 2016. <http://www.seti.org/seti-institute/john-glenn-1921-2016>
618. **Shostak, S.** “Are Humans the Real Ancient Aliens?” NBC News, December 13, 2016.
<http://www.nbcnews.com/mach/space/are-we-ancient-aliens-n695456>
619. **Shostak, S.** Guest (one hour) on “Dark Thirty Radio”, April 1, 2016.
620. **Shostak, S.** Guest on the BBC World Service Television on *Breakthrough Starshot*, 12 minutes, April 12, 2016.
621. **Shostak, S.** Guest for news segment (*Breakthrough Starshot*) on “Coast to Coast AM” radio, 10 minutes, April 12, 2016.
622. **Shostak, S.** Guest on “Coast to Coast AM” radio, two hours, April 14, 2016.
623. **Shostak, S.** Interview about SETI by KHOI radio, Ames Iowa, May 13, 2016.
624. **Shostak, S.** Interview about SETI by Dr. J. Radio, May 16, 2016.
625. **Shostak, S.** SETI on “On Point”, NPR radio show out of WBUR (Boston), May 19, 2016.
626. **Shostak, S.** Interview, Wolfgang Radio (London), May 23, 2016.
627. **Shostak, S.** Interview, Australian Radio, May 24, 2016.
628. **Shostak, S.** Interview, Packman Show (television), 2016.
629. **Shostak, S.** Weekly Space Hangout (web TV show), May 27, 2016.
630. **Shostak, S.** *SETI Update*, BayCon, San Mateo, CA, May 28, 2016.
631. **Shostak, S.** *SETI*, Mythic Internet Radio, May 31, 2016.
632. **Shostak, S.** “Dark Thirty” radio show, May 31, 2016.
633. **Shostak, S.** *Independence Day: Core Values*, *Huffington Post*, July 5, 2016. http://www.huffingtonpost.com/seth-shostak/independence-day-core-val_b_10813464.html
634. **Shostak, S.** Interview in studio, *In Depth*, KCBS radio, San Francisco, Sept. 1, 2016.

635. **Shostak, S.** Interview in studio for *Business Insider*, New York, Sept. 6, 2016.
636. **Shostak, S.** Interviewed by Michio Kaku for his radio show, Sept. 6, 2016.
637. **Shostak, S.** Interviewed by Neil deGrasse Tyson for his TV show, Sept. 7, 2016.
638. **Shostak, S.** Interview for the National Geographic Channel at the ATA, Nov. 12, 2016.
639. **Shostak, S.** Interview about SETI by Radio 2U3, Sydney Australia, Nov. 23, 2016.
640. **Shostak, S.** Interview about SETI, Irish Radio Dublin, Dec. 09, 2016.
641. **Shostak, S.** Interview about SETI, WBAI radio, New York, Dec. 23, 2016.
642. **Shostak, S.** Weekly *Big Picture Science*, Radio Show, the SETI Institute.
643. **Tarter, J.** OLLI at Santa Clara, *SETI Lectures*, April 7, 2016.
644. **Tarter, J.** Media interviews and press conference to promote the Starmus 3 Festival in Tenerife, May 9-13.
645. **Tarter, J.** Filming with Neil de Grasse Tyson for an episode of StarTalk on Nat Geo., May 27, 2016.
646. **Tarter, J.** Submitted new foreword for *Murmurs of Earth* that is being translated into Chinese by editor Alexei LU Fei, May 2016.
647. **Tarter, J.** Film video for the Asteroid Day website, Aug. 3, 2016.
648. **Tarter, J.** Film with California Humanities, Aug. 22, 2016.
649. **Tarter, J.** Phone interview with Tommy Schnurmacher on CJAD800, Montreal. Aug. 25, 2016.
650. **Tarter, J.** Phone interview with Leonard David.
651. **Tiscareno, M.** Media/Interview - Close Views Show Saturn's Rings in Unprecedented Detail. <http://www.jpl.nasa.gov/news/news.php?feature=6729>
652. **Tiscareno, M.** *Life in Outer Space*, a 2-episode documentary to be aired soon on Discovery USA, and featuring interviews with a number of SETI Institute scientists.
653. **Tiscareno, M.** Interview by Emily Benson of *New Scientist* for comments on a new article on the origins of Saturn's rings, Sept. 16, 2016. <https://www.newscientist.com/article/2106108-saturns-rings-may-be-from-the-whirl-of-a-passing-icy-rock>.
654. **Tiscareno, M.** Interviewed by PBS Nova on the Cassini Grand Finale, Dec. 2016.
655. **Zalucha, A.** Quora: Most Viewed Writer: Meteorology, Weather Forecasts; Answer published in Forbes: What Do We Know About Pluto's Atmosphere? May 2016. <http://www.forbes.com/sites/quora/2016/04/04/what-do-we-know-about-plutos-atmosphere/#507aec651e0d>
656. **Zalucha, A. M.** Spoke about SETI (the science) and Pluto at the Denver Comic Con, June 18, 2016.

5.

