

# Philosophy of Science and Public Policy

PHIL 93825, HPS 93825

Spring 2014

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Professor: Dr. Kristin Shrader-Frechette

Class Time: Monday 3:30-6:00

Classroom: TBA

Website: <http://www.nd.edu/~kshrader>

Office Hours: Monday and Tuesday, 2-3:15 pm, or other days/times,  
by prior arrangement

email: [kshrader@nd.edu](mailto:kshrader@nd.edu)

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Welcome! To help professor learn everyone's name, quickly, and to facilitate review papers, please sit in the same spot for every class.

**Place of Office Hours:** Malloy 211 (sign-up sheet available on office door).

**Late-Paper Policy:** Professor accepts no late papers except in case of sickness and required MD note. All late papers will receive grade of zero. In case of sickness, students must contact professor before due date/time.

**Questions:** At beginning of each class, the professor asks for questions. At this time, be sure to ask questions about assignments, research, procedures, or content of prior lectures. For government-research, scientific-journal, journal-database questions for your paper assignments, see professional ND (research or govt.-doc) librarians. Before emailing the professor with a question, be sure to (1) read the syllabus carefully and (2) ask the question at class.

**Contact Information:** Please see Dr. Shrader-Frechette during her office hours or after class. For appointments, please sign the sheet on her office door. If none of these appointment times will work, please follow directions on the office door and, two weeks ahead of time, email her at [kshrader@nd.edu](mailto:kshrader@nd.edu) to let her know 4 times that you are available Monday-Wednesday. Dr. Shrader-Frechette receives about 100 emails daily, many handled by her assistant. Unfortunately, this high email volume means she cannot quickly answer student emails, so be sure to plan ahead; email her early. She wants to see everyone, so please do not hesitate to see her. For emergency/sickness contact, email her at [kshrader@nd.edu](mailto:kshrader@nd.edu). Be sure to sign up for appointment or contact Dr. Shrader-Frechette early, as she often is out of town weekly (doing science–advising work in Washington, DC – or pro-bono science work). Often she cannot quickly see those who do not make appointments early.

This course will (1) introduce students to classic readings in philosophy of science (by Carnap, Cranor, Hempel, Kitcher, Kuhn, Laudan, Longino, Machamer, Mayo, Schaffner, Scriven, Woodward, and others, and (2) provide an overview and analysis of different accounts of scientific explanation (e.g., deductive-nomological, mechanistic, unificationist, counterfactualist, etc.) It also will (3) investigate the role of epistemic and ethical values in contemporary science – and how these values affect both scientific method and science-based policy. Finally, the course will (4) show how misuse of scientific method – and ignoring classic philosophy-of-science insights – causes flawed science and flawed science-based, public policy. Case studies will come from contemporary public-policy disputes in biology, epidemiology, hydrogeology, medicine, and toxicology. These case studies will assess the validity of scientific methods used to assess theory choice in science, esp. theory choices about climate change, medical diagnosis, pollution-induced deaths, species losses, and nuclear accidents. The main course work will be students' continually revising a short paper, whose topic is chosen by the student. This will enable the eventual paper, after 3-4 revisions-with-comments, to be in near-publishable form. Students will also do very short comments on the papers of others. Typically, about half the students in the course get an immediate publication from the course.

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<b>Course Goals</b>	1 to introduce students to a basic overview of the classic texts in philosophy of science
	2 to show students that typical mistakes in philosophy of science, epistemology, and logic underlie much flawed science that is misused (often by special interests) so as to support questionable public policy
	3 to develop students' logical, argumentative, and analytic skills
	4 to help students learn to write <u>a short, publishable paper – through repeated revisions</u>

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<b>Class Readings</b>	1 Thomas McGarity and Wendy Wagner, <u>Bending Science</u> , Harvard U Press, 2008, 299 pp., paper \$23.95.
	2 David Michaels, <u>Doubt Is Their Product: How Industry's Assault on Science Threatens Your Health</u> , Oxford University Press, 2008, 265 pp., hardcover \$18.45.
	3 classic philosophy-of-science articles, supplied by prof. in e form, by Carnap, Cranor, Feyerabend, Harman, Hempel, Jasanoff, Kitcher, Kuhn, Laudan, Lipton, Longino, Machamer, Mayo, Schaffner, Scriven, Shrader-Frechette, Woodward, and others. (no tests or quizzes, but 15 pages of analytic writing, plus 9 pages of revisions)

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<b>Class Assignments</b>	1 one-page BS (bad-science) paper, due at class 3
	2 one-page CA (class-analysis) paper for topic in classes 5-12, due class 5. Give prof. a priority-ranked list of 3 topics, eg., 5 Kuhn-con, 6 Mayo-pro, 11 Cranor-pro (OPTIONAL)
	3 one-page RP (review papers) of 4 assignments (2,4,5,6 here) for student on left, each of which is due on the same day as the respective main paper is due
	4 one-page four-item, AOR (argument-objection-response) paper, due class 7
	5 one-page revision of paper 4, AOR-REV paper, due class 8
	6 eight-page FP or final paper, double spaced, based on paper 5, due class 10
	7 eight-page revision of paper 6, FP-REV, final-paper revision, double spaced, due class 12

Assignments 1, 4-7 above are directed at writing a near-publishable paper by the end of the course, and these four assignments (all versions of the final paper) are 50+ percent of the course grade.

