

Curriculum Vitae

Daniel W. McShea
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Dept. of Biology, Box 90338
Duke University
Durham, NC 27708

Academic Positions (present)

Professor, Biology Dept., Duke University, 2012-present (with secondary appointment in Philosophy).
Editorial Board, Biology and Philosophy, 2001-present.

Academic Positions (past)

Co-Director, Center for the Philosophy of Biology, Duke University, 2002-2020.
Associate Professor, Biology Dept., Duke University, 2003-2011.
Assistant Professor, Biology Dept., Duke University, 1996-2003.
Postdoctoral Fellow, Santa Fe Institute (Santa Fe, NM). 1995-1996.
Postdoctoral Fellow, Michigan Society of Fellows, University of Michigan. 1991-1994.

Education

1984-90. University of Chicago, Ph.D., Evolutionary Biology. Dissertation title: Complexity and Evolution.
1974-78. Harvard College, A.B., Biology, *summa cum laude*.

Books

Brandon, R.N. and D.W. McShea. **2020**. The Missing Two-Thirds of Evolutionary Theory. Cambridge University Press.
McShea, D.W. and R.N. Brandon. **2010**. Biology's First Law, University of Chicago Press.
Rosenberg, A. and D.W. McShea. **2007**. The Philosophy of Biology: A Contemporary Introduction, Routledge.

In Review & In Press

McShea, D.W. and G. Babcock. In review. Teleology. Aeon.
Babcock, G. and D.W. McShea. In review. Agency as internal control. In: A.F. Tejada, G. Radick, G.I. Prieto, and J. Baedke, eds. The Riddle of Organismal Agency: New Historical and Philosophical Reflections. Routledge.
Babcock, G. and D.W. McShea. In press. Goal directedness and the field concept. Philosophy of Science.
doi:10.1017/psa.2023.121

Published Papers

McShea, D.W. **2023**. Evolutionary trends and goal directedness. Synthese. 201:178. <https://doi.org/10.1007/s11229-023-04164-9>
McShea, D.W. **2023**. Evolutionary success. In: H. Desmond and G. Ramsey, eds., Human Success: Evolutionary Origins and Ethical Implications, pp. 17-39. Oxford University Press.
McShea, D.,W. **2023**. Four reasons for skepticism about a human major transition in social individuality. Phil.Trans.

R. Soc. B. 378: 20210403. <https://doi.org/10.1098/rstb.2021.0403>

Keenan, J.P. and D.W. McShea. **2022**. Synergies among behaviors drive the discovery of productive interactions. Biological Theory. <https://doi.org/10.1007/s13752-022-00420-2>

Babcock, G. and D.W. McShea. **2022**. Resolving teleology's false dilemma. Biological Journal of the Linnean Society. <https://doi.org/10.1093/biolinnean/blac058>

de Castro, C. and D.W. McShea. **2022**. Applying the Prigogine view of dissipative systems to the major transitions in evolution. Paleobiology 48(4):711-728. <https://doi.org/10.1017/pab.2022.7>

Babcock, G. and D.W. McShea. **2021**. An externalist teleology. Synthese 199:8755–8780. <https://doi.org/10.1007/s11229-021-03181-w>

McShea, D.W. **2021**. The evolution of complexity. In: Evolutionary Developmental Biology, L. Nuño de la Rosa and G.B. Müller, eds. Springer. https://doi.org/10.1007/978-3-319-33038-9_123-1

Lee, J.G. and D.W. McShea. **2020**. Operationalizing goal directedness: An empirical route to advancing a philosophical discussion. Philosophy, Theory, and Practice in Biology 12:5. <https://doi.org/10.3998/ptpbio.16039257.0012.005>

McShea, D.W., S.C. Wang, and R.N. Brandon. **2019**. A quantitative formulation of biology's first law. Evolution. 73(6): 1101-1115. <https://doi.org/10.1111/evo.13735>

McShea, D.W. **2017**. Logic, passion, and the problem of convergence. Journal of the Royal Society Interface Focus 7: 20160122. <http://dx.doi.org/10.1098/rsfs.2016.0122>

Heim, N.A., J.L. Payne, S. Finnegan, M.L. Knope, M. Kowalewski, S.K. Lyons, **D.W. McShea**, P.M. Novack-Gottshall, F.A. Smith, and S.C. Wang. **2017**. Hierarchical complexity and the size limits of life. Proceedings of the Royal Society of London B. 284: 20171039, <http://dx.doi.org/10.1098/rspb.2017.1039>

McShea, D.W. **2016**. Hierarchy: The source of teleology in evolution. In: Evolutionary Theory: A Hierarchical Perspective, N. Eldredge et al., eds., pp. 86-102. University of Chicago Press, Chicago.

