

## **Catherine Neish – Curriculum Vitae**

Postdoctoral Fellow, Planetary Geodynamics Laboratory  
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### **Education**

- August 2004 – Dec. 2008      University of Arizona  
Ph.D., Planetary Science  
Dissertation: “Formation of prebiotic molecules in liquid water environments on the surface of Titan”
- August 1999 – May 2004      University of British Columbia  
B.Sc., Combined Honours Physics and Astronomy

### **Work Experience**

- July 2012 – present              NASA Postdoctoral Fellow  
Dr. Lynn Carter  
NASA Goddard Space Flight Center
- May 2009 – June 2012          Postdoctoral Fellow  
Dr. D. Benjamin Bussey  
Johns Hopkins University Applied Physics Laboratory
- January 2009 – Apr. 2009      Postdoctoral Research Associate  
Dr. Jonathan Lunine, Dr. Mark Smith  
Planetary Sciences Department, University of Arizona
- August 2004 – Dec. 2008      Graduate Research Assistant  
Dr. Jonathan Lunine, Dr. Ralph Lorenz, Dr. Mark Smith  
Planetary Sciences Department, University of Arizona
- August 2008 – Dec. 2008      Graduate Teaching Assistant  
January 2007 – May 2007      Dr. William Hubbard  
Planetary Sciences Department, University of Arizona

### **Professional Societies**

American Geophysical Union  
Division for Planetary Science, American Astronomical Society

## Currently Funded Grant Proposals

Aug 2013 – July 2016      Erosion on Titan as revealed by its crater population\*  
NASA's Outer Planets Research Program  
\$232,697

*\*Selected as an Early Career Fellow, which enables me to apply for an additional \$100K upon receipt of a tenure-track position.*

## Honours and Awards

- NASA Fellowship for Early Career Researchers, 2012
- NASA Postdoctoral Fellowship, 2012
- NASA Group Achievement Award to the Lunar Reconnaissance Orbiter (LRO) Team, 2010
- Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship (Doctoral), 2005 - 2008
- Galileo Circle Scholarship, College of Science, University of Arizona, 2008
- Julie Payette-NSERC Research Scholarship, 2004 – 2005

## Professional Activities

- Associate Team Member of the Cassini Radar Science Team (2010 – present)
- Team Member of the Chandrayaan-1 and LRO Mini-RF Science Team (2009 – present)
- Member, Scientific Organizing Committee, 45<sup>th</sup> Annual Meeting of the Division for Planetary Sciences of the AAS (October 2013)
- Member, Scientific Organizing Committee, “Habitable Worlds Across Time and Space”, STSci 2013 Spring Symposium (canceled due to sequester)
- Member, Scientific Organizing Committee, 5<sup>th</sup> Annual NLSI Lunar Science Forum (July 2012)
- Lead organizer, NLSI Workshop Without Walls, a virtual meeting on lunar swirls (September 2011)
- Co-organizer, 1<sup>st</sup> Annual LunGradCon meeting (July 2010)
- Review panel member for NASA ROSES 2008, 2009, 2012
- External reviewer, Arecibo Scheduling Advisory Committee (2012)
- Manuscript reviewer for *Icarus*, *Journal of Geophysical Research*, *Geophysical Research Letters*, *Planetary and Space Sciences*, *ApJ Letters*, *Advances in Space Research*, *Nature Geosciences*, *Earth and Planetary Science Letters*, and *Eos*
- Chapter reviewer for the *Titan from Cassini-Huygens* book
- Featured in Discovery channel documentary “Are We Alone?” (2009)
- University of Arizona Graduate and Professional Student Council
  - President (May 2007 – May 2008)

## Recent Invited Seminars

### Titan's Crater Makeover

- Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, April 1, 2013
- Department of Planetary Sciences, University of Arizona, February 14, 2013

### Radar Love: Observing the Planets with SAR

- Department of Physics, University of Idaho, March 25, 2013
- Department of Physics and Space Sciences, Florida Institute of Technology, February 1, 2013

