

**Explanation – Philosophy of Science Seminar 920 – Fall 2015**  
**Larry Shapiro and Elliott Sober**

In this seminar we will explore issues concerning explanation and investigate their application in various examples from evolutionary biology and cognitive science. After surveying some historically prominent theories of explanation, including the deductive nomological model, the causal process theory, and the unificationist account, we will examine the controversy surrounding reductive forms of explanation, where some philosophers have expressed a preference for explanation in terms of micro-structure, and others have sought to show the legitimacy and necessity of explanation at a "higher-level". This will take us to a discussion of explanatory pluralism, and then onto several arguments that seek to establish that higher-level explanations are in fact merely epiphenomenal, with no genuine causal significance. The later weeks of the course will focus on questions about explanation in evolutionary biology, including a debate over what natural selection explains, the role of models in population biology, and the form and goals of functional explanation. Within cognitive science, we will look at the claims of the "new mechanists", who have argued that all explanation in psychology should be mechanistic, and we will also examine the nature of dynamical systems explanations in some areas of cognitive science. Discussion of dynamical systems will lead us to ask whether, and if so how, mathematics can be explanatory. Finally, we will consider some psychological research concerning the instrumental value of explanation and its relation to understanding.

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### **Course Requirements**

In addition to weekly reading assignments, students are required to submit a question to a common discussion site at Learn@UW every Monday by noon. We will discuss some of these questions during the class period on the following Wednesday. There are three writing assignments. The first two papers, 5pp in length, are due September 30 and November 4. A final paper, 15-20pp, is due December 20. Attendance at all Seminars and participation in Seminar discussions is required.

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### **Schedule of Readings**

September 2 Introduction; DN Explanation and its Critics	Woodward: SE, §§1-2 Hempel: "Aspects of Scientific Explanation," Parts 1-2 REC: Salmon, FDSE: §2.3
September 9 Probabilistic Explanations – IS & SR	Woodward: SE, §3 Hempel: "Aspects of Scientific Explanation," Part 3 REC: Salmon, FDSE, §§2.4, 2.5, 3.1, 3.2 REC: Sober, "A Probability Primer"
September 16	Van Fraassen, <i>Scientific Image</i> , Ch. 5.

Pragmatic Theories of Explanation	Sober, "Explanatory Presupposition" REC: Salmon, FDSE: §4.4
September 23 Unificationist Theory and its Critics	Woodward: SE, §5 Philip Kitcher: "Explanatory Unification and the Causal Structure of the World" Friedman: "Explanation and Scientific Understanding" Sober: "Two Uses of Unification"
September 30 Non-Causal Explanation of Singular Events?	Lewis: "Causal Explanation" Skow: "Are There Non-Causal Explanations (Of Particular Events)?" Lange: "What Makes a Scientific Explanation Distinctively Mathematical?" Sober, "A Plea for Pseudo-Processes"
October 7 Reductionism and its Critics	Garfinkel: <i>Forms of Explanation</i> , Ch. 2 Fodor: "Special Sciences, or The Disunity of Science as a Working Hypothesis" Putnam: "Philosophy and Our Mental Life"
October 14 More on Reductive Explanation	Enç: "Identity Statements and Microreductions" Richardson: "Functionalism and Reductionism" Patricia Kitcher: "Genetics, Reduction and Functional Psychology"
October 21 Explanatory Pluralism	Jackson and Pettit: "In Defense of Explanatory Ecumenism" Sober: "The Multiple Realizability Argument against Reductionism" Dennett: "Real Patterns"
October 28 What Does Natural Selection Explain?	Sober: <i>The Nature of Selection</i> , pp. 147-155 Neander: "What Does Selection Explain? Correction to Sober" Forber: "On the Explanatory Roles of Natural Selection" Helgeson: "There is No Asymmetry of Identity Assumptions in the Debate Over Selection and Individuals" Hart: "Natural Selection <i>Still</i> Doesn't Explain Why You Have Thumbs"
November 4 Model Building	Godfrey Smith: "The Strategy of Model-Based Science" Levins: "The Strategy of Model Building in Population Biology" Orzack and Sober, "A Critical Assessment of Levins's The Strategy of Model Building in Population Biology"
November 11 Functional Explanation	Wright: "Functions" Cummins: "Functional Analysis" Godfrey-Smith: "A Modern History Theory of Functions" REC: Salmon, FDSE: §§1.3, 3.8
November 18 Mechanistic Explanation	Machamer, Darden, and Craver: "Thinking about Mechanisms" Piccinini and Craver: "Integrating Psychology and Neuroscience" Shapiro: "Mechanism or Bust? Explanation in Psychology"
December 2 Dynamical Systems Explanations	Bechtel and Abrahamsen: "Dynamic Mechanistic Explanation" Walmsley: "Explanation in Dynamical Cognitive Science" Zednik: "The Nature of Dynamical Explanation"
December 9 Mathematical Explanation	Pincock: "A Role for Mathematics in the Physical Sciences" Batterman: "On the Explanatory Role of Mathematics in Empirical Science"

	Pincock: "On Batterman's 'On the Explanatory Role of Mathematics in Empirical Science'"
December 16 The Psychology of Explanation	Lombrozo: "The Instrumental Value of Explanations" Trout: "The Psychology of Explanation"