LING H2052
Theories of Linguistics:
The Scientific Method for abstractions and unobservables

Instructor
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Course Meeting Times & Location
Dulles 012
TR 11:10-12:30

Office Hours
TBA, as well as by appointment. The Linguistics Department is being temporarily housed in the office space under the stadium bleachers. To find us go in through the glass doors located between gates 22 and 24 of the stadium (side closest to the RPAC). Go up one flight of stairs, through the double doors and take the first left. My office is halfway down on the left. The main office is at the end of that hall.

Course Description
The aim of this course is to provide a strong grounding in some of the fundamental principles of scientific reasoning – illustrated through concrete examples across the Natural and Social sciences. There will be a particular focus on the "mentalistic" sciences of Psychology and Linguistics; however, this course is suitable for students from all backgrounds, and the material will be relevant not only across the sciences, but to non-science majors as well. Students will gain a deeper understanding of what it means to "do science", and what, exactly is entailed by the Scientific Method. In the evaluation of original research there will be four main questions that are posed: 1) At what level of description is the theory being described? 2) What is the relationship between the theory and the model, 3) what is the linking hypothesis the author is assuming whereby their results can be interpreted as evidence for or against the given theory? and 4) is the proposed theory falsifiable, and if so, what type of evidence would falsify it?

The general aim of this course is to provide students with rigorous analytic and reasoning skills. Students will practice high level critiques of scientific articles that will allow them to assess the quality of the argumentation, the validity of the conclusions, and the relevance of the result, even in cases where they may be unfamiliar with certain details of the subject matter.

GE Quantitative and Logical Skills Requirement: Mathematical or Logical Analysis
The Goals of the Quantitative and Logical Skills GE are stated as follows *to develop skills in quantitative literacy and logical reasoning, including the ability to identify valid arguments, and use mathematical models*. This course will stress logical reasoning and

argumentation via discussion and careful analysis of theories across Philosophy, Biology, Psychology, and Linguistics. Students will learn how to identify and interpret evidence as it applies to specific theoretical claims.

Expected Learning Outcomes: Students are expected to learn how to construct valid arguments, understand inductive and deductive reasoning, increase their general problem solving skills, and develop sophistication in critiquing scientific scholarship in any domain.

Assignments & Grading
Students are expected to complete the weekly reading assignments and come prepared to discuss their contents. For each assigned reading students will submit at least three questions. These questions will be due on Carmen before the start of the class period in which the reading is to be discussed. Questions will be graded Satisfactory or Non-Satisfactory. Non-Satisfactory questions are those that are superficial and fail to demonstrate close reading of the material. Along with the questions, students will submit a 1-2 sentence thesis statement on each reading for which they are *not* writing a synopsis (see below). This statement should accurately capture the central idea of the reading. These will also be graded as Satisfactory/Non-Satisfactory. Questions and thesis statements will count towards part of the class participation grade.

Students will also be required to prepare concise synopses of a subset of the class readings. Only certain readings are eligible for synopsizing (marked with ✔ in schedule; note that often synopses must include multiple related papers – the required set of papers can be inferred from the number of marks in the far left-hand column). Students must complete synopses on any 8 of the 13 eligible readings/sets of readings.

Synopses are NOT article summaries; they are to be clear descriptions of the argument structure of the article, explaining the reasoning of the author, the theoretical assumptions, the linking hypotheses between experiment and theory (as relevant), the type and quality of evidence used, the conclusions, links to other work, and any shortcomings or problematic issues in the claims of the paper. Synopses should be between 1-3 pages in length. Example synopses will be provided as guidelines.

Because the material is difficult and likely to be unfamiliar to most students, and because the writing task is one that requires considerable skill and effort, the synopses will be due one week after the reading (Tuesday readings due on the following Tuesday; Thursday readings due on the following Thursday). Synopses are due in pdf format via Carmen dropbox before the start of class. Class discussions should help to clarify the essential claims and arguments of the reading. They should also serve to answer questions about the content of the material. Students are expected to use the discussions as a jumping off point for their writing. Students will also have the option to submit a revised version of any synopsis within 1 week after it is returned to them. Revised synopses are expected to address my written and oral comments, and will be re-graded, with the new grade substituting for the old.

Synopses will be graded on a 20 point scale. Scores translate to letter grades in the following approximate ranges: 0-4: E; 5-7: D; 8-10: C; 11-14: B; 15-20: A. See the Grading Rubric for more details on how grades will be calculated.