### The Enigmatic Lunar Swirls

- NASA Museum Alliance Telecon, November 20, 2012

### The (not so) Lonely Planet: A scientist's guide to exploring the third rock from the Sun

- Rollins College, Winter Park, FL, November 12, 2012

### Radar Love: Mini-RF Observes the Moon

- Department of Planetary Sciences, University of Arizona, February 15, 2013
- NASA Goddard Space Flight Center, February 8, 2012
- Carnegie Institution Department of Terrestrial Magnetism, January 13, 2012.
- Department of Astronomy, University of Maryland, October 27, 2010
- Night Sky Network, Astronomical Society of the Pacific, July 22, 2010

## Teaching and Mentorship

- Guest Lecturer for JHU course "Planets, Life, and the Universe", 2011, 2012
- Mentor for Mini-RF Student Planetary Investigators Program, 2010-2012
- Mentor for APL undergraduate intern Natalie Glines, 2011
- Participant, Teaching Excellence Workshop sponsored by the Center for Astronomy Education (CAE), 2011
- Guest Lecturer for JHU course "Seminar in Planetary Sciences", 2010

## Publications (H-Index = 8)

1. R.D. Lorenz, B.W. Stiles, O. Aharonson, A. Lucas, A.G. Hayes, R.L. Kirk, H.A. Zebker, E.P. Turtle, F. Nimmo, **C.D. Neish**, J.W. Barnes, and E.R. Stofan (2013) A global topographic map of Titan. *Icarus*, in press, doi:10.1016/j.icarus.2013.04.002.
2. R.M.C. Lopes, R.L. Kirk, K.L. Mitchell, A. LeGall, J.W. Barnes, A. Hayes, J. Kargel, L. Wye, J. Radebaugh, E.R. Stofan, M. Janssen, **C. Neish**, S. Wall, C.A. Wood, and J.I. Lunine (2013) Cryovolcanism on Titan: New results from Cassini RADAR and VIMS. *Journal of Geophysical Research*, 118, 1-20, doi:10.1002/jgre.20062.

