

# Rachel L. Smith

## Curriculum Vitae

(Updated, 4/23/18)

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### CURRENT EMPLOYMENT

**(2012-present):**

**Head, Astronomy & Astrophysics Research Laboratory**

**Curator of Meteorites**

North Carolina Museum of Natural Sciences

121 West Jones Street, Rm. 3802B

Raleigh, NC 27603

**(2018-present):**

**Associate Professor**

Department of Physics and Astronomy

Appalachian State University

Boone, NC 28608

Email: [rachel.smith@naturalsciences.org](mailto:rachel.smith@naturalsciences.org); [smithrl2@appstate.edu](mailto:smithrl2@appstate.edu)

Phone: 919.707.8239

**(2017-present):**

**Adjunct Professor**

Department of Physics and Astronomy, University of North Carolina at Chapel Hill

### Previous Academic Appointments:

(2012-2018) Assistant Professor, Dept. of Physics & Astronomy, Appalachian State University

(2013-2016) Visiting Scholar, Dept. of Physics & Astronomy, UNC at Chapel Hill

(2011-2012) Postdoctoral Scholar, California Institute of Technology, Pasadena California

Blake Research Group, Astronomy & Astrochemistry, Planetary Science

### EDUCATION

**University of California, Los Angeles**, Los Angeles, CA

(2011) Doctor of Philosophy, Cosmochemistry/Astrochemistry (officially, Geochemistry)

Advisors: Prof. Edward D. Young (Geochemistry/Cosmochemistry, UCLA);

Dr. Klaus M. Pontoppidan (now, Space Telescope Science Institute); and

Prof. Mark Morris (Astronomy, UCLA)

*Thesis: High-resolution near-infrared observations toward protostellar objects as proxies for solar system chemical evolution*

**University of California, Los Angeles**, Los Angeles, CA

(2009) Master of Science, Cosmochemistry/Astrochemistry (officially, Geochemistry)

**Cornell University, New York State College of Veterinary Medicine**, Ithaca, NY

(1998) Doctor of Veterinary Medicine

**Cornell University, College of Agriculture and Life Sciences**, Ithaca, NY

(1995) Bachelor of Science

### AWARDS & HONORS

(2010) *Gordon A. McKay Award*, The Meteoritical Society

(2009) *Chambliss Astronomy Achievement Student Award*, American Astronomical Society

(2009) *Career Development Award*, Lunar and Planetary Institute

(2007) *Best Poster Award*, Kobe International School of Planetary Sciences 2007, Hyogo, Japan

## **PUBLICATIONS (Peer-reviewed)**

- Tillett A., Dermigny J., Emamian M., Tonin Y., Bucay I., **Smith R. L.**, Darken M., Dearing C., Orbon M., Iliadis C. (2017). A low-background  $\gamma\gamma$ -coincidence spectrometer for radioisotope studies. *Nuclear Inst. and Methods in Physics Research, A* 871, 66.
- Smith R. L.**, Pontoppidan K. M., Young E. D. and Morris M. R. (2015) Heterogeneity in  $^{12}\text{CO}/^{13}\text{CO}$  abundance ratios toward solar-type young stellar objects. *The Astrophysical Journal* 813, 120.
- Young E. D., Gounelle M., **Smith R. L.**, Pontoppidan K. M., and Morris M. R., (2011). Astronomical oxygen isotopic evidence for supernova enrichment of the solar system birth environment by propagating star formation. *The Astrophysical Journal* 729, 43.
- Smith R. L.**, Pontoppidan K. M., Young E. D., Morris M. R. and van Dishoeck E. F. (2009) High-precision  $\text{C}^{17}\text{O}$ ,  $\text{C}^{18}\text{O}$  and  $\text{C}^{16}\text{O}$  measurements in young stellar objects: analogues for CO self-shielding in the early solar system. *The Astrophysical Journal* 701, 163-175.
- Pumbwe L., Chang A., **Smith R. L.** and Wexler H. M. (2007) BmeRABC5 is a multidrug efflux system that can confer metronidazole resistance in *Bacteroides fragilis*. *Microb Drug Resist.* Summer;13(2):96-101.
- Pumbwe L., Chang A., **Smith R. L.** and Wexler H. M. (2006) Clinical significance of overexpression of multiple RND-family efflux pumps in *Bacteroides fragilis* isolates. *J Antimicrob Chemother.* Sep;58(3):543-8.
- Pumbwe L., Ueda O., Yoshimura F., Chang A., **Smith R. L.**, Wexler H.M. (2006) *Bacteroides fragilis* BmeABC efflux systems additively confer intrinsic antimicrobial resistance. *J Antimicrob Chemother.* Jul;58(1):37-46.

## **AWARDED GRANTS**

### **Current:**

- (2018) \$6,000, PI. NASA North Carolina Space Grant Consortium. Astrophysics Lab Internship.
- (2018) \$3,500, PI. NASA North Carolina Space Grant Consortium, Astronomy Days 2018 program/speaker support for speakers: Murthy Gudipati, JPL; Klaus Pontoppidan, STScI, and development of a new rocket-building activity (\$2500 awarded grant funds; \$1000 supplement).
- (2017-2019) \$462,000, PI. NASA Emerging Worlds Research Program (#16-EW16\_2-0185). Smith, R.L. (PI), Gudipati, M., Willacy, K., Blake, G., Boogert, A., Pontoppidan, K. *Investigating Carbon Inheritance in the Early Solar Nebula: An Interdisciplinary Approach.*
- (2017) \$1000, PI. Office of Student Research. Undergraduate Research Assistantship, Fall 2017. Student: Nicholas Wright. *Analysis of Protoplanetary Carbon Monoxide in Young Stellar Systems Using High-Resolution Spectroscopy.*
- (2016-2020) \$6,289,489, Co-I and NCMNS PI for subaward, NASA Science Mission Directorate Science Education Cooperative Agreement Notice (#15-SE CAN15-0047). *OpenSpace: An Engine for Dynamic Visualization of Earth and Space Science for Informal Education and Beyond.* PI, Rosamond Kinzler, American Museum of Natural History.

### **Past:**

- (2017) \$6,000, PI. NASA North Carolina Space Grant Consortium. Astrophysics Lab Internship.

- (2017) \$1000, PI. NC Space Grant Consortium. Astronomy Days speaker honorarium (David Jewitt, UCLA).
- (2016) \$1,000, PI. Office of Student Research/Undergraduate Research Award, Appalachian State University. Spring 2016, Student: Sarah Harvey. Project: *Detailed CO analyses of young stellar binaries and isolated cores using high-resolution spectroscopy.*
- (2016) \$3,300, PI. Youth Advocacy Internship Office/Department of Environment and Natural Resources. Summer Intern 2016, 3D Modeling of Museum Meteorites. Co-supervisor w/Eric Knisley.
- (2016) \$6,000, PI. NASA North Carolina Space Grant Consortium. Summer 2016 Astrophysics Lab Internship.
- (2015) \$5,000, PI. NASA NC Space Grant Consortium, Education/Public Outreach Program. *From Local Sky to Deep Space: Connecting Museum Visitors to Astronomy & Astrophysics.*
- (2015) \$3,300, PI. Youth Advocacy Internship Office/Department of Environment and Natural Resources. Summer 2015 Intern, Meteorite Curation and Astrophysics.
- (2015) \$5,000, PI. NASA North Carolina Space Grant Consortium. Summer 2015 Astrophysics Lab Internship.
- (2014) \$6,000, PI. NASA North Carolina Space Grant Consortium. Summer 2014 Astrophysics Lab Internship.
- (2014) \$3,300, PI. Youth Advocacy Internship Office/Department of Environment and Natural Resources. Summer 2014 Internship, Astrophysics Lab.
- (2014) \$4,750, PI. Research lab grant, Research and Collections, NC Museum of Natural Sciences.
- (2013) \$4,500, PI. Research lab grant, Research and Collections, NC Museum of Natural Sciences.
- (2012) \$22,493, PI. NASA NC Space Grant Consortium, New Investigator Program. *Investigating solar system evolution using high-resolution spectroscopy and radiative transfer modeling* (Award#: NNX10AI68H).