Invited Talks
(Professional & Public)

657. **Ballard, L.** *How To Play with Deep Space Data*, invited speaker at Dent:Space, San Francisco, September 2016.
658. **Ballard, L.** *Postcards from the Outer Planets*, invited speaker at Science Hack Day, San Francisco, Nov. 12-13, 2016.
659. **Ballard, K.** *Space Hacks with WordPress and Python*, invited speaker at DotAstronomy 8 Conference, Oxford, UK.
660. **Beyer, R.** *Charon: Pluto's Fascinating Moon from New Horizons*. SETI Weekly Lecture Series, May 17, 2016.
661. **Beyer, R.** Talk to two 3rd grade classes about planetary exploration, Nov. 4, 2016.
662. **Beyer, R.** *New Horizons*, public talk, San Mateo Astronomy Club, Nov, 4, 2016.
663. **Beyer, R.** Keynote speaker at Stanford's GISday, Nov. 16, 2016.
664. **Bishop, R.** Invited speaker at the GSA Gilbert Session, Denver, Sept. 27, 2016.
665. **Bishop, J.** *History of Clays on Mars: How we Found them and their Astrobiological Importance*. SETI Weekly Lecture Series, Nov. 8, 2016.
666. **Bonaccorsi, R.** MarsFest Symposium Guided Talks, March 2016.
667. **Bonaccorsi, R.** *Analog Field Research in Extreme Desert Environments*. Osher Lifelong Learning Institute, Santa Clara University, April 21, 2016.
668. **Bonaccorsi, R.** Invited to speak (public talk) at the Visual Performing Arts (VPA) theater, Evergreen College, Nov. 2, 2016.
669. **Bonaccorsi, R.** *Summary Activities of the Lipid Biomarker Detection Group*. Opening event for Spaceward Bound India, Lemon Tree Delhi, Aug. 8, 2016.
670. **Bonaccorsi, R.** *International Seminar and Space Forum*, Amity Institute of Aerospace Engineering (AIAE), New Dehli, Aug. 21, 2016.
671. **Bonaccorsi, R.** *Searching Life Elsewhere: Life Detection in Planetary Analog Materials*. Seeker's Interaction Forum, Lucknow (India), Aug. 31, 2016.
672. **Bonaccorsi, R.** Invited talk: *Science Expeditions to Planetary-Like Environments and the Search for Life in the Solar System*, Evergreen College's Performing Arts (VPA) Theater, San Jose, Dec. 2, 2016.
673. **Brown, A.** Invited talk: *Volatiles and Ices in the Polar Regions of Mars - the future is LIDAR*, NASA Goddard Science Colloquium, April 5, 2016.
674. **Busch, M.** Outreach at the California Academy of Sciences evening event, March 10, 2016.
675. **Busch, M.** Seminar at the University of Central Arkansas (via videoconference), March 15, 2016.
676. **Busch, M.** *Strange New Worlds* – Panel discussion on recent planetary science results at the BayCon Science Fiction Convention, San Mateo, CA, May 29, 2016.
<https://sites.grenadine.co/sites/baycon/en/2016/items/104/Strange+New+Worlds>
677. **Busch, M.** *Small Bodies in the Solar System*, REU Program, the SETI Institute, June 15, 2016.
678. **Busch, M.** *Asteroid Impact Response*, talk series for the NASA Frontier Development Lab (FDL), June 27-29, 2016.
679. **Busch, M.** *Near-Earth Asteroid Spacecraft Missions and the Impact Hazard*, Evergreen Community College. Sponsored by the College's Astronomy Club, Aug. 2, 2016.
680. **Cabrol, N. A.** *Decoding a Changing Planet*, Rolex Prize, Finalist, Geneva, Switzerland, April 2016.
681. **Cabrol, N. A.** *Comparison of Environmental Habitability: Evolution and Preservation in Time*, Invited talk, Biosignature Preservation and Detection in Mars Analogues Conference, Tahoe, May 16-18, 2016).
682. **Cabrol, N. A.** *Searching for Life Beyond Earth*, REU Program, the SETI Institute, June 23, 2016.
683. **Cabrol, N. A.** *Searching for Habitability and Life Beyond Earth*, Mount Tam Astronomy Nights, CA, July 9, 2016.
684. **Cabrol, N. A.**, Invited seminar: *Biosignature Detection on Mars*, Universidad Católica del Norte, Antofagastam Chile. Nov. 9, 2016.
685. **Cabrol, N. A.** *The Coevolution of Life & Environment and the Astrobiological Quest*, Invited Sagan Lecture, AGU Fall Conference, Biogeoscience and Planetary Science Section, Dec. 14, 2016.
686. **Cami J.** *Fullerenes in the PAH Universe*, invited review talk at the "The Past and Future of AstroPAH Research" conference, Noordwijk, the Netherlands, Oct 30—Nov 1, 2016.
687. **Cami J.** *The formation of fullerenes in planetary nebulae*, invited talk at the "Energetic Processing of Large Molecules II" meeting, Stockholm, Sweden, April 11—13, 2016. **Cuk, M.** *Tidal Evolution of the Moon from a High-Obliquity High-Angular Momentum Earth*, CITA Colloquium, Toronto, Canada, March 31, 2016.
688. **Cami J.** *Fullerenes and PAHs in planetary nebulae*, invited review talk at the "Workshop for Planetary Nebula observations (WorkPlANS)", Leiden, The Netherlands, Jan 25—29, 2016.
689. **Cuk, M.** *Orbital Dynamics Suggests a Recent Formation of Saturn's Moons*. SETI Institute Weekly Lecture Series, April 12, 2016.
690. **Cuk, M.** *Orbital Evolution of the Moon from a High-Obliquity High-Angular-Momentum Earth*. LPL colloquium series, May 17th, 2016.
691. **Cuk, M.** *Past Dynamics of Saturn's Moons and Earth's Moon*, Seminar at Petnica Science Center in Serbia, Oct. 7, 2016.
692. **Cuk, M.** Invited Talk: *Dynamical Evidence for a Recent Formation of Saturn's Moons*. Presented at the Young Moons and Rings Workshop, Monrovia, CA, Oct. 14, 2016.
693. **Dalle Ore, C.** Presented a **TEDx** talk in Bergamo, Italy: *The challenges behind the mission to Pluto*. July 25, 2016.
694. **Davila, A.** MarsFest talks, Death Valley, April 9-11, 2016.
695. **Davila, A.** *Enceladus and the Icy Moons of Saturn*, July 26-29, 2016, Boulder, Colorado.
696. **Davila, A.** Invited to speak at the SPINDLE Project Workshop, (Bill Stone, PI), Sept. 2016.
697. **DeVore, E.** Searching for ET's Home, **TED-x**, Amador Valley High School, Pleasanton, CA Sept. 8.
698. **DeVore, E., Harman, P.** When I Grow Up! Girl Scout Day at NASA ARC, Hands-on activities for Girl Scouts, Nov. 5.
699. **DeVore, E., Harman, P.** Girl Scout Bridging Day-Long Event, Crissy Field, San Francisco. Hands-on activities for Girl Scouts. April 30.
700. **Diamond, W.** *QUEST! The Search for Life Beyond Earth and Science at the SETI Institute*, SETI Institute Weekly Lecture Series, June 21, 2016.