All assignments must be single spaced, except assignments 6-7, which must be double spaced.

There will be no tests or quizzes unless most of class members repeatedly fail to do assigned reading.

Note that **all required papers (1) must have line-numbering and page numbering** (so that prof. can always refer to specific line numbers in making comments on paper), and (2) must make corrections based on professor's earlier criticisms. If papers do not address earlier criticisms of professor, they will lose double points.

Students who do not bring copies of papers for class members; or do not bring 2 copies of R papers for professor; or do not bring copies of papers for professor's box (2 days early), on time, will automatically **lose 5 points** for each failure. R papers are due on dates listed above, at class.

<b>Basis for Grades</b>	Assignment 1	10 percent	
	Assignment 2	10 percent	(OPTIONAL)
	Assignment 3	10 percent	
	Assignment 4	20 percent	
	Assignment 5	10 percent	
	Assignment 6	20 percent	
	Assignment 7	10 percent	
	Classroom Analysis	10 percent	

## **Format for BS, CA, AOR Papers (One Page Only)**

1. State your four-part thesis in the form “A is B because 1, 2, 3, and 4.” Sample thesis: “Laudan’s comparativist philosophy of science is incomplete because (1) he ignores the role of evidence in science, (2) he is unable to define ‘progressive’ theory choices, (3) he ignores unsolved problems, and (4) he is unable to explain the role of anomaly in science.”
2. Provide 3 sentences (including an argument, an objection, and a response to the objection) to support each of the claims 1, 2, 3, 4 that support your thesis. These 3 sentences should be numbered as follows: 1A, 1O, 1R; 2A, 2O, 2R; 3A, 3O, 3R; 4A, 4O, 4R. Each of these 12 sentences should be of the form “A is B because C.” Sample 1A, 1O, 1R:
  - (1A) Laudan ignores the role of evidence in science because he says a theory’s being tested means only “that it has survived tests its known rivals have failed to pass” (Laudan 1977, 314), and therefore, for Laudan, evidence against a theory can be ignored until some other theory is successful in meeting this evidence.
  - (1O) Laudan does not ignore evidence because he recognizes evidence for what scientists are interested in knowing, and he says scientists are “interested less” in hypotheses’ truth or probability than in their ability to “solve empirical problems” (Laudan 1997, 306), or to make “the most progressive theory choices” (Laudan 1977, 30).
  - (1R) Laudan errs in assuming scientists are more interested in evidence for comparative theory assessment, than for truth/probability, because many areas of science (e.g., toxicology, population biology, psycho-metrics, epidemiology) use statistical evidence to assess the probability of single hypotheses, independent of competing hypotheses.
3. Use only 1 page for your 12 sentences (1A, 1O, 1R; 2A, 2O, 2R, etc), and use 1 page for references, cited in the style of the journal, Philosophy of Science.
4. Use in text citations of the form (author last name, date, page).
5. Provide at least 5 references that you use in 12 sentences.
6. If students wish, instead of format above, for paper BS, they can follow the format of the paper on p. 4, in which students should (1) state a quotation from some “bad science” source from a non-popular journal, book, government report, or other reputable source—a quotation that reveals the errors you hope to criticize; (2) state your own thesis about these errors; and (3) provide arguments for your thesis.
7. If students wish, instead of format above, for paper CA, they can follow the format of the paper on p. 5.

### **POSSIBLE TOPICS FOR BAD SCIENCE AND LATER PAPERS**

Document how (1) heavy metals cadmium, lead may cause neurodegenerative diseases; (2) HM copper, zinc, arsenic may cause neurodegenerative diseases; (3) HM cadmium, lead may bio-magnify up the food chain; (4) HM copper, zinc, arsenic may biomagnify up the food chain; (5) nuclear cleanup at Rocky Flats is incomplete; (6) nuclear cleanup at Hanford is incomplete; (7) diesel should be named a hazardous air pollutant; (8) East LA environmental-pollution-impact report is scientifically flawed and unjust; (9) East LA environmental-health impact report is scientifically flawed and unjust; (10) “trickle-down” is a flawed economic hypothesis; (11) there are no health standards/regulations for ultrafine pollution; (12) there are no special pollution regulations for children—who are more sensitive.

**BS Paper Sample** [an A paper, but references need updating, and lines need numbers]  
(BASIS OF AOR PAPER)

**BAD SCIENCE QUOTATION:** For “people with childhood exposure to iodine-131 (I-131) fallout from nuclear-weapons testing in Nevada from 1951 to 1962 . . . the risk of developing thyroid cancer is still small . . . less than many other cancers [from other causes] in the general population. Thyroid cancer is rarely life-threatening. . . . [Therefore] routine screening for thyroid cancer is not recommended.” (IOM 1998, 113-114).

**Thesis:** At least 5 reasons suggest many US citizens, especially children, were harmed by the nuclear tests and I-131.

