

CAROL E. CLELAND

(2021)

Department of Philosophy, CB 232
University of Colorado
Boulder, CO 80309-0232
(303) 492-7619

EDUCATION:

Ph.D. in philosophy, Brown University
B.A. in mathematics, University of California at Santa Barbara

PROFESSIONAL EXPERIENCE:

Affiliate, (2020-), SETI Institute, Mountain View, CA.
Director (1/17-), Center for the Study of Origins, University of Colorado Boulder.
Visiting Fellow (spring semester, 2016), Center for the Philosophy of Science, University of Pittsburgh, PA
Full Professor (2006-present), University of Colorado Boulder, Philosophy Department, Boulder, CO 80309.
Associate Professor (1993-2006), University of Colorado Boulder, Philosophy Department, Boulder, CO 80309.
Visiting Researcher (2002-2003), Centro de Astrobiologia, Madrid, Spain
Exchange Professor (1998-99), Australian National University, Philosophy Department, Canberra, ACT, Australia
Assistant Professor (1986-1993), University of Colorado Boulder, Philosophy Department, Boulder, CO 80309.
Postdoctoral Fellow in Philosophy and Computer Science (1985-86), Center for The Study of Language and Information (CSLI), Ventura Hall, Stanford University, Stanford, CA 94305
Software Engineer (1984-85), Motion Analysis Corporation, Santa Rosa, CA, 95401.
Assistant Professor (1981-84), Wheaton College, Department of Philosophy, Norton, MA 02766.
Visiting Lecturer (1979-81), Wheaton College, Department of Philosophy, Norton, MA 02766.

AREAS OF TRAINING:

Areas of Specialization
Philosophy of Science, Philosophical Logic, Metaphysics

Areas of Competence
Logic, Epistemology, History of Modern Philosophy (Descartes, Leibniz and Hume), History of Analytic Philosophy

SCHOLARLY WORK:

Volumes:

4. *The role of Anomalies in Scientific Discovery* (in progress).
3. *The Quest for a Universal Theory of life: Searching for life as we don't know it*, Cambridge: Cambridge University Press (2019).

Book Reviews:

1. Pilcher, C. (2020), "Review of The Quest for a Universal Theory of Life: Searching for Life as we Don't Know it by Carol E. Cleland", *Astrobiology* **20** (7): 922-23.
2. Schultze-Makuch, D., "The Quest for a Universal Theory of life", *Basic and Applied Ecology* (2020): <https://doi.org/10.1016/j.baae.2020.02.009>
2. *The Nature of Life: Classic and Contemporary Perspectives from Philosophy and Science* (Bedau, M. A. & C. E. Cleland eds.), Cambridge: Cambridge University Press (2010). [English edition reprinted in paperback 2019; Spanish Language edition published in 2016]
1. *Effective Procedures*, (guest editor) special volume of *Minds and Machines* 12 (2002).

Articles (forthcoming or in progress)

50. "Time in Historical Natural Science" (invited). In Lestienne, R. & P. Harris (eds.), *Time and Science*, World Scientific Publishing (forthcoming 2022).

Articles (published)

49. "Historical Natural Kinds and Mineralogy: Systematizing contingency in the context of necessity" (Cleland, C. E., Hazen, R. M. & S. M. Morrison), Perspective Article, *Proceedings of the National Academy of Sciences (PNAS)* 118 (2021), pp. 1-9.
48. "Is it possible to scientifically reconstruct the history of life on Earth? The biological sciences and deep time. In Kampourakis, K. and T. Uller (eds.), *Philosophy of Science for Biologists*, Cambridge: Cambridge University Press (2020), pp. 193-215.
47. "Hidden Concepts in the History and Philosophy of Origins-of-Life Studies" (Mariscal, C., ..., Cleland, C. E., ... & H. J. Cleaves) *Origins of Life and Evolution of the Biospheres* (2019) <https://doi.org/10.1007/s11084-019-09580-x>
46. "Moving beyond Definitions of Life in the Search for Extraterrestrial Life" *Astrobiology* 9 (2019), pp. 722-729.
45. "Should We Call E.T.? An Ethical-Political Analysis of METI" (Wilson, E. M. and C. E. Cleland) *Theology and Philosophy* 17 (2019), pp. 382-394.
44. "Traces of the Past: Drumlins", *Extinct: The Philosophy of Paleontology Blog* (2016): <http://www.extinctblog.org/extinct/2016/3/14/18vx759zkrz8jdm86uq3h5pmyiaued>