701. **Doyle, L.** All day seminar: *Science and Spirituality*, Pasadena, July 2016.
702. **Doyle, L.** Invited talk, *Quantum Astronomy*, Foundational Questions in Physics) FQXI Institute, Banff, Canada, Aug. 2016.
703. **Estrada, P.** *How can we solve the mystery of the plateaus? The role of ballistic transport in Saturn's rings.* Presented at the 68th Cassini PSG Meeting, Feb. 8-12, 2016, JPL, Pasadena, CA.
704. **Estrada, P.** *Fractal Growth and Radial Migration of Solids: The Role of Porosity and Compaction in an Evolving Nebula*, presented at the SADL weekly talk series, the SETI Institute, April 27, 2016.
705. **Estrada, P.** *Micrometeoroid Pollution and Ballistic Transport in Saturn's Rings*, Ring and Satellite Composition Workshop, Cassini PSG meeting, Noordwijk, The Netherlands.
706. **Fenton L.** Presentation to the SOFIA educators at the SETI Institute (via Zoom), March 27, 2016.
707. **French, R.** *Saturn's Rings: New results from Cassini.* Public talk to the Peninsula Astronomical Society, Sept. 9, 2016.
708. **French, R.** *Saturn's Rings: New results from Cassini.* Public talk to the Mount Diablo Astronomical Society, Feb. 23, 2016.
709. **French, R.** *Saturn's Rings: New results from Cassini.* Public talk to the Civil Air Patrol Squadron 10, Palo Alto Airport, Feb. 16, 2016.
710. **Freund, F.** Invited talk at the GNS, NZ center of seismology in Lower Hutt, near Wellington, Dec. 2016.
711. **Freund, F.** Earthquakes – no Surprise, Keynote Address, International Conference Aula Magna, PUCP, Lima, Peru, Nov. 14-15, 2016.
712. **Freund, F.** TEDx Christchurch 2016, Christchurch New Zealand, Oct. 29, 2016 <https://www.youtube.com/watch?v=B1yno8RjaFE>
713. **Freund, F.T.** (2016). Mystery of the Missing Water on the Moon. Friends of Lunar Volatiles John Hopkins University, Baltimore, MD. Sep. 8, 2016.
714. **Freund, F.T.** (2016). Global Earthquake Forecast System, Singularity University Grand Challenge Awards, San Francisco, CA, Aug. 28-30, 2016.
715. **Freund, F.T.** (2016). Satellite Technology to Capture Pre-Earthquake Signals from Above NASA Ames Mission Design Center presentation, Aug. 18, 2016.
716. **Freund, F.** *Protonic Semiconductor Approach to Proton Translocation through Membranes*, Physikalisch-Technische Bundesanstalt, Berlin, Germany, Apr. 15, 2016.
717. **Gillum, E.** *OSETI: All Sky, All the Time*, at the Breakthrough Discuss Event, April 15, 2016.
718. **Gillum, E.** *A Novel Approach to OSETI*, SETI Institute Weekly Lecture Series, Oct. 4, 2016.
719. **Glines, N., and V. Gulick.** *Indications of meltwater-driven gully formation in Moni Crater, Mars.* In: HiRISE Instrument Team Meeting. Desert Studies Center, Zzyzx, CA, Feb. 17, 2016. Presented by N. Glines.
720. **Glines, N., and V. Gulick.** *The Gullies of Mars*, In: NASA Ames Early Career Mars Science Seminar, Feb. 26, 2016. Presented by N. Glines.
721. **Gorti, U.** *Evolution of gas in protoplanetary disks.* Invited talk at the Solar System Exploration Seminar Series, NASA Goddard, Feb. 3, 2016.