1. Many US children were harmed – especially women now about 45-55 old and those who drank milk from backyard cows/goats – because such doses induce thyroid disease; many received lethal radiation doses, above 160 rads (IOM 1998, p. 42); 3.5 million US children received doses 50 times above annual background; and all doses are risky (US Congress 1998, pp. 421-439).

2. Although the National Academy of Sciences (IOM 1998) and National Cancer Institute (NCI 1997) minimize fallout-caused cancers, they underestimate them because they calculated only average risk from fallout, ignored the higher risks to children and to the medically sensitive 25 % of the population, ignored all non-cancer thyroid diseases/ deaths, and all effects not caused by I-131 (NCI 1999, pp. B-8 through B-29; Shrader-Frechette 2004).

3. Objectors say average fallout risk was low (IOM 1998), but other groups, like Physicians for Social Responsibility (Rush and Geiger 1997-1998, pp. 1-2), say I-131 cancers are 600-700 % higher than IOM says, and MIT scientists estimate global, US-fallout-caused fatal cancers at one million (Makhijani, Hu, Yi 1995).

4. Although objectors claim that I-131 fallout likely caused only several hundred thousand additional cancers, even IOM (1998, p. ES-2) says I-131 doses were “too uncertain” to be used in estimating risk (IOM 1998, p. ES-2); as a result, the I-131 risks are at best uncertain, not low.

5. Objectors say fallout had no obvious effects, but this ignores statistically significant increases in fallout-related childhood leukemias and other cancers (US Congress 1998) and the fact that test-era radiation-risk estimates have been shown to be massive underestimates (Abbott and Barker 1996).

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Abbott A, Barker S. 1996. Chernobyl damage underestimated. **Nature** 380 (6576): 658-659.

Institute of Medicine (IOM). 1998. **Exposure of the American People to Iodine 131 from Nevada Nuclear-Bomb Tests**, Washington, DC, National Academy Press.

Makhijani, A. Hu, H., and Yih, K. 1995. **Nuclear Wastelands**, Cambridge, MIT Press.

National Cancer Institute (NCI). 1997. **Estimated Exposures and Thyroid Doses Received by the American People from Iodine-131 in Fallout Following Nevada Atmospheric Nuclear Bomb Tests**, NIH Publication 97-4264, Washington, DC, National Institutes of Health.

Rush, D, Geiger, J. 1997-1998. NCI study on I-131 exposure from nuclear testing: a preliminary critique, **Physicians for Social Responsibility** 4 (3, Winter): 1-5.

Shrader-Frechette, K. 2004. Comparativist rationality and epidemiological epidemiology. **Topoi** 23 (1): 153-163.

US Congress. 1998. **National Cancer Institute's Management of Radiation Studies**. Washington, DC, US Government Printing Office.

[Note: This is an “A” paper but would be better with newer references and with numbering of 5 arguments in the thesis.]

**Thesis:** Chapter 9 of *How Are We to Live?* discusses the nature of ethics, dismisses several theories of ethics, and supports some ethical principles that (Singer says) lead to universal concern for others. There are at least 5 reasons to suggest Singer’s positive account lacks sufficient evidence and that his dismissal of other theories is unwarranted.

1. Singer discusses the possibility that ethics is gendered and hypothesizes that “the predominance of women in environmental and animal movements therefore suggests a greater readiness to work for larger goals and not just to help oneself or one’s own kind” (179) because they have adopted more of an ethics of universal concern, or “care-ethic.” However, one study suggests the care-ethic was not significantly higher in female participants who volunteered than in those who did not (Karniol et al 2003). Partly because Singer may erroneously identify behavior and concern, he insufficiently documents the claim that the nature of ethics has a gender component.
2. Singer claims, as R.M. Hare does, that ethics must be “universalizable,” that we should be “prepared to prescribe them independently of the role that we occupy” (174), taking the needs and desires of all other beings into account. However, Olson and Svensson (2003) show Hare used the term “universalizable” in only one sense: situations with identical properties merit identical moral judgments. Singer may misinterpret Hare and thus have little Hare support that moral judgments must take into account desires and needs of other beings.
3. On page 172, Singer claims that Christianity creates overwhelming guilt and causes the abandonment of ethics in some people because of unnecessary tension between self-interest and ethics when Christians emphasize “the denial of harmless bodily pleasures, especially sexual pleasures.” Yet the philosopher, St. Augustine, argues in his *Confessions* that sexual pleasures can often be harmful, in that they “overcast [one’s] heart so that [one] is unable to discern pure affection from unholy desires” (Second Book, ch.2). Singer does not address the possibility that moral rules of sexual purity protect people from some harm, such as blinding one’s reason, and he may therefore be unwarranted in dismissing the Christian emphasis on moral rules concerning sexuality.
4. Singer claims the Buddhist tradition is “a failure in social terms” (190) because in Japan, the ‘first precept’ of Buddhism is not upheld: sentient beings are used as food. However, when Singer judges Buddhism, he is assessing Japanese adherence to Theravada Buddhism, though the Buddhism that was introduced into Japan was a less-strict, less-purification-oriented Mahayana Buddhism (Burt 1982). In applying the standards of one form of Buddhism to another, Singer may unfairly reject Buddhist ethics.
5. Singer refutes the Kantian concept of morality by showing that horrific Nazi acts (e.g. acts of Adolph Eichmann) were merely a consequence of blindly adhering to duties for their own sake (184). However, Claudia Koonz studied the Nazi motivation for genocide and concluded in her book, *The Nazi Conscience*, that the Holocaust was a result of extreme racism that developed into violence, as German society saw the ethnic majority as morally righteous and denounced corrupting outsiders (Koonz 2005). Given other explanations for the Holocaust, it may be unfair for Singer to dismiss Kantian duty, based on Eichmann’s claim of duty.