43. "The Moral Subject of Astrobiology: Guideposts for exploring our ethical and political responsibilities towards extraterrestrial life" (Wilson, E. M. & **C. E. Cleland**) in Dick, S. J. (ed.), *The Impact of Discovering Life Beyond Earth*. Cambridge: Cambridge University Press (2015), pp. 207-221.
42. "Common cause explanation and the search for a smoking gun," in Baker, V. (ed.) *125th Anniversary Volume of the Geological Society of America: Rethinking the Fabric of Geology*, Special Paper 502 (2013), pp. 1-9.
41. "Lessons from Earth: Towards an Ethics of Astrobiology," (**Cleland, C. E.** & M. E. Wilson), in Impey, Spitz, and Stoeger (eds.), *Encountering Life in the Universe: Ethical Foundations and Social Implications of Astrobiology*. Tucson: University of Arizona Press (2013), pp. 17-55
40. "Conceptual Challenges for Contemporary Theories of the Origin of Life," *Current Organic Chemistry* 17 (2013), pp. 1704-1709.
39. "Science and the Messy, Uncontrollable World of Nature" (**Cleland, C. E.** & S. Brindell), in Pigliucci, M and Boudry, M. (eds.), *Philosophy of Pseudoscience: Reconsidering the Demarcation Problem*. Chicago: University of Chicago Press (2013), pp. 183-202.
38. "What is life?" (**Cleland, C. E.** & M. Zerella), in Kampourakis, K. (ed.), *The Philosophy of Biology: A Companion for Educators*, Springer (2013), pp. 31-48.
37. "Is a General Theory of Life Possible? Seeking the nature of life in the context of a single example," *Biological Theory* 7 (2013), pp. 368-379.
36. "Pluralism or Unity in Biology: Do microbes hold the secret to life?" *Biology & Philosophy* 28 (2013), pp. 189-204.
35. "Life without Definitions," *Synthese* 185 (2012), pp. 125-144.
34. "Prediction and Explanation in Historical Natural Science," *British Journal of Philosophy of Science* 62 (2011), pp. 551-582.
33. "Justification in Historical Natural Science," *EUI Working Papers*, Max Weber Programme, (2010), pp 17-29.
32. "Signatures of a shadow biosphere" (Davies, P., Benner, S., **Cleland, C.**, Lineweaver, C. & C. McKay), *Astrobiology* 9 (2009), pp. 241-249.
31. "Philosophical issues in natural history and its historiography" in Tucker, A. (ed), *Blackwell Companions to Philosophy: A Companion to the Philosophy of History and Historiography*. Oxford: Blackwell Pub. (2009), pp. 44-62.
30. "Epistemological issues in the study of microbial life: alternative biospheres?," *Stud. Hist. Phil. Bio. & Biomed. Sci.* 38 (2007), pp. 847-861.
29. "Does 'life' have a definition?" (**Cleland, C.** & C. Chyba), in Sullivan and Baross (eds.), *Planets and Life: The Emerging Science of Astrobiology*, Ch. 5. Cambridge: Cambridge University Press. (2007), pp. 119-131.

[Reprinted in C. E. Cleland & M. A. Bedau (eds.) *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge (2010), pp. 326-339.]