3. B. Shankar, G.R. Osinski, I. Antonenko, and **C.D. Neish** (2013) A multispectral geological study of the Schrödinger impact crater. *Canadian Journal of Earth Sciences* 50, 44-63.
4. **C.D. Neish**, R.L. Kirk, R.D. Lorenz, V.J. Bray, P. Schenk, B. Stiles, E. Turtle, K. Mitchell, A. Hayes, and the Cassini RADAR Team (2013) Crater topography on Titan: Implications for landscape evolution. *Icarus* 223, 82-90.
5. S.W. Bell, B.J. Thomson, M.D. Dyar, **C.D. Neish**, J.T. Cahill, and D.B.J. Bussey (2012) Dating small fresh lunar craters with Mini-RF observations of ejecta blankets. *Journal of Geophysical Research* 117, E00H30.
6. **C.D. Neish**, L. Prockter, and G.W. Patterson (2012) Observational constraints on the identification and distribution of chaotic terrain on icy satellites. *Icarus* 221, 72-79.
7. J.E. Moores and 44 colleagues (2012) A Mission Control Architecture for Lunar Sample Return as Field Tested in an Analogue Deployment to the Sudbury Impact Structure. *Advances in Space Research* 50, 1666-1686.
8. B.J. Thomson, D.B.J. Bussey, **C.D. Neish**, J.T.S. Cahill, E. Heggy, R.L. Kirk, G.W. Patterson, R.K. Raney, P.D. Spudis, T.W. Thompson, and E. Ustinov (2012) An upper limit for ice in Shackleton crater as revealed by LRO Mini-RF orbital radar. *Geophysical Research Letters* 39, L14201.
9. **C.D. Neish**, R.D. Lorenz (2012) Titan's global crater population: A new assessment. *Planetary and Space Science* 60, 26-33.
10. L.M. Carter, **C.D. Neish**, D.B.J. Bussey, P.D. Spudis, M.S. Robinson, G.W. Patterson, J.T. Cahill, and R.K. Raney (2012) Initial observations of lunar impact melts and ejecta flows with the Mini-RF radar. *Journal of Geophysical Research* 117, E00H09.
11. **C.D. Neish**, D.T. Blewett, D.B.J. Bussey, S.J. Lawrence, M. Mechtley, B.J. Thomson (2011) The surficial nature of lunar swirls as revealed by the Mini-RF instrument. *Icarus* 215, 186-196.
12. **C. Neish** (2011) News and Views: Titan's nitrogenesis. *Nature Geosciences* 4, 356-357.
13. R.K. Raney, P. Spudis, B. Bussey, J. Crusan, J.R. Jensen, W. Marinelli, P. McKerracher, **C. Neish**, M. Palsetia, R. Schulze, H. Sequeira, H. Winters (2011) The Lunar Mini-RF Radars: Hybrid Polarimetric Architecture and Initial Results. *Proceedings of the IEEE* 99, 808-823.
14. **C.D. Neish**, D.B.J. Bussey, P. Spudis, W. Marshall, B.J. Thomson, G.W. Patterson, L.M. Carter (2011) The nature of lunar volatiles as revealed by Mini-RF observations of the LCROSS impact site. *Journal of Geophysical Research* 116, E01005.
15. **C.D. Neish**, R.D. Lorenz, R.L. Kirk, and L.C. Wye (2010) Radarclinometry of the sand seas of Africa's Namibia and Saturn's moon Titan. *Icarus* 208, 385-394.
16. D.B.J. Bussey, J.A. McGovern, P.D. Spudis, **C.D. Neish**, H. Noda, Y. Ishihara, and S-A. Sorensen (2010) Illumination conditions of the south pole of the Moon derived using Kaguya topography. *Icarus* 208, 558-564.
17. **C.D. Neish**, A. Somogyi, and M.A. Smith. (2010) Titan's primordial soup: Formation of amino acids via low temperature hydrolysis of tholins. *Astrobiology* 10, 337-347.

18. P.D. Spudis and 29 colleagues (2010) Initial results for the north pole of the Moon from Mini-SAR, Chandrayaan-1 mission. *Geophysical Research Letters* 37, L06204.
19. **C.D. Neish**, A. Somogyi, J.I. Lunine, and M.A. Smith (2009) Low temperature hydrolysis of laboratory tholins in ammonia-water solutions: Implications for prebiotic chemistry on Titan. *Icarus* 201, 412-421.
20. A. Coustenis and 154 colleagues (2009) TandEM: Titan and Enceladus mission. *Experimental Astronomy* 23, 893-946.
21. **C.D. Neish**, R.D. Lorenz, and R.L. Kirk (2008) Radar topography of domes on planetary surfaces. *Icarus* 196, 552-564.
22. **C.D. Neish**, A. Somogyi, H. Imanaka, J.I. Lunine, and M.A. Smith (2008) Rate measurements of the hydrolysis of organic polymers in cold aqueous solutions: Implications for prebiotic chemistry on the early Earth and Titan. *Astrobiology* 8, 273-287.
23. R.M.C. Lopes, K.L. Mitchell, E.R. Stofan, J. I. Lunine, R. Lorenz, F. Paganelli, R. L. Kirk, C.A. Wood, S.D. Wall, L. Robshaw, A.D. Fortes, **C.D. Neish**, and 32 colleagues (2007) Cryovolcanic features on Titan's surface as revealed by the Cassini Radar Mapper. *Icarus* 186, 395-412.
24. **C.D. Neish**, R.D. Lorenz, D.P. O'Brien, and the Cassini RADAR Team (2006) The potential for prebiotic chemistry in the possible cryovolcanic dome Ganesa Macula on Titan. *The International Journal of Astrobiology* 5, 57-65.
25. M.C. Nolan, E.S. Howell, A.S. Rivkin, and **C.D. Neish** (2003) (5381) Sekhmet. *IAU Circular*. 8163: 1.
26. P.C. Gregory and **C.D. Neish** (2002) Density and velocity structure of the Be star equatorial disk in the binary LS I +61 303, a probable microquasar. *The Astrophysical Journal* 580, 1133-1148.