## AWARDED OBSERVING PROPOSALS

- (2016) Blake, G. A. and **Smith, R. L.** *Investigating Carbon Reservoirs in Protoplanetary Systems: A Study of Carbon Chemistry Across the Galaxy.* Keck Observing Program, Caltech Allocation Committee. 2017A, C295. 2 nights, May 12 and July 2, 2017.
- (2015) Co-I. PI, Adwin Boogert. Other Co-Is: Richter, M., Indriolo, N., DeWitt, C., Neufeld, D., Karska, A., Bergin, T. *The Mystery of Sulfur in Dense Environments: EXES Spectroscopy of Sulfur Dioxide toward Massive Protostars.* SOFIA. ***Flew on March 21-22, 2016, and January 23, 2017 flights as "guest investigator."***
- (2014) Blake, G., **Smith, R.**, Iopollo, S. *Observing Carbon Reservoirs Toward Massive Protostars: A Continuing Investigation of Protoplanetary Prebiotic Chemistry.* Keck Observing Program, Caltech Time Allocation. Award (2014, Semester B, Award#: 2014B\_C238NS, 1 night, ~ \$100K in telescope time).
- (2013) Blake, G., **Smith, R.**, Iopollo, S., *Carbon Reservoirs in High-UV Protostellar Environments: A Continuing Investigation of Solar System Chemistry.* Keck Observing Program, Caltech Time Allocation Award. (2014, Semester A, Award#: NIRSPEC 2014A\_C237NS, 1.5 nights, ~ \$150K in telescope time).

(2011) **Smith, R.**, Blake, G. *Carbon chemistry in high-UV protostellar environments: an investigation of Solar System evolution*. Keck Observing Program, Caltech Time Allocation Award, (2012, Semester A, Award#: NIRSPEC 2012A\_C214NS, 1 night, ~ 100K in telescope time).  
Role: PI, Led proposal writing and submission, planned and led observing.

## **PUBLISHED SCIENTIFIC CONFERENCE PROCEEDINGS**

### **(2018)**

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan, Tucker, M. A. (2018) An Observational Study of Protoplanetary Carbon from the Galactic Center to the Local Solar Neighborhood, 49<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI 2083, 2985 (poster contribution).

Smith, L. R. (undergraduate), Panto, E. M. (undergraduate), Gudipati, M. S., **Smith, R. L.** (2018) Exploring <sup>12</sup>CO/<sup>13</sup>CO Ice-Gas Fractionation Through Interstellar Ice-Analogue Experiments, 49<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI 2083, 1187 (poster contribution).

Crapster-Pregont, E. J., Gemma, M. E., Emmart, C., Trakinski, **Smith, R. L.**, Ebel, D. S., Kinzler, R. (2018) Setting the Universe Free, 49<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI 2083, 2111 (poster contribution).

### **(2017)**

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan (2017) An Observational Survey of Protoplanetary Carbon in Young Stellar Systems Across the Galaxy, 80<sup>th</sup> Annual Meeting of the Meteoritical Society, Santa Fe, New Mexico, LPI 1987, 6174 (oral contribution).

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan (2017) New Observations of Carbon Monoxide in Complex Solar-type and Massive Young Stellar Systems: Investigations of Protoplanetary Carbon Reservoirs, 48<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI, No. 1964, p. 2998 (poster contribution).

### **(2016)**

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan, K. M., Lockwood, A. C. (2016) High-Resolution Observations of CO Toward Massive Young Stellar Objects: Investigations of Protoplanetary Carbon and Oxygen in the Galaxy, 47<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI, No. 1903, p. 3028 (oral contribution).

### **(2015)**

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan, K. M., Lockwood, A. C. (2015) Investigating Protoplanetary Carbon Reservoirs and Molecular Inheritance along a Galactic Gradient, 78<sup>th</sup> Meteoritical Society Meeting, Berkeley, CA, LPI, No. 1856, pg. 5385 (oral contribution).

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan, K. M., Lockwood, A. C. (2015) Investigating Molecular Inheritance of Carbon in Star-forming Regions along a Galactic Gradient, International Astronomical Union General Assembly, Honolulu, Hawaii, id. 2257444 (poster contribution).

### **(2014)**

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan, K. M., Lockwood, A. C. (2014) Investigating Protoplanetary Carbon Reservoirs with High-Resolution Spectroscopy Toward Massive Young Stellar Objects. 77<sup>th</sup> Meteoritical Society Meeting, Casablanca, Morocco, LPI, No. 1800, p. 5435 (oral contribution).

**Smith, R.L.**, Blake, G. A., Boogert, A.C.A., Pontoppidan, K. M., Lockwood, A. C. (2014) New observations of CO isotopologues toward massive protostars: an expanded view of molecular reservoirs in the galaxy. 45<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI, No. 1777, p. 2563 (oral contribution).

**(2013)**

**Smith, R.L.**, Pontoppidan, K. M., Blake, G. A., Lockwood, A. C. (2013) Observations of carbon and oxygen isotopic heterogeneity toward protostars ranging in morphology and parent cloud. 44<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI, No.1719, p. 2698 (oral contribution).

**Smith, R.L.**, Pontoppidan, K. M., Blake, G. A., Boogert, A.C.A., Lockwood, A. C. (2013) Observations of isotopic heterogeneities toward embedded cores and binary systems: potential tracers of varying chemical evolutionary pathways in protostellar gas. Protostars and Planets VI, Heidelberg, July 15-20, 2013, #1S027 (poster contribution).

**(2011)**

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2011) Observational signatures of carbon isotope ice-gas fractionation towards solar-type protostars. 42<sup>nd</sup> Lunar and Planetary Science Conference, The Woodlands, TX, LPI, No. 1608, p.1281 (oral contribution).

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2011) Observations of <sup>12</sup>CO-<sup>13</sup>CO partitioning toward solar-type protostars as proxies for solar system chemical evolution. 74<sup>th</sup> Meteoritical Society Meeting, London, England, *Meteoritics & Planetary Science (Supplement)*, id. 5406 (oral contribution).

**(2010)**

**Smith, R. L.**, Pontoppidan, K. M., Herczeg, G. J., and Young, E. D (2010) Observations Of Unusual Carbon Isotope Fractionation In Protostars Using VLT/CRIRES, American Astronomical Society, AAS Meeting #215, Washington, D.C., #369.06; Bulletin of the American Astronomical Society, Vol. 42, p.560 (oral contribution).

Young, E. D., **Smith, R. L.**, Gounelle, M., Morris, M. R., and Pontoppidan, K. M. (2010) Astronomical Oxygen Isotopic Evidence for Supernova Enrichment of the Solar System Birth Environment, American Astronomical Society, AAS Meeting #215, #334.01; Bulletin of the American Astronomical Society, Vol. 42, p.433.

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2010) Observations of high <sup>12</sup>CO/<sup>13</sup>CO toward protostars and implications for the origin of the <sup>12</sup>C/<sup>13</sup>C ratio in the solar system, 41<sup>st</sup> Lunar & Planetary Science Conference, The Woodlands, TX, LPI Contribution No. 1533, p.2254 (oral contribution).