722. **Gorti, U.** *Resolving planet formation in the era of ALMA and extreme AO*, ESO, Santiago, Chile, May 16-20, 2016. Invited review on Photoevaporation.
723. **Gorti, U.** *Gas and Dust Evolution in Disks and Implications for Planet Formation.* Invited talk presented at the "Linking Exoplanet and Disk Compositions STScI Workshop", John Hopkins, Baltimore, MD, Sept. 12-14, 2016.
724. **Gorti, U.** Invited Review Talk on *Protoplanetary Disks*, SOFIA: The Local Truth Conference, Asilomar, CA, Oct. 11-14, 2016.
725. **Gulick, V.** *Fluvial and Hydrothermal Processes Science Theme Updates and Gully Analysis Studies Update.* MRO HiRISE Team Meeting, Desert Studies Center, Zzyzx, CA, Feb. 15, 2016.
726. **Gulick, V.** *Understanding Mars: A new era of exploration.* Invited talk, GS 122/222 Planetary Systems: Dynamics and Origins class, Stanford University, Stanford, CA, Feb. 25, 2016.
727. **Gulick, V.** *New Evidence for Water Activity on Mars as seen by the Mars Reconnaissance Orbiter*, SJSU Astronomy and Physics Department Seminar, Nov. 3, 2016.
728. **Gulick V.** *What Makes a Habitable Planet*, Stanford Undergrad/grad. Geological Sciences 121 class, Nov. 17, 2016.
729. **Hargitai, H., V. Gulick, and N. Glines** (presented by Hargitai). *Discontinuous Drainage Systems in Navua Valles, Mars.* NASA Ames Early Career Network Series, Feb. 26, 2016, NASA Ames, Moffett field, CA.
730. **Hargitai, H., and V. Gulick** (presented by Hargitai). *Mapping Navua Valles.* Invited talk, Stanford University, in Planetary Systems: Dynamics and Origins, Class, Feb. 25, 2016, Stanford, CA.
731. **Hargitai, H.** *400 Years of Planetary Cartography – Mapping Channels on Mars.* SETI Institute Weekly Lecture Series, May 24, 2016.
732. **Harp, G.** *The Radio Search for Extraterrestrial Intelligence at the SETI Institute*, SETI Institute Weekly Lecture Series, Oct. 18, 2016.
733. **Harp, G.** *NASA STEM Day*, Hartnell Community College, Salinas, CA.
734. **Harp, G., and S. Shotask.** *Humans need Alien Life*, Breakthrough Radio.
735. **Harp, G.** *The Search for Extraterrestrial Intelligence at the SETI Institute*, American Association of Physics Teachers, Sacramento, CA, July 7, 2016.
736. **Huang, X.** *Computing Highly Accurate Spectroscopic Line Lists for Characterization of Exoplanet Atmospheres and Assignment of Astronomical Observations.* Invited talk presented at the ASA-HITRAN 2016 Congress, Reims, France, Aug. 25, 2016.
737. **Jenniskens, P.** *Observing the Re-Entry of Space Debris WT1190F.* SETI Institute Weekly Lecture Series, Jan. 19, 2016.
738. **Kamakolanu, Gayathri, U.** Webcast participant in a workshop on *Searching for Life Across Space and Time*, Space Studies Board, held Dec. 5-6, 2016, Beckman Conference Center, Irvine, CA.
739. **Lee, P.** (Theater). Commonwealth Club SV - Wonderfest Event w/ A. Weir+M. Roach - 19 Oct 2016
740. **Lee, P.** (Theater). Christopher B. Smith Rafael Film Center – Science On Screen – 16 Jun 2016
741. **Lee, P.** gave a presentation about planning and preparing for the first human mission to Mars and discussed our progress, from the Arctic to Antarctica, from basement labs to the International