### **Publications in Progress**

- **C.D. Neish**, L.M. Carter (2013) Planetary radar. In: Spohn, T., Johnson, T. (Eds.) *Encyclopedia of the Solar System, 3<sup>rd</sup> Edition*. Academic Press, London, UK, submitted.
- **C.D. Neish**, R.D. Lorenz (2013) Elevation distribution of Titan's craters suggests extensive wetlands. *Icarus*, submitted.

### **Conference Presentations**

- C. D. Neish, R. D. Lorenz, J. L. Molaro, J. Lora, A. D. Howard, R. L. Kirk, J. W. Barnes, J. Radebaugh, E. P. Turtle, V. J. Bray, P. M. Schenk (2013) The unusual crater Soi on Titan: Possible formation scenarios. The 44<sup>th</sup> Annual Lunar and Planetary Science Conference, Abstract 2079. Oral presentation.
- C. D. Neish, B. T. Greenhagen, G. W. Patterson, J. T. S. Cahill, J. L. Bandfield, N. E. Petro, B. R. Hawke (2013) Impact melt deposits at Tsiolkovskiy crater: Constraints on crater age. The 44<sup>th</sup> Annual Lunar and Planetary Science Conference, Abstract 1585. Poster presentation.

- C.D. Neish, L.M. Carter, V.J. Bray, B.R. Hawke, T. Giguere, G.R. Osinski, J.T. Cahill (2012) Impact melt emplacement on the Moon: New results from Mini-RF on LRO. AGU Fall Meeting, P13D-08. Oral presentation.
- C.D. Neish, D.T. Blewett, J.K. Harmon, E.I. Coman, J.T.S. Cahill (2012) Secondary cratering as the primary mechanism for ray formation on the Moon and Mercury. The American Astronomical Society, DPS meeting #44, #509.01. Oral presentation.
- C. Neish, L. Carter, V. Bray, N. Glines, B.R. Hawke, D.B. Bussey (2012) New lunar impact melt flows as revealed by Mini-RF on LRO. The 34<sup>th</sup> International Geological Congress, Abstract #2965. Oral presentation.
- C. Neish, C. Robinson, S. Kinahan, A. Marziali, J. DiRuggiero, C. Bradburne (2012) A new approach for DNA detection in Mars analogue soils using SCODA. Astrobiology Science Conference 2012, #1421. Poster presentation.
- C.D. Neish, N. Glines, L.M. Carter, V.J. Bray, B.R. Hawke, D.B.J. Bussey, and the Mini-RF Team (2012) New lunar impact melt flows as revealed by Mini-RF on LRO. The 43<sup>rd</sup> Annual Lunar and Planetary Science Conference, Abstract 2388. Oral presentation.
- C.D. Neish, R.L. Kirk, R.D. Lorenz, V.J. Bray, P. Schenk, B. Stiles, E. Turtle, and the Cassini RADAR Team (2012) Crater topography on Titan: Implications for landscape evolution. The 43<sup>rd</sup> Annual Lunar and Planetary Science Conference, Abstract 2412. Oral presentation.
- C. Neish, S. Besse, G. Kramer, W. Farrell, C. Pieters, M. Horanyi, Y. Pendleton (2011) Virtual swirls: Highlights from NLSI's first Workshop Without Walls. 2011 Annual meeting of the Lunar Exploration Analysis Group. Oral presentation.
- C. Neish, L. Prockter, G.W. Patterson (2011) The identification of chaotic terrain on Europa. EPSC-DPS Joint Meeting, Vol. 6, EPSC-DPS2011-259. Oral presentation.
- C.D. Neish, L. Carter, D.B.J. Bussey, J. Cahill, B. Thomson, O. Barnouin, and the Mini-RF Science Team (2011) Correlation between surface roughness and slope on a lunar impact melt. The 42<sup>nd</sup> Annual Lunar and Planetary Science Conference, Abstract 1881. Poster presentation.
- C.D. Neish, R.D. Lorenz (2011) Titan's global crater population: A new assessment. The 42<sup>nd</sup> Annual Lunar and Planetary Science Conference, Abstract 1412. Poster presentation.
- C.D. Neish (2010) The formation of oxygen-containing molecules in liquid water environments on the surface of Titan. AGU Fall Meeting, P22A-08. Oral presentation (invited).
- C.D. Neish, D.T. Blewett, D.B.J. Bussey, S.J. Lawrence, M. Mechtley, B.J. Thomson, M.S. Robinson (2010) The surficial nature of lunar swirls as revealed by the Mini-RF instrument. The American Astronomical Society, DPS meeting #42, #18.06. Oral presentation.
- C.D. Neish, D.B.J. Bussey, P. Spudis, W. Marshall, B. Thomson, G.W. Patterson, L. Carter, and the Mini-RF Science Team (2010) The nature of lunar volatiles as revealed by Mini-RF observations of the LCROSS impact site. NASA Lunar Science Forum. Oral presentation.