McShea, D.W. **2016**. Freedom and purpose in biology. Studies in History and Philosophy of Biological and Biomedical Sciences 58:64-72.

Smith, F.A., J.L. Payne, N.A. Heim, M. Balk, S. Finnegan, M. Kowalewski, S.K. Lyons, **D.W. McShea**, P.M. Novack-Gottshall, P.S. Anich and S.C. Wang. **2016**. Body size evolution across the Geozoic. Annual Review of Earth and Planetary Sciences 44:523–553.

McShea, D.W. **2015**. Bernd Rosslenbroich: On the origin of autonomy: A new look at the major transitions in evolution. Biology and Philosophy 30:439-446.

McShea, D.W. **2015**. Three trends in the history of life: An evolutionary syndrome. Evolutionary Biology 43:531–542.

McShea, D.W. **2013**. Machine wanting. Studies in History and Philosophy of Biological and Biomedical Sciences 44:679-687.

McShea, D.W. and W. Hordijk. **2013**. Complexity by subtraction. Evolutionary Biology 40:504-520. (DOI 10.1007/s11692-013-9227-6)

Fleming, L. and D.W. McShea. **2013**. *Drosophila* mutants suggest a strong drive toward complexity in evolution. Evolution and Development 15:53-62.

McShea, D.W. **2012**. Upper-directed systems: A new approach to teleology in biology. Biology and Philosophy 27:663-684.

Brandon, R.N. and D.W. McShea. **2012**. Four solutions for four puzzles. Biology and Philosophy 27:737-744.

McShea, D.W. and C.G. Simpson. **2011**. The miscellaneous transitions in evolution. In: The Major Transitions in Evolution Revisited, B. Calcott and K. Sterelny, eds., pp. 19-33. Vienna Series in Theoretical Biology. The MIT Press, Cambridge, MA.

McShea, D.W. **2011**. Evolutionary progress. In: Evolution: The First Four Billion Years, M. Ruse and J. Travis, eds., pp. 550-557, Harvard University Press, Cambridge, MA.

Liow, L.H., C. Simpson, F. Bouchard, J. Damuth, B. Hallgrímsson, G. Hunt, **D.W. McShea**, J.R. Powell, N.C. Stenseth, M.K. Stoller, and G. Wagner. **2011**. Pioneering paradigms and magnificent manifestos - Leigh Van Valen's priceless contributions to evolutionary biology. Evolution 65:917-922.

Kowalewski, M., J.L. Payne, F.A. Smith, S.C. Wang, **D.W. McShea**, S. Xiao, P.M. Novack-Gottshall, C.R. McClain, R.A. Krause, Jr., A.G. Boyer, S. Finnegan, S.K. Lyons, J.A. Stempien, J. Alroy, and P.A. Spaeth. **2011**. The Geozoic supereon. Palaios 26: 251-255.

Payne, J.L., C.R. McClain, A.G. Boyer, J.H. Brown, S. Finnegan, M. Kowalewski, R.A. Krause, S.K. Lyons, **D.W. McShea**, P.M. Novack-Gottshall, F.A. Smith, P. Spaeth, J.A. Stempien, S.C. Wang. **2010**. The evolutionary consequences of oxygenic photosynthesis: A body-size perspective. Photosynthesis Research 107: 37-??.

Payne, J.L., A.G. Boyer, J.H. Brown, S. Finnegan, M. Kowalewski, R.A. Krause, Jr., S.K. Lyons, C.R. McClain, **D.W. McShea**, P.M. Novack-Gottshall, F.A. Smith, J.A. Stempien, S.C. Wang. **2009**. Two-phase increase in the maximum size of life over 3.5 billion years reflects biological innovation and environmental opportunity. Proceedings of the National Academy of Science 106:24-27.

