

S0288

What's in an analogy? A journey from the sciences to the humanities and back

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Course Times: Wed & Fri 14:00-15:30

Office Hours: by appointment

Analogical and metaphorical thinking is increasingly regarded not only as playing a major role in the formation of new ideas, but as an underlying mode of reasoning that we often resort to when confronted with unknown realities. When recognized as a core aspect of cognition, analogies and metaphors can be understood to shape their objects of investigation (e.g., in the case of gender-oriented metaphors). They thereby reveal their contradictory status, as both instruments and obstacles. Engaging with key primary sources selected from the history of physics, mathematics, and biology, and concentrating on the functions that analogical and metaphorical thinking has served in specific cases, we will see how natural scientists and mathematicians have made use of, and theorized, this mode of cognition. Our aim will be to see what the scientific and non-scientific analogizing might have in common, and to examine how these instances illuminate the nature and assumptions of scientific thinking itself. The larger purpose will be to consider the further interconnections between science and the humanities, through an exploration of the part played by metaphor and literary effect in science. Students will discover the relevance of analogical reasoning to the production of knowledge, along with an awareness of its more subtle and hidden mechanisms.

Requirements

Academic Integrity

Bard College Berlin maintains the staunchest regard for academic integrity and expects good academic practice from students in their studies. Instances in which students fail to meet the expected standards of academic integrity will be dealt with under the Code of Student Conduct, Section 14.3 (Academic Misconduct) in the Student Handbook.

Attendance

Attendance at all classes is a crucial part of the education offered by Bard College Berlin. To account for minor circumstances, two absences from twice-per-week courses or the equivalent (e.g. one absence from a once-per-week course) should not affect the participation grade or require documentation.

Bard College Berlin does not offer credit for any course in which a student has missed more than 30% of classes, regardless of the reasons for the absences, whether excused or unexcused.

The full Bard College Berlin attendance policy can be found in the Student Handbook, Section 2.8.

SPECIAL CONSIDERATIONS FOR SPRING 2021: Some students might need to begin the semester remotely due to travel restrictions caused by the pandemic. In addition, all students and instructors must refrain from in-person attendance if they are feeling ill. Instructors should make efforts to offer alternatives to in-person attendance where needed, including remote participation or asynchronous options.

Assessment

The assessment will take place in two different examination sessions, in an oral and a written form: the former is a mid-semester informal conversation on a topic of student's choice among those dealt with in the first half; the latter consists in a written essay, to be submitted by the end of the course, that can be based on a further elaboration of the previous topic of choice or a new topic. With regard to the essay, it will be possible to submit a draft which I can review and comment, before submitting the version object of the final assessment. General participation and engagement in class will be part of the assessment.

Assignments

The only required written assignment is the end of semester essay of roughly 5k to 7k words.

Policy on Late Submission of Papers

Essays that are up to 24 hours late can be downgraded up to one full grade (from B+ to C+, for example). Instructors are not obliged to accept essays that are more than 24 hours late. Where an instructor agrees to accept a late essay, it must be submitted within four weeks of the deadline. Thereafter, the student will receive a failing grade for the assignment. Grades and comments will be returned to students in a timely fashion. Students are also entitled to make an appointment to discuss essay assignments and feedback during instructors' office hours.

Students receive mid- and end-of-semester grades for their seminar work. Students are entitled to make an appointment with an instructor to discuss seminar participation, or may be asked to meet with the instructor at any stage in the semester regarding class progress.

Grade Breakdown

According to the general policy adopted by Bard College, the percentage grade for participation will be 30% for the semester, 15% related to the weeks 1-7 and 15% for the weeks 8-14. The remaining 70% of the grade will be set by the informal conversation (20%) and the written essay (50%).

Schedule

The classes will take place each week on Wednesday and Friday. Every week on Friday, I will introduce the new topic/aspect—there might be a first preparatory reading due for that Friday, see list below—and on the following Wednesday the second reading will be discussed with the class and some conclusions drawn from them.