28. "A Shadow Biosphere," *Astrobiology Magazine*, December 1, 2006, pp. 1-4.
27. "The Church-Turing Thesis: A last vestige of a failed mathematical program," in Olszewski, A., Wolenski, J. and R. Janusz (eds.), *Church's Thesis after Seventy Years*. Berlin: Ontos Verlag (2006) pp. 119-146.
26. "Understanding the Nature of Life: A Matter of Definition or Theory?," in Seckbach, J. (ed.), *Life as We Know It*. (Vol. 10 of the *Cellular Origins, Life in Extreme Habitats and Astrobiology Series*). Berlin: Springer (2006), pp. 589-600.
25. "The Possibility of Alternative Microbial Life on Earth," (Cleland, C. E. & S. D. Copley), *International Journal of Astrobiology* 4 (2005), pp. 165-173.
[Reprinted in C. E. Cleland & M. A. Bedau (eds.) *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge (2010), pp. 198-209.]
24. "Review of Keith M. Parsons, *Drawing Out Leviathan: Dinosaurs and the Science Wars*" *Philosophy of Science* 71 (2004), pp. 605-607.
23. "The Concept of Computability," *Theoretical Computer Science* 317/1-3 (2004), pp. 209-225.
22. "Why it is a mistake to define 'life'," in Bedau, Husbands, et al. (eds), *Artificial Life IX Workshop Proceedings* (2004), pp. 93-95.
21. "Defining 'Life'" (with Christopher Chyba), *Origins of Life and Evolution of the Biosphere* 32(4) (2002), pp. 387-93.
20. "Methodological and Epistemic Differences Between Historical Science and Experimental Science," *Philosophy of Science* 69 (2002), pp. 474-496.
19. "Effective Procedures," *Minds and Machines* 12 (2002), pp. 159-179.
18. "Reply to Kevin Kilty's 'Comment on: Historical science, experimental science, and the scientific method'," *Geology* 30 (2002), pp. 951-952.
17. "Reply to R. J. Bailey's 'Comment on: Historical science, experimental science, and the scientific method'," *Geology* 30 (2002), pp. 953-954.
16. "Historical science, experimental science, and the scientific method," *Geology* 29 (2001), pp. 987-990.
15. "Recipes, Algorithms, and Programs," *Minds and Machines* 11 (2001), pp. 219-237.
14. "[Review of] David Miller, 'Critical Rationalism,'" *The Philosophy Quarterly* (1997), pp. 400-404.

13. "Standards of Evidence: How High for Ancient Life on Mars?," *The Planetary Report Vol. XVII No.1* (1997), pp. 20-21.
12. "[Review of] Moore, G. E., 'Lectures on Metaphysics 1934-35,'" *The Review of Metaphysics*, March (1995), pp. 671-673.
11. "Effective Procedures and Computable Functions," *Minds and Machines* 5 (1995), pp. 9-23.
10. "[Review of] John Carroll, *Laws of Nature*," *The Review of Metaphysics*, December (1995), pp. 406-408.
9. "[Review of] Jonathan Bennett, *Events and their Names*, *Noûs* Vol. XXVIII, No. 1 (1994), pp. 103-109.
8. "Is the Church-Turing Thesis True?" *Minds and Machines* 3 (1993), pp. 283-312.
7. "The Church/Turing Thesis: Procedures, Processes and Causation," *ICS Technical Report*, No. 92-04 (1992), pp. 1-38.
6. "On the Individuation of Events," *Synthese*, Vol 86 (1991), pp. 229-254. [Reprinted in R. Casati & A. Varzi (eds.) *Events*. Dartmouth (1996), pp. 373-400].
5. "The Difference Between Real Change and *Mere* Cambridge Change," *Philosophical Studies*, Vol 60 (1990), pp. 257-280.
4. "Is Smolensky's Treatment of Connectionism on the Level?" *Behavioral and Brain Sciences* 11:1 (1988), pp. 27-28.
3. "Change, Process and Events," *CSLI Report*, No. CSLI-87-95 (1987), pp. 1-36.
2. "Causality, Chance and Weak Non-Supervenience," *American Philosophical Quarterly*, Vol. 22 (1985), pp. 287-298.
1. "Space: An Abstract System of Non-Supervenient Relations," *Philosophical Studies*, Vol. 46 (1984), pp. 19-40

SELECTED PRESENTATIONS:

"Answering the question: What is life?" (invited), Crossroads of Ideas Public Lecture Series, Department of Philosophy, University of Wisconsin, Oct 12, 2021.

