## GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK

PEAVY 108: T/Th – 9:00-9:50 AM (lecture) / T - 3:00-3:50 PM (recitation)
Students must sign up and attend both the lecture and recitation sections
Instructors: Dr. Steve Strauss, x7-6578 | Dr. Dave Stone, x7-4433

Prerequisite: One quarter each of biology and chemistry helpful but not essential

Satisfies **Bac Core** Course in Synthesis category of Science, Technology & Society
(Bac core goals and related procedures listed on last page)

## COURSE SCHEDULE – SPRING 2013

*(Note: Lecture presentations will generally not be available until after lectures are completed)*

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<td>Class organization, rationale, goals. GMO and TOX issues</td>
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<td><strong>Recitation:</strong> Anti- and pro-GMO worldviews</td>
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<td>Apr 4</td>
<td>Plant genetic engineering methods (SHORT INTRO ESSAY DUE)</td>
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<td>Apr 9</td>
<td>History of domestication and breeding; green revolution</td>
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<td><strong>REC:</strong> Dr. Oz: What’s Behind the Curtain?</td>
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<td>Breeding and genomics concepts, biotech application to animals</td>
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<td><strong>REC:</strong> Radiation and Fukushima</td>
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<td>Intellectual property in crop breeding and biotechnology</td>
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<td>Regulating GMOs</td>
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<td>Toxicology basics</td>
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<td><strong>REC:</strong> Wakefield and the vaccine scandal</td>
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<td>Natural toxins in food and environment (SECOND ESSAY DUE)</td>
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<td><strong>MIDTERM IN CLASS</strong></td>
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<td>May 7</td>
<td><strong>REC:</strong> India, GMOs and suicide YOU TUBE ENTRIES DUE TODAY</td>
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<td>May 9</td>
<td>World of pesticides</td>
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<td>May 14</td>
<td>Concepts of sustainability</td>
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May 14  | **REC**: The saga of Seralini | Grad/Honors  
May 16  | Biomonitoring of environmental chemicals | Stone  
May 21  | Risk perception | Stone  
May 21  | **REC**: Videos 1 – You Tube (student submissions) | Students  
May 23  | Is local food better?  
THIRD ESSAY DUE, grad/honors only | Grad/Honors  
May 28  | Golden rice & biofortification | Elorriaga  
May 28  | **REC**: Videos 2 – You Tube (student submissions) | Students  
May 30  | Nanotechnology | Harper  
Jun 4   | Discussion panel 1: Rodenticide Ban?/BPA ban? | Strauss/Stone  
Jun 4   | **REC**: Q and A and review session for final exam / student questions | Strauss/Stone  
June 6  | Discussion panel 2: Ban or label? Did California get it right or wrong? Should GE salmon be allowed? | Strauss/Stone  
Jun 10  | FINAL EXAM @ 9:30 Monday June 10th – Peavy 108 | Strauss/Stone

**Measurable Student Learning Outcomes:**

At the end of the class, students should be able to describe and critically analyze:

- Relationships among science, technology, and society with relation to GMO crops and pesticides using critical perspectives or examples from historical, political, or economic disciplines
- The role of science and technology in shaping breeding, and gene and chemical regulation, over time.
- How organisms have been domesticated, cultivated, and genetically manipulated via conventional breeding, and how biotechnology is similar and different
- The basic methods used to isolate and manipulate genes, and transfer them into plants, animals, and microbes
- The kinds of GE organisms in commercial use, and on the horizon for use in the near to mid-term, including insect-resistant corn, herbicide-resistant crops, medicine-producing livestock, and growth-enhanced fish
- How genetic engineering has modified agricultural practices with respect to pesticide use, soil conservation, water quality, and other environmental measures
- How environmental and health impacts of chemical use are studied and analyzed
- How chemical uses have led to unintended consequences, and how these lessons have informed subsequent laws and regulations
- How the toxicity of synthetic and natural chemicals compares and is regulated by governments
• How GE organisms are tested for food and environmental safety in the USA, the
government regulatory bodies involved, and their requirement
• How ethical values and perspectives affect social and personal acceptance of
GM crops and chemicals
• How the interests and values of populations in the poor and developing world
differ from those in the developed world with respect to GM crops
• The reasons for ideological as well as legal and ecological concerns by organic
farmers and some activist groups about GM crops
• Ability to critically analyze claims made by companies, scientists, and
government agencies about food and environmental safety of new agricultural
technologies
• Students should also be able to articulate in writing a critical perspective on
issues involving gene and chemical science, technology, and society using
evidence as support.