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Burt, E.A. 1982. **The Teachings of the Compassionate Buddha**. New York, New York: New American Library.

Karniol, R., Grosz, E., Schorr, I. 2003. Caring, Gender Role Orientation, Volunteering. **Sex Roles** 49 (1-2): 11-19.

Koonz, C. 2005. **The Nazi Conscience**. Cambridge, Massachusetts: Harvard University Press.

Olson, J., Svensson, F. 2003. A Particular Consequentialism: Why Moral Particularism And Consequentialism Need Not Conflict. **Utilitas** (15) 2:194-207.

Pilkington, J.G. 1876. **The Confessions of St. Augustine, Bishop of Hippo**. Edinburg: T. & T. Clark. Digitized Oct 3, 2007.

Singer, P. 1995. **How Are We to Live? Ethics in an Age of Self-Interest**. Amherst, New York: Prometheus Books.

[Paper is an A paper, except for needed newer references, line numbering, and listing and numbering arguments in thesis.]

## Additional Requirements, BS, CA, AOR Papers

Because AOR paper is based on the BS paper, if there are uncorrected problems with the BS paper, there will be massive, compounded problems with the AOR paper. All papers should be succinct, precise, clear, and well argued—with only minor flaws. Your papers should be fine, if you follow my directions and syllabus directions—and if you correct all problems noted on the earlier papers. Use the table/column page, returned by professor, to correct all papers, as instructed earlier.

Remember that your BS, CA, and AOR papers, and their revisions, should:

- (1) contain only argument, and no summary;
- (2) contain no extraneous words, phrases, sentences, comments, redundancies, etc. that are not absolutely necessary to the clean line of your precise argument;
- (3) contain no more than one side of one paper for the arguments, and no more than one side of one page for references;
- (4) avoid use of “this” as pronoun, passive voice, rhetorical questions;
- (5) contain enveloped copies of all prior, corrected/graded drafts of those papers, so that I can ensure you are not repeating the same mistakes that I corrected earlier;
- (6) list (and number) the main specific arguments in the thesis;
- (7) be crisp, clear, and well argued, in a concise way, so that we all easily can check the logic, and so that all papers look like the sample papers in the syllabus;
- (8) not contain any question-begging claims where you say “A is B” when you should be saying “A is B because C.”

Ideally, the BS, CA, and AOR papers should be of the form:

Smith (errs) (is correct) to say “A is B because C” because Smith assumes/ is (in) complete/ is (in) consistent/ is (in) coherent/ etc in claiming D—because E.

Remember, your papers should look like the sample papers in the syllabus—which have no footnotes or endnotes and no extraneous material—only arguments. In particular, for excellent AOR papers, see two undergraduate papers, “Sample Paper McCann P1,” and “Sample Paper Nowalk P,” both of which can be found under “ND Course Material” on my website at <[www.nd.edu/~kshrader](http://www.nd.edu/~kshrader)> or see my EJ syllabus, on my website, under “ND Courses.” Note that McCann and Nowalk papers have other material in them, besides AOR, but at least you can see what good AOR argument-chunks look like. They are not “woolly,” not confusing, not full of extraneous material.

## Instructions FP paper

Your FP paper (4-8 pp. maximum) should have 9 parts, each of which is numbered and labeled, so that I can tell what you are trying to do. These parts are given below:

- 1 [Snappy] Title;
- 2 [One-paragraph] Abstract of no more than 100 words (use frame and your basic arguments to do this);
- 3 [Very short, one-paragraph] Hook to motivate readers;
- 4-5 [One paragraph that provides a] Frame for your paper and a history of the literature on the problem you are discussing;
- 6 [One paragraph that explains the] Importance of the unsolved problem, and your solution to it, either theoretically or practically, or both;
- 7 [The main body of your paper, which follows the argument, objection, response outline; which has one section (of the paper) for the] First Argument-obj-resp, a second section for the Second Argument-obj-resp, a third section.....; and which develops/explains/argues for each A,O, and R;
- 8 [A one-paragraph] Conclusion that repeats what you have done and suggests further avenues for research;
- 9 [An alphabetical list of] References that is complete, consistently formatted, and follows the style of the journal Philosophy of Science. If you plan to submit to another journal than Philosophy of Science, submit the style-format page for that journal, so that I can check your formatting.

