

SIO 189/289: Pollution, Environment and Health

Syllabus v.1 - 26 Sep 2016

Fall 2016, TuTh 11:00-12:20, Center Hall 212

4 units credit, offered for letter grade

**This syllabus will change. Please check for the latest version on TED.
Student discussion is highly encouraged.**

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Course description:

In less than 100 years, humans have released nearly 85,000 new synthetic chemicals into the environment, and have dramatically increased the environmental concentrations of natural harmful compounds such as carbon dioxide and mercury. Is this pollution a problem? Do environmental chemicals affect our health or the health of wildlife? What scientific approaches are being applied to solve this problem? This course tackles these questions, and hopes to accomplish three major goals. The first is to study the scope and consequences of the pollution problem. The second is to understand the basic properties and fate of chemicals in the environment. The third is to study the biological mechanisms, particularly those operating at the cellular level, that determine accumulation and toxicity of chemicals. By the end of the course, students should have the basic toolkit necessary for evaluating complex information on the effects of pollutants on human and environmental health and an appreciation of the factors that shape our dependence on them.

Prerequisites:

Introductory biology and chemistry are highly recommended. Having completed a basic course in toxicology will be helpful but is not required. If you are concerned about having sufficient background come talk to me – many students have done well without the pre-requisites as long as they cover the extra material on their own and meet regularly with the TAs.

Required reading:

Specific readings for each lecture will be announced in class and assigned on TED. A course reader has relevant material from 4 textbooks on environmental science. Some students find they do not need

their own copy of the reader. We have made nine copies of it available on reserves, so feel free to check it out before buying.

Online materials:

TED.ucsd.edu website. Original scientific papers will be posted to TED, and these are also required readings. **Please subscribe to the course twitter account @hamdounlab to receive updates with links to news articles relevant to the lectures.**

Recommended reading:

These two books on environmental science are recommended reading during the quarter, and some lecture and exam material will be based on them.

1. *Merchants of Doubt* by Naomi Oreskes
2. *Plastic: A Toxic Love Story* by Susan Freinkel

Grading:

30% Midterm Exam 1

30% Midterm Exam 2

30% Final

10% Op-ed Assignment (see attached)

The top op-eds will be shared in class in and their authors awarded the “**Green Pen**”.

Academic conduct:

Please see UCSD policy <http://students.ucsd.edu/academics/academic-integrity/defining.html>. Please do not text, e-mail, surf the Internet, Facebook, tweet or otherwise be enslaved to your gadgets during class. **Phones are NOT allowed during exams. All assignments must be your own independent work – plagiarism will be referred to campus.**

Class Schedule:

UNIT I The behavior of chemicals in the environment.

Tue Sep 27	Introduction to the class: Scope of the chemical problem.
Thr Sep 29	A brief history of toxicology. <i>Silent Spring</i> , DDT.
Tue Oct 4	Chemodynamics and physical properties of chemicals that govern accumulation in organisms.
Thr Oct 6	Environmental fate and transport of pollutants. (Bio)remediation.
Tue Oct 11	Persistent organic pollutants.
Thr Oct 13	The mercury cycle – mind your sushi!
Tue Oct 18	Beautiful unapologetic plastics.
Thr Oct 20	Midterm 1

Unit I Relevant reading in the course reader:

1. “Principles of Toxicology” by David Eaton and Steven Gilbert from *Casarett and Doull’s Toxicology*.
2. “Environmental Chemodynamics” and “Refractory pollutants” from *Environmental Toxicology and Chemistry* by Donald Crosby
3. “Fate and Transport of Contaminants” from Landis, Sofield and Yu.

UNIT II How chemicals interact with biological systems.