Grading

Student grades will be determined according to the following breakdown: Final grades
for undergraduates, undergraduate honors students, and graduate student grades will
be assessed separately.

• 20% = Participation (10%) / attendance (10%). Attendance will be determined by
iclicker responses and sign-up sheets at recitations. Participation will be rated by
instructors as low, average, or high (0.5, 0.75, 1.0) and used to multiply the
maximum 10% attendance score. Students are responsible for bringing their i-
clickers to class each lecture and recitation class meeting. Grades will be
withheld (incomplete) until the iclicker is returned at the end of class.
• 20% = Essays (2 submissions for undergrads, 3 for grad/honors students). First
essay (self-introduction) is worth 5%; the remaining one is worth 15%
(undergrads) or 7.5% for each of two more (grad/honors).
• 10% = Grad/honors only: 10-15 minute summary, and posing of discussion
questions, for a recitation or discussion topic (the questions to help stimulate
discussion). May be done by a pair of students depending on enrollment.
• 10% = Undergrads (non-honors) only: You Tube video contribution and both
written (50-100 words) and verbal explanation (in class) of why you chose it and
the lesson it provides.
• 5% = Written outline/text/ppt, and associated verbal presentation, for discussion
panels in last week of class)
• 20% = Mid-term exam
• 25% = Final exam

Extra Credit

“View any one of the video lectures and powerpoints provided via the OSU Food for
Thought Biotech Lecture Series (http://oregonstate.edu/orb/food-for-thought) and write
up a 2 (minimum) to 4 page (maximum) double-spaced essay (no references needed)
following the essay guidelines below, that show you have read and understood the WHOLE lecture, and CRITIQUE it in some way. Maximum credit: 3%.

Submit via SafeAssign like other written assignments, but alert us you have made a submission by email to the TA.

Class make up

Students will be excused from missing one class or recitation, whether for illness, family, or any other reasons. Excused absences beyond this will need to be discussed with the professors and must involve extreme circumstances. One excused absence can be made up if before the end of the last class they provide a 1 page, double-spaced, well written summary of the lecture powerpoint or reading (recitation) for that day.

Essays

All essays will be submitted online via the SafeAssign system in Blackboard (described below). For each essay submission, apart from that for the first short essay and the panel presentation, essays should be a minimum of 4, with a maximum of 5, double-spaced pages with 12 pt font and 1 inch margins (excluding references, and figures and tables; the latter, if used, which must be cited and placed after the text, and include a legend).

The first short introductory essay is a maximum of one single-spaced page that must include a photo of yourself to help us recognize you in class (the photo will not be posted or otherwise distributed). For this essay, use it as an opportunity to:

1. introduce yourself as it relates to the class (education, work, home background),
2. state why you have taken this class,
3. summarize your general familiarity with DNA, biotechnology, chemicals, toxicology
4. state what issues related to the course most interest you, and
5. state your hopes/goals for learning—i.e., what questions you have, or what knowledge you most hope to obtain via the class to help in your life, career, etc.
6. No references allowed