## Instructions, FP Paper, Continued

Up to this point, recall that you have written a “bad-science” paper, as well as an “argument-objection-response” paper, based on the bad-science paper. The goal now is to prepare your final paper FP. To help you with this task, I give below some further instructions that make the paper-writing process more explicit. Recall that the purpose of the bad-science and other paper is to provide a case study and beginning argument for a final paper. To get a good FP, your paper needs to have 9 parts, noted in the previous section of this paper (title, abstract, ... conclusion, references). In addition to these 9 parts, your paper must meet 3 additional criteria, new, citations and support. For more details on these 9 “parts” and 3 criteria, see below:

Part 4, **F FOR FRAME**: Be sure to frame your paper so that your existing argument or case study or science problem is an example of a bigger conceptual, ethical, or factual problem. This framing means that you have a target journal in mind for your publication, and that you frame your material in terms of a phil science problem, an EJ problem, an ethics problem, a policy problem, or a science-education problem. This frame for your paper will be apparent in the abstract you provide for the paper (100 words max).

Part 5, **L FOR LITERATURE AND HISTORY**: Do a literature check on the problem you are discussing, your thesis, the relevant arguments, etc., and provide a one-paragraph history of work on this problem. That is, you need to know, really well, all the relevant literature on the topic that your paper addresses—so that you can provide a context of who, when, where, how this problem has been addressed. Use indices to do this work, to be sure that you catch major journals and books.

Part 6, **I FOR IMPORTANCE**: After you do the L step, above, you need to write one paragraph to explain why the problem you address is important, either theoretically or practically, and why addressing it will likely lead to important consequences for scholarship, for philosophy, for science, for policy, or for practice, etc.

Part 7, **B FOR BODY**: Write one section for each AOR chunk (4 such chunks).

Criterion **N FOR NEW**: After you have done a literature check on the problem you are discussing (step L above), you need to make sure that your proposed paper does not “reinvent the wheel.” Remember that journals are interested only in something new. You can repeat points made by others, but you will need (1) to cite all/most of the other authors that make similar points, and (2) you will need to be sure that most of your paper adds something genuinely new to analysis of the problem. Otherwise, no one will publish your paper.

Criterion **C FOR CITATIONS**: Be sure that you have citations, esp. Quotations when needed, for each argument, for each objection, for each response. Every A, O, R needs not only (1) citations, but also (2) an example to back it up and to illustrate your point. Be sure that you have, also, (3) claims of the form “A is B because C”—and that you make no question-begging claims anywhere in the paper. You can use in-text citations, following the standard scientific and philosophy-of-science format, e.g., (Smith, 2009, p. 84).

Criterion **S FOR SUPPORT**: In connection with step L above, be sure that you have citations to everyone/most of the people who make the similar kinds of mistakes as those that you criticize—so that your paper looks as if you are not attacking one stray lunatic—but a powerful position. Papers that attack widespread, powerful positions are more important and more likely to be published than those who attack one lone lunatic. Hence, try to (1) generalize the targets of your paper by getting other citations to other related literature, and try to (2) show that the position you attack is widespread, and why it is so.

## **Format for 1-Page (Only) Assignment, Paper RP (Review Paper):**

4 one-page **review papers (RP)**, of assignments 2, 4, 5-6, of persons on your immediate left, are due at class on same day as the person's papers are due. Bring copy for professor (and for everyone in class) of review papers of assignments 2, 4-6. Each of these 4 papers must have at least 6 numbered sentences (3 positive, 3 constructive criticism), with blank lines between points, assessing the paper. Use the 5 criteria. Separate sentences/points should be numbered, and skip at least one line after each point. Each sentence must be of the form: "A is B because C." Each sentence should list a precise argument or reference being evaluated. Sample positive sentence: "Mary Smith's argument 3 is more convincing because it effectively answers a prominent objection to her thesis, namely that the consensus of journal articles does not agree with her position." Sample constructive-criticism sentence: "Joe Brown's second argument is weak because, although Joe seems possibly correct to argue that his grandmother's breast cancer occurred because of her taking menopausal hormones, Joe does not systematically eliminate other likely causes of her cancer, such as family history or genetics." Mention specific arguments and claims of author, and make no general statements about the paper. Avoid hasty generalizations, such as "Joe's paper is good because. . . ." Have someone else read paper, to check for problems of logic, clarity, or grammar. No later than 48 hours prior to class beginning, people whose papers are being evaluated should give professor hard copy in 211 Malloy box and should send professor and their evaluator final email copies of their papers. In email subject line, put: "Paper for PS." If authors do not send paper to professor and evaluators in time, authors will lose 20 points. Always check the grammar sheet, given by professor, before you turn in your paper. Format: at center top of paper R, put: "Review of Joe Smith Paper." Skip 2 lines, and at far left, put your own name, followed by: "PH Class." Class-analysis grade will depend partly on how well you present RP in class. Be sure to bring extra copy of RP paper to class, so that you can present it. Develop each RP point completely and precisely, and give full reasons for each point. Students who forget extra copies of RP papers will lose 5 points.

