

CHAPMAN UNIVERSITY  
University Honors Program  
One University Drive  
Orange, CA 92866

COURSE SYLLABUS

HON 310-01  
(Experiencing Forms and Colors: Goethe's Approach to Science)

Spring Term

**Instructor:** Dr. Domenico Napoletani

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**Office Hours:** Mondays and Wednesdays 10am-11:30am, or by appointment. DeMille Hall, room 150F.

Catalog Description: *Prerequisite: acceptance to the University Honors Program, or consent of instructor.* (Offered as needed.) 3 credits. Is it possible to imagine a science that has subjective experience at its core, that acknowledges the primacy of daily experiences as mediated by the senses, all along without diminishing its own rigor, objectivity and predictive power? In this course we will attempt to find answers to these questions by taking Johann Wolfgang von Goethe's scientific work as a starting point.

Course Learning Outcomes:

By the end of this course, students will have:

- 1) Obtained a nuanced knowledge of the assumptions and beliefs on which scientific understanding is built, providing an example of how shared values inform a fundamental form of human understanding.
- 2) Developed a rigorous and effective ability to distinguish science from non-science, through a careful study of the significance of subjective perceptual experience in approaching scientific problems.
- 3) Understood the key ideas and the quantitative methods used in mathematics, physics and biology to approach the concepts of form and metamorphosis. Students will learn how to find quantitative evidence to support the theoretical development of such concepts, and how to analytically discuss and write about them.

Honors Program Learning Outcomes:

Upon completing a course in the University Honors Program students will have:

- a) Obtained a starting point for integrative exploration of the development of cultures and intellectual achievements through a variety of disciplinary and interdisciplinary perspectives;
- b) Sharpened their ability to critically analyze and synthesize a broad range of

- knowledge through the study of primary texts and through engagement in active learning with fellow students, faculty, and texts (broadly understood);
- c) Understood how to apply more integrative and interdisciplinary forms of understanding in the advancement of knowledge and in addressing complex challenges shaping the world;
  - d) Developed effective communication skills, specifically in the areas of written and oral exposition and analysis.

Content:

Today Johann Wolfgang von Goethe is better known for his literary output, which includes works such as *Faust*, and the *West-East Divan*, and yet his fame as a writer often obscures the intellectual basis of all his work: his longtime dream of a science that would overflow from the subjective experience of life and of change.

Goethe's scientific approach developed especially in two directions: a study of the constancy and individuality of life forms despite their multiform changes (primarily as manifested in plants); and a study of colors as they appear to us in the full variety of natural settings to which we are exposed.

Goethe's scientific efforts are only partially compatible with the interests and methods of contemporary scientific practice mostly because of his rejection of the value of isolated key experiments as linchpins of a theory. And yet Goethe's ideas managed to have a profound influence in the Gestalt theory of perception, as well as the study of animal and plant morphology.

Ultimately, despite their most obvious limitations, the significance of Goethe's scientific theories rests on their explicit goal of demonstrating the profound unity of all forms of human knowledge. A unity that is mediated by the twofold realization of the power of the senses in shaping our view of the world, and of the transformative value of natural knowledge in shaping us as individuals.

We will see that every significant poetic work of Goethe can be reinterpreted in light of his effort of constructing a fluid, living natural philosophy suitable for his times. And maybe suitable for ours as well? In today's fragmented intellectual landscape, in a society that seems unwittingly bent on objectifying our humanity, it is worth exploring to which extent Goethe's vision of the unity of experience and knowledge can be recovered.

It is in this perspective that we will confront Goethe's core ideas on science with our contemporary understanding of concepts such as form, metamorphosis and color. More particularly we will study:

- The key ideas and techniques underpinning the study of shape and form invariance in mathematics.
- Plant and animal morphology and its relations to evolution as understood in evo-devo biology.
- Modern theories of color perception as well as the physical causes and properties

of colors.

- We will also explore the role of observers and first person thought experiments in classical, quantum and relativistic physics.

To test to which extent Goethe's vision of a humanistic science is still possible today, we will also carefully expand our discussions to include: precursors such as Nicholas of Cusa with his art of conjecturing and Giordano Bruno with his mnemonic theories; neo-confucianist scholars such as Chu Xi that developed forms of natural philosophy in very different cultural settings; and modern philosophers, such as the phenomenologist Edmund Husserl, that put the foundations of another first person approach to science, quite different from the one envisioned by Goethe.

#### Current Required Texts:

*Goethe on Science. An anthology of Goethe's Scientific Writings*, edited by Jeremy Naydler, Floris Books, 2009.

Whenever possible, I will point out online access to the texts we will discuss. These are some of the basic references (on reserve in the library) that we will use to put Goethe's approach in a modern perspective:

*Forms of Becoming: The Evolutionary Biology of Development* by A. Minelli, Princeton University Press, 2009.

*What Is Mathematics? An Elementary Approach to Ideas and Methods* by R. Courant, H. Robbins. Oxford University Press, 1996.

*QED : the strange theory of light and matter* by R. Feynman, Princeton University Press, 2014.

*Principles of Neural Science* edited by by Eric R. Kandel et al., McGraw-Hill Education, 2012.

#### Instructional strategies:

The course will include daily, in-depth discussions, based on a variety of readings. Scientific topics will be introduced by lectures. A period of guided written reflection will be set aside at the end of each class. Moreover, students will write an extensive and rigorously argued analysis of a specific topic agreed with the instructor by the second week of class. They will also present their research in class and moderate the resulting discussion.

#### Methods of Evaluation:

Assessment of student performance will be based on the following items:

**In-class discussions and written reflections (30% of the grade).** Each student is expected to be directly involved in the discussion during each meeting. Because of this, daily attendance is required and at most one justified absence is permitted. For each additional absence, 2% of the grade will be deducted from the overall grade. At the end of each class, students will be given time to engage in a written reflection on a problem that puts in relief the arguments discussed on that day.

**Midterm evaluation (25% of the grade).** There will be an in-class evaluation of conceptual understanding of the basic scientific ideas that we will introduce.

**Final paper (30% of the grade).** Students are expected to submit a final paper of 15 pages (12pt font, 1" margin and double spaced) by the last day of class. By the end of the second week of class, students need to confirm a topic for their paper related to the main themes of the course, chosen among a wide selection of given topics. **Papers should offer a synthesis and an original viewpoint on the chosen topic, with an extensive review of relevant literature and a clear grasp of the core concepts of data science (minimum of 10 scholarly citations).**

**Presentation and discussion moderation (15% of the grade).** All students will present the research topic of their final paper and moderate the discussion for a total of half an hour, during the last week of class. Students will be assessed based on their grasp of the topic at hand; the creativity used in framing the topic and linking it with other discussions; the ease and effectiveness of their moderation.

Chapman University Academic Integrity Policy:

Chapman University is a community of scholars which emphasizes the mutual responsibility of all members to seek knowledge honestly and in good faith. Students are responsible for doing their own work, and academic dishonesty of any kind will not be tolerated anywhere in the university

Students with Disabilities Policy:

In compliance with ADA guidelines, students who have any condition, either permanent or temporary, that might affect their ability to perform in this class are encouraged to inform the instructor at the beginning of the term. The University, through the Center for Academic Success, will work with the appropriate faculty member who is asked to provide the accommodations for a student in determining what accommodations are suitable based on the documentation and the individual student needs. The granting of any accommodation will not be retroactive and cannot jeopardize the academic standards or integrity of the course.

**Last revised: 08/08/2018**