To allow you to become familiarized with the sensitive plagiarism checking tool present in SafeAssign (described more below), at the bottom of the page in your introductory essay insert one line copied directly from a published source. Perhaps use something you like a lot such as a favorite quote that tells us something about you. Label it “plagiarism test.” This should allow you to see how SafeAssign finds and highlights different types of plagiarized (or even quoted) text. This option will not be available to you (but will be to us!) after the first essay.
For the second (all) and third essay (honors/grad only), choose any topic of interest to you that is directly related to the class, and email the tentative title and a short description (1-2 line) of the essay topic to one of the instructors for approval prior to submission. These essays must be clearly and directly related to the course themes and have not been used for any other courses. The essay should not be too generic (e.g., “GMOs and agriculture,” or "Pesticides and our World," are not good topics; better topics would be "Herbicide tolerant crops and biodiversity" or “Is BPA an endocrine disruptor.” For each essay provide:

1. A summary of the general and technical aspects of the issue that cites and summarizes at least five (but no more than 10) published, credible references other than the assigned course readings, including high quality web pages from scholarly institutions, governments, scientifically credible NGOs, or high quality news outlets (blogs and Wikipedia are acceptable if they appear to be rigorous, credible, and/or are hosted by high quality media outlets or institutions). This should be about 2/3rds of the essay.

2. Your own insights/critiques and its justification (not simply your personal opinion) of the issue or reference(s) you have chosen to focus on. This should be about 1/3 of the essay.

3. Use of subheadings to help organize and communicate the logical flow of the essay is highly encouraged.

Essays will be graded based on technical content (70%) and quality/clarity of writing/organization (30%). To do well on the quality/clarity score, carefully check your essay for correct spelling, grammar, sentence structure, formatting, use of subheads, etc before submission. See the lecture schedule for essay due dates. Essays will only be accepted up to one week after the deadline date, but their value for class credit will be reduced by 50% if late. Please alert us via email if you will submit late. All submissions are via SafeAssign.

Give full literature references for all sources cited in a consistent, scholarly format with author, year, title, source, web site URL as hot link. For example:


60(9): 729-741.

Citations in the text should have this form: (LASTNAME or INSTITUTION, YEAR), examples: (Stone 2007, Stone and Strauss 2009, Stone et al. 1955, EPA 2004). Do not put URLs in the text; put them at the back with references.

Online submission of essays

This course uses SafeAssign, an online grading and plagiarism detection system within Blackboard. Students are required to submit designated written work through it. That system will check for matches between submitted work and internet sources as well as comparing submitted works for significant matches. SafeAssign returns reports assessing the percentage of text matching and allows the instructor to view suspected matches in order to judge the likelihood of plagiarism. It is highly effective; if you plagiarize you will be caught so don't do it.

A video on how to use SafeAssign, and a guide on how to cite and paraphrase correctly can be accessed at: http://ica.library.oregonstate.edu/subject-guide/1771-Academic-Integrity-for-Students

As defined in the Oregon State University Student Conduct Code, Plagiarism is: “Representing the words or ideas of another person or presenting someone else’s words, ideas, artistry or data as one's own, or using one’s own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing (including use of quotation marks), presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.”

For more information about plagiarism and how to avoid it, please refer http://www.plagiarism.org/. You are responsible for the content at this web site.

Consistent with the OSU Student Conduct Code, The primary purpose for using a plagiarism detection system is to “maintain and protect an environment conducive to learning, in keeping with the educational objectives of Oregon State University.” These educational objectives include proficient and individual effort in academic writing.

You may reduce the likelihood of plagiarism in your work in three ways:
1. Use proper style, quotations, and references.
2. Use the online Plagiarism Resource Site (see your online course site).
3. Consult with the OSU Writing Center (http://writingcenter.oregonstate.edu)

Submitted work in all classes at OSU that use it will be retained as comparison documents in the SafeAssign reference database. Works in that database will be
retained as source documents in future terms. Works in the SafeAssign reference database will be used solely for the purpose of detecting plagiarism.

Essays with plagiarism will either have their value reduced by up to 25% if only moderate instances are noted. Essays with multiple instances of plagiarism will not be graded but will be returned to students who will have one week to revise and resubmit the essay for credit; the maximum essay value will be reduced by 50%. Instances of repeated plagiarism will be referred to the OSU Office of Student Conduct and may result in failure of the class or more serious actions by OSU.