Readings schedule

(In case of reference to a book, only short excerpts from it will be given; numbers refer to the weekly topic)

1. Metaphors, analogies and the exercise of critical thinking

Wednesday Feb. 10.

N. Sieroka, V.I. Otto, G. Folkers: “Critical Thinking in Education and Research—Why and How? Guest Editorial”, *Angewandte Chemie* 57 (2018)

2. Inspirations from literature

Friday Feb. 12

R. Musil, “The man without qualities”, New York: Random House (1995)

Wednesday Feb. 17

J.W. von Goethe, “Elective affinities”, London: Penguin Classics (1978)

3. Analogies and metaphors in ancient philosophy

Friday Feb. 19

Lloyd, G.E.R.: “Polarity and Analogy”, Cambridge, University Press (1966)

Wednesday Feb. 24

Plato: “Plato’s cosmology, the *Timaeus* of Plato”, Indianapolis: Hackett Publishing Company (1935)

4. Analogical reasoning at work in physics

Friday Feb. 26

Jeans, J.: "Clerk Maxwell's method", in James Clerk Maxwell, A Commemoration Volume 1831–1931, Cambridge University Press (2012)

Wednesday Mar. 3

Maxwell, J. C.: "Are there real analogies in nature?" in *The Scientific Letters and Papers of James Clerk Maxwell*. ed. p. M. Harman. Vol. 1. Cambridge: Cambridge UP, 376–83 (1990)

5. Analogical reasoning at work in mathematics

Wednesday Mar. 10

Hadamard, J.: "The Mathematician's Mind: The Psychology of Invention in the Mathematical Field", Princeton University Press (1996)

6. Analogy from the philosophy of science's perspective

Friday Mar. 12

Oppenheimer, R.: "Analogy in Science", *The Centennial Review of Arts & Science*, 2, 351-373 (1958)

Wednesday Mar.17

Hesse, M.: "Models and Analogies in Science", University of Notre Dame Press (1966)

7. Analogy from a cognitive perspective

Wednesday Mar. 24

Hofstadter, D.; Sander, E.: "Surfaces and Essences: Analogy as the Fuel and Fire of Thinking", Basic Books (2013)

8. The heuristic function of analogical-reasoning in biology

Wednesday Apr. 7

Canguilhem, G.: "The Role of Analogies and Models in Biological Discovery", in A. Crombie (ed.), *Scientific Change*. New York: Basic Books (1963)

9. Critics to reductive accounts of metaphors in mathematics

Wednesday Apr. 14

Wagner, R.: "A historically and philosophically informed approach to mathematical metaphors", *International Studies in the Philosophy of Science* 27(2) (2013)

10. Between science and literature

Wednesday Apr. 21

McMullin, E.: "The fertility of theory and the unit for appraisal in science" in R. S. Cohen, P. K. Feyerabend & M. Wartofsky (eds.), *Essays in Memory of Imre Lakatos*. Reidel (1976)

11. Meta-reflections from *literati*

Friday Apr. 23

Henderson, A.: "The Physics and Poetry of Analogy", *Victorian Studies* 56, no. 3 (2014)

Wednesday Apr. 28

Stevens, W.: "Effects of Analogy", in *The Necessary Angel: Essays on Reality and the Imagination*, Vintage (1965)

12. Cross-disciplinary analogical leaps between mathematics and philosophy

Wednesday May 5

Sieroka, N.: "Neighbourhoods and Intersubjectivity Analogies Between Weyl's Analyses of the Continuum and Transcendental-Phenomenological Theories of Subjectivity", in *Weyl and the Problem of Space*, Springer (2019)

Essay Deadlines

The date of the informal conversation will be scheduled singularly with each student. The deadline of the written essay is Friday May 14 for the senior students, and Friday May 21 for the other students.

Grades Submission

Midterm grades will be given on 26 March 2021. Final grades for senior students will be provided by May 20, and by June 4 for all the other students.

Library and Book Purchase Policies

All the readings will be provided in pdf format to the students. No purchase is needed.