Marcot, J. and D.W. McShea. **2007**. Increasing hierarchical complexity throughout the history of life: phylogenetic tests of trend mechanisms. Paleobiology 33:182-200.

McShea, D.W. **2005**. The evolution of complexity without natural selection, a possible large-scale trend of the fourth kind. Paleobiology (Supplement) 31:146-156.

McShea, D.W. and C. Anderson. 2005. The modularization of the organism. In: Modularity: Understanding the Development and Evolution of Natural Complex Systems. W. Callebaut & D. Rasskin-Gutman, eds., pp. 185-206. MIT Press, Cambridge.

McShea, D.W. 2005. A universal generative tendency toward increased organismal complexity. In: Variation: A Central Concept in Biology. B. Hallgrímsson and B. Hall, eds., pp. 435-453. Academic Press, New York.

Marino, L., D.W. McShea, and M.D. Uhen. 2004. Origin and evolution of large brains in toothed whales. Anatomical Record 281A:1247-1255.

McShea, D.W. and M.A. Changizi. 2003. Three puzzles in hierarchical evolution. Integrative and Comparative Biology 43:74-81.

McShea, D.W. 2002. A complexity drain on cells in the evolution of multicellularity. Evolution 56:441-452.

McShea, D.W. and E.P. Venit. 2002. Testing for bias in the evolution of coloniality: A demonstration in cyclostome bryozoans. Paleobiology 28:308-327.

McShea, D.W. 2001. The hierarchical structure of organisms: a scale and documentation of a trend in the maximum. Paleobiology 27:405-423.

- McShea, D.W. 2001. The "minor transitions" in hierarchical evolution and the question of directional bias. Journal of Evolutionary Biology 14:502-518.
- McShea, D.W. 2001. Parts and integration: consequences of hierarchy. In: Evolutionary Patterns: Growth, Form, and Tempo in the Fossil Record, J.B.C. Jackson, S. Lidgard, & F.K. McKinney, eds., pp. 27-60. Univ. Chicago Press.
- McShea, D.W. 2001. Evolutionary trends. In: Palaeobiology II. D.E.G. Briggs and P.R. Crowther, eds., pp. 206-210. Oxford: Blackwell.
- McShea, D.W. and E.P. Venit. 2001. What is a part? In: The Character Concept in Evolutionary Biology. G.P. Wagner, ed., pp. 259-284. San Diego: Academic Press.
- Anderson, C., and D.W. McShea. 2001. Individual versus social complexity, with particular reference to ant colonies. Biological Reviews (of the Cambridge Philosophical Society) 76: 211-237.
- Anderson, C. and D.W. McShea. 2001. Intermediate-level parts in insect societies: adaptive structures that ants build away from the nest. Insectes Sociaux 48:291-301.
- Ciampaglio, C.N., M. Kemp, and D.W. McShea. 2001. Detecting changes in morphospace occupation patterns in the fossil record: characterization and analysis of measures of disparity. Paleobiology 27:695-715.
- Anderson, C., N.R. Franks, and D.W. McShea. 2001. The complexity and hierarchical structure of tasks in insect societies. Animal Behaviour 62:643-651.
- McShea, D.W. 2000. Functional complexity in organisms: parts as proxies. Biology and Philosophy 15:641-668.
- McShea, D.W. 2000. Trends, tools, and terminology. Paleobiology 26:330-333.
- McShea, D.W. 2000. A hypothesis about hierarchies. In: Unifying Themes in Complex Systems, Y. Bar-Yam, ed., pp. 45-52. Cambridge: Perseus Books.
- McShea, D.W. 1999. Feelings as the proximate cause of behavior. In: Where Psychology Meets Biology: Philosophical Essays, V.G. Hardcastle, ed., pp. 181-200. Cambridge, MA: MIT Press.
- McShea, R.J. and D.W. McShea. 1999. Biology and value theory. In: Biology and the Foundations of Ethics, J. Maienschein & M. Ruse, eds., pp. 307-327. Cambridge: Cambridge U. Press.
- McShea, D.W. 1998. Possible largest-scale trends in organismal evolution: eight "live hypotheses." Annual Review of Ecology and Systematics 29:293-318.
- McShea, D.W. 1998. Dynamics of large-scale trends. In: Biodiversity Dynamics, M.L. McKinney & J.A. Drake, eds., pp. 91-108. NY: Columbia Univ. Press.
- McShea, D.W. 1997. Complexity in evolution: A skeptical assessment. Philosophica 59:79-112.
- McShea, D.W. 1996. Metazoan complexity and evolution: Is there a trend? Evolution 50:477-492.
- McShea, D.W. 1996. Complexity and homoplasy. In: Homoplasy: the Recurrence of Similarity in Evolution, M.J. Sanderson & L. Hufford, eds., pp. 207-225. San Diego: Academic Press.
- McShea, D.W. 1994. Mechanisms of large-scale evolutionary trends. Evolution 48:1747-1763.
- McShea, D.W. 1993. Arguments, tests, and the Burgess Shale: A commentary on the debate. Paleobiology 19:399-402.