Evaluation:
8 synopses: roughly 50% of the course grade.
In class participation in discussion + reading questions: roughly 50% of the course grade

Academic Misconduct
"It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student
Conduct http://studentlife.osu.edu/csc/."

Students with Disabilities
"Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/."

Readings:
Readings will be selections from the following list, organized by topic. All Readings will be available in pdf format on the Carmen site for this class.

Science & the Scientific Method

Mill, John Stuart. *System of Logic: Ratiocinative and Inductive, Being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. Longmans, Green, 1898.

Hume, David. "1739. A treatise of human nature." *London: John Noon* (1978).

Boole, George. *An investigation of the laws of thought: on which are founded the mathematical theories of logic and probabilities*. Dover Publications, 1854.

Popper, Karl. *Conjectures and refutations: The growth of scientific knowledge*. Routledge, 2014.

Popper, Karl R. "Falsificationism." In Klee, R. (Ed). *Scientific Inquiry: Readings in the Philosophy of Science*. *London: Hutchinson* (1959). Pp. 65-71.

Mendel, Gregor. *Gregor Mendel's Experiments on plant hybrids: a guided study*. Rutgers University Press, 1993.

Poincaré, Henri. *Science and Method*. Courier Corporation, 2013.

Poincaré, Henri. *Science and Hypothesis*. Science Press, 1905.

Adler, Irving. "Thinking machines, a layman's introduction to logic, Boolean algebra, and computers." (1961).

Brain & Behavior

Rosenblatt, Frank. "The perceptron: a probabilistic model for information storage and organization in the brain." *Psychological review* 65.6 (1958): 386.

Hebb, Donald Olding. *The organization of behavior: A neuropsychological theory*. Psychology Press, 2005.

Gallistel, Charles R., and Adam Philip King. *Memory and the computational brain: Why cognitive science will transform neuroscience*. Vol. 6. John Wiley & Sons, 2011.

Koltermann, R. "Periodicity in the activity and learning performance of the honeybee." *Experimental Analysis of Insect Behaviour*. Springer Berlin Heidelberg, 1974. 218-227.

Psychology & Cognitive Science

Marr, D. "Vision, 1982." *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information*.

Turing, A.M., 1950. Computing machinery and intelligence. *Mind*, *59*(236), pp.433-460

Carnap, R., 1955. Meaning and synonymy in natural languages. *Philosophical studies*, *6*(3), pp.33-47

Fodor, Jerry A. *The language of thought*. Vol. 5. Harvard University Press, 1975.

Cummins, Robert, and Denise D. Cummins. "Minds, brains, and computers: An historical introduction to the foundations of cognitive science." (2000).

Language & Linguistics

De Saussure, Ferdinand. *Course in general linguistics*. Columbia University Press, 2013. (reconstruction of lectures given between 1906- 1911, from student notes)

Sapir, Edward. *Language: An introduction to the study of speech*. Courier Dover Publications, 2004.

Sweet, Henry. *A Primer of Phonetics*. Clarendon Press, Oxford. 1906.
Sweet, Henry. *The Indispensable Foundation: A Selection from the writings of Henry Sweet*. Henderson, E.J.A (Ed). Oxford University Press, London. 1971

Bell, Melville A. *English Visible Speech in Twelve Lessons*. The Volta Bureau, Washington, D.C. 1899.

Chomsky, N. and Halle, M. *The Sound Pattern of English*. Harper & Row. 1968

Chomsky, Noam. *Aspects of the Theory of Syntax*. No. 11. MIT press, 1965.

Cohen, David. *Explaining linguistic phenomena*. Halsted Press, 1974.

Everett, D., 2005. Cultural constraints on grammar and cognition in Pirahã. *Current anthropology*, *46*(4), pp.621-646.

Nevins, A., Pesetsky, D. and Rodrigues, C., 2009. Pirahã exceptionality: A reassessment. *Language*, *85*(2), pp.355-404