Young, E. D., **Smith, R. L.**, Gounelle, M., Morris, M. R., and Pontoppidan, K. M. (2010) The oxygen isotopic case for supernova enrichment of the solar system birth environment, 41<sup>st</sup> Lunar and Planetary Science Conference, The Woodlands, Texas. LPI Contribution No. 1533, p.1550.

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2010) Observations of high <sup>12</sup>CO/<sup>13</sup>CO toward protostars and implications for the origin of the <sup>12</sup>C/<sup>13</sup>C ratio in the solar system, 41<sup>st</sup> Lunar & Planetary Science Conference, The Woodlands, TX, LPI Contribution No. 1533, p.2254 (oral contribution).

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R (2010) New Insights on the Origin of the solar system <sup>12</sup>C/<sup>13</sup>C ratio using protostellar observations and radiative transfer modeling, Disks, Meteorites, Planetesimals Workshop, American Museum of Natural History, New York City, NY, 07/2010 (oral contribution).

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2010) New  $^{12}\text{CO}/^{13}\text{CO}$  observations in young stellar objects and molecular clouds: implications for  $^{12}\text{C}/^{13}\text{C}$  in the early solar nebula. 73<sup>rd</sup> Meteoritical Society Meeting, New York City, NY, *Meteoritics & Planetary Science (Supplement)*, id. 5381 (oral contribution). **Won the Gordon A. McKay Award** – given to the best oral presentation by a student at the annual meeting ([http://meteoriticalsociety.org/?page\\_id=64](http://meteoriticalsociety.org/?page_id=64)).

### (2009)

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2010) Observations of high  $^{12}\text{CO}/^{13}\text{CO}$  toward protostars and implications for the origin of the  $^{12}\text{C}/^{13}\text{C}$  ratio in the solar system, 40<sup>th</sup> Lunar & Planetary Science Conference, The Woodlands, TX, id.1471 (oral contribution).

**Smith, R. L.**, Pontoppidan, K. M., and Herczeg, G. J. (2009) Observations of  $^{12}\text{C}/^{13}\text{C}$  fractionation in embedded protostars using VLT-CRIRES. American Astronomical Society, AAS Meeting #214, #422.05; Bulletin of the American Astronomical Society, Vol. 41, p.691 (poster contribution).

**Won the Chambliss Astronomy Achievement Student Award** -- given to recognize exemplary research by undergraduate and graduate students who present at one of the poster sessions at the meetings of the AAS (<http://aas.org/grants-and-prizes/chambliss-astronomy-achievement-student-awards>).

### (2008)

Young, E. D., **Smith, R. L.**, Gounelle, M., Morris, M. R., and Pontoppidan, K. M. (2008) Solar system oxygen isotope ratios: a consequence of Type II supernovae pollution, 39<sup>th</sup> Lunar and Planetary Science Conference, League City, Texas. LPI Contribution No. 1391., p.1329 (oral contribution).

### (2007)

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., Morris, M. R., van Dishoeck, E. F. (2007) Detection of rare CO isotopologues in protostellar disks: an infrared investigation of molecular self-shielding, The Chronology of Meteorites and the Early Solar System workshop, Kauai, Hawaii (poster contribution).

**Smith, R. L.**, Young, E. D., and Morris, M. R., and Pontoppidan, K. M. (2007) Detection of rare CO isotopologues in a protostellar disk: towards an astronomical approach to understanding oxygen isotopes in the solar system, 38<sup>th</sup> Lunar & Planetary Science Conference, League City, TX, LPI Contribution No. 1338, p.2293 (oral contribution).

**Smith, R. L.**, Pontoppidan, K. M., Young, E. D., Morris, M. R., van Dishoeck, E. F. (2007). Detection of Rare CO Isotopologues in Protostellar Disks Using CRIRES and NIRSPEC. American Astronomical Society, AAS Meeting #211, #50.01; Bulletin of the American Astronomical Society, Vol. 39, p.811 (poster contribution).

## NON-PUBLISHED SCIENTIFIC PROCEEDINGS

### (2017)

Smith, L. R., Panto, E., Gudipati, M. S., **Smith, R.L.** Exploring Carbon Isotope Chemistry through Experiments at the Jet Propulsion Laboratory. State of NC Undergraduate Research and Creativity Symposium (oral contribution).

Mabe, D. and **Smith, R. L.** A Survey of CO Isotopologues of Young Stellar Objects using High-Resolution Spectra from VLT-CRIRES. State of NC Undergraduate Research and Creativity Symposium (poster contribution).

**Smith, R. L.** A Survey of Protoplanetary Carbon in Young Stellar Systems Using Keck-NIRSPEC. Keck Science Meeting, Santa Cruz, CA (oral contribution)

**(2016)**

Matchunis, K. and **Smith, R. L.** Analysis of  $[^{12}\text{C}^{18}\text{O}]/[^{12}\text{C}^{17}\text{O}]$  Abundance Ratios of Young Stellar Objects in the Local Solar Neighborhood. State of NC Undergraduate Research and Creativity Symposium, and NC Space Grant Undergraduate Student Symposium, NC Central University, Nov. 5 (poster contribution).

Boogert, A., Richter, M., DeWitt, C., Indriolo, N., Neufeld, D., Karska, A., Bergin, T., and **Smith, R.** EXES Observations of  $\text{CH}_4$  and  $\text{SO}_2$  Toward Massive Young Stellar Objects. *The Local Truth: Star-Formation and Feedback in the SOFIA Era – Celebrating 50 Years of Airborne Astronomy*. Pacific Grove, CA (oral contribution).

Harvey, S. and **Smith, R. L.** (2016) Detailed Analysis of Carbon Monoxide Isotopologues Toward Young Stellar Objects using High-Resolution Spectroscopy. Annual Celebration of Student Research and Creative Endeavors, Appalachian State University (poster contribution). **Finalist for the Undergraduate Student Poster Competition.**

**(2015)**

Harvey, S. (ASU student). and **Smith, R. L.** (2015) Identifying CO Isotopologues Toward Young Stellar Binaries and Isolated YSOs using High-Resolution Spectroscopy. State of NC Undergraduate Research and Creativity Symposium, and North Carolina Space Grant Board of Directors and Advisory Council, High Point University (poster contribution).

**(2014)**

**Smith, R. L.** (2014) Exploring the solar system: Voyage to the Sun, Asteroid Belt, and Beyond. North Carolina Academy of Science, 111<sup>th</sup> Annual Meeting, North Carolina Museum of Natural Sciences (oral contribution).

**(2013)**

**Smith, R.L.,** Pontoppidan, K. M., Blake, G. A., Boogert, A.C.A., Lockwood, A. C. (2013) Observations of isotopic heterogeneities toward embedded cores and binary systems: potential tracers of varying chemical evolutionary pathways in protostellar gas. Gordon Research Conferences, Origins of Solar Systems, Mt. Holyoke, MA (poster contribution).

**Smith, R.L.,** Pontoppidan, K. M., Blake, G. A., Boogert, A.C.A., Lockwood, A. C. (2013) Observations of spatial dispersion in C and O isotopic heterogeneity toward protostellar cores and binaries. ALMA Workshop, Hawaii (poster contribution).

**Smith, R.L.,** Pontoppidan, K. M., Blake, G. A., Boogert, A.C.A., Lockwood, A. C. (2013) Observations of unusual CO isotopologue abundances toward protostars. Workshop on Ice and Planet Formation, Lund Observatory, Lund, Sweden (oral contribution).

**(2011)**

**Smith, R. L.,** Pontoppidan, K. M., Young, E. D., Morris, M. R., Herczeg, G. J., and van Dishoeck, E. F. (2011) Observations of CO isotopologues in young stellar objects and molecular clouds: implications for early solar system chemistry. Hawaii NASA Astrobiology Winter School (poster contribution).