McShea, D.W. 1993. Evolutionary change in the morphological complexity of the mammalian vertebral column. Evolution 47:730-740.

McShea, D.W. 1992. A metric for the study of evolutionary trends in the complexity of serial structures. Biological Journal of the Linnean Society 45:39-55.

McShea, D.W. 1991. Complexity and evolution: what everybody knows. Biology and Philosophy 6:303-324.

McShea, D.W. and D.M. Raup. 1986. Completeness of the geological record. Journal of Geology 94:569-574.

Book Reviews & Letters

McShea, D.W. 2013. "Unnecessary complexity" (Book review: *Complexity and the Arrow of Time*, C.H. Lineweaver, P. Davies, & M. Ruse, eds.) Science 342:1319-1320.

McShea, D.W. 2011. (Book review: *The Tangled Bank* by Carl Zimmer). Quarterly Review of Biology 86: 47.

McShea, D.W. 2011. "Untangling the morass." (Book review: *The Mirage of a Space between Nature and Nurture* by Evelyn Fox Keller). American Scientist (March-April) 99:154-156.

McShea, D.W. 2004. "A Revised Darwinism" (Book review: *The Structure of Evolutionary Thought* by Stephen Jay Gould). Biology and Philosophy 19:43-53.

McShea, D.W. 2003. "Adaptive glory" (Book review: *Darwin and Design: Does Evolution Have a Purpose?* by Michael Ruse). American Scientist (November-December).

McShea, D.W. 2001. "Measuring complexity" (Book review: *Cosmic Evolution: The Rise of Complexity in Nature* by Eric J. Chaisson). American Scientist (November-December).

McShea, D.W. 2000. "Sense and depth" (Book review: *Sex and Death: An Introduction to the Philosophy of Biology* by K. Sterelny and P. Griffiths). Biology and Philosophy 15:751-758.

McShea, D.W. 1999. "Comment." (A letter to the editor in response to a paper entitled "Evolutionary complexity," H. Morowitz, Complexity 3(6):12-14.) Complexity 4(2):11-12.

McShea, D.W. 1996. (Book review: *Complexity and the Function of Mind in Nature* by P. Godfrey-Smith.) Adaptive Behavior 4:466-470.

McShea, D.W. 1996. (Book review: *New Approaches to Speciation in the Fossil Record*, edited by D.H. Erwin and R.L. Anstey.) Geotimes 41(3):35.

McShea, D.W. 1996. (Book review: *The Garden in the Machine*, Claus Emmeche.) Complexity 1(5):36-38.

McShea, D.W. 1995. (Book review: *Fractal Modeling: Growth and Form in Biology*, by Jaap A. Kaandorp.) Quarterly Review of Biology 70:124-5.

McShea, D.W. 1992. "Gene-talk talk about sociobiology." (An invited response to a paper in the same issue, "Gene talk in sociobiology," H. Howe & J. Lyne.) Social Epistemology 6:183-192.

Invited Talks

"A universally applicable and function-free notion of parts." Keynote address. Conference: Traits of Contention: Character Identification and Comparative Thinking in Evolutionary, Developmental, and Behavioural Biology. Katholieke Universiteit Leuven, 25-26 May 2023.