## **ABOUT THE PROFESSOR**

Kristin Shrader-Frechette has degrees in mathematics and in philosophy of science and has done 3 post-docs, one in hydrogeology, one in economics, and one in population biology/community ecology. Author of 380 professional papers and 16 books, KS-F has had her work translated into 13 languages. It has appeared in science journals such as Science, BioScience, Health Physics and Quarterly Review of Biology, as well as in philosophy journals such as Ethics, Philosophy of Science, and Journal of Philosophy. Her 2007 book is Taking Action, Saving Lives, and her latest book, What Will Work, appeared in 2011. Shrader-Frechette has addressed the national academies of science in 3 nations and advised various foreign and US governments, the UN, and the WHO on science-related issues, e.g., quantitative risk assessment. Shrader-Frechette just finished 2 terms on the US EPA Science Advisory Board. She also has served on many committees and boards of the US National Academy of Sciences, the UN, the WHO, and the International Commission on Radiological Protection. Her HPS research has been funded continuously by NSF for 27 years. She is Past President of the Risk Assessment and Policy Association, the International Society for Environmental Ethics, and the Society for Philosophy and Technology. She is on the editorial board of 18 top journals, including Philosophy of Science, and was a candidate for the presidency of the Philosophy of Science Association in 2013. See her website at [www.nd.edu/~kshrader](http://www.nd.edu/~kshrader).



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## PHILOSOPHY OF SCIENCE AND PUBLIC POLICY

### OUTLINE OF LECTURES, ASSIGNMENTS, AND DISCUSSIONS

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<b>Monday 1-13-14</b>	<b>1</b>	<b>From Carnap and Hempel to Feyerabend: Alternative Accounts of Scientific Explanation</b>	
	1.1 Lecture-Discussion	<ol style="list-style-type: none"><li>1 Introduction to course; course overview</li><li>2 "Big picture" lecture on the scientific-explanation continuum</li><li>3 KS-F on climate change, data trimming, and <u>Rolling Stone</u></li><li>4 KSF on ATSDR and the death of toddler Emily Pearson</li><li>5 Read Bokulich paper before this class. (total reading: 19 pages)</li></ol>	
	1.2 Student Analysis	Discuss topics above during classroom exchanges.	
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<b>1-20-14</b>	<b>2</b>	<b>The Logical-versus-Historical-School Debate in Philosophy of Science and Its Separatist Consequences for Public Policy</b>	
	2.1 Lecture-Discussion	<ol style="list-style-type: none"><li>1 Students choose CA paper topics (3 ea); due today</li><li>2 Read Carnap, <u>Philosophical Foundations of Physics</u>, chs. 23-25 (19 pages)---and (optional only) Hempel-Oppenheim, "Studies in the Logic of Explanation," <u>Phil. of Science</u></li><li>3 Read Feyerabend article (8pp)</li><li>4 Read McGarity-Wagner, <u>Bending Science</u>, 1-59 (total reading: 107 pp., 59 of which are easy)</li></ol>	
	2.2 Student Analysis	Discuss and analyze readings above during classroom exchanges.	
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<b>1-27-14</b>	<b>3</b>	<b>Scientific Consensus and Popper's Falsificationism: The Case of Climate Change Science</b>	
		BS PAPER DUE (e.g., false-negative cancer studies, etc.)	
	3.1 Lecture-Discussion	<ol style="list-style-type: none"><li>1 Read Popper (5 pp)</li><li>2 Read Oreskes (30 pp)</li><li>3 Read Michaels, <u>Doubt</u>, ix-44, 192-211 (total reading: 99 pp., 64 of which are easy)</li></ol>	
	3.2 Student-Analysis	Students present BS papers; class will discuss/analyze first half of student BS papers.	

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2-3-14

**4 Laudan, Schaffner, and the Historical School in Philosophy of Science:  
Comparativist Accounts of Scientific Explanation**

- 4.1 Lecture-Discussion
- 1 KS-F on theory comparison, necessary, but often flawed, as in risk comparisons; fallacy of false analogy
  - 2 Read Schaffner , “Theory Structure in the Biomedical Sciences,” from J of Medicine and Philosophy ( 40pp)
  - 3 Read Laudan , “How about Bust?” from Philosophy of Science (10 pp)
  - 4 Read KSF on comparativist philosophy of science (Laudan) from Philosophy of Science (11pp)  
(total pages to read = 61, none of which are easy)
- 4.2 Student Analysis
- Students present BS papers; class will discuss/analyze second half of student BS papers.
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2-10-14

**5 Carnap to Kitcher, Kuhn, Longino, and Scriven, to Latour  
Alternative Accounts of Values in Science**

CA AND RP PAPERS DUE

- 5.1 Lecture and Discussion
- 1 KS-F will do “big picture” lecture on values in science.
  - 2 Read Carnap in Minn. Studies in Philosophy of Science (38 pp)
  - 3 Read Longino ,”Beyond Bad Science,” STHV, 1983 (10 pp)
  - 4 Read Scriven on value judgments (28 pp)
  - 5 Read Kuhn , ch. 13 of Essential Tension (13 pp)  
(total pages to read = 89, 23 of which are easy)
- 5.2 Student Analysis
- Pro Carnap \_\_\_\_\_ Con Carnap \_\_\_\_\_  
Pro Kuhn \_\_\_\_\_ Con Kuhn \_\_\_\_\_
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2-17-14