"Searching for Extraterrestrial Life without a Definition of Life" (invited), Cambridge Life in the Universe Initiative (Seminar), Cambridge University, UK, April 15, 2021.

"How to Search for Extraterrestrial Life without a Definition of Life" (invited), CHESSE Seminar, Department of Philosophy, Durham University, UK, March 23, 2021.

Author-Meets-Critic Session: “Cleland’s *The Quest for a Universal Theory of Life*”, American Philosophical Association (APA), Eastern Division Meeting, Jan 2021.

Panelist, "What is Life", Dartmouth's *Institute of Cross-disciplinary Engagement*. Oct. 13, 2020

Panelist, Asimov Memorial Debate 2020, American Museum of Natural History, New York City, Sept 9, 2020.

“Searching for unfamiliar forms of life without a definition of life” (invited), Geophysical Lab Seminar, Carnegie Institution for Science, Washington DC, June 3, 2019.

“Common Cause Explanation and the Search for a Smoking Gun” (invited), Department of Philosophy, University of Auckland, N.Z., April 20, 2019.

“Searching for Potentially Biological Anomalies using Tentative Criteria for Life” (Keynote Speaker) Workshop: Perspectives on the origin, nature and limits of life, University of Auckland, New Zealand, April 19, 2019.

“Searching for *potentially* biological anomalies using tentative criteria” (invited), Life Detection Challenge Workshop (for NASA scientists and engineers), NASA-Ames, Moffett Field, CA, April 25, 2018.

“Scientific Realism & Common Cause Explanation” (invited), Workshop on Contemporary Scientific Realism and the Earth Sciences”, University of Durham, England, January 16, 2018.

“Life without Definitions” (invited), Science Colloquium Series, NASA-Goddard, Maryland, October 4, 2017.

“Prediction and Explanation in Historical Science” (invited), Department of Philosophy, University of Bern, Switzerland, June 7, 2017.

“Searching for Extraterrestrial Life without a definition of life” (invited), Center for Space and Habitability, University of Bern, Switzerland, June 6, 2017.

“The Quest to Find Extraterrestrial Life” (invited), *Brain Bar Budapest 2017*, Budapest, Hungary, June 2, 2017.

“Microbial Life on Earth: Tree or Forest,” Shadow Biosphere and the Nature of Life (Invited Symposium), American Philosophical Association (APA), Pacific Division Meeting, April 14, 2017.

“Developmental Plasticity and Common Cause Explanation”, Philosophy of Science Association (PSA), Atlanta, Georgia, Nov. 4, 2016.

“Models of the origin(s) of Life: Scientific puzzles or philosophical confusions” (invited), History and Philosophy of Origins Research Workshop, August 24, 2016, ELSI Tokyo, Japan.