- C.D. Neish, D.B.J. Bussey, P. Spudis, B. Thomson, G.W. Patterson, L. Carter, and the Mini-RF Science Team (2010) Mini-RF observations in support of LCROSS. The 41<sup>st</sup> Annual Lunar and Planetary Science Conference, Abstract 2075. Poster presentation.
- C.D. Neish, A. Somogyi, and M.A. Smith (2009) Titan's primordial soup: Formation of amino acids via low temperature hydrolysis of tholins The American Astronomical Society, DPS meeting #41, #30.02. Oral presentation.
- C.D. Neish, R.D. Lorenz, and R.L. Kirk (2009) Out of Africa: Radarclinometry of the sand seas of Namibia and Titan. The 40<sup>th</sup> Annual Lunar and Planetary Science Conference, Abstract 1071. Poster presentation.
- C. Sotin, R. Mielke, M. Choukroun, C. Neish, M. Barmatz, J. Castillo, J. Lunine, and K. Mitchell (2009) Ice-hydrocarbon interactions under Titan-like conditions: Implications for the carbon cycle on Titan. The 40<sup>th</sup> Annual Lunar and Planetary Science Conference, Abstract 2088. Oral presentation.
- C.D. Neish, A. Somogyi, J.I. Lunine, and M.A. Smith (2008) Hydrolysis of laboratory made tholins in aqueous solutions: Implications for prebiotic chemistry on Titan. The American Astronomical Society, DPS meeting #40, #34.09. Oral presentation.
- C.D. Neish, A. Somogyi, J.I. Lunine, and M.A. Smith (2008) Hydrolysis of laboratory made tholins in solutions of varying pH: Implications for prebiotic chemistry on Titan. The 5<sup>th</sup> Astrobiology Science Conference, #23.12. Oral presentation.
- C.D. Neish and 15 colleagues (2007) VEIL (Venus Exploration In-situ Landers): A New Frontiers Class Mission Design Concept. The American Astronomical Society, DPS meeting #39, #34.13. Poster presentation.
- C.D. Neish, R.D. Lorenz, and R.L. Kirk (2006) Radar topography of dome volcanoes on Venus and Titan. The 37<sup>th</sup> Annual Lunar and Planetary Science Conference, Abstract 2151. Poster presentation.
- C.D. Neish, R.D. Lorenz, D.P. O'Brien, and the Cassini RADAR Team (2005) Shape and thermal modeling of the possible cryovolcanic dome Ganesa Macula on Titan: Astrobiological implications. The American Astronomical Society, DPS meeting #37, #46.11. Poster presentation.
- C.D. Neish, M.C. Nolan, E.S. Howell, and A.S. Rivkin (2004) Radar Observations of Binary Asteroid 5381 Sekhmet. The American Astronomical Society Meeting 203, #134.02. Oral presentation.