**6 Epistemic or Methodological Value Judgments in Science  
And Their Public-Policy Consequences**

- 6.1 Lecture-Discussion
- 1 KS-F overview of methodological value judgments, esp. in stats
  - 2 Read Mayo on sociological & metascientific explanation (30pp)
  - 3 Read McGarity-Wagner, Bending Science, 60-228  
(total pages to read = 198, of which 168 are easy)
- 6.2 Student Analysis
- Pro McGarity-Wagner \_\_\_\_\_ Con M-G \_\_\_\_\_  
Pro Mayo \_\_\_\_\_ Con Mayo \_\_\_\_\_
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2-24-14	7	<b>Epistemic or Methodological Value Judgments in Science: The Case of Biochemical Hormesis, The Case of Community Ecology</b>	FAO AND RP PAPERS DUE
	7.1 Lecture-Discussion	1 KSF on conceptual analysis of terms in community ecology; Lewis and equivocation 2 Read Calabrese and Baldwin in <u>Nature</u> , 2003 (2pp) 3 Read Cook and Calabrese, 2006 (4pp) 4 Read KSF on hormesis from <u>H and E Toxicology</u> (44pp.) (total pp. to read – 50, none of which are easy)	
	7.2 Student Analysis	Class will present AOR papers, and reviewers and class will analyze them.	
3-3-14	Class analysis to ensure that paper AOR-REV is perfect. It is due next class.		
3-10-14	<b>SPRING BREAK</b>		
3-17-14	8	<b>Public-Policy Consequences of Ignoring Methodological Value Judgments in Science</b>	AOR-REV AND RP PAPERS DUE
	8.1 Lecture-Discussion	1 KS-F will lecture on science “tricks” that “hired” scientists use 2 Read Michaels, <u>Doubt</u> , 45-160 (total pages to read = 115, all easy)	
	8.2 Student Analysis	Class will present AOR-REV papers, and reviewers and class will analyze them .	
3-21-14	<b>LAST DAY TO DROP</b>		
3-24-14	9	<b>From Machamer and Kitcher to Harman, Lipton, and Schaffner: Alternative Accounts of Causal Evidence and Theory Choice</b>	
	9.1 Lecture-Discussion	1 KS-F will give “big picture” lecture on causal evidence in science 2 Read Machamer et al on mechanisms, from <u>Philosophy of Science</u> (24pp) 3 Read Kitcher on unificationist accounts from <u>Philosophy of Science</u> (24pp) 4 Read Lipton from <u>Episteme</u> (13pp) (total pages to read = 62, of which 13 are easy)	
	9.2 Student Analysis	Pro Machamer _____ Con Machamer _____ Pro Kitcher _____ Con Kitcher _____	

3-31-14

**10 Scientific Certainty and Woodward's Account of Causal Decision-making: Evidence for Harm from Environmental Pollutants**

FP AND RP PAPERS DUE

- 10.1 Lecture-Discussion
- 1 Read Woodward, "Explanation..." in Phil. of Science (15pp)
  - 2 Read KS-F on Woodward, TMI, in Philosophy of Science (20 pp)
  - 3 Read Michaels, Doubt, on uncertainty(161-91), militarism (212-3)  
(total pages to read = 84, of which 49 are easy)

10.2 Student Analysis Pro Woodward \_\_\_\_\_ Con Woodward \_\_\_\_\_

Students present first half of FP papers, and class and reviewers will analyze them.

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4-7-14

**11 From Laudan and Savitz -- to Haack, Schaffner, Wing, and Cranor: Alternative Views of Scientific, Especially Epidemiological, Methods and Their Policy Consequences**

- 11.1 Lecture-Discussion
- 1 KS-F: "big picture" lecture, black-box vs. ecological explanation
  - 2 Read Schaffner, "Causing Harm" (16 pp.)
  - 3 Read Laudan on reserve (5pp.)
  - 4 Read Cranor, "Science with..." "Scientific Inferences..." (11pp.)
  - 5 Read KS-F on statistical significance in Biological Theory (4pp)  
(total pages to read = 36, of which 5 are e easy)

11.2 Student Analysis Pro Cranor \_\_\_\_\_ Con Cranor \_\_\_\_\_

Students present second half of FP papers, and class and reviewers will analyze them.

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4-14-14

EASTER; NO CLASS; CONSULT PRIVATELY WITH PROFESSOR TO ENSURE THAT FP-REV PAPER IS PERFECT. IT IS DUE NEXT CLASS

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4-21-14

**12 From Bayesians, Harsanyi, and Glymour to Arrow, Mayo, and Kitcher: Alternative Accounts of Default Rules under Uncertainty and Their Policy Consequences**

FP-REV PAPERS DUE; 48 HOURS AHEAD, EMAIL TO ENTIRE CLASS

- 12.1 Lecture-Discussion
- 1 KS-F: "big picture" lecture, types-I, -II error, maximin, exp. Utility
  - 2 Read Kitcher on "Public Knowledge..." (19 pp)
  - 3 Read Cranor, "The Use of Comparative..." (18 pp)
  - 4 Read first half of FP-REV papers; be ready to assess

11.2 Student Analysis Pro Kitcher \_\_\_\_\_ Con Kitcher \_\_\_\_\_

FIRST HALF OF CLASS DO POINTPOINT PRESENTATIONS ON FP PAPER.