**Smith, R. L.,** Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2011) Observational signatures of  $^{12}\text{CO}$ - $^{13}\text{CO}$  partitioning in ice and gas toward local young stellar objects and molecular clouds. Gordon Research Conferences, Origins of Solar Systems, Mt. Holyoke, MA (poster contribution).

**Smith, R. L.,** Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2011) Signatures of  $^{12}\text{CO}$ - $^{13}\text{CO}$  partitioning in ice and gas toward local young stellar objects and molecular clouds. International Astronomical Union symposium, The Molecular Universe, Toledo, Spain (poster contribution).

**(2010)**

**Smith, R. L.,** Pontoppidan, K. M., Young, E. D., and Morris, M. R. (2010) Observational signatures of  $^{12}\text{CO}$ - $^{13}\text{CO}$  partitioning in ice and gas toward local young stellar objects and molecular clouds. Student Symposium, UCLA (oral contribution).

**(2009)**

**Smith, R. L.,** Pontoppidan, K. M., Herczeg, G. J., and Young, E. D (2009) Observations of unusually high  $^{12}\text{C}/^{13}\text{C}$  fractionation in protostars using VLT-CRIRES. From Circumstellar Disks to Planetary Systems Workshop, Max-Planck-Institut für extraterrestrische Physik, Garching, Germany (poster contribution).

**Smith, R. L.,** Pontoppidan, K. M., Herczeg, G. J., and Young, E. D (2009) VLT-CRIRES observations of  $^{12}\text{C}/^{13}\text{C}$  fractionation in protostellar envelopes, Goldschmidt conference, Davos, Switzerland (oral contribution).

**Smith, R. L.,** Pontoppidan, K. M., Young, E. D., Morris, M. R., van Dishoeck, E. F., and Herczeg, G. J. (2009) Observations of rare CO isotopologues in young stellar objects using VLT-CRIRES: evidence of self-shielding in early solar system analogues, Gordon Research Conference, Origins of Solar Systems, Mt. Holyoke, MA (poster contribution).

**(2007)**

**Smith, R. L.,** Pontoppidan, K. M., van Dishoeck, E. F., Young, E. D., and Morris, M. R. (2007) Detection of rare CO isotopologues in protostellar disks: an infrared investigation of molecular self-shielding, Kobe International School of Planetary Sciences: The Origin and Evolution of Planetary Materials, Hyogo Japan. **Won Best Poster Award.**

**(1998)**

**Smith, R. L.,** et al., Shell Repair in a Loggerhead Sea Turtle, American Association of Zoo Veterinarians, Omaha, NE, 1998 (oral contribution).

## **MUSEUM AND OUTREACH CONFERENCES**

**(2013)**

**Smith, R. L.** (Presenter and Session Leader), Horvath, J., Trautwein, M., Kwiek, N., Huffman, K. (2013). Integrating scientists and their research into the science museum matrix. Association of Science Technology Conferences, Albuquerque, NM (oral contribution).

**(2012)**

**Smith, R. L.** (2012). The astronomy & space observation research laboratory: A new platform for communicating science to museum audiences. Astronomical Society of the Pacific, Tucson, AZ (poster contribution).

**Participant:**

(2017) Scientists Center for Animal Welfare (SCAW), Meeting the Challenges of IACUC Oversight in Fish and Wildlife Research. San Diego, CA.

(2017) Association of Science-Technology Conference, presented overview of progress at *OpenSpace* team meeting (w/American Museum of Natural History)

(2014-2016) Association of Science-Technology Conference. Raleigh, NC; Columbus OH; Tampa, Florida

- (2015) Supernova Fifty-One Erg Conference, NC State (invited participant).
- (2012) Origins of Planetary Systems workshop, Weizmann Institute, Rehovot, Israel.
- (2010) Extrasolar Planets and Habitability Summer School, UIMP, Santander, Spain.

## **UNIVERSITY COURSES** (Current; Appalachian State University, new undergraduate courses)

*Astrobiology: Searching for Life in the Universe* (2013-present, Gen Ed since 2016), spring semesters  
*Star Formation*, 2014-present, fall semesters.

## **Travel Grants and Fellowships:**

- (2015) Travel grant, American Astronomical Society, for attending the IAU General Assembly 2015. \$1500.
- (2014) Travel grant for Dr. Harold Connolly to present at Astronomy Days, NC Museum of Natural Sciences \$400.
- (2010) NSF travel grant, 73rd annual meeting of the Meteoritical Society, New York City, NY
- (2009) Travel grant, From Circumstellar Disks to Planetary Systems workshop, European Southern Observatory/Max-Planck-Institut für extraterrestrische Physik, Garching, Germany
- (2009) Travel grant, Geochemical Society of America, Goldschmidt Conference, Davos, Switzerland
- (2009) Travel grant, Gordon Research Conference, Origins of Solar Systems, Mt. Holyoke College, MA
- (2009) Faculty Mini-Grant, Office of Instructional Development, UCLA
- (2007) Travel grant, Kobe International School of Planetary Sciences, Hyogo, Japan
- (2007) Travel grant, University of Hawaii, The Chronology of Meteorites and the Early Solar System workshop, Kauai, Hawaii
- (2006) Inter-departmental Cross-Training Fellowship, Dept. of Earth and Space Sciences, UCLA. Mark R. Morris, Dept. of Physics & Astronomy, project co-advisor. Project title: *Photochemistry and isotope fractionation in circumstellar disks: an astronomical approach to cosmochemical phenomena in early solar nebulae.*

## **INVITED SCIENTIFIC PRESENTATIONS**

- (2017) CONTRIBUTED: student science talk on JPL experiments, ASU Physics & Astronomy colloquium (9/29).
- (2016) Wake Forest University physics colloquium (11/30).
- (2015) COSMS retreat, UNC-CH (5/7): "Elevator Pitch" on current research.
- (2014) North Carolina Academy of Science, 111<sup>th</sup> Annual Meeting, NC Museum of Natural Sciences.
- (2014) Science Lunch, NCMNS, for R&C staff.
- (2013) Science Lunch, NCMNS, for R&C staff.
- (2012) ASU Physics & Astronomy Colloquium, September, 2012.
- (2012) North Carolina State University, Physics & Astronomy Journal Club, April, 2012.
- (2012) American Museum of Natural History, New York City. Astrophysics Colloquium, Feb, 2012.
- (2012) University of North Carolina at Chapel Hill. Astrophysics Colloquium, Feb, 2012.
- (2010) Carnegie Institute of Washington, Astronomy Group seminar, Jan, 2010.
- (2010) Institute for Geophysics and Planetary Physics colloquium, UCLA.
- (2009) California Institute of Technology, Journal Club seminar.
- (2009) Presentation of latest CRIRES results, CRIRES team meeting, Max-Planck-Institut für extraterrestrische Physik, Garching, Germany, Oct, 2009.
- (2009) Star and Planet Formation Group seminar, ETH, Zurich, Switzerland.
- (2008) Presentation of latest CRIRES results, SPITZER-IRS/CRIRES joint team meeting, Caltech, Nov, 2008.
- (2008) Presentation of latest CRIRES results, CRIRES team meeting, Max-Planck-Institut für extraterrestrische Physik, Garching, Germany, May, 2008.
- (2007) Presentation of latest CRIRES results, CRIRES team meeting, Caltech, Sept, 2007.

## MEDIA, FILM

### 2017-2018: The Most Unknown

May-July (filming on location): Featured scientist in VICE/Motherboard documentary, *The Most Unknown* (Ian Cheney, Director). Costa Rica: Atlantis ship (Woods Hole Oceanographic Institute, and the ALVIN deep sea submersible); and Keck Observatory: Waimea (Keck HQ) and Mauna Kea, HI (summit and telescope).