“Agency in teleological systems.” Conference on The Place of the Organism in Biology and Medicine, Ruhr University Bochum, Nov 2022.

“Field goals: three points about how teleology is structured.” Symposium: Perspectives on Biological Teleology. Philosophy of Science Association annual meeting. Pittsburg, Nov 2022.

“Teleology: All goal-directed systems have the same architecture(?)” Center Leo Apostel for Interdisciplinary Studies (CLEA), Vrije Universiteit Brussel (VUB), Belgium, Sept 2022.

Conference on Agency Directionality & Function, invited commentator, San Antonio, March 2022.

“Natural selection is goal directed,” International Society for the History, Philosophy, and Social Studies of Biology, Cold Spring Harbor, July 2021.

“An externalist teleology” (with Gunnar Babcock). Linnaean Society Symposium: Evolution ‘On Purpose’: Teleonomy in Living Systems, June 2021.

“An externalist teleology,” Rotman Institute, Univ Western Ontario, May 2021.

“Four reasons for skepticism about a human transition in social individuality.” (Attended and talk delivered via Zoom). Workshop on Socio-Technological Evolution of the Human Species: Is Humanity undergoing an evolutionary transition? Israel Academy of Sciences and Humanities, Safed, Israel, September 2019.

“Wholesale returns of conjecture from trifling investments of fact.” Conference on the Evolution of Complex Life, Georgia Institute of Technology, Atlanta GA, May 2019.

“The current state of philosophy with respect to directionality.” Workshop on Long-Term Trends in Evolution. Biosphere2, Tucson AZ, March 2019.

”Teleology in Biology and the Philosophy of Biology: Key Findings, Important Questions, and Major Challenges.“ Workshop entitled: Teleological and Functional Explanations in the Biosciences: A Conversation, sponsored by the Templeton Foundation and the Issachar Fund. Chicago. October 2018.

“A Quantification of the ZFEL” (a “team talk” with Robert Brandon). Consortium for the History and Philosophy of Biology, at Duke. May 2018.

“Universals in the Evolution of Intelligence.“ Workshop entitled: Decoding Alien Intelligence, organized by the Search for Extraterrestrial Intelligence Institute (SETI). March 2018.

“Evolution’s Laws of Motion.” Geology Colloquium series at the University of Pennsylvania. February 2018.

“The Architecture of Teleology.” The Georgetown Active Materials Project. Washington, DC, June 2017.

“An engineering approach to the major transitions in individuality.” Philosophy of Science Association, Annual Meeting, Atlanta, November 2016.

“The philosophy of biology.” Summer Seminars in Neuroscience and Philosophy (SSNAP), Duke University, May 2016.

“The hierarchical organization of goal directedness in thought and action.” Department of Systems Biology, Harvard University Medical School. May 2016.

“Convergence on what: Rationality, reason, or passion?” Conference entitled: Convergent Minds: Investigating the Evolution of Cognitive Complexity in Nature, Boston University Center for the Philosophy and History of Science, Boston University. October 2015.

Plenary speaker. "The Evolution of Insideness and the Architecture of Purpose." International Conference on Evolutionary Patterns, Calouste Gulbenkian Foundation, Lisbon, Portugal, 2013.

"Freedom and purpose in biology." Workshop on Contingency and Order in History and the Sciences, Oxford, U.K. 2013.

"Complexity without (and perhaps despite) natural selection." Biology Department, College of Charleston, South Carolina. 2013.

Keynote talk. **Nescent Catalysis Meeting** (Evolution of Insect Sociality: An Integrative Modeling Approach), Durham, 2010.

"Biology's First Law." Center for the Study of Complex Systems, **University of Michigan**, 2010.

"Hierarchy and the relationship between emotion and behavior." **International Society for Developmental Psychobiology**, Chicago, 2009.

"Complexity, evolution, and the tinkerer's assistant." **1st keynote talk** at a conference on "complexity and self-organization," sponsored by the Consortium for the History and Philosophy of Biology, **University of Montreal**, 2006.