- “Microbial Life on Earth: Tree or Forest” (invited), Workshop on Understanding Life, May 27, 2016, University of Bern, Switzerland.
- “Common Cause Explanation and the Search for a Smoking Gun, Department of Geology and Environmental Science, University of Pittsburgh, Feb. 18, 2016.
- “Is Earth Host to a Shadow Biosphere?” (invited), University of Mississippi Medical School, Jackson, Miss., Feb. 3, 2016.
- “Searching for Extraterrestrial Microbial Life: Will we recognize it if we encounter it?” (invited), Dunbar Lecture, Millsapp College, Jackson, Miss, Feb 2, 2016.
- “Microbial Life on Earth: Tree or Forest” (invited), Center for Philosophy of Science, University of Pittsburgh, PA, Jan 26, 2016.
- “Searching for a Shadow Biosphere” (invited), Workshop: Exploring the Diversity of Life, Joint Genome Institute & Boundaries of Life Initiative (Lawrence-Berkeley Laboratory), Pacifica, CA, Dec.17, 2015.
- “Life without Definitions” (invited keynote), Second Conference on History and Philosophy of Astrobiology, Höör, Sweden, May 8-10, 2015.
- “Prediction and Explanation in Historical Natural Science” (invited), Department of Philosophy, University of Pennsylvania, Jan. 30, 2015.
- “Scientific Theories: Structure & Function” (invited), Graduate Reading Seminar, Department of History and Philosophy of Science, Indiana University (Bloomington), Oct. 29, 2014.
- “Lessons from Earth: The moral status of nonhuman organisms” (invited), Astrobiology and Society Symposium, Library of Congress, Washington DC, Sept. 19, 2014.
- “Could there be alternative forms of microbial life on Earth?” (invited), Molecular Biology Roundtable, University of Colorado Medical School, Denver, Colorado, June 17, 2014.
- “Scientism and the Peculiar Case of Possible Worlds Semantics” (invited), Workshop on Scientism, City University of New York, May 16, 2014.
- “Prediction and Explanation in Historical Science” (invited), IHPST Seminar, University of Paris Sorbonne, April 29, 2014.
- “Common Cause Explanation and the Search for a Smoking Gun” (invited), Department of History and Philosophy of Science, Indiana University (Bloomington), February 14, 2014.
- “Common Cause Explanation and the Search for a Smoking Gun” (invited), Department of Philosophy, University of Illinois (Urbana-Champaign), Jan 31, 2014.
- “Common cause explanation and the search for a smoking gun,” International Doctoral Summer School in Forensic Science and Criminology, Arolla Switzerland, August 27, 2012.

- “Differences in the methodology and justification of the field sciences and classical experimental science” (keynote talk), Teaching the Methods of Geoscience (workshop), sponsored by InTeGrate (Interdisciplinary Teaching of Geoscience for a Sustainable Future), Montana State University (Bozeman), July 2012.
- “Common Cause Explanation and the Search for a ‘Smoking Gun’” (invited), Van Tuyl Lecture, *School of Mines*, Golden, CO, April 19, 2012.
- “Conceptual Challenges for Contemporary Theories of the Origins of Life” (invited), *American Chemical Society*: Special Session on Prebiotic Chemistry, San Diego, CA, March 26, 2012.
- “Is a General Theory of Life Possible? Understanding the nature and origin of life in the context of a single example” (invited), Konrad Lorenz Institute (KLI) Workshop, Vienna, Austria, July 2, 2011.
- “Philosophical Perspectives on the Mono Lake Arsenic Paper” (invited “testimony”), Meeting of the *National Research Council’s Committee on the Origins and Evolution of Life (COEL)*, Washington D.C., March 2, 2011.
- “Conceptual Challenges for Contemporary Theories of the Origin of Life” (invited), Symposium on the Origin of Life, *CEES Colloquia on Ecology and Evolution*, University of Groningen, Netherlands, Dec. 2, 2010.
- “The Methodology of Historical Science” (invited), Special Session: High Country of the Geological Mind, *Geological Society of America*, November 2, 2010.
- “Prediction and Explanation in Historical Science” (Plenary Talk). Integrating Complexity: Environment and History, *Rotman Institute for Science and Values*, University of Western Ontario, Ontario, Oct 10, 2010.
- “Historical Science” (invited), Workshop: Types of Explanation in the Special Sciences: The Case of Biology and History, Universität zu Köln, Germany, Sept. 30, 2010.
- “Towards an Ethics of Astrobiology” (invited), NASA Planetary Protection Workshop, Princeton University, June 8, 2010.
- “Common Cause Explanation and the Asymmetry of Overdetermination” (invited), Karl Popper and Beyond, *Max Weber Programme*, European University, Florence, Italy, Feb, 2009.
- “What is life?” (invited), Astrobiology: Expanding our Views of Society and Self, Biosphere II, University of Arizona, May 9, 2008.
- “The Evolution of Microbial Life on Earth: Tree or Forest” (invited), Darwin Day Symposium: Origin & Early Evolution of Life, *National Evolutionary Synthesis Center*, Feb. 8, 2008.
- “Could there be undetected alternative forms of microbial life on Earth?,” *International Society for the History, Philosophy, and Social Studies of Biology*, Exeter, England, July 12, 2007.