Syllabus

Scientific Thinking	
Week 1	8/23 Introduction 8/25 Selections from Mill's *Systems of Logic* Vol II. Book V. <u>On Fallacies</u> • Of Fallacies in General pp. 481-484 • Classification of Fallacies pp. 484-488 • Fallacies of Generalization pp. 514-526
Week 2	8/30 Selections from Mill's *Systems of Logic* Vol I. • Book III. Of Induction. Ch 1. Pp.185-188 • Ch.3: Of the Ground of Induction pp.200-206 • Ch 11. Of the Deductive Method pp. 299- 305 9/1 Selections from Hume's *Treatise of Human Nature* Book I.Part III. <u>Of Knowledge & Probability</u> pp.151-174 • Of the impressions of the senses and memory • Of the inference from the impression to the idea • Of the nature of the idea or belief
Logical Systems & The Scientific Method	
Week 3 ✔	9/6 Boole, G. An Investigation of the Laws of Thought. Ch 1. Nature and Design of this work. Pp.1-23
✔	9/8 Popper, K. Conjectures & Refutations: The Growth of Scientific Knowledge • Ch 3: Three Views Concerning Human Knowledge. Pp. 97-119 • Ch 10: Truth, Rationality and the Growth of Scientific Knowledge pp. 215-222 In Klee, Robert (Ed). "Scientific inquiry: Readings in the philosophy of science." (1999). • Popper, K. Falsificationism. Pp 65-71
Week 4	9/13 & 9/15 **<u>Case Study</u>** Excerpts from Corcos & Monaghan (1993): *Gregor Mendel's Experiments on Plant Hybrids*
Week 5	9/20 Poincare, H. Science & Method (1921). • Ch 1. The Selection of Facts. Pp 15-24

✔	• Ch.2 up to about page 35 Poincare, H. Science & Hypothesis (1905). Part I Ch I: on the nature of mathematical reasoning. Pp 1-16
	9/22 Adler, Irving. "Thinking machines, a layman's introduction to logic, Boolean algebra, and computers." (1961). • Ch. 4 Numbers and Numerals pp.32-42 • Ch. 5 Algebra of Numbers pp.43-49 • Ch 8 Algebra of Classes pp.76-86
Brain & Behavior	
Week 6	9/27 Adler, Irving. "Thinking machines, a layman's introduction to logic, Boolean algebra, and computers." (1961). • Ch 8 Algebra of Classes pp 87-101 9/29 Rosenblatt, Frank. "The perceptron: a probabilistic model for information storage and organization in the brain." *Psychological review* 65.6 (1958). Pp.386-391 Hebb, Donald O. The Organization of Behavior (2005). • Ch.2 Summation and Learning in Perception pp.17-37
Representations and Symbols	
Week 7 ✔	10/4 Gallistel, Charles R., and Adam Philip King. *Memory and the computational brain: Why cognitive science will transform neuroscience*. Vol. 6. John Wiley & Sons, 2011. • Ch. 11 The Nature of Learning pp.187-206
	10/6 **Case Study** Koltermann, R. "Periodicity in the activity and learning performance of the honeybee." *Experimental Analysis of Insect Behaviour*. Springer Berlin Heidelberg, 1974. 218-227.
Information Processing Models	
Week 8 ✔	10/11 Readings from Marr (1982) • *General Introduction* • *The Philosophy & The Approach* • *In Defense of the Approach*
Autumn Break	

Week 9 ✔	10/18 & 10/20 Turing Machines Turing, A.M., 1950. Computing machinery and intelligence. *Mind*, *59*(236), pp.433-460. Adler, Irving. "Thinking machines, a layman's introduction to logic, Boolean algebra, and computers." (1961). • Ch 3 Getting an Idiot to Think Pp. 21- 31 Gallistel, Charles R., and Adam Philip King. *Memory and the computational brain: Why cognitive science will transform neuroscience*. Vol. 6. John Wiley & Sons, 2011. Pp. 107-120
Week 10 ✔	10/25 Adler, Irving. "Thinking machines, a layman's introduction to logic, Boolean algebra, and computers." (1961). • Ch 9 Algebra of Propositions pp 115-134 Carnap, R., 1955. Meaning and synonymy in natural languages. *Philosophical studies*, *6*(3), pp.33-47. p41-end only Fodor, Jerry. The Language of Thought (1975). • Ch 2 Why there has to be a private language. Pp 55-64
✔	10/27 Cummins, Robert, and Denise D. Cummins. "Minds, brains, and computers: An historical introduction to the foundations of cognitive science." (2000). • Part II Introduction. Pp.171-177 • Smolensky, Paul. Connectionism, Constituency, and the Language of Thought. pp286-306.
The Science of Language	
Week 11 ✔	11/1 Readings from De Saussure. "Course in General Linguistics." (1911/2013). Pp65-83; pp101-122 11/3 Readings from Sapir (1921/2004) I: Introductory; Language Defined pp.3-23 Readings from Sweet, H. "A Primer of Phonetics." (1906).pp 1-6 Readings from Bell. "English Visible Speech in 12 Lessons. (1899) ppVI-VIII; Lesson III p.22