★ *Opening film in the Science program of the Copenhagen International Film Festival, CPH-DOX (3/16/18); US premier at the Metrograph, New York City, 4/18/18, and featured panelist with director Ian Cheney, filmmaker and film advisor, Werner Herzog, and 3 other scientists, moderated by Tabitha Jackson (Sundance).*

★ Relevant links: VICE: [https://motherboard.vice.com/en\\_us/article/wj44gz/watch-the-trailer-for-the-most-unknown-motherboards-first-feature-documentary](https://motherboard.vice.com/en_us/article/wj44gz/watch-the-trailer-for-the-most-unknown-motherboards-first-feature-documentary); Official trailer: <https://vimeo.com/258144049>; Science Sandbox: <https://www.simonsfoundation.org/2018/02/23/the-most-unknown-selected-to-open-major-film-festival/>; Variety: <http://variety.com/2018/digital/news/netflix-vice-motherboard-most-unknown-documentary-theatrical-1202764193/>

## MEDIA, TV/RADIO/WEB

### 2018

(4/6) Interview w/Becky Ferreira, VICE Motherboard, podcast.

(1/17) *News & Observer* phone interview with reporter Corbie Hill for Astronomy Days article.

(1/11) *The State of Things*. "At 'Astronomy Days' Young Stars and Comets Hold Secret to Planetary Life". Live radio interview with Frank Stasio. (<http://wunc.org/post/astronomy-days-young-stars-and-comets-hold-secrets-planetary-life>)

### 2017

(8/20) WRAL live in-studio interview on total solar eclipse (eclipse safety: <http://www.wral.com/weather/video/16893219>)

(8/14) Interview with the News & Observer for article on total solar eclipse (<http://www.newsobserver.com/news/local/education/article167065292.html>)

(6/15) *The State of Things*. "There goes the Sun". Live radio interview (~ 12 minutes) with Frank Stasio. (<http://wunc.org/post/there-goes-sun>)

(5/26) Phone interview with DaShawn Brown (WSOC TV in Charlotte), for 5 pm news segment on suspected "meteorite" fall (WSOCTV: <http://www.wsoc.tv/news/local/familys-truck-damaged-after-mysterious-object-fell-from-the-sky/527004858>; ABC News: <http://abc11.com/news/mystery-object-falls-from-sky-onto-nc-pastors-car/2043568/>; Fox News: <http://myfox8.com/2017/05/27/north-carolina-pastors-truck-damaged-after-mysterious-object-falls-from-the-sky/>)

(4/11) *Women in Astronomy* Blog, Career Profile (invited interview, print) <http://womeninastronomy.blogspot.com>

(4/4) University of North Carolina interview for "A Living Exhibit" (print) <https://www.northcarolina.edu/news/2017/04/Living-Exhibit>

(1/23) NASA/SOFIA Outreach for "Snapchat" in-flight video, Jan 23 flight. Interviewed by Cassandra Bell. Video received 1.54 million views within 24 hours, the most of any NASA "Snapchat." <https://www.dropbox.com/s/rs578hjlzbnlqgu/Snapchat-Jan25-2017.mp4?dl=0>

### 2016

(11/15) North Carolina Symphony promotional video for Holst's *The Planets, LIVE!* <https://www.youtube.com/watch?v=au6EdrQi2OA>

(3/9) Time Warner Cable interview, taped. Topic: Transit of Mercury (during event)

(3/7) WRAL Studio. Live. Topic: Transit of Mercury

### 2015

(6/6) WRAL Studio. Live. Topic: International SUNDAY.

- (1/21) WNCN- NC Today. Live. Topic: meteorites and Astronomy Days.  
(1/21) Sci-Works Radio. Topic: my research and related topics. Two online interview postings.

## 2014

- (12/4) WRAL Weather segment. Live (and on WRAL Facebook page) w/Elizabeth Gardner. Topic: Orion launch.  
(6/7) WRAL Studio. Live. Topic: International SUNDAY.  
(1/23) WRAL Weather segment. Live w/Elizabeth Gardner. Topic: meteorites, Chelyabinsk.  
(1/17) News & Observer. Recorded. Topic: My research at museum.

## 2013

- (10/5) WRAL Studio. Live. Topic: International Observe the Moon Night.  
(9/5) WRAL Weather Segment w/Mike Maze. Topic: LADEE launch.  
(2/5) WRAL Weather Segment. Live. Topic: International Space Station.  
(5/18) WRAL Weather Segment. Live w/Mike Maze. Topic: Astronomy Days.

## INVITED OUTREACH (EXTERNAL)

### 2018

- (4/18) Invited guest/panelist to the red carpet screening (US premier) of *The Most Unknown* documentary, Metrograph Theater, NYC, VICE/The Simons Foundation. Panel included Director Ian Cheney, filmmaker Werner Herzog, and three other scientists, moderated by Tabitha Jackson (Sundance).  
(4/13) "Lean In: Women in Stem" panelist, NC Science Festival, NC School of Science and Mathematics  
(3/3) American Museum of Natural History, *OpenSpace* team meeting, overview presentation of NCMNS participation with *OpenSpace* software.  
(2/22) Presentation on stars and planets, third grade class, JW Seabrook Elementary School (via Skype)

### 2017

- (12/5) Speaker, "Astronomy on Tap". Topic: *Search for Life Beyond Earth*, location: Fullsteam, Durham, NC.  
(10/4) Guest lecture for ASU Freshman seminar, Inspired Engineers (taught by Carla Ramsdell). Topic: *Interstellar Travel*.  
(8/20) Eclipse Science Panelist, Southwest Community College  
(6/20) Tar Heel Gem and Mineral Club, Raleigh. Topic: *Meteorites and the Origin of Life on Earth and Beyond*.  
(4/21) Earth Day interactive program with AMNH: *Open Space and Climate Change, The Dynamic Earth*.  
(2/8) Osher Lifelong Learning Institute (NCSU). Instructor, short course, *Space Travelers: Human endeavors to reach the stars*.

### 2016

- (12/1) Guest speaker, Space Explorers Club, Cardinal Gibbons High School  
(11/18-19) *The Planets Live!* Pre-concert program, NC Symphony, interview with Catherine Brand (host, NPR) for Symphony patrons, Duke Energy Performing Arts Center  
(7/11) American Museum of Natural History. *OpenSpace* team meeting, overview presentation of NCMNS participation with *OpenSpace* software.  
(5/12) Raleigh Astronomy Club. *Astronomy from the Stratosphere: Observing with EXES on SOFIA*.  
(4/25) Panelist: *The Future of Space*. Cary Academy  
(3/6) Bayport educational series lecture (Longboat Key, FL), *Exploring planetary systems & life beyond Earth*.  
(1/20) Osher Lifelong Learning Institute (NCSU). Instructor, short course, *Exploring planetary systems and life beyond Earth*.

### 2015

- (7/11) Host for inaugural Neutrino Day event. Includes guest scientists in physics and live-feeds to the Sanford Lab, South Dakota.  
(5/7) COSMS retreat, UNC-CH. Discussions with scientists and educators on important questions at the cutting-edge of physics, astrophysics, and outreach.  
(4/13) Celebrate Women in STEM Dinner, NCSU. Includes student mentoring.  
(3/4) Cleveland High School, Clayton, NC. Topic: Ethics of space exploration and planetary protection.

(12/13) Dark Sky Observatory, ASU, Public Observing night. Guest astronomer for evening program.

