

## University Honors 3700

### Nature as Technology: From Alchemy to Biomimcry

UNC Charlotte, Fall 2014

Mondays & Wednesdays, 11:00am-12:15pm, Winningham 107

**Instructor:** Trevor Pearce                      Office Hours: T/Th 10-11am or by appointment  
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### Description

Today's newspapers are bursting with stories about engineers imitating nature, from sharkskin ships to spider's silk. Should we try to copy nature? Can science create living things? The idea of a parallel between technological artifacts and products of nature has endured for millennia, from ancient philosophy to cutting-edge science. In this class, we will examine the claim that nature is a kind of technology. Once we have analyzed a series of historical perspectives—for thinkers like Descartes and Leibniz, for example, God was a divine engineer—we will consider four specific topics: mimicking nature in engineering research; synthesizing organic compounds and living organisms; genetically modifying food; and enhancing the human body through technology. Along the way, we will discuss the ethical implications of “playing God.”

### Required Texts

Vogel, *Cats' Paws and Catapults* (W.W. Norton, 1998) [ISBN #9780393319903]

Butler, *Damn* (Warner, 1987) [ISBN #9780446603775]

These books will be available for purchase at the university bookstore. All other texts will be available at the course website via <https://moodle2.uncc.edu/>.

### Evaluation

5% Participation  
10% Attendance  
25% Summaries  
30% Paper 1 (1200 ± 200 words)  
30% Paper 2 (1200 ± 200 words)

**August 20 to December 3**  
**October 3**  
**December 5**

Your attendance grade is calculated by dividing attended classes by total classes. I automatically excuse two absences. Requests for additional excused absences due to medical emergencies, family emergencies, military orders, or court orders should be made to the Dean of Students Office ([http://unccdso.orgsync.com/academic\\_accommodations](http://unccdso.orgsync.com/academic_accommodations)), and not to me directly.

“Participation” means making comments and asking questions that reflect your having read and thought about the text under discussion. **Your participation grade cannot be higher than your attendance grade.** I often call on individual students following the small-group discussion or the summary write-up. **You must bring a copy of the reading to each class**, or you will not be able to effectively participate.

For the summaries, at the beginning of each class you will spend five minutes writing a paragraph that includes (a) the main claim or thesis of the reading for that day and (b) the arguments or evidence the author gives to support this claim or thesis. You may use books and notes. **I will collect and grade these summaries throughout the semester**, though not every class. If you arrive late, you must still hand in your summary at the same time as everyone else. Late summaries will not be accepted. Summaries submitted via e-mail will not be accepted. **Absence from class is not a valid excuse for not turning in a summary** unless you receive accommodation from the Dean of Students office (see above). The lowest summary grade will be dropped.

Topics for Papers 1-2 will be circulated by e-mail on September 19 and November 21, respectively. I encourage you to talk to me about your paper before you submit the draft and/or before you submit the final version. I am happy to give feedback on outlines or introductory paragraphs. **The two papers must be submitted by 7pm on the due date at the Moodle 2 site via turnitin.com.** Papers that are too long or too short will be penalized a minimum of half a grade point. Late papers will be penalized half a grade point per day.

The use of cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class except in emergencies. Students are permitted to use computers during class for note-taking and other class-related work only.

The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by announcement in class or by e-mail notice.

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## University Policies

All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or at <http://legal.uncc.edu/policies/up-407>.

As a condition of taking this course, all required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of

detecting plagiarism of such papers. No student papers will be submitted to Turnitin.com without a student's written consent and permission. If a student does not provide such written consent and permission, the instructor may: (i) require a short reflection paper on research methodology; (ii) require a draft bibliography prior to submission of the final paper; or (iii) require the cover page and first cited page of each reference source to be photocopied and submitted with the final paper.

Students who miss classes, examinations or other assignments because of a religious practice or belief must provide reasonable notice of the dates of religious observances on which they will be absent by submitting a Request for Religious Accommodation Form (<http://goo.gl/I1Ncv0>) to the instructor prior to August 29, 2014.

Students in this course seeking accommodations to disabilities must first consult with the Office of Disability Services (<https://ds.uncc.edu/>) and follow the instructions of that office for obtaining accommodations.

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## Reading Schedule

Aug. 18  
No reading

### PART 1: SCIENTIFIC & PHILOSOPHICAL BACKGROUND

Aug. 20  
Aristotle, "Book II, Chapters 1-3" & "Book II, Chapters 4-9," pp. 49-56 & 59-69 of *Aristotle's Physics: A Guided Study*, trans. Sachs (New Brunswick, NJ: Rutgers University Press, 1995).

Aug. 25  
Newman, "Alchemy and the Art-Nature Debate," pp. 34-114 of *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (Chicago: University of Chicago Press, 2004).

Aug. 27  
Descartes, "Treatise on Man," trans. Robert Stoothoff, pp. 99-108 of *The Philosophical Writings of Descartes*, vol. 1 (Cambridge: Cambridge University Press, 1985). [1629-33]  
Cohen, "Descartes and Henry More on the Beast-Machine—A Translation of their Correspondence Pertaining to Animal Automatism," *Annals of Science* 1 (1936): 48-61.