- “Has alien life been detected already? (invited), Tree or Forrest? Searching for Alternative Forms of Life on Earth (workshop), Arizona State University, Tempe, Dec. 9, 2006.
- “Epistemological issues in the study of microbial life: Alternative Terran Biospheres (invited), Philosophical and Social Dimensions of Microbiology (workshop), University of Exeter, England, July 14, 2006.
- “Answering the question ‘what is life?’” (invited), *Templeton Lecture*, University of Arizona, Tucson, Arizona, May 11, 2006.
- “Answering the Question ‘What is life?’” (invited), *AAAS*, Feb 18, 2006.
- “Epistemic and methodological differences between historical science and classic experimental science” (invited), Center for the History and Philosophy of Science, University of Minnesota, October 21, 2005.
- “What is life?” *International Society for the History, Philosophy, and Social Studies of Biology*, Guelph, Canada, July 16, 2005.
- “Answering the Question ‘What is life?’,” (invited), Center for Astrobiology and the Origin of Life, Harvard University, May 23, 2005.
- “Searching for a General Theory of Living Systems” (invited presenter), *Dibner Seminar in the History and Philosophy of Biology*, MBL, Woods Hole, MA, May 20, 2005.
- “Defining ‘Life’” (invited), *American Philosophical Association* (Pacific Division), March 25, 2005.
- “Why it is a mistake to define ‘life’” (invited), *ALIFE9*, Boston, MA, Sept. 12, 2004.
- “The Advent of Historical Science” (invited), Woodfest (The New Astronomy: Opening the Electromagnetic Window and Expanding our View of Planet Earth), University of Washington, Seattle, Washington, June 16, 2004.
- “Rethinking the justification of phylogenetic methods” (invited), *A. Watson Armour III Spring Symposium: Systematics at a Crossroads Again: Biological and Philosophical Arguments in Contemporary Phylogenetics*, Chicago, May 10, 2003.
- “The Concept of Computability” (invited). *American Mathematical Society* (Special Session: “Beyond classical Boundaries of computability”), May 4, 2003.
- “Defining ‘life’” (invited). Inaugural Ceremonies, *Centro de Astrobiologia*, Madrid, Spain, January 16, 2003.
- “Historical Science, Experimental Science, and the Scientific Method” (invited), Department of Earth Resources, Colorado State University, October 7, 2002.
- “Defining ‘life’” (invited), *ISSOL '02* (13th International Conference on the Origin of Life). Oaxaca, Mexico, July 4, 2002.

"What is Life?" (invited). *AAAS* (workshop on the nature of life), Washington D.C., March 5, 2001.

"Effective Procedures and Causal Processes" (invited), *Hypercomputation Workshop*, London, England, May 24, 2000.

"Life in ALH84001: Confirming the Best Explanation", *NASA Institute of Astrobiology* (Video-Seminar), Jan. 20, 2000.

"Recipes, Algorithms, and Programs" (invited), *American Philosophical Association* (Eastern Division), Dec. 28, 1999.

"Recipes, Algorithms, and Programs" *Australasian Association of Philosophy*, Melbourne (Logic Stream), Australia, July 10, 1999.

"Standards of Evidence" (invited). Mars Meteorite Symposium, University of Colorado (Boulder), August 29, 1996.

"On the Nature of Computation" (invited). Symposium on Computation, *Society for Philosophy and Psychology*, San Francisco State University, June 1996.

"Response to Horsten's "Can Turing Machines Bake Cakes?" (invited). *American Philosophical Association* (Midwest Division), April 29, 1995.