Tue Oct 25	Doubt: How and why we do not act. Discussion of op-ed assignment.
Thr Oct 27	The intoxication: Introduction to the biological effects of chemicals.
Tue Nov 1	Contaminants in the body: Absorption, Distribution, Metabolism and Excretion of Toxicants.
Thr Nov 3	Contaminants in the body: Absorption, Distribution, Metabolism and Excretion of Toxicants.
Tue Nov 8	Cellular defenses: Bouncers and policemen.
Thr Nov 10	Emerging pathways of intoxication: Transporter Interfering Compounds.
Tue Nov 15	Midterm 2
Thr Nov 17	Endocrine disruption Op-ed Assignment due.
Tue Nov 22	Epigenetics and evolutionary consequences. Developmental origins of disease.
Thr Nov 24	Thanksgiving holiday.
Tue Nov 29	Developmental origins of disease
Thr Dec 1	Course Summary

Unit II Relevant reading in the course reader:

1. “Absorption distribution and excretion of toxicants” by Lehman-Mckeeman and “Developmental Toxicology” by John Rogers from *Casarett and Doull’s Toxicology*.
2. “The environment as a normal agent in producing phenotypes” and “Endocrine disruptors” From Gilbert and Epel *Ecological Developmental Biology*.
3. “The epigenetic origins of adult disease” From Gilbert and Epel *Ecological Developmental Biology*

Final Exam Wednesday, December 7, 11:30-2:30 pm.

Required Assignment: A Pollution, Environment and Health Op-ed.

The section of a newspaper opposite the editorial page is often reserved for guest opinion on current topics. Op-eds are usually written by people with no affiliation with the newspaper itself, but who may have some expertise in the topic of interest. Op-eds can have significant impact on public opinion by amplifying the discussion on a current topic and by providing alternative views. In many cases, op-eds are written by lobbyists who are paid to campaign on behalf of a specific position. However, in any democratic society, it is important for well-educated citizens to contribute to the discussion on topics of social or environmental importance. That is you.

The goal of this assignment is for each of you to write a long op-ed piece (750- 1000 words) from the perspective of a scientist on any topic related to the theme of this course – i.e. the interaction of pollutants, the environment and health. One suggestion is to read the recommended book on plastics (which can be purchased used for ~\$5 on Amazon) and to turn in both the Op-ed and Extra Credit Assignments. But you are free to choose any topic you like, as long as it clearly relates to the course. For example, you could write your op-ed on the need to reform the Toxic Substances Control Act.

Your position for or against a certain issue will have no impact on your grade. To do well on this assignment, you will need to write a highly focused op-ed that uses factual information from the course to make your arguments. Passionate pleas for action (eg. “we must act now”) are less important than logical sequences of argument (eg. “inaction will lead to accumulation of 400,000 tons of mercury in yellowfin tuna, reducing average IQ of children by 6 points and thereby reducing America’s literacy by 6% by the year 2020”). In other words, this should be more editorial than opinion. See the example on TED entitled “Warnings from a flabby mouse”.

In grading the op-eds, we will evaluate in equal parts:

1. Quality and quantity of the content: use of independent reading and course material to formulate quantitative arguments and factual accuracy.
2. Clarity of the writing: grammar, spelling, syntax, presentation and following these instructions.
3. Sophistication of logical argument: how many arguments/dots you connect in 75-1000 words and how reasonable those connections are.

Your op-ed should be submitted on **paper**, in class on or before **Nov 17** – sorry, but no late or e-mailed assignments will be scored. However do hang on to your e-versions for submission to newspapers.

We will select some of the op-eds to send off for submission to major newspapers. Again, you are free to choose any topic you like, as long as it clearly relates to the course. Ask us if you are in doubt. Keep in mind your chances of being published will increase if you choose a topic related to an issue currently in the news (i.e. plastic bag bans, oil extraction). You can check the twitter feed @hamdounlab for links to recent pollution-related news articles. Your grade will not be affected by whether or not your op-ed is published. If you really **DO NOT** wish to have your op-ed considered for submission to a newspaper, please indicate so in writing on your submitted assignment.