## 2014

- (8/1) High school careers in math contributor (Print. contact, Trey Ferguson).  
(4/24) Siemens "Bring your child to work day." Presentation on research at museum, w/P. Treuthardt.  
(4/9) STEM EXPO, ASU. Meteorites and impact cratering presentation and activity, w/Anthony Love.  
(1/14) CHAOS, Chapel Hill astronomy club. Presentation of research.

## 2013

- (6/17) REU workshop, UNC: How to present to museum audiences.  
(6/14) Central NC Mineral Club presentation on research.  
(2/28) STEM conference, ASU. Short presentation on Astronomy & Astrophysics Lab.  
(1/16) Croasdaile Village, Topic: solar system exploration.

## POPULAR PUBLICATIONS

- (2016) NC Symphony, 2016-2017 Program, *The Planets: LIVE! An Out-of-this-World Partnership*. provided images and captions, interviewed for article, and made significant contributions to article text (<http://ncsymphony.org/mediacenter/The%20Planets.pdf>).
- (2016) **Smith, R. L.** Lab intern highlight: Elisabeth Panto, The Intern: State of North Carolina Internship Program. July 8 issue.
- (2016) **Smith, R. L.** Stratopsheric Adventure. *Naturalist*, Spring.
- (2016) **Smith, R. L.** Researcher gets a closer look at the stars. *News & Observer/Charlotte Observer*, April 16.
- (2015) **Smith, R. L.** July brings close peek at Pluto. *News & Observer; Charlotte Observer*, May 31.
- (2015) **Smith, R. L.** On the origin of the solar system: comet landing makes history. *Naturalist*, Winter.
- (2015) **Smith, R. L.** On the origin of the solar system: shedding new light on planet formation. *Naturalist*, Winter.
- (2015) **Smith, R. L.** Image of protostar suggests planets form earlier. *News & Observer; Charlotte Observer*, Jan 4.
- (2014) **Smith, R. L.** Scientists search for new Earths. *News & Observer; Charlotte Observer*, Aug 3.
- (2012) **Smith, R. L.** Chemical clues to solar system origins. *Naturalist*, Winter.
- (2013) **Smith, R. L.** Meet the Museum Scientists (biography). *Naturesearch* Newsletter. Issue 03.
- (2012) **Smith, R. L.** The Chemistry of forming solar systems, Current Research Briefs. Issue 02.
- (2011) Pontoppidan, K. M., van Dishoeck, E. F., Blake, G. A., **Smith, R.**, et al. 2011. Planet-forming regions at the highest spectral and spatial resolution with VLT-CRIRES. *The Messenger*, 143, 32-36.

## Blogs:

- (2012-2016) **Smith, R. L.** 2012- present. Numerous astronomy-related blogs  
<http://naturalsciencesresearch.wordpress.com/author/rachel1010/>

## CREATIVE ENDEAVORS & MENTORING

As Head of the Astronomy & Astrophysics Research Laboratory & Curator of Meteorites at the North Carolina Museum of Natural Sciences, highlights:

- ★ Developing ongoing vision for visitor engagement via glass-wall interface of the lab.
- ★ Mentoring students working and volunteering in the lab Astronomy & Astrophysics Lab.
- ★ Acquired new equipment for research and outreach (totaling ~ \$67.5K)
  - Nikon polarizing light microscope for viewing meteorite thin sections (25 K, Museum Director's fund).
  - H-alpha solar telescope for outreach programs and student projects (5 K, from ASU).
  - Celestron night-viewing scope w/filters (1.5 K, from Museum Director's fund).
  - Two 10-inch Meade night scopes for outreach programs (donations).
  - 4 LEED-grade desk lamps for lab (Exhibits fund).
  - Sony Camera 70 mm digital camera + accessories (for meteorite archiving and lab use)
  - 10 new HD screens for two new wall tiles, new Mac Pro for running *OpenSpace* software, NASA grant.

- ★ Initiated and led new astronomy-themed special events:
  - Transit of Mercury (5/9/16) – observing and talks
  - Rosetta landing on comet (11/12/14) – presentation and live stream.
  - International Sun-Day at the museum - presentation and observing (6/22/14; repeated each subsequent year).
  - International Observe the Moon Night at the museum – presentation and observing (10/12/13).
  - Venus Transit event – observing, presentations and live-streaming (June 2012).
- ★ Facilitating ongoing connections with ASU and Dark Sky Observatory via live observing w/Dan Caton; new proposal development to set up.
- ★ Development and acquiring of new exhibits.
- ★ Label writing (Chelyabinsk meteorite display; meteorite label re-write).
- ★ Image acquisition: Chelyabinsk meteorite display case; meteorite label.
- ★ Astronomy Exhibit Cases: Glass Eagle Nebula (located artist, Alyssa Joy, and chose piece).
- ★ Astronomy Exhibit Cases: Glass Planet display (located artist, Alyssa Joy, chose pieces, installed with Exhibits team).
- ★ Regular “meet the scientist” presentations to museum public in Daily Planet Theater and Science Cafes on topics ranging from space missions, new discoveries, and personal research projects; invited presentations for community outreach.
- ★ Enabled connections with local REU groups at UNC and NC State, providing workshops on presenting science to the public.

As Associate Professor at Appalachian State University, highlights:

- ★ Creating and teaching two undergraduate courses for the Department of Astronomy & Astrophysics: *Astrobiology: Searching for Life in the Universe*, Spring 2013-present; *Star Formation*, Fall 2014-present.
- ★ Reconfiguring the Astrobiology course an Honors College Freshman Seminar, taught in Fall, 2014.
- ★ As of January, 2015, *Astrobiology: Searching for Life in the Universe* was approved by the University as a General Education course.
- ★ Established numerous grant-funded summer internships for ASU undergraduates.

### **Student Interns in Astronomy & Astrophysics Lab:**

#### **Present**

Robert Lewis (ASU, 2018, JPL summer intern w/collaborator M. Gudipati)

Collin Sweeney (ASU, 2017-present, Keck data intern, based at ASU + summer 2018 at museum)

Lucas Smith (ASU, 2017-present, lab and JPL summer intern w/ collaborator M. Gudipati)

Tierra White (NCSU, College of Design, 2018 *OpenSpace* summer intern)

Kate Richardson (UNC-CH, 2018 Space Grant summer intern)

Nicholas Wright (ASU, 2017-2018, CRIRES data intern, based at ASU)

#### **Past**

Daniel Mabe (ASU, 2017, NC Space Grant summer intern)

Elisabeth Panto (ASU, 2017, lab and JPL summer intern w/ collaborator M. Gudipati)

Christopher Allen (ASU, 2017, *OpenSpace* summer intern)

Michael Tucker (ASU, 2016: Astrovisualization Summer intern, AMNH grant, *OpenSpace*; 2017: Keck intern)

Katherine Matchunis (ASU, 2016: Astrophysics Summer intern; 2017: NC Space Grant; research for credit)

Elisabeth Panto (ASU, 2016, Meteorite 3D Visualization/Curation intern)

Sarah Harvey (ASU, 2015, Astrophysics intern, NC Space Grant)

Justin Garrett (NCSU, 2015 DENR-YAIO Summer intern, Meteorite Curation)

Graham Henry (ASU, course credit)

Katherine Matchunis (ASU, 2015, research intern, stipend from ASU)

Robert Buhrman (NC State, undergraduate, 2014 ASTC and 2015 Astronomy Days volunteer; summer 2015)

Megan Kim (High school, 2015-present)

Margie Bruff (Enlo High school, as of 2014- NC School for Science and Mathematics, 2012-present)