- Space Station, to achieve the first human voyage to Mars. San Rafael, June 16, 2016.
742. **Lee, P.** Talk, Space Center Houston, Houston, TX, March 23, 2016.
743. **Lee, P.** Talk, Chabot Space and Science Center, Wonderfest – Oakland, March 18, 2016.
744. **Lee, P.** Speaker at School Library, Contra Costa, March 2016. http://www.contracostatimes.com/news/ci_29641820/bay-point-spacedout-scientist-make-big-impact-on-kids
745. **Lee, P.** Library Talk: San Rafael Library, Feb. 24, 2016
746. **Lee, P.** Library Talk: Corte Madera Library, Feb. 24, 2016
747. **Lee, P.** Library Talk: Point Reyes Library, Feb. 23, 2016
748. **Lee, P.** Library Talk: Mill Valley Public Library, Jan. 8, 2016.
749. **Marchis, F.** *Tiny Moons around Asteroids*. California Academy of Sciences, April 4, 2016). <http://buff.ly/21kBW6J>.
750. **Marchis, F.** Invited at SciFOO, Google HQ, and co-organized two group discussions, July 22-24:
- Life in Space. The Future of Humanity?* with Sanjoy Som (Blue Marble Institute).
 - Megastructures and Megacivilizations*, with Bruce Macintosh (Stanford University) and Tabettha Boyajian (LSU).
751. **Marchis, F.** *Life in Space: From Europa to Aliens*, invited talk, Yerba Buena Center for Arts, Nov. 9, 2016.
752. **Marchis, F.** Public talk: *Comètes et Astéroïdes: L'Exploration de Cérès & Tchouri*, Stella Matutina, and Saint-Paul, La Réunion Island, Nov. 29-30, 2016.
753. **Marchis, F.** Schools: *SETI et l'Exploration du Système Solaire*, NORDEV, La Réunion Island, Dec. 1, 2016.
754. **Marchis, F.** *La Recherche d'une Nouvelle Terre: Science ou Fiction?*, Makes Observatory, La Réunion Island, Dec. 3, 2016.
755. **Marchis, F.** presented the MapX instrument at the SSRL SLAC user meeting since we used one of the Synchrotron lines to calibrate it, Oct. 2016.
756. **Marcu, O.** *NASA's GeneLab Project*, NASA Jet Propulsion Laboratory, Pasadena July 28, 2016, hosted by Kasthuri Venkateswaran.
757. **Nielsen, E.** *The Gemini Planet Imager (GPI): Discovering Young Jupiter Around Other Stars*, San Mateo County Astronomical Society.
758. **Peeters, E.** Invited review talk on *An observational perspective on astronomical PAHs* at "The past and future of AstroPAH research", Noordwijk, The Netherlands, Oct 30-Nov 5, 2016.
759. **Peeters, E.** Invited Colloquium, Queen's University, Canada. *PAH emission characteristics in Photo-Dissociation Regions*, March 14, 2016.
760. **Race, M.** *Acting Ethically on the Red Planet*. Panel on issues in human exploration on Mars. Santa Clara University, Seminar at Markula Center for Applied Ethics, Feb. 17, 2016. <https://scu.edu/ethics/focus-areas/more/resources/martian-morals/>
761. **Race, M.** participated in the STAR_Net Webinar Series *NASA's Solar System Ambassador's: Nationwide Support for Libraries Webinar*, March 16t, 2017 10PT/11MT/12CT/1ET.
762. **Race, M.** *Death Valley National Park Centennial Celebration*, April 8-10, 2016.
763. **Race, M.** *Aliens, Astronauts, and Astrobiology: Bringing Space Exploration to your Library*. National Webinars with JPL Solar System Ambassadors and STAR-net (for Librarians), March 16, 2016.
764. **Race, M.** *Life and Career as an Interdisciplinary Mosaic – From Mudflat Ecology to Mars*. Careers in Life Sciences Graduate Seminar Series. University of Pennsylvania.
765. **Race, M.** March 13, 2016:
- Acalanes High School Career Day - two presentations on STEM careers and Astrobiology* "Astrobiology: Basic Science, Technology and Teamwork"
 - Pittsburg Public Library: "All about Space: Searching for ET and Understanding our Place in the Universe"*
 - Bay Point Public Library & Riverside Middle School: Astrobiology and STEM*
766. **Race, M.** Two co-authored papers at the IEEE Conference, Big Sky MT (presented by Andy Spry, SETI Co-I).
- Unanswered Questions in the Development of Planetary Protection Policy & Implementation for the Human Exploration of Mars*. (Spry, J. A., M. S. Race, J. D. Rummel, and C. A. Conley).
 - NASA's Path to Planetary Protection Requirements for Human Exploration Missions: Update on Recent Progress*. (Johnson, J. E., J. A. Spry, M. S. Race, B. Siegel, and C. A. Conley).
767. **Race, M.** *Astrobiology*. Career Fair, Acalanes High School, Lafayette, CA, March 10, 2016.
768. **Race, M.** *Astrobiology & Searches for ET Life*. Bay Point and Pittsburgh Libraries, Contra Costa County, March 10, 2016.
769. **Race, M.** *Panel Presentation and Webcast with JPL Solar System Ambassadors for STEM & Libraries*, March 16, 2016.
770. **Race, M.** *A Mosaic of Careers: From Marine Biology to Mars*, University of PA, Graduate Career Seminar, Biology Department, March 18, 2016.
771. **Race, M.** *Astrobiology and STEM: Searches for ET*. Novato Library, April 6, 2016.
772. **Race, M.** *Death Valley National Park Centennial and MarsFest* (April 8-9, 2016).
- Safeguarding Special Places on Earth & Beyond: How to preserve, protect and study environmentally and culturally important places.*
 - Panelist- Unimpaired for Future Generations - Preservation & Protection of sites.*
 - EXPO Hands-on Activities (SETI Table).*
773. **Race, M.** *The Process of Change in Science*. Lectures on Planetary Protection & Astrobiology; and Planetary Defense and Decision Making, USC Senior Honors Program, April 18-19, 2016.
774. **Race, M.** *Astrobiology and Planning Human Missions*, Burkhalter School, Oakland, CA.
775. **Race, M.** Invited Planetary Protection and Icy Moons – Talk: *Enceladus Focus Group Meeting*, UC Berkeley. June 2016.
776. **Race, M.** Invited Talk. *Risk Communication and Hazardous Asteroids*, NASA Frontier Development (FDL), June 21-23, 2016.
777. **Race, M.** *Astrobiology, Planetary Protection, and Science in the Real World*, REU Students Program, the SETI Institute, June 2016.

