

MIDTERM: Thursday, October 18

- **Part I:** Choose 5 out of 6 terms to define (@ 6 pts apiece = 30 pts total). If you do all 6 I'll grade the best 5. For full credit, each will require at least a few simple sentences, but should be no more than a concise paragraph. "Just the facts, ma'am," in other words. **No critical discussion or essay! You should spend no more than 20 minutes on this section**
- **Part II:** Choose 2 out of 3 essays to write (@ 35 pts each = 70 pts total). **You should allow approximately 25 min. per essay. Do not try to write all three essays (you won't have time, and it's not worth the risk and extra effort since I'll grade only two anyway.** Though not like a term paper, in which (an) introductory and (a) concluding paragraph(s) are required, thorough exposition and critical analysis is required for full credit. Read each question carefully and make sure to answer *all* points that asked, but *no* more. The grading on exposition and critical discussion will be divided depending on the nature of the question (some 20/15, others 18/17). To organize your thoughts it's best to write the expository portion first, and then the critical discussion, instead of interspersing expository with critical discussion sentences/paragraphs.

STUDY TERMS¹:

- a.) Methodological/logical [a/]symmetry
- b.) Falsificationism
- c.) Posterior/Prior Probability
- d.) Ontology
- e.) Methodology
- f.) Apriori/Aposteriori
- g.) Scientific Realism
- h.) Paradigm. **Aside from giving a concise definition (1-2 sentences) list what is encompassed by this concept, as described explicitly by Kuhn².**
- i.) Anomaly/crises (Aside from defining both in a simple sentence or two, state in 1-2 sentences their relation)
- j.) Normal science/puzzle solving (Aside from defining both in a simple sentence or two, state in 1-2 sentences their relation)
- k.) Empirical adequacy (Both the "informal sense" and van Fraassen's notion)
- l.) Retrorecognition³
- m.) Models/Conceptual change (Aside from defining both in a simple sentence or two, state in 1-2 sentences their relation⁴)

¹ The text has a glossary, but you'll also find these terms cited frequently and defined throughout the Lecture Notes. Most (but not all) of the above quotes are found therein. **Note however I may ask you to specify instances/examples given for the term as coined by the authors in your readings (you'll see this explicitly asked)**

² Hint: See quote from SSR in **Lecture XIII** notes.

³ See **Lecture XIV** and/or the Lightman & Gingrich article

⁴ According to Nersessian.

STUDY QUESTIONS:

1.) Explain briefly what is meant by the “Problem of Demarcation.” Describe (without explaining in depth) the various criteria proposed by Popper, Lakatos, Kuhn, and Thagard. Make sure you specify: a) who argued that their criteria function only as necessary conditions, b) who argued that their criteria were both necessary and sufficient, c) who didn’t venture that far (i.e. believed the demarcation line is vague at best). Then, in a paragraph or two, argue why you think one the above four provide the most effective ‘solution’ *or* argue why all them fall short—i.e. , argue why you think the problem is unsolvable.

2.) Explain briefly what Longino meant by ‘cognitive’ versus ‘contextual’ values, and what relation they have (if any) with Kuhn’s notions as discussed in his essay on Values and Theory-Choice. Make sure you give (at least) a brief mention of what Kuhn meant by ‘background.’ List Kuhn’s five criteria (without explaining them in depth) and Longino’s criteria of ‘transformative criticism’ (without explaining them in depth). Make sure you state in a sentence or two whether (or not) Kuhn or Longino believe objectivity in theory-choice is a process that is irrational or logically regimented. Then, in a paragraph or two, argue either: a) Kuhn against Longino: I.e. who do think provides a more effective account of objectivity/theory choice and why? or b) Neither K nor L: I.e. argue that both attempts fall seriously short either because (on one extreme) objectivity is untenable or (another extreme) there are reliable procedures in place to secure such notions (i.e. inductive logic).⁵

3.) Explain briefly what is meant by the problem of conceptual change and how Popper, Kuhn, and Laudan sought to deal with it. For the latter, simply give a brief description without explaining in depth their ‘takes’ or programmes. Feel free to use any convenient analogy concerning how the ‘ontology’ of their variously fundamental explanatory notions fit together. Then, in a paragraph or two, argue either: a) Why one of the above three has the most effective approach and why, or b) Why all of them fall short in significant ways. Feel free to mention (without explaining in much detail) whether or not you feel Giere/Nersessian have a better ‘take’ and why (or why not, i.e that you believe the problem of conceptual change is insurmountable).

4.) Explain briefly what is meant by scientific realism versus scientific anti-realism. Just give a few brief sentences here, without listing all of their garden varieties. Then, in the case of realism, state briefly (without explaining in depth) what Boyd’s essential take is (i.e. what underwrites Boyd’s “Lex Orandi Est Lex Credenti) and ~~Arthur Fine’s~~ [Ian Hacking’s] essential take. In the case of anti-realism, describe without explaining in depth what Bas Van Fraassen’s (BVF’s) position is. Then, in a paragraph or two: a) Either argue for anti-Realism (wherein you may or may not agree with BVF⁶ or for realism (where you’re welcome to defer to Boyd or ~~Fine~~ [Hacking] and point out briefly why you think their arguments prove the most effective. b) Argue against the realism/anti-realism in which you defend Fine’s NOA stance and mention why you think McMullin’s criticisms against Fine are unjustified.