Tara Miller (ASU, undergraduate, 2015 Astronomy Days volunteer)  
Timothy Stone (ASU, undergraduate, 2015 Astronomy Days volunteer)  
Lucas James (ASU, undergraduate, 2015 Astronomy Days volunteer)  
Quinlin Riggs (ASU, undergraduate, 2014 ASTC volunteer)  
Charles Kurgatt (ASU, MS student paid intern, 2014, NC Space Grant)  
Frank Luca (ASU, MS student paid intern, 2014, DENR-YAIO/NC Space Grant)  
Mithi de los Rayes (NC State, undergraduate, 2014)  
Benjamin Beaumont (NC State, undergraduate, 2013-2014)  
Christal Chowthin (NC State, undergraduate, 2013)  
Ryan Beauchemin (UNC, undergraduate, 2013)  
Sandra Blevins (visiting grad student, Catholic University/Space Telescope Science Institute, Summer 2012)  
Zachary deGraffenreid (NCCU, undergraduate, pursued MS, 2012-2013)  
Travis Berger (UNC, undergraduate)

### **Adult Volunteers in Lab:**

#### **Current**

Ken McAdams  
Ian Hewitt

#### **Past**

Margaret Gaines  
Anna Morris  
Karen Warmbein

### **Other mentoring/service:**

#### **2018**

(2/15) Johnnie Mae Boutwell, Craven Community College, Space Grant Scholar interview on research  
(1/27-28) Astronomy Days, NCMNS. Proposed the selected topic, "Space Telescopes and Missions"; invited guest speakers, Klaus Pontoppidan (StSci) and Murthy Gudipati (Jet Propulsion Lab)

#### **2017**

(10/2) Toria Davenport (ASU), freshman undergraduate, research scientist profile interview  
(1/28-29) Astronomy Days, NCMNS. Proposed the selected topic, "Sun and Stars"; invited guest speakers David Jewitt (UCLA) and Jay Pasachoff (Williams College)

#### **2016**

(10/6) Interview for Teen Newsroom (NCMNS). Topic: Microbes in space.  
(6/14) Interview with Miranda Broussard for *AppTV* (ASU student) on NASA research  
(4/11) Kayla Gomez, Nash Community College, interview for Women in Science student project  
(2/19) Space Grant Scholar student interview on STEM research, Olivia Paschell  
(2/17) Masters thesis (Museology) interview on visible labs in museums: Justine Lopez, University of Washington  
(2/4) Space Grant Scholar student interview on STEM research, Kayla Gomez  
(1/30-31) Astronomy Days, NCMNS. Proposed selected topic, "Search for Life Beyond Earth." Invited and hosted guest speakers, Dr. Seth Shostak (SETI) and Dr. Klaus Pontoppidan (STSci).

### **INVITED/CONTRIBUTED OUTREACH (NCMNS)**

#### **2018**

(4/20-21) Members' tours of astronomy lab  
(3/15) Featured scientist, "Beyond Curie" exhibition  
(1/27) Astronomy Days. *Exciting Astronomy from Earth: Using the Keck Telescope to Study Young Stars*. Daily Planet talk.

## 2017

- (12/13) Member Holiday Party, lab open house
- (10/26) "Halloween at Hogwarts" Adult Night, lab open house
- (8/21) Total solar eclipse live stream from Southwestern Community College campus (recording, <https://livestream.com/naturalsciences/eclipse>)
- (8/10) Science Café: *Day to Night and Back Again: The Solar Eclipse of 2017*. Included poetry by local writers, composed in real-time (<https://www.youtube.com/watch?v=uacq-cUYB6A&feature=youtu.be>)
- (7/19-20) *OpenSpace* Daily Planet showcase, evaluation for NASA project (Astrobiology theme)
- (6/22) *Superhero Science*, special event.
- (6/18) *Day to Night and Back Again: The Solar Eclipse of 2017*. International Sun-Day special event.
- (4/28-29) Members' tours of astronomy lab (5 groups)
- (1/28-29) Astronomy Days. *How the Sun and other stars affect planets and (potential) life*, Daily Planet talk.
- (1/14) Science Olympiad. Star formation in the Milky Way Galaxy.

## 2016

- (12/16) Member Holiday Party, lab tour and evening observing.
- (12/14) Lab tour, Mountain Sun School group.
- (6/26) The Living Sun: How Stars Affect Potential Life on Planets (Daily Planet talk for International SunDay)
- (5/9) Transit of Mercury: "Planet One: A Brief Tour of History and Discovery on Mercury"
- (4/23) Science-Technology Festival, NCMNS. Topic: Astronomy from the Stratosphere: High-Tech Observing on SOFIA
- (1/31) Astronomy Days. *Interstellar Travel* Daily Planet talk
- (1/30) Astronomy Days. The science of "The Martian" panelist

## 2015

- (12/2) BASF corp. evening event and lab tour
- (6/21) Extreme Space Weather (Daily Planet talk for International SunDay)
- (5/14) Court of Appeals, Lab tour
- (5/6) Capstone event for Museums Connect grant; lab tour for students
- (3/27) Interview for Teen TV. Topic: Space Exploration
- (4/16) NC School for Science and Mathematics, class lab tour and discussion
- (4/11) Science-Technology Festival, NCMNS. Topic: Technology of Keck telescope mirrors and data processing
- (3/2) Citizen Science Association – Lab tour and project discussion
- (3/2) DH Conley High School – Astronomy class lab tours
- (3/25) Interview with high school students for their Carl Sagan Legacy documentary
- (3/18) Introduction to Paul Bogard, author of "The End of Night", NCMNS.
- (1/24-25) Astronomy Days, NCMNS. Topic: Comets and why Pluto is not a planet; introduced visiting astronaut, Andrew Feustel.

## 2014

- (12/4) NCMNS, Orion launch special presentation.
- (10/20) ASTC conference, NCMNS. Organized and led lab tours and programs, and solar observing.
- (8/1) Organizer and host: NC State REU presentations in Daily Planet (contact, John Blondin).
- (6/25) Intern communications workshop, "How to give a talk", w/Brian Malow.
- (6/22) Journey to the Center of the Solar System (Daily Planet talk for International SunDay)
- (5/3) Science Saturday, NCMNS. Topic: Astronomy on the Edge: Latest discoveries from our Solar System to the beginning of the Universe.
- (4/17) Inaugural Astronomy member event, NCMNS, Tour of meteorite exhibit, lab, and observing program.
- (4/16) Cathedral school group, 1<sup>st</sup> grade, hosted visit to lab.
- (4/7) St. Mary's High School visit to NCMNS, tour of lab, discussion of research.

(1/25-26) Astronomy Days, NCMNS, presentation, tour of meteorite exhibit and lab; introduction of Russian Cosmonaut.

(1/16) Science Café, NCMNS. Invited panelist, 2014 Year-in-review.

### **2013**

(12/5) Comet ISON, NCMNS, special presentation.

(11/8) MAVEN launch, NCMNS, special presentation.

(11/18) Harwood Montessori School visit to lab.

(9/6) LADEE special presentation, NCMNS.

(7/6) Organizer and host: UNC REU presentations in Daily Planet.

(6/17) REU workshop, UNC: How to present to museum audiences.

(4/2) Lab tour and discussion of research for Susan McCracken, Director of External Affairs, ASU.

(3/27) Lab tour and discussion of research for Origin of Life course, Prof. Jonathan Lindsay, NCSU.

(3/2) Science Saturday, NCMNS. Topic: Search for life in the Universe.

(2/28) STEM conference, ASU. Short presentation on Astronomy & Astrophysics Lab.

(2/5) ISS downlink w/astronaut John Marshburn. Provided introduction prior to downlink, NCMNS.

(1/27) Tour of lab and brief discussion of research with Dr. Jim Green, NASA HQ.