"Hierarchy: the grand ascent of life (and a screeching halt 480 million years ago?)" **2nd keynote talk** at a conference on "complexity and self-organization," sponsored by the Consortium for the History and Philosophy of Biology, **University of Montreal**, 2006.

"Complexity is easy and bad." Workshop sponsored by the Committee on History and Philosophy of Science, **University of Chicago**, 2005.

"Cells, multicellulars, and colonies: Three puzzles in the history of hierarchy." **Duke University Marine Lab**, 2003.

"Nowhere to go but up (and other trend mechanisms)." Evolutionary Morphology Seminar Series, Dept. of Biological Anthropology & Anatomy. **Duke University**, 2001.

"The redmodularization of the organism." Center for Non-Linear Systems. **Duke University**, 2001.

"The hollowing of hierarchy." Evolutionary Morphology Seminar Series, Dept. of Geophysical Sciences, **University of Chicago**, Chicago, 2000.

"Evolution of complexity: News from the parts department." Earth History and Paleobiology Seminar Series, Depts. of Earth and Planetary Sciences & Organismic and Evolutionary Biology, **Harvard University**, Cambridge, 2000.

"Organisms: Parts and parcels." A presentation for journalists attending a national science writing workshop. **Santa Fe Institute**, Santa Fe, NM, 1999.

"Complexity and evolution." A week-long series of lectures for the Complex Systems Summer School, **Santa Fe Institute**, Santa Fe, NM, 1999.

"Cells, multicells, and hierarchies." Dept. of Geology, **University of Cincinnati**, 1998.

"A new hypothesis regarding the emergence of hierarchical levels in evolution." Dept. of Biology, **University of North Carolina**, Chapel Hill, 1997.

"Upper limits to complexity?" Geology Dept., **University of California, Los Angeles**, 1996.

"Hierarchical aspects of superorganisms." A Gordon-style conference on large-scale evolutionary processes. **Oxford University**, U.K., 1996.

"Something increases in evolution, but is it complexity?" Keynote Address, Sixth International Conference on Genetic Algorithms. **University of Pittsburgh**, 1995.

"Complexity in biology: an overview." Keynote address at a course on biological complexity. **University of Madrid**, El Escorial, Spain, 1994.

"Complexity and evolution: what nobody knows." A Gordon-style conference on large-scale evolutionary processes. **Oxford University**, U.K., 1994.

"Distinguishing passive and driven trends in paleontological data." Department of Bioengineering Seminar Series. **Nagaoka University**, Japan, 1993.

"Complexity increases in evolution. NOT!" **Santa Fe Institute**, Santa Fe, NM 1993.

"An empirical test for increasing morphological complexity." Meeting of the "Ames Group," a discussion of thermodynamics and evolution. **Brigham Young University**, Utah, 1992.

"Evolutionary progress and the salience bias." Inter-departmental Seminar Series in Evolution and Systematics. **University of Guelph**, Ontario, 1991.

Other Conference & Meeting Presentations

"Complexity and progress in evolution." **International Society for the History, Philosophy, and Social Studies of Biology**, Montreal, July 2015.

"Statistical analysis of encephalization patterns in Mammalia: Revisiting trends in the evolution of intelligence with a new and more direct analytical tool." **Bioastronomy 2002**. Hamilton Island, Queensland, Australia, 2002.

"Three provocative patterns in hierarchical evolution." **Society for Integrative and Comparative Biology**. Anaheim, CA, 2002.

"Parts and Parts of Parts." **International Society for the History, Philosophy, and Social Studies of Biology**. Quinnipiac University, CT, 2001.

"Developmental models." **Workshop on Computational Approaches to Theoretical Morphology**, Santa Fe Institute, Santa Fe, NM, 2000.

"Parts." **Modularity: Understanding the Development and Evolution of Complex Natural Systems**. 5th **Altenberg Workshop in Theoretical Biology**, Konrad Lorenz Institute, Altenberg, Austria, 2000.

"Cells and multicells, zooids and colonies: hierarchical relationships in biology." Integrative Themes Workshop, **Santa Fe Institute**, 1998.

"A hypothesis about hierarchies." **Society for the Study of Evolution**. Vancouver, British Columbia, 1998.