"The Convenience of Spatial Relations" (invited). Symposium on Symmetrical Universes, *American Philosophical Association* (Pacific Division), March 30, 1995.

"The Church/Turing Thesis: Procedures, Processes and Causation" (invited). University of California (Davis), Nov. 22, 1991.

"Events and Modes of Change," Center for the Study of Language and Information, Stanford University, April, 1986.

"Space as an Abstract System of Non-Supervenient Relations" (invited) Symposium on Space and Time, University of California at Davis, June 6, 1985

HONORS, AWARDS & GRANTS:

Co-investigator on NSF grant (2123995) "Collaborative Research: synthetic and Systems Biology Approaches to semi-synthetic Cells with Expanded DNA alphabets, Steven Benner (PI), Foundation for Applied Molecular Evolution (Fflame), Florida, Aug. 2021-2024.

Co-Investigator on Templeton Grant (#61783) "Frequency distributions in complex organic molecular mixtures: A search for biological anomalies and their meaning", Robert Hazen (PI), Carnegie Institute for Science, Jan. 2021-2024.

Member at Large of Section L Committee (History & Philosophy of Science), American Association for the Advancement of Science (AAAS), Feb 2020-2024

Co-Investigator on Templeton Grant (#60645) "Chance, Necessity, and the Origins of Life", Robert Hazen (PI), Carnegie Institute for Science, June 2017-2020.

Visiting Fellowship, Center for Philosophy of Science, University of Pittsburgh, spring 2016

BFA (Boulder Faculty Assembly) Award for Excellence in Research, 2013.

Co-Investigator NASA Astrobiology Institute (NAI) Teams, 1st & 2nd round funding (Grant to Cleland, PI, and the University of Colorado's Center for Astrobiology, CO-I), 1999-2008.

GCAH (Graduate Committee on the Arts and Humanities) Grant, University of Colorado (Boulder), 1991 (spring), 1998 (spring).

Nominated for SOAR Outstanding Teacher Award, 1992 (spring).

Institute of Cognitive Science Grant, University of Colorado (Boulder), 1987 (winter) & 1989 (fall).

CSLI (Center for the Study of Language and Information) Postdoctoral Fellowship in Philosophy and Computer Science, Stanford University, 1985-86.

Mellon Grant, Wheaton College, 1982 (summer) & 1980 (summer).

FIPSE Grant, Wheaton College, 1982 (spring).

NEH Postdoctoral Fellowship, Institute on Psychology and Philosophy of Mind, University of Washington, 1981 (summer).

Fellowships, Philosophy Department, Brown University, 1975-78.

TEACHING EXPERIENCE

Undergraduate

Courses: Philosophy of Science (introductory & advanced); Metaphysics (introductory & advanced); Epistemology (introductory & advanced); Logic (introductory & advanced); History of Modern Philosophy; Twentieth Century Philosophy; Critical Thinking; Philosophy of Mind; Introduction to Philosophy; Senior Seminar on Leibniz; Senior Seminar (What is life?).

Thesis Supervision: 13 undergraduate theses.

Graduate

Courses: Causation, Causation and Events; Connectionism and the Mind/Body Problem; Philosophy of Quantum Mechanics; Is a naturalistic theory of intentionality possible?; The Nature of Scientific Explanation; Nature of Life; Philosophical Problems in Astrobiology; Historical Science; Emergence and Mechanism; Natural kinds and Scientific Theories.

Thesis Supervision

Principle Advisor: 4 Ph.D. students, 9 M.A. Students.

Member of Committees: 9 Ph.D. students (philosophy), 5 M.A. students (philosophy), 7 Ph.D. students in mathematics, 1 Ph.D. student in Astronomy, 1 Ph.D. student in Chemistry & Biochemistry, 1 Ph.D. student in geological sciences, 1 Ph.D. student in English, 1 Ph.D. student (computer science).