(1/27) Astronomy Days presentation, NCMNS, Searching for life beyond Earth.

### **2012**

(12/12) Science Café, NCMNS. Searching for life in the Universe.

(11/12) Teen Science Café, NCMNS.

(9/13) Citizen Science Board, brief overview of research.

(5/1) Hosted Astronaut Bill McArthur visit to lab; introduced presentation in theater.

### **2011**

(5/19-20) Astronomy Days presentation, NCMNS.

## **INVITED EXTERNAL OUTREACH PARTNERSHIPS**

(2016) w/Roy Campbell, Chief of Exhibits and Digital Media at the NCMNS, partnership with the NC Symphony on providing imagery and video (created with our new *OpenSpace* project software) for the live performance of Holst's, *The Planets* (performances on 11/18 and 11/19).

(2015 – present) Institute for Cosmology, Subatomic Matter & Symmetries, with UNC at Chapel Hill, NC State University, Duke University, and Oak Ridge National Laboratory.

## **MUSEUM COMMITTEES**

(2017-present) Wayfinding Task Force

(2017-present) Institutional Animal Care and Use Committee (IACUC)

(2016-present) 50<sup>th</sup> Anniversary Moon Landing Commemoration Steering Committee (with historians from the NC Department of Cultural Resources)

(2014-present) Museum-University Partnership Council

(2016) Impact Planning Workshop (museum evaluation project with Randi Korn & Associates)

(2013-2016) Meteorite Exhibit renovation team

(2015) Hiring committee for Science Historian joint appointment with NCSU

(2014) Core Values Task Force

(2012) Hiring committee for Astrophysics Lab Assistant Director

## **UNIVERSITY COMMITTEES**

(2016) Morgan Lecture Speaker Series (speaker for 2017, Mike Brown, Caltech)

## PROFESSIONAL SERVICE

- (2017) Co-chair for conference session, *Volatiles, Carbon and Organics – The Universal Cycle*, 80<sup>th</sup> Annual Meeting of the Meteoritical Society, with Christian Vollmer
- (2012-2015, 2017) NASA review panel and chair service (federal grant programs, confidential)
- (2016) Referee, *ACS Omega*
- (2016) NC Space Grant proposal reviewer
- (2016) Consultant on Earth's cycles and habitability for *Earth Moves* exhibit planning, Museum of Life & Science.
- (2015) Moderator, State of NC Undergraduate Research and Creativity Symposium, High Point University
- (2015) Judge of student papers for the Gordon A. McKay Award, 78<sup>th</sup> Annual Conference of the Meteoritical Society, UC Berkeley, Berkeley, CA
- (2013) Judge of student papers for the Dwornik Award, Lunar and Planetary Science Conference
- (2010) Co-chair for conference session, *Solar Systems Before and During Planet Formation*, 73<sup>rd</sup> Annual Meeting of the Meteoritical Society, New York City, NY, with Fred Ciesla
- (2009) Co-chair for conference session, *Early Nebula Processes and Models*, 40<sup>th</sup> Lunar and Planetary Science Conference, The Woodlands, TX, with Jim Lyons

## PROFESSIONAL MEMBERSHIPS

Meteoritical Society; American Astronomical Society

## PAST RESEARCH APPOINTMENTS

- (2005-2011) Graduate Student Researcher, UCLA:  
Observations, data reduction and analysis of infrared spectra of CO isotopologues toward protostars and molecular clouds using CRILES and NIRSPEC. Taught myself IDL and coding to run the analyses.
- (2009) Teaching Fellow, Evolution of the Cosmos and Life, freshman cluster course, UCLA.
- (2005-2007) Teaching Assistant, Solar System and Planets; Oceanography.
- (2004-2005) Research Associate, VA Greater Los Angeles Healthcare System, Wadsworth Anaerobe Laboratory  
Microbiological genetic research and scientific writing; performing genetic deletions in *Bacteroides fragilis* to characterize membrane proteins and study the role of membrane pumps in drug efflux. Resulted in 3 co-authored publications.
- (2000-2002) Visiting Scientist, USGS, Astrogeology Team, Flagstaff, AZ  
Global impact cratering research with Dr. David Roddy; crater map development; hands-on impact cratering, Science Festival, Flagstaff, AZ.
- (1996) Field Researcher, The Bellairs Research Institute, McGill University, St. James, Barbados  
Barbados Sea Turtle Project: studying and monitoring the safety of nesting Hawksbill sea turtles, nest sites, eggs and hatchlings.
- (1993) Field Researcher, The School for Field Studies, Ecology of Endangered Sea Turtles, Costa Rica  
Studying Olive Ridley sea turtle nesting patterns; initiating a research project comparing adult female body size to egg count
- (1991-1993) Research Assistant, Cornell University, College of Veterinary Medicine, Ithaca, NY  
Equine Orthopedics, Equine Behavior, Canine Cardiology

## PAST NON-RESEARCH EMPLOYMENT

- (2004-2005) Freelance Exhibit Evaluator, Randi Korn & Associates, Inc., Alexandria, VA  
Remedial Evaluation: Visitor interviews, observation, and data collection  
Selected projects: *Sea Floor Science: Slopes, Slides, and Tsunamis* and *Lights! Cameras! Interaction!*  
Client: Ocean Institute, Dana Point, CA
- (2004) Freelance Exhibit Researcher/Concept Developer, BRC Imagination Arts, Burbank, CA  
Project: National Health Museum, Atlanta Georgia
- (2003-2004) *Associate Producer*, Chedd-Angier Production Company, Inc., Watertown, MA

Content research & development, footage, image, sound research & acquisition, label proposal & writing

Selected projects:

*The Search for Life Beyond Earth*. Client: New York Hall of Science. Opened fall, 2004

*Kamikaze Experience*. Client: USS Intrepid Sea-Air-Space Museum. Opened spring, 2004

*Adventures In Flight*, new gallery. Client: Virginia Air and Space Center. Opened 10/2003

(2002-2003) Exhibit Developer, Jeff Kennedy Associates, Inc., Somerville, MA

Content research and development, label and report writing, exhibit prototyping, object/image acquisition

Selected projects:

*The Search for Life Beyond Earth*. Client: New York Hall of Science. Opened fall, 2004

*Connections*. Client: New York Hall of Science. Opened, fall, 2004

*New England Economic Adventure*. Client: Federal Reserve Bank of Boston. Opened 10/2003

*Addiction*. Client: Arizona Science Center. Opened January, 2003

*Cosmic Questions*. Client: Harvard-Smithsonian Center for Astrophysics. Traveling; opened 9/2002

*Molecules and Health*. Client: New York Hall of Science

(1999-2002) Museum Educator, Museum of Life and Science, Durham, NC

Exhibit and program development, program presentation and evaluation

Selected projects, exhibits: *World Data*: software and data upgrade; *Sending Signals*: interactive live insect exhibit

Selected projects, programs: Aquatic life, insect communication, planetary surfaces and solar system

## **PAST COURSE DEVELOPMENT AND TEACHING**

(2008-2009) Teaching Fellow (UCLA)

Developed and taught a seminar, *Exploring Life in the Universe*, for the undergraduate Evolution of the Cosmos and Life cluster course. Seminar was a combination of lectures, discussions, presentations and lab activities. Taught weekly lab sections for other parts of the other lecture portions course.

(2006-2007) Teaching Assistant (UCLA): *Solar System and Planets*, three quarters. Revised and taught weekly computer-based laboratory and discussion sections.

(2005) Teaching Assistant (UCLA)

Blue Planet: Introduction to Oceanography, Fall quarter. Taught weekly laboratory sections and designed laboratory evaluation tools.