SENIOR EXAMINER REPORT
HPS PART 1B June 2015

Senior Examiner: Simon Schaffer (Lauren Kassell in Lent Term 2015)

Examiners:
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There were no incidents during the examinations. HPS 1 was initially scheduled for 6 June, too late to allow marking, then happily rescheduled to the usual time of 1 June. HPS1 was at 9am on 1 June; HPS2 was at 9am on 2 June. Examiners met at 2pm on 9 June.

Marking/Scaling:

Percentage in each class: 1 (19.35); 2.1 (41.94); 2.2 (33.87); 3 (4.84)
Average mark: 62.02 SD 6.66

Marking and class criteria approved by the HPS Board were distributed to and discussed with each examiner; examiners met in Lent Term to agree examination papers and discuss evaluation; agreed marks were reached on the basis of reconciliation across marks awarded independently by two examiners of each script. In a few cases of substantial variation, a third examiner moderated these marks.

Variation in performance between the history of science and the philosophy of science papers was within expected limits: in just three cases there were two class differences between candidates' performance in HPS1 and HPS2, discussed at the examiners' meeting. Scaling up the 2.2/2.1 boundary was necessary to turn raw marks, which gave a very high number of 2.1s, into an approved comparative distribution of classes.

Examiner's meeting:

(a) Examiners are normally encouraged to use the full scale of available marks, especially at the upper end of the first class. Award of higher marks for first class performances might have the advantage of encouraging NST Part 1B candidates to take HPS Part 2. Use of the full range of marks was perhaps better pursued during the marking process rather than rescaling marks at the final examiners' meeting.

(b) Candidates notably follow the content of questions from the previous year's papers and seek to make current questions into versions of past questions. Questions must therefore avoid as much as possible any reiteration of recently set material. Candidates' avoidance of some questions may be attributed to a lack of close linkage between supervision and lecture content: this co-ordination is essential. Examiners discussed ways of setting questions that work to sort candidates better

into classes; and of lecturing so that students are encouraged to attempt such questions.

History of science examination

Section A:

1 (34) Has science always been on the side of power?
Some good answers addresses the range of kinds of power, or the ways science generated power as well as aligning with it; others discussed science's opposition to power, or its neutrality with respect to power; many answers used the question to offer an essay about the relation between science and religion. Many weak answers spent too long reflecting on the question's meaning.

2. (30) Laboratories have been the most important institutions in the history of science. Do you agree?
There was frequent identification of laboratories with experiments; most examined other institutions, such as universities or hospitals; strikingly few offered comments on museums, field sciences or any comparable related sites and institutions.

Section B (expected number of answers per question : 19-20)

3 (23) How did early modern natural philosophers and physicians discover new knowledge?
Strong answers to this question. Good answers used the idea that new methods for creating knowledge emerged in the early modern period, and reflected both on the historiography of revolutionary change while challenging the notion of a complete overhaul of methods; not all noted that the question asked about physicians; and many ignored the specific question about discovery.

4 (16) Why did early modern astronomers come to accept heliocentrism?
Many hoped this was a question asking *which* early modern astronomers accepted heliocentrism. Some did attempt broader generalisations about historical causes: the balance between social context and empirical evidence made for a stronger answer.

5 (15) To what extent did new experimental evidence influence the development of eighteenth-century chemistry?
Not a popular question; some strong answers identified the importance and rationale of experimentation and also put these in the context of other developments; several assumed this was a question about Lavoisier's scientific biography.

6 (19) How did global travel affect natural history?
Good answers showed how exploration expanded natural historical knowledge and also made natural history ever more significant for nation states; several strong responses extended from Bacon to Darwin and beyond; a few, weaker,

answers assumed that accounts of longitude determination and astronomical expeditions should be discussed at length without showing relevance to the question.

7 (30) What were the most significant changes in the sciences in the decades around 1800?

A popular question that received a large number of weak or rambling answers. Many used this as a chance to write the history of science around 1800 or, especially, to describe the French Revolution and its aftermath. The few answers that made a comparative survey of France, britain and Germany, and the fewer which addresses changes in knowledge and method attrated higher marks.

8 (12) Hospitals and laboratories became central to medicine before they could offer any new treatments. Explain and assess this claim.

Few students attempted the question and those who did often used it as an opportunity to offer facts about laboratory medicine or the Paris method. The question did not manage to attract many answers that addressed its terms.

9 (41) In what ways did the publication of *On the Origin of Species* change the debate about evolution?

Significantly the most popular question in section B . Poorer answers assumed it was enough to offer a scientific biography of Darwin before 1859; or a survey of evolutionary theory from the eighteenth century. Stronger answers focused more closely on the *Origin's* publication and evolutionary debates, and in the best cases addressed both intellectual concerns and social context. Very few examined the publication history of the book and its editions' varying impacts.

10 (2). Should we be surprised that Albert Einstein developed the special theory of relativity while working in the Swiss Patent Office?

A very small number of answers to this question. The best response made good use of Galison's *Einstein's maps, Poincaré's clocks*. The topic may require stronger supervision.

11 (35) The effect of World War II on the physical sciences was much greater than its effect on the life sciences. Do you agree?

Many students attempted this question: not a few saw it as a chance to tell the story of Big Science in the cases of the Manhattan and Human Genome projects; several decided to discuss the publication of Rachel Carson's *Silent spring*. Better answers focused rather on the wartime and immediate postwar contexts; strongest answers discussed physics