OSU has plagiarism prevention tools as well that are available at: http://ica.library.oregonstate.edu/subject-guide/1776-Academic-Integrity-for-Instructors?tab=519731.

Videos

For YouTube "videos" days during recitation, please identify one short video clip available on the web, either pro-biotech or anti-biotech (or pro- or anti-chemical), or just good and informative or very entertaining and related to the class themes. Upload the URLs as part of a 50-100 word description (at top state the subject and length) and then say why you think it's worth seeing. Upload under assignments in Blackboard by 5 PM on the date prior to the first YouTube session. Choose one that you can show most of (or a part of) in less than about 2 minutes. Please avoid any graphic images or language that might offend others. You may wish to team up with one or two other students to show something longer (time extended to max of 6 minutes for three students, but each must submit an independently written 50-100 word comment on it). After showing it, you will be asked to explain in less than 1 minute per 2 minutes of video why you chose it (funny, informative, absurd, etc) and thus its value or lesson. All students will then engage you in brief discussion about it.

Discussion panels

For the discussion panels at the end of the class (see schedule), before you speak provide a "transcript" with your name on it what issue you are addressing (BPA ban, rodenticide ban, GE salmon, GMO labeling). The write-ups should be 2 to 3 double spaced pages for the transcript, or 5 to 10 ppt slides if you choose to use powerpoint (ppt) slides for the presentation (please print two slides per page for readability, and use them when you speak). They will be graded in the same way, and have the same lateness policy, as described for essays above. You may assume a particular role if you wish, such as of an advocate for or against the issue, or simply present the facts and your conclusions as a citizen or scholar.

Structure and goals of panel discussions

The issue of "should we label" comes up time and time again with respect to GE and cloned animal foods. It brings to the fore, and forces us to integrate, many of the
science and social issues discussed in this class. People mostly want labels if asked, though most don't read or understand them, and the tracking that goes into labeling (not the printing cost) can be quite high, depending on how strict it is. Thus it can impose significant costs on consumers, for which the poorest will suffer most. Though perhaps intended to inform, labels about esoteric things that are not truly dangerous also can scare and mislead consumers about safety vs. benefit. Thus, many companies will choose not to include ingredients, even if beneficial to consumers and economics, if they might scare consumers. Consumer choice can therefore be reduced, not expanded, by labels. On the other hand, to many consumers it is a simple right to know issue, economics and perception notwithstanding.

Likewise, the issue of "should we ban" or strictly regulate a common and unregulated chemical forces us to reckon with all the scientific uncertainties, biases in arguments and viewpoints, and the benefits as well as costs to society for discontinued or greatly restricted use. It also forces us to consider the alternatives that would be used if use is restricted or stopped, for which there may be less knowledge of its effects.

You will make a presentation on a panel that is presenting expert and public testimony on government policy on a GMO or cloned foods issue, or alternatively on whether to ban or regulate a chemicals issue (separate sessions). The issues change each year; see the class meeting schedule. You only need to do one presentation, but they can fill up. Email Strauss as soon as you know the issue you wish to present on.

Whatever your viewpoint, use a logical and science informed argument that shows you understand the key issues (even if in an assumed role you choose to "bend" them). Please aim for two to three minutes for your oral remarks.

You may read from a prepared transcript (does not need to be word for word), or use powerpoint slides; either way, please hand in a printed version of your remarks that can be understood on their own at the time of your presentation (required length given in class web page on grading). If you use ppt, be sure to send the ppt slide presentation to Strauss via email by 4 PM the day before the panel discussion so we can have it on the computer, ready for you to show.

You will also be expected to cross-examine other panel members, so have at least one question ready for another panel member, preferably one directed at a member whose views are contrary to yours. Depending on time, there may be a small debate/discussion.