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4-28-14

## 13 Solutions to Policy Mistakes Based on Flawed Philosophy of Science

- 13.1 Lecture-Discussion
- 1 Read McGarity-Wagner, Bending Science, 229-end (70pp.)
  - 2 Read Michaels, Doubt, 232-265 (33pp.)
  - 3 KS-F on professional duties of civic, scientific activism  
(total pp. to read = 103, all easy)
  - 4 Read second half of final, revised student papers.
- 13.2 Student Analysis
- Second half of class gives powerpoint presentation of FP-REV papers.
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### Possible Paper Topics (Not an Exhaustive List)

#### Epistemic Topics (Not Exhaustive):

What methodological value judgments are made by those who find flaws in climate predictions and therefore claim that climate change is scientifically uncertain?

Are the subjective probabilities, used in the IPCC report to assess 5 classes of climate change, scientifically defensible?

What methodological value judgments underpin claims about minimum viable populations, and thus claims about possible future species losses?

What methodological value judgments do critics of evolution and critics of climate change share, when they reject both scientific views?

Is there a scientific basis for asserting racial or sexual differences in intelligence? Explain/adjudicate the controversy.

Is the weakening of US pesticide standards for children from 1996 to 2006, scientifically defensible? On what epistemic and methodological value judgments, in the relevant science, does this weakening rely?

From a purely scientific point of view, is homosexuality "natural" in the non-human animal kingdom? Explain/adjudicate the controversy.

Do critics in the "Climategate" debate misrepresent the nature and significance of scientific anomaly?

Use Woodward's counterfactual causal method to evaluate critics of climate change.

Use Laudan's comparative theory assessment to evaluate critics of climate change.

Do studies of UCLA epidemiologists, who deny oil-drilling Amazon harm, misrepresent scientific certainty? How? With what consequences?

What rules for type-I and type-II analysis should be followed in assessing climate change?

What rules for type-I and type-II analysis should be followed in assessing cancer risks?

What rules for type-I and type-II analysis should be followed in assessing biochemical hormesis?

What rules for type-I and type-II analysis should be followed in assessing possible species losses?

### **Ethics Topics (not Exhaustive)**

Is the 1995 scientific-experimentation rule, that allows experiments on civilians without their knowledge and consent, provided an independent committee has agreed, ethically defensible?

Is the 1995 scientific-experimentation rule, that allows secret experiments, esp. biowarfare experiments, provided an independent committee has agreed, ethically defensible?

Should scientific tests of pharmaceutical effectiveness and safety continue to be done by drug companies, or should they be done by an independent government agency, but funded by the companies?

## **SAMPLE PAPERS THAT PROVIDE MODELS FOR YOUR OWN FINAL, PUBLISHABLE PAPER**

### **1 Sample Papers That Use Philosophy of Science Analysis to Assess Competing, Policy-Relevant Scientific Claims**

Wendy Parker, "Comparative Process Tracing and Climate Change Fingerprints," *Philosophy of Science Association Proceedings*, 2008.

Wendy Parker, "Whose Probabilities? Predicting Climate Change with Ensembles of Models", *Philosophy of Science Association Proceedings*, 2008.

Kevin Elliott, "A Novel Account of Scientific Anomaly," *Philosophy of Science* 73 (2006): 790-802.

KSF paper on Woodward's account of causal inference and nuclear energy, from ch. 4 of her 2011 book, *WWW*, from class 10 of this course

### **2 Sample Papers That Use Philosophy of Science Analysis to Show That a Scientific Claim Is False**

Oreskes paper on climate change from class 3 of this course

Roger Cooke, "Risk Assessment and Rational Decision Theory," *Dialectica* 36, no. 4 (1982).

KS-F paper from *Modern Energy Review*, 2009, on her website at [www.nd.edu/~kshrader/pubs/](http://www.nd.edu/~kshrader/pubs/)

KSF paper *Human and Experimental Toxicology*, 2008, on her website at [www.nd.edu/~kshrader/pubs/](http://www.nd.edu/~kshrader/pubs/)

### **3 Papers That Use Philosophy of Science Analysis to Show That a Methodological Value Judgment is False**

Carl Cranor papers on risk assessment from class 11 of this course.

Kevin Elliott, "Conceptual Clarification and Policy-Related Science," *Perspectives on Science* 8 (2000): 346-366.

Deborah Mayo paper on risk assessment from class 6 of this course.

KSF paper on animal studies from *Environmental Justice*, 2008, on her website website at [www.nd.edu/~kshrader/pubs/](http://www.nd.edu/~kshrader/pubs/)

KSF paper on relative risk from *Biological Theory*, 2007, on her website website at [www.nd.edu/~kshrader/pubs/](http://www.nd.edu/~kshrader/pubs/)

#### **4 Papers/Books that Use Scientific Analysis and Cases to Make New Claims about Philosophy of Science**

Kenneth Schaffner, *Discovery and Explanation in Biology and Medicine*, University of Chicago Press, 1994.

Deborah Mayo, *Error and the Growth of Experimental Knowledge*, University of Chicago Press,

KSF and McCoy paper on case studies from *Philosophy of Science*, 1994, on her website at [www.nd.edu/~kshrader/pubs/](http://www.nd.edu/~kshrader/pubs/)

KSF paper on Laudan and the Florida panther, from *Perspectives on Science*, from class 4 of this course.