Sep. 3  
Leibniz, "New System of the Nature of Substances" pp. 10-20 of *Leibniz's 'New System' and Associated Contemporary Texts*, trans. Woolhouse & Francks (Oxford: Oxford University Press, 1997). [1695]  
Leibniz, "Principles of Nature and Grace, Based on Reason," pp. 258-266 of *Philosophical Texts*, trans. Woolhouse & Francks (Oxford: Oxford University Press, 1998). [1714]

Sep. 8

Riskin, "The Defecating Duck, or, the Ambiguous Origins of Artificial Life," *Critical Inquiry* 29 (2003): 599-633.

Sep. 10

Kant, "Critique of the Teleological Power of Judgment," §§64-66, 70-71, 75, & 80-81, pp. 242-249, 258-261, 268-271, & 286-293 of *Critique of the Power of Judgment*, trans. Guyer & Matthews (Cambridge: Cambridge University Press, 2000). [1790]

## **PART 2: EVOLUTION—ENGINEER?**

Sep. 15

Darwin, [Natural Selection as Architect], pp. 429-432 of *Variation of Animals and Plants under Domestication*, vol. 2 (London: John Murray, 1868).

Jacob, "Evolution and Tinkering," *Science* 196 (1977): 1161-1166.

Sep. 17

Dennett, "Biology Is Engineering," pp. 187-228 of *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (New York: Simon & Schuster, 1995).

Sep. 22

Vogel, *Cats' Paws and Catapults* (New York: W.W. Norton, 1998), Chapters 1-4

Sep. 24

Vogel, Chapters 5-7

Sep. 29

Vogel, Chapters 8-10

Oct. 1

Vogel, Chapters 11-14

## **PART 3: ENGINEERING LIFE**

Oct. 8

Berzelius, *Traité de chimie* [Treatise on Chemistry], translated excerpts. [1831/1849]

Dumas & Liebig, "Note sur l'état actuel de la chimie organique" [Note on the Present State of Organic Chemistry], translation. [1837]

Berthelot, "Introduction," *Chimie organique fondée sur la synthèse* [Organic Chemistry Founded on Synthesis], translated excerpts. [1860]

Oct. 13

Gibson et al., "Creation of a Bacterial Cell Controlled by a Chemically Synthesized Genome," *Science* 329 (2010): 52-56.

Bedau & Triant, "Social and Ethical Implications of Creating Artificial Cells," pp. 31-48 of *The Ethics of Protocells: Moral and Social Implications of Creating Life in the Laboratory*, ed. Bedau & Parke (Cambridge: MIT Press, 2009).

Oct. 15

Niccol, *Gattaca* (1997) [watch outside of class]

Oct. 20

RetroReport, "Test Tube Tomato" (2013), online at <http://retroreport.org/test-tube-tomato/>  
Plumer, "Everything You Need to Know About Genetically Modified Foods" (2014), online at [www.vox.com/cards/genetically-modified-foods/](http://www.vox.com/cards/genetically-modified-foods/)

Ronald, "The Truth about GMOs," *Boston Review* (2013), online at <http://www.bostonreview.net/forum/pamela-ronald-gmo-food>

Shiva, "Genetic Engineering and Food Security," pp. 95-116 of *Stolen Harvest: The Hijacking of the Global Food Supply* (Cambridge, MA: South End, 2000).

Oct. 22

Andow & Zwahlen, "Assessing Environmental Risks of Transgenic Plants," *Ecology Letters* 9 (2006): 196-214.

Le Curieux-Belfond et al., "Factors to Consider before Production and Commercialization of Aquatic Genetically Modified Organisms: The Case of Transgenic Salmon," *Environmental Science & Policy* (2009): 170-189.

Oct. 27

Stone, "Constructing Facts: Bt Cotton Narratives in India," *Economic & Political Weekly* 47 (22 September 2012): 62-71.

Herring, "Reconstructing Facts in Bt Cotton: Why Scepticism Fails," *Economic & Political Weekly* 48 (17 August 2013): 63-66.

Rao, "Bt Cotton Yields and Performance: Data and Methodological Issues," *Economic & Political Weekly* 48 (17 August 2013): 66-69.

Stone, "A Response to Herring and Rao," *Economic & Political Weekly* 48 (17 August 2013): 70-72.

#### **PART 4: HUMAN ENHANCEMENT**

Oct. 29

Bostrom & Sandberg, "The Wisdom of Nature: An Evolutionary Heuristic for Human Enhancement," pp. 375-416 of *Human Enhancement*, ed. Savulescu & Bostrom (Oxford: Oxford University Press, 2009).

Nov. 3

Butler, *Dawn* (New York: Warner, 1987)

Nov. 5

Butler, *Dawn* (New York: Warner, 1987)

Nov. 10

Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist Feminism in the Late Twentieth Century," *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), pp. 149-181.

Nov. 12

Heyes, "Diagnosing Culture: Body Dysmorphic Disorder and Cosmetic Surgery," *Body & Society* 15 (2009): 73-93.

Nov. 17

Brashear, *Fixed: The Science/Fiction of Human Enhancement* (2013) [documentary film]

Nov. 19

Discussion of *Fixed*

Nov. 24

Overall, "Life Enhancement Technologies: The Significance of Social Category Membership," pp. 327-340 of *Human Enhancement*, ed. Savulescu & Bostrom (Oxford: Oxford University Press, 2009).

Dec. 1

Chiang, "The Lifecycle of Software Objects," *Subterranean Press Magazine* (Fall 2010)

Dec. 3

Chiang, "The Truth of Fact, The Truth of Feeling," *Subterranean Press Magazine* (Fall 2013)