The issues you may wish to consider in your testimony and questions include:

- Is legal and ethical to label, increasing costs and possibly alarming consumers where scientific evidence is weak or still uncertain?
- Is there evidence that labels improve consumer choice, or the opposite?
- If GE and cloned foods are safe, why bother to label?
If a ban makes sense to you, when and how should it be implemented? Any exceptions for any reason?
If GE/cloned foods are considered scientifically safe, why NOT label...i.e., what are you hiding?
Should the chemical be allowed but a warning included on labels?
If we decide to label, how do we do it? What level of "contamination" warrants labeling? What is the threshold where no labels are needed?
What do we monitor and what do we print on the label?
How we verify compliance by companies (i.e., that labels are truthful of what is done)?
Who/how pays for the tracking and checking system?
What percentage of GE, cloned food, or chemical in a mixture deserves a label? Does it depend on amount of DNA, protein, chemical, chemical breakdown products, or documents that track the food supply chain?
How do we harmonize the different systems that might arise in different states and countries?
How do we deal with processed foods where the GE DNA or derived protein is chemically modified or removed so as not to be readily quantifiable?
How do we deal with restaurant food where food is often processed, mixed in complex and variable ways, and consumers generally do not want to read technical labels along with their fine wine?
Is it fair to label on the basis of process used, vs. the new/novel product properties?

Required readings and preparation for exams:
There is a rich literature of views and evidence about biotechnology and toxicology issues. Thus, doing the assigned readings is a major part of this course, and keeping up on them during the class is essential for you to understand the materials and lectures, and to take part in the recitation sections (most of which are primarily discussions of readings). You are responsible for the readings assigned for the day of the lecture or recitation.

For exams, it is best to look at old exams to get an idea of the level of preparation is needed. Several will be posted on the Blackboard site.

Recitation
For the recitations, we expect students to read the material beforehand and to actively participate in the discussion of the recitation paper. The intent of the recitations is to provoke thoughtful responses and elicit your perspective on complex or controversial issues. Honors and graduate students are required to lead or co-lead one recitation. At the start of recitation, the student will present a summary of the papers for review, including the scientific underpinning of the article(s). This summary should be 15-20 minutes and can be an oral discussion or powerpoint. If co-leading a presentation, the student is expected to coordinate with their co-presenter in advance of the presentation.
Students with Disabilities

"Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098."

Bacc Core Learning Outcomes

This class qualifies for the Bacc Core in the Synthesis category of Science, Technology, and Society. The student learning outcomes for courses in this area are for students to be able to:

1. Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
2. Analyze the role of science and technology in shaping diverse fields of study over time.
3. Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.

Evaluation of Bacc Core learning outcomes with respect to class content

Criterion 1: Many lectures and readings in class explicitly include historical, political, or economic perspectives and information. Students will be evaluated for their understanding of this information by their participation in relevant class discussions, and by evaluations of exams, essays, and presentations. For example, students will be expected to understand regulation of GMO crops and pesticides in relation to historical practices in plant breeding, patents, and chemical development, and the economic and political forces and consequences pertaining to these developments.

Criterion 2: Many lectures and readings in class explicitly include consideration of how related fields of study have been affected by genetic and chemical technology. Examples include how recombinant DNA methods gave rise to the discipline and business of genetic engineering, and how advances in basic chemistry have given rise to pest management/fertilizer businesses and fields of study.

Criterion 3: All students must write, and are graded, essays on gene/chemical topics related to course content that include 2/3 on data and evidence related to the topic, at least 1/3 on a critical analysis of the core issues pertaining to the technology and/or social acceptance. It is an essay requirement that they cite literature and facts as evidence for positions they take.

Graduate Student Work and Learning Outcomes
As outlined above, graduate students must lead a recitation session and submit an additional analytical essay. In addition to the BAC core learning outcomes described above that apply to all students, graduate students will:

- Understand the relevant biology, food safety, legal, and environmental issues with suitable depth and capacity to integrate among the various issues.
- Be able to propose solutions, in the form of biological innovations and regulatory modifications, that might help to resolve important pesticide and GMO crop issues.
- Critically evaluate the biases inherent to information from various sources, including to identify the ideologies and information frames adopted by various interest groups and citizens.