COMMUNITY, PROFESSIONAL AND UNIVERSITY SERVICE:

Philosophy Department

Committee on the History and Philosophy of Science	Member	4/88-6/92, 6/03-
	Chair	8/03-1/16
Program Review ("Self Study")		6/95-96, 6/03-04, 6/08-09
Faculty Reappointment Committees		(circulates)
Post Tenure Review Committees		2016, 2018
Graduate Admissions Committee	Member	6/94-95, 7/14-15, 7/16-17
	Chair	8/04-6/05, 1/11-6/11

Departmental Honors Advisor		6/94-96
Ad Hoc Committee on Improving Teaching		8/92-6/93
Undergraduate Advisor		1991-96
Curriculum Committee	Chair	8/91-8/92
	Member	(circulates)
Salary Committee		(circulates)
Personnel Committee		(circulates)
Faculty Advisor to the Undergraduate Philosophy Club		9/87-6/91
Graduate Teaching Mentor		9/87-6/88
Fellowships and Appointments Committee		9/87-6/88
Ad Hoc Committee for Prelim Reform		1/87-6/87
Graduate Prelim Exam Committee on Metaphysics and Epistemology	Chair, Member,	9/86-6/87, 9/89-93 9/86-93
Colloquium Committee		9/86-6/88
Graduate Studies Committee		9/86-6/87, 9-6/2013
<i>Center for Astrobiology</i>		8/98-present
<i>Institute of Cognitive Science (ICS)</i>		
Member		1/87-2005
Curriculum Committee		10/89-91
Executive Committee		(circulates)
Personnel Committee (joint positions with Computer Science)		1/87-6/88
Joint ICS/Philosophy Colloquium Series Committee	Chair,	1/90-6/97
<i>College of Arts and Sciences</i>		
Internal Reviewer for EBio (Department of Ecology and Evolutionary Biology) Program review		8/11-6/12
A & S Council		8/96-6/98
A & S Committee on Committees		1/97-6/98
A & S Budget Committee		1/97-6/98
<i>University of Colorado</i>		
Director, Center for the Study of Origins		1/17-
Grand Challenge Steering Committee		9/14-6/15
Executive Advisory Council of the Graduate School		8/04-07
President's Fund for the Humanities		6/93-6/97
BFA		8/99-2003
Student Affairs Committee		8/99-2003
Committee on Women		7/92-6/94
Core Advisor for College of Arts & Sciences		5/92-8/92
<i>Profession</i>		
Member-at-Large, Section L (History & philosophy of Science), American Association for the Advancement of Science (AAAS):		2/2020-2/24
Program Committee, Philosophy of Science Association		6/2017-2018
External Reviewer, Department of Philosophy and Classics, University of Texas San Antonio:		2017
Editorial Board: <i>International Journal of Astrobiology</i>		03/16-9/21

Philosophy & Theory in Biology 10/08-
 Philosophy of Science Association, Program
 Committee, member, November 2016 meeting: 8/15-11/16
 Reviewer for NSF Proposals in Philosophy of Science 4/21, 11/06, 10/08, 4/16
 NEH Summer Stipend Panelist 10/92-12/92
 Philosophy Expert Reviewer, John Templeton Foundation 3/2015-12/2015
 Reviewed philosophers for promotion to tenure 1/2016, 9/13/2020
 Reviewed philosophers for promotion to full 10/2014, 11/2014
 Reviewer for the following journals: (varies from yr to yr)
Australian Journal of Philosophy, Biology and Philosophy, Biological Theory, History and Philosophy of Science, Origins of Life and Evolution of the Biosphere, Philosophical Studies, Astrobiology, International Journal of Astrobiology, Journal of Philosophical Research, The Computer Journal, Dialogue, Minds and Machines, Synthese, Philosophy and Phenomenological Research, Philosophy and Theory in Biology, Biological Journal of the Linnean Society, Journal of Theoretical Biology, Geology, American Mineralogist, ACTA Biotheoretica
 Professional Organizations (Member):
 APA (American Philosophical Association),
 PSA (Philosophy of Science Association),
 AAAS (American Association for the Advancement of Science),