⁵ If you choose this option, you need not explain in any depth what inductive logic is. Just give 1-2 sentences giving the gist of its aims.

⁶ If you disagree with BVF, make sure you at least mention in passing ~~McMullin’s~~ [Musgrave’s] criticism against BVF

Recall from **Lecture XIII:**

KUHN'S SSR – Sticking points or Hermeneutical⁷ Difficulties:

“Today in the sciences, books are usually either texts or retrospective reflections...The scientist who writes one is more likely to find his professional reputation impaired than enhanced...In dynamics [the study of the causes of motion] research became similarly esoteric [as contemporary physics] in the later Middle Ages,...recaptur[ing] general intelligibility only briefly during the early 17th century when a new paradigm replaced the old one that had guided medieval research.” (20)

Note 1: Is this question-begging on the part of Kuhn? Popper, for instance, in his essay “the Myth of the Framework” questions the ‘external’/‘internal’ issue in a manner that alternate explanations can be offered (diminishing returns of corroboration.)

- **Anticipating value-talk:**

“Though many scientists talk easily and well about particular individual hypotheses that underlies a concrete piece of individual research, they are little better than laymen at characterizing the established bases of their field, its legitimate problems and methods...**paradigms guide research by direct modeling as well as through abstracted rules...[r]ules should therefore become important and the characteristic unconcern about them should vanish wherever paradigms or models are felt to be insecure. That is...exactly what does occur.**” (47)

- **Anomaly Emergence:**

“The characteristics include...previous awareness of anomaly, gradual and simultaneous emergence of both observational and conceptual recognition, and the consequent change of paradigm categories and procedures often accompanied by resistance. **There is even evidence that these same characteristics are built into the nature of the perceptual process itself.**”⁸

The basic question appears to be a tension concerning how strictly one should interpret Kuhn here, concerning the ‘stubbornness’ of paradigms and their resistance to novelty (as signaled by a ‘critical mass’ of anomalies precipitating a crisis.) On the one hand Kuhn has written here and elsewhere that ‘internal’ to scientific paradigms there appear to be no criteria for ‘transcending’ them (i.e. “one paradigm’s anomaly becomes a new paradigm’s exemplar”). On the other hand, as he write in detail here it

⁷ Hermeneutics is the ‘science’ of interpreting texts. Sometimes referred to as “textual criticism.”

⁸ Alison Gopnik’s early work on schema acquisition in infancy

seems as though paradigms aren't that blind or opaque to external novelty...recall also his points about the 'background' in his "Value Choice" essay.

This is one way to think about the Problem of Conceptual Change!
(In the case of Kuhn, we can ask ourselves: How 'punctuated' is this
[r]evolutionary process? Perhaps it's more gradual after all?)⁹

Larry Laudan: The Evolution is *Gradual*, not Punctuated: From Paradigm to Research Tradition.

- This process is ultimately generated by two fundamental kinds of **problems**¹⁰

EMPIRICAL PROBLEMS

“If it is true that theory complexes, and only theory complexes, can confront experience, then *the successful prediction of an experimental outcome leaves us in as much doubt about how to distribute credit, as an unsuccessful prediction leaves us unclear about where to locate blame.*” (41)

- **Note2:** Compare this above quote with Kant's “concepts without percepts are empty, and percepts without concepts are meaningless.” One can understand a similar notion (especially in the portion underlined) writ large: laboratory procedures & protocols ('percepts') anchor the theory-complexes (the 'concepts'). Compare this with Hacking's subsequent writing.

CONCEPTUAL PROBLEMS

“The elimination of incompatibilities between a theory and the relevant methodology constitutes one of the most impressive ways in which a theory can improve its cognitive standing.” (59)

- **Note3:** Compare again “concepts without percepts are empty, and percepts without concepts are meaningless.” Recall also Burian's desideratum #1: Philosophical accounts of conceptual change must take the issues of conceptual disruption/discontinuity seriously (e.g. Kuhn's 'crises'), not just explain them away.

⁹ Recall Boyd here, and his illustration of 'selective breeding' to explain for the proliferation of species diversity. For Boyd, there was no 'natural selection' mechanism; rather the virtuous circularity of confirmation theory (which underwrites his realism.) Confirmation theory plays the analogous role of 'selective breeding' (among 'species' –i.e., paradigms/theoretical frameworks.)