"A hypothesis about hierarchies." **International Conference on Complex Systems**. Nashua, NH, 1997.

"Feeling: the proximate cause of behavior." **International Society for the History, Philosophy, and Social Studies of Biology**. Univ. of Washington, 1997.

"A simple measure of developmental complexity." **Society for the Study of Evolution**. McGill University, 1995.

"The new evolutionary animism: empirical consequences and tests." **International Society for the History, Philosophy, and Social Studies of Biology**. Brandeis University, 1993.

"What makes evolutionary trends go? (A new test)." A joint meeting of the **American Society of Naturalists, Society of Systematic Biologists, and the Society for the Study of Evolution**. Snowbird, Utah, 1993.

"Is evolution going anywhere? Research biases in identifying evolutionary trends." **International Society for the History, Philosophy, and Social Studies of Biology**. Northwestern University, 1991.

"Progress in evolution: accidents will happen." **International Society for the History, Philosophy, and Social Studies of Biology**. Univ. W. Ontario, 1989.

Teaching: Duke University

Signature Course:

Three Big Ideas in Evolution (Arts and Sciences 190). Course Description: Three big ideas have dominated thinking about evolution. One is Charles Darwin's idea that organisms are collections of adaptations – like the webbed feet of ducks – that help them survive and reproduce. The second big idea, from paleontologist Stephen Jay Gould, is that organisms are collections of historical accidents. Five fingers on each hand and certain aspects of our intelligence might have more to do with chance than with adaptation. The third is what biologist Stuart Kauffman calls self-organization. Our ability to maintain ourselves and to evolve might not be adaptations, but rather the inevitable properties of complex systems.

Which view is right? (All.) Is there some viewpoint that reveals all three to be aspects of a single process? (Yes.) Can that viewpoint help us understand the factors that govern our lives? (Maybe.)

First-Year Course:

Emotion, Evolution, and Ethics (Biology 93.03FCS). Course Description: Fear, love, anger, pride, regret, envy – the emotions seem to play a big role in our lives, as well as in the lives of certain other animal species. But what are the emotions? Are they guides to behavior? Are they judgments, or perhaps biases of judgment? Or maybe they are epiphenomenal – mere side effects of other mental processes, essentially irrelevant to proper mental function. The course explores what the emotions are, what they are for, and how they evolved. We begin with readings of some classic treatments of behavior and emotion in certain animal species, including gulls and chimpanzees. We then consider emotions in humans, reading selections from important works in psychology, neurobiology, literature, politics, and ethics. A central issue throughout will be the role of emotion in behavior and judgment, especially moral judgment.

Undergraduate Biology Core Course:

The Evolution of Animal Form (Bio 121). The evolution of animal form is discussed from three theoretical viewpoints: functionalist (form as the product of natural selection), historicist (form as a collection of chance or "frozen accidents"), and structuralist (form as the result of physical laws and the generic properties of complex dynamical systems).

Other Undergraduate Courses:

The Biology of Happiness (Biology 295S).

Philosophy of Biology (Phil 314, Bio 255), co-taught with Alex Rosenberg/Robert Brandon.

The Question of Evolutionary Progress (Bio 49S).

Graduate Seminars

Life's Purpose (Bio 516S), team-taught with Gunnar Babcock.

Ten Big Ideas in Evolution (Bio 790S).

Macroevolution (Bio 588), team-taught with Louise Roth

Relative Frequency of Phenotypic Evolution (Bio 790S), team-taught with Cliff Cunningham.

Group Selection, Sex, and Fossils: The Legacy of Leigh Van Valen (Biology 295S), team-taught with Louise Roth.

Emotion, Evolution, and Ethics (LS 760).

Philosophy of Biology (LS 760).

A Missing Piece of Darwinism (Bio 395), team-taught with Robert Brandon.

Emotion, Morality, and Human Nature (LS 270).

The Structure of Evolutionary Theory (Bio 295S), team-taught with Cliff Cunningham.

Evolutionary Trends (Zoo 296S.47).

Complexity in Biology (Zoo 296S.47).

The Life and Work of Darwin (Bio 259), team-taught with Susan Alberts.

The Origin and History of Life (LS 270).