778. **Race, M.** Three Invited Talks and Q&A for science-space camp students: *Planning a Trip to Mars – Children’s Fairyland*, Oakland, CA. June 2016.
779. **Race, M.** *Thanksgiving on Mars? Planning a Really Long Space Mission*. El Cerrito Library, Nov. 19, 2016.
780. **Race, M.** *Workshop on Social & Conceptual Issues in Astrobiology*, Clemson University, Sept. 24-25, 2016.
781. **Race, M.** *Planetary Protection Policies & Practices*, NASA Kennedy Space Center, course instructor, Sept. 27-29.
782. **Race, M.** *Astrobiology, Planetary Protection, and Missions in the Solar System*, Los Altos Library, Oct. 19, 2016.
783. **Race, M.** *Searching for ET and Understanding Life --- Past, Present, Future*, Los Altos Library, Oct. 19, 2016.
784. **Race, M.** Menlo-Atherton High School, College and Career Day Speaker, Oct. 19, 2016.
785. **Race, M.** New Space Conference, Austin Texas, Nov. 4-5, 2016.
786. **Race, M.** Springhill School, Lafayette, CA, Nov. 7.
787. **Richards, J.** Public talk, Sacramento Astronomical Society, Dec. 16, 2016.
788. **SETI SCIENCE ADVISORY BOARD MEETING – Tarter, J., S. Shostak, and G. Harp** participated in the meeting, Sept. 27-28, 2016, at the SETI Institute.
789. **SETI Institute PANEL – Nathalie Cabrol, Seth Shostak, Mark Showalter, Fergal Mullaly.** Moderator: Bill Diamond. *When Will We Find Life Beyond Earth?* SETI Weekly Lecture Series, May 3, 2016.
790. **SETI Institute PANEL – The Exoplanet Group and Colloquium Series of the SETI Institute** organized a panel on Proxima Centauri b with Natalie Batalha, Chris Burkhart, Eduardo Bendek, Tom Barclay on Aug. 30, 2016.
791. **Shostak, S.** Panelist at the Conference on World Affairs – Science and Technology, Nine panels between April 4-8, 2016.
792. **Shostak, S.** Nueva School, Hillsboroughm CA., March 2016.
793. **Shostak, S.** Presentation for a Russian class on entrepreneurialism, Menlo Park, CA, March 2016.
794. **Shostak, S.** Five talks during the eclipse tour MWT Associates, Indonesia.
795. **Shostak, S.** *Fermi Paradox* (via Skype). Class in New York arranged by Vladimir Butkov, Ultimate Risk Solutions, April 15, 2016.
796. **Shostak, S.** *The Future is Here*, Smithsonian Event, Invited SETI Talk, April 24, 2016.
797. **Shostak, S.** *The Search for Extraterrestrial Intelligence*, Institute of High Energy Physics, Frascati, Italy, May 5, 2016.
798. **Shostak, S.** *When will we Find ET?* Santa Barbara, CA, May 18, 2016.
799. **Shostak, S.** *SETI*, Colloquium at Las Cumbres Observatory, Goleta, CA, May 19, 2016.
800. **Shostak, S.** Astrobiology Class Lecture on SETI, Santa Clara University, May 25, 2016.
801. **Shostak, S.** *Searching for Non-Biological Intelligence*, Starquest Conference, Green Bank, WV, July 9, 2016.
802. **Shostak, S.** Talk for the University of New Hampshire Students, Durham, NH, Sept. 9, 2016.
803. **Shostak, S.** Keynote talk, Northeast Fall Astronomy Festival, Durham, NH, Sept. 9, 2016.
804. **Shostak, S.** Brief SETI talk for a business event in Palo Alto, CA, Sept. 19, 2016.
805. **Shostak, S.** Talk on *The Real Aliens*, DENT: Space Conference, San Francisco, Sept. 22, 2016.
806. **Shostak, S.** Keynote presentation on the 21st Century, for NASA, Oct. 1, 2016.
807. **Shostak, S.** *SETI Update*, Science Adventures (Phil Plait), Sonoma, CA, Oct. 1, 2016.
808. **Shostak, S.** Lecture: *New Developments in SETI*, Mount Tam Astronomy Lectures, Oct. 8, 2016.
809. **Shostak, S.** *Science of Star Wars*, Silicon Valley Lecture Series, Oct. 12, 2016.
810. **Shostak, S.** Physics Colloquium, San Jose State University, Oct. 13, 2016.
811. **Shostak, S.** Presentation to the Physics Department, McKuen University, Edmonton, Canada, Oct. 17, 2016.
812. **Shostak, S.** Public presentation at the Space and Science Center, Edmonton, Canada, Oct. 17, 2016.
813. **Shostak, S.** Presentation for the Mt. Diablo Astronomical Society, Walnut Creek, CA, Oct. 25, 2016.
814. **Shostak, S.** Panels for *Alien Con*, Santa Clara, CA, Oct. 29, 2016.
815. **Shostak, S.** Participating in the Bay Area Science Festival, San Francisco, CA, Oct. 30, 2016.
816. **Showalter, M. R.** *The New Horizons Flyby of Pluto: An Insider’s View*. The Space Station Museum, Novato, January 9, 2016
817. **Showalter, M.** *Pluto Flyby*, Lockheed, Feb. 18, 2016.
818. **Showalter, M.** *Orbital and Rotational Dynamics of Pluto’s Small Moons*, Invited Talk, *EGU Meeting*, Vienna, week of April 2016 (presented by Showalter, and co-authored by: Harold Weaver, John Spencer, Simon Porter, Douglas Hamilton, Richard Binzel, Marc Buie, William Grundy, Francis Nimmo, Robert Jacobson, Marina Brozovic, S. Alan Stern, Cathy Olkin, Leslie Young, Kimberly Ennico, and The New Horizons Science Team.
819. **Showalter, M.** Public Talk: *The New Horizons Flyby of Pluto: An Insider’s View*, San Francisco Amateur Astronomers, May 17, 2016. <http://www.sfaa-astronomy.org/lecture-17-may-the-new-horizons-flyby-of-pluto-insiders-view-by-mark-showalter-phd/>
820. **Showalter, M.** Public Talk: *The New Horizons Flyby of Pluto: An Insider’s View*, Geological Society of Nevada, May 17, 2016.
821. **Showalter, M.** *Orbital and Rotational Dynamics of Pluto’s Small Moons*, Division for Dynamical Astronomy Meeting of the AAS, Nashville, May 25, 2016. <http://adsabs.harvard.edu/abs/2016DDA...4730302S>
822. **Showalter, M.** *Pluto Up Close*. Modesto Area Partners in Science lecture series, Modesto Junion College, November 18, 2016.
823. **Showalter, M.** *The Solar System*. Skype presentation to the seventh grade students of Pennridge Middle School, Perkaspie, PA, December 20, 2016.
824. **Sobron, P.** *In Situ Chemistry, Mineralogy, and Organic/Biomarker Content on Phobos and Deimos: A New Instrument Concept*. Presented at the Tohoku Forum for Creativity: International Workshop: Planetary Science and Space Exploration, Sendai University, Japan, July 5, 2016.