Week 12 ✔	<u>What is Linguistics?</u> 11/8 Readings from De Saussure. "Course in General Linguistics." (1911/2013). Pp. 38-49 Readings from "The Indispensable Foundation." E.J.A. Henderson (Ed). (1971). pp.228-236
	11/10 Chomsky, N. & M. Halle. *The Sound Pattern of English* (1968) • Ch 1. Setting pp.3-14 • Ch 8. Principles of Phonology pp.330-340
Week 13 ✔	11/15 & 11/17 Chomsky, N. *Aspects of the Theory of Syntax*. Ch 1 pp. 3-62
Thanksgiving Break	
Week 14 ✔	<u>Theory Evaluation & Falsification</u> 11/29 Readings from Cohen (1974) *Explanatory Inadequacy* E. Bach **<u>case study</u>** 12/2 Everett, D., 2005. Cultural constraints on grammar and cognition in Pirahã. *Current anthropology*, *46*(4), pp.621-646.
Week 15 ✔	12/6 Nevins, A., Pesetsky, D. and Rodrigues, C., 2009. Pirahã exceptionality: A reassessment. *Language*, *85*(2), pp.355-376 only.

Assessment of Synopsis Scoring Template

A "synopsis" is a clear description of the argument structure in an article. It explains (1) the reasoning structure of the author, (2) the theoretical assumptions, (3) the type and qual of evidence used, (4) the conclusions made, (5) how the article relates to other course materials and (6) an assessment of the strengths and weaknesses of the argument. This last element requires that you formulate and express an opinion about the reading. This opinion should be based on **specific** aspects of the experimental methodology, evidence, analys and/or theoretical claims. You should keep in mind also, that the synopsis, as with the traditional essay, should begin with a thesis statement that is subsequently elaborated in the following paragraphs. All technical terms you use must be defined, and you should avoid using direct quotes from the reading whenever possible. Your job is to translate what you have read in your own terms.

The following rubric will be used to grade each synopsis that you write.

Performance Element	Exemplary (4)	Proficient (3)	Developing (2)	Emerging (1)	Not Present (0)
I. Organization	Contains a thesis statement; is coherently and logically ordered; all terms are adequately defined; sufficient supporting details and examples are provided.	Contains a thesis statement, but relationship between ideas is not always clear; some terms not clearly defined or explained.	There is no explicit thesis statement, but the ideas are ordered in a reasonable way. There are some examples.	No main idea is identified; concepts, terms, and evidence are not organized in any discernible way.	Lacks any sort of structure; provides no explanation of terms, or elaborating details.
II. Communication	Writing is clear and concise; sentences are not overly long; statements are not unnecessarily repeated; but connections between ideas and paragraphs are made clear; language is exact and not vague	Writing is easy to follow; vague language is avoided; statements are not unnecessarily repeated.	Writing is more or less understandable, although vague in places	The writing is difficult to understand and circuitous; sentences typically contain too many different ideas	The writing is almost impossible to follow and words and phrases are mis-used
III. Concepts	Correctly identifies main argument versus peripheral arguments; accurately describes critical elements of chain of reasoning; Describes conclusions and evidence.	Identifies main argument; describes most of the critical steps of reasoning, the conclusion, and the most important evidence.	Identifies only peripheral rather than main arguments; describes part of the evidence and conclusions. (Records parts of the text verbatim, rather than paraphrasing)	Identifies a part of the argument; incorrectly describes the reasoning, or not at all. (Excessive use of quotations from the text)	Mis-characterizes the argument, conclusions, reasoning and/or evidence.
IV. Evaluation	Insightfully interprets the evidence and conclusions; identifies overt as well as hidden assumptions; identifies possible shortcomings	Offers a personal interpretation of the data; Identifies overt assumptions; identifies a possible shortcoming	Provides a superficial interpretation; expresses an opinion on the reading	Provides little to no interpretation; incorrectly identifies shortcomings, or fails to do so.	Provides no evaluation of the work at all.
V. Synthesis	Insightfully relates concepts and ideas from previous texts; suggests alternative explanations	Makes some connections from previous texts; considers a different explanation	Only superficial reference to previous texts;	Identifies a few similar texts, but without discussion.	Makes no connections to othe work; does not critically evaluate conclusions.