#### **Biology 17: The Biology of Food**

Instructor: Dr. Scott Poethig

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This non-science-majors course is based on the premise that almost everything organisms do or care about is ultimately about food (or sex, but this is another course). Consequently, to understand how the world works, we need to understand food—what it is, how we acquire it, how we modify it, and how it influences human activities on both a large and small scale. We will begin by dealing with fundamental topics in biology: the chemistry, structure, and physiology of plants and animals, and principles of genetics and evolution as illustrated by the origin and genetic modification of domesticated animals and plants. Next, we will consider the history, practice, and future of agriculture. Finally, we will discuss food distribution and marketing, the place of food in the global economy, and the politics of food production and food security.

#### Grading

Grades will be based on two midterms (40%), a final exam (30%), and a 3-page (10%) and 5-page (20%) term paper.

#### Lectures

Aug. 31	Food and humans: a complex interaction	PDF: Eating Arlene; A vegan manifesto
Sept. 2	Movie: The Queen of Trees	PDF: Biology, Chap. 1
Sept 5	Labor day, no class	
7	Nutrient cycling in ecosystems	P&S, Chap. 26, Biology, Chap. 55
9	Chemistry of food	P&S, pp. 8-15; 495-497
12	Cell structure and function	P&S, Chap. 2 pp. 16-24
14	Metabolism: photosynthesis, respiration, fermentation	P&S, pp 55-68
16	Meat: the structure and function of muscle	F&C, Meat
19	Milk: production and processing (demonstration)	F&C, Milk
	Plant structure and function	P&S, Chap. 3, 5 and 6; F&C, Edible plants;
21		PDF: How to spend a quiet evening with a
		potato
23	Supermarket Botany: 3- page term paper and	
23	student presentations	
26	Cooking, and other forms of food processing	PDF: The end of food
28	Animal nutrition: eating, digesting, defecating	PDF: Biology, Chap. 41
30	Human nutrition	PDF: Concepts of energy expenditure; PDF:
		The meaning of food
Oct. 3	Midterm exam #1	
5	Class discussion: how to become an intelligent	
	eater	
7	Midterm break	
10	Meiosis and the amazing egg	P&S, pp. 24-27;74-80
12	Mendelian genetics 1: the basics	P&S, pp. 100-104
14	Mendelian genetics 2: more complicated stuff	P&S, pp. 104-108

17	Gene structure and function	P&S, pp. 109-115
10	Mutations and variation in chromosome number	
19	and structure	P&S, pp. 115-11/
21	Population genetics and evolution	PDF: Biology Chap. 23
24	Origin of agriculture	P&S, Chap. 11
26	Plant and animal domestication	P&S: Chap. 12 & 13;
20	r fant and annual domestication	PDF: Documenting domestication
28	Cows: evolution, breeding, utilization	PDF: Diary genomics
		PDF: Boyd, W. Making meat: science,
31	Chickens: evolution, breeding, utilization	technology, and American poultry
		production.
	Plant breeding and hybrid corn	Cornicopia Institute, Scrambled Eggs
Nov. 2		P&S, 189-196;
		PDF: The development of hybrid maize
4	The Green Revolution	P&S, pp. 236-240;
		PDF:History of IR8; Norman Borlaug
7	Diant histochus is seu malaine CM alante	P&S, pp. 248-261; PDF: The future of
/	Plant biotechnology: making GM plants	tood; Opposition to transgenic
9	Class discussion: GMOs—good, bad, or neither?	Pringle, Food Inc.
11	Midterm # 2	
14	Agroecology	PDF: The role of agroecology
16	Traditional agriculture	PDF: After 10,000 years of agriculture
18		P&S, pp. 241-245
10	Sustainable agriculture	PDF: Sustainable agriculture: an
		introduction.
21	Field trip to Penn Farm	
23	Movie: King Corn	
25	Thanksgiving	
28	Fishing and aquaculture	PDF: Aquaculture production and
20		biodiversity conservation
30	Food distribution: supply chains and food deserts	Dr. Dominic Vitiello
Dec. 2	Agriculture in developing countries	PDF: Dirt Poor—fertilizer use in Africa
5	Global politics of food	PDF: A groimparialism
7	Upper and faminast East aid	DDE: World Hunger
/	Hunger and famines; Food and	PDF: world Hunger
9	Movies: Trade trap; A perfect famine	
12	Case study: bananas	PDF: We have no bananas
Dec. 16	Final term paper due	
TBD	Final exam	

## Books

P&S: Levetin, E. and K. McMahon. Plants and Society, 6<sup>th</sup>-8<sup>th</sup> edition
F&C: McGee, H. (2004) On Food and Cooking: the Science and Lore of the Kitchen. 2<sup>nd</sup> edition.
Pringle, P. (2003) Food, Inc : Mendel to Monsanto - the promises and perils of the biotech harvest

# Term papers

## Supermarket Botany:

Write a 3 page, double-spaced description of a food plant of interest, covering the following points. You may use Wikipedia as a starting point, but you should consult other sources as well. References should be numbered in the order in which they are cited, and should be cited in the text using this number.

1 Latin name.

- 2. Part of the plant (leaf, stem, fruit, etc).
- 3. Where did it originate (historically), and where is it grown now?
- 4. Does it contain any interesting/dangerous chemicals?

5. How do we use it?

6. Anything else you find interesting.

10 students will be asked to volunteer to present a 3-minute description of their plant to the class.

## Final term paper:

Write a 5-8 page double-spaced paper on any food-related topic of interest to you. Here are some examples of previous term paper topics. You may choose one of these, or come up with something else.

1. The USDA creates the guidelines for national nutrition programs, including school lunches. Its recommendations were graphically depicted in the "food pyramid", which was created in 1992. This has now been transformed into the "food plate". How does the USDA decide what Americans should eat? What are the criteria?

2. All American supermarkets look more-or-less the same. This is not an accident; supermarkets are organized on the basis of detailed studies of human behavior. Study the history, organization and operation of an American supermarket.

3. What does the "Organic" label on food mean? In other words, what does it take for a farmer to be able to put this government-regulated label on the food they grow.

4. Triticale is often grown as a winter cover crop, and is also used in a variety of food products. It is a completely artificial species. Describe its history and uses.

5. Canola (rapeseed) oil is considered healthier than other types of oil. However, this is a recent perception. Not too long ago, rapeseed oil was toxic to humans, and was only used for industrial purposes. Discuss how the transformation from toxic oil to "heart healthy" oil occurred, and recent attempts to further engineer this crop.

6. Migrant farm workers: where do they come from and what do they do? Can American agriculture survive without them?

7. "Food stamps are really the only functioning part of the safety net..." How did the food stamp program originate, and how does it work?