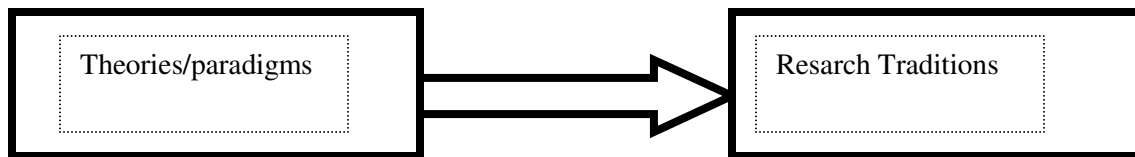
¹⁰ Note the switch back to Popperian lingo (problem-solving versus puzzle-solving).

“Conceptual problems are characteristic of theories and have no existence independent of the theories which exhibit them, not even that limited autonomy which empirical problems sometimes possess...conceptual problems are higher-order questions concerning the well-foundedness of the conceptual structures (e.g., theories which have been devised to answer the first order questions. In point of fact, there is a continuous shading of problems intermediate between straightforward empirical and conceptual problems; for heuristic reasons, however, I shall concentrate on the distant ends of the spectrum.” (48)

- **Note4:** Recall Longino’s notion of a ‘spectrum’ existing purely cognitive values and purely contextual values. Though Laudan is addressing issues concerning met-analysis of theories and theoretical frameworks, not values in theory-choice, a similar notion of gradations between ‘internal’ and ‘external’ is at work.
- **Note5:** Recall Kuhn’s criteria: Laudan addresses *consistency* (both internal and external) as engendering conceptual problems. See, for instance (concerning the issue of external consistency) the 5 ways two theories can conceptually interrelate: a) entailment, b) reinforcement, c) compatibility, d) implausibility, e) inconsistency. (54) (“Degrees of cognitive threat.”)

Methodology¹¹ & methodological “well-foundedness” (MWF) must subsume issues pertaining to conceptual problems of theories: “methodological well-foundedness has been constitutive of, rather than tangential to, the most important appraisals of theories.” (59) (see his note 13, pp230-1 for a list of historical exemplars of MWF: Comptean positivism, Darwinism, etc.

“The **solved problem**—empirical or conceptual—is the **basic unit of scientific progress**...*the aim of science is to maximize the scope of solved problems, while minimizing the scope of anomalous or conceptual problems.*” (66)



“A **research tradition** provides a set of guidelines for the development of specific theories...[t]he function of specific theories within the research tradition is to explain

¹¹ Recall: Theories of scientific method, “norms...rules expected to govern the behavior of the scientist.” (58). Example: up to 18th cent., methodology was assumed to be inductive, experimental. In the 19th century and later, it seems there are a proliferation of methodologies for different scientific sub-specialties (whether ‘Platonic’ or ‘Pythagorean’ [as described by Mark Steiner] in the case of abstract theoretical physics, Bayesian for many of the life sciences, etc.)

all the empirical problems in the domain by ‘reducing’ them to the ontology of the research tradition.” (79)

“[A] research tradition is a set of general assumptions about the entities and processes in a domain of study, and about the appropriate methods to be used for investigating the problems and constructing the theories in that domain.” (81)

“Research traditions are neither explanatory, nor predictive, nor directly testable. Their very generality, as well as their normative elements, precludes them from leading to detailed accounts of specific natural processes.” (81-82)

Fast & Loose Analogy (Lecture XIII)

Political Systems	Philosophy of Science
<i>Laws/ Legislation</i>	<i>Theories/ methodology</i>
<i>Constitutions</i>	<i>Paradigms</i>
<i>Political Parties</i>	<i>Research Programmes¹² (Lakatos)</i>
<i>Constitutional Governments</i>	<i>Research Traditions</i>

“A research tradition, at best, specifies a *general* ontology for nature, and a *general* method for solving problems in a given domain. A theory, on the other hand, articulates a very specific ontology and a number of specific and testable laws about nature.” (84)

- **Incommensurability & Revolutions & Progress**

“With respect to any two research traditions...in any field of science, the[re] are some joint problems which presuppose nothing which is syntactically dependent upon the specific research traditions being compared.” (144)

“It is...possible, at least in principle and perhaps eventually in practice, to be able to compare the progressiveness of different research traditions, even if those research traditions are utterly incommensurable in terms of substantive claims they make about the world!” (146)

- **Note6: Is the ‘retro-recognition’ of anomalies (Lightman & Gingerich)...(pp 693-4) symptomatic of a bankrupt or productive research tradition?**

¹² Like a political party often being driven by ideology/rigidity to the ‘party line’ so Laudan accuses Lakatos’ RPs as being too “rigid in their hard-core structures.” (78)

The Cognitive Research Tradition

(Adopt methodology of cognitive science to provide a general framework for philosophy of science [Giere] or to account for the problem of conceptual change therein [Nersessian])

- **Constructive Realism:** “The important relationship between [cognitive] models and the world is not a [logical] semantic relationship, such as truth, but similarity between two nonlinguistic entities, an abstract model and a real system.” (Giere, 20)
- **Analogies aren’t *arguments*, but no-linguistic *modes of abstraction*.** (Nersessian) See her naturalistic classification of the ontologies of cognitive models, underwritten by analogy (a cognitive sub-linguistic activity), in her analysis of Maxwell’s diaries (sections 4-6)