825. **Sobron, P.** *Robotic Missions to Explore the Solar System – And How We Prepare for Them.* Presented at the 2016 South American Space Generation Workshop, Lima, Peru, Aug. 5, 2016.
826. **Tarter, J.** Keynote: Northern Arizona Planetary Science Alliance Workshop, Lowell Observatory, March 2016.
827. **Tarter, J.** Keynote: MarsFest in Death Valley – *A Cosmic Perspective: Searching for Aliens, Finding Ourselves*, April 8, 2016.
828. **Tarter, J.** California Academy of Sciences – Yuri’s Night at NightLife: *Life Beyond Earth?* April 14, 2016.
829. **Tarter, J.** Session Chair at the “Breakthrough Discuss Meeting” at Stanford University: *OSETI and Directed Energy Propulsion Systems*, April 15, 2016.
830. **Tarter, J.** Brown University, President’s Thinking Out Loud Lecture Series: *The 21st Century: The Century of Biology on Earth and Beyond*”, April 20, 2016.
831. **Tarter, J.** Mills College Noon Lecture: *Life Beyond Earth?*, April 27, 2016.
832. **Tarter, J.** Moderated a discussion with Neil de Grasse Tyson on the theme of Intelligent Life in the Universe during the Starmus III Festival in Tenerife, Beyond the Horizon, Tribute to Stephen Hawking. June 28, 2016.
833. **Tarter, J.** Narrated *Contact*, for NASA FDL participants, Aug. 2, 2016.
834. **Tarter, J.** Talk for Early Career Network group, NASA Ames, Aug. 12, 2016.
835. **Tarter, J.** Presentation and interview with school students (via Skype), Princeton, NJ. Aug. 2016.
836. **Tarter, J.** Talk at the Singularity University Summit, Aug. 30, 2016. <https://exponential.singularityu.org/summit/2016presenters/>
837. **Tarter, J.** Attended *Curiosity Retreat*, Gateway Canyon, CO, conducting a precept session with Allen, Oct. 2016.
838. **Tarter, J.** Attended the celebration for the 25th Anniversary of Ira Flatow’s Science Friday in New York, Oct. 2016.
839. **Tarter, J.** *SETI Futures*, North American Breakthrough Listen Workshop, Green Bank, WV, Oct. 6, 2016.
840. **Tarter, J.** *Life Beyond Earth?* Los Altos High School STEM celebration week, Oct. 25, 2016.
841. **Tarter, J.** *SETI: An Alternate Reality*, Celebration of Marvel Cinematic Universe and Dr. Strange, Oct. 27, 2016.
842. **Tarter, J.** *Life Beyond Earth?*, CSIcon, Las Vegas Oct. 29, 2016.
843. **Tiscareno, M.** *Rotational and Interior Models for Enceladus*, University of California Berkeley, Weekly Colloquium, March 2016.
844. **Tiscareno, M.** *Propellor peregrinations: Ongoing Observations of Disk-embedded Migration in Saturn’s Rings* (SADL SEMINAR, SETI Institute).
845. **Tiscareno, M.** *Propellor peregrinations: Ongoing Observations of Disk-embedded Migration in Saturn’s Rings* (DDA Meeting, Nashville, TN).
846. **Tiscareno, M.** *Saturn’s Rings: A Nearby Astrophysical Disk*. REU Students Program, the SETI Institute.
847. **Tiscareno, M.** *Rings Science Update*. Cassini Project Science Group Meeting, (subgroup: Imaging Team), Noordwijk, Netherlands, June 20, 2016.
848. **Tiscareno, M.** *Propeller and Wisp Science Update*, Cassini Project Science Group Meeting, (subgroup: Imaging Team), Noordwijk, Netherlands, June 22, 2016.
849. **Tiscareno, M.** *Saturn’s Rings Update. Cassini-Huygens Analysis and Results from the Mission (charm)*. Public telecom, Oct. 2016. <https://saturn.jpl.nasa.gov/cassinicharm/>
850. **Tregloan-Reed, J.** *A broadband transmission spectrum of HAT-P-32b from Ground-Based Simultaneous Multi-Band Photometry*, presented at the Bay Exoplanet Meeting, March 2016.
851. **Zalucha, A.** *But What About the Stellar Occultation Data of Pluto’s Atmosphere?* SETI Weekly Lecture Series, May 10, 2016.
852. **Zalucha, A.** Invitation to speak at a panel about mental health for students, faculty, and researchers, American Physical Society, (scheduled March 13, 2017).



6.

Honors, Awards, &
Discoveries

Ballard, L. Named to “100 Awesome Women in Open Source”, Oct. 2016, and appointed to NASA Datanauts 2016 Class.

Cabrol, N. A. AGU Sagan Lecture, Dec. 14, 2016.

Coughlin, J. and **C. Burke:** NASA Exceptional Achievement Medal, July 2016. <http://nasapeople.nasa.gov/awards/nasamedals.htm>

Gordon, M. participated in the releases of versions 1.6 (March 31) and 1.7 (September 28) of the archiving standards for NASA's Planetary Data System.

Lee, P. The movie “*Passage to Mars*” is awarded *Best Non-Fiction Feature Film* at RAW Science Film Festival in Hollywood. Pascal present to accept the award on behalf of the film team, Dec 10, 2016.

Marchis, F., and his group discovered a triple asteroid (107) Camilla using the VLT/SPHERE instrument. The announcement was made via a IAU circular, Aug. 2016.

NASA Kepler and K2 Team is the winner of the *National Space Society's 2017 Space Pioneer Award* in the ScEngineering

category. <http://www.seti.org/seti-institute/news/kepler-k2-team-wins-national-space-society's-2017-space-pioneer-award-science>

Pilorz, S. received a NASA Group Achievement Award for his contribution to the VIMS Thermal Modeling Team. Stu developed and implemented the models that predict the heating that two instruments on the Cassini spacecraft will receive as a result of close flybys of Saturn and the rings. June 2016.

Pilorz, S., received NASA RHG Exceptional Achievement Award for Mission & Enabling Support to Cassini CIRS Operations Team, March 2016.

Rowe, J. NASA's Exceptional Scientific Achievement Medal for Exoplanet Research.

Showalter, M. was selected in January to serve on NASA's Science Definition Team for a proposed future mission to Uranus and/or Neptune.



7.

Acknowledgments

Contributors to this annual report include:

- Andersen, D.: *Chair, SI Climate and Geoscience Research Group, Astrobiology.*
- Backman, D.: *Education and Public Outreach, SOFIA, IR Astronomy.*
- Ballard, L. *Planetary Science Web. Developer.*
- Beyer, R. *Planetary Exploration, Remote Sensing.*
- Bishop, J. *Chair, SI Astrobiology Research Group, Astrobiology, Mars, Remote Sensing.*
- Bonaccorsi, R. *Geosciences, Astrobiology, Analogs.*
- Brown, A. *Co-Chair, SI Climate & Geoscience Group, Mars, Astrobiology, Remote Sensing.*
- Bryson, S. *Kepler, Exoplanets*
- Burke, C. *Exoplanet, Kepler SO Support Scientist.*
- Busch, M. *Young Scientists Representative at the SI Science Council, Asteroids, Planetary Exploration.*
- Bywaters, K. *Mars, Geochemistry, Biosignature Detection, Analogs.*
- Cabrol, N. *Director, SETI Institute Carl Sagan Center, Planetary Exploration, Astrobiology, Analogs.*
- Caldwell, D. *Co-Chair, SI Exoplanet Research Group, Exoplanets.*
- Cami, J. *Astronomy, Fullerenes, Cosmic Carbon, Spitzer.*
- Catanzarite, J. *Exoplanets, SOC Scientific Programmer, Kepler,*
- Chiar, J. *Astronomy, IR, REU Program.*
- Christiansen, J. *Exoplanets, Kepler, Planetary Transits.*
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- Kalas, P. *Astronomy, Direct Imaging of Planetary Systems, Ground and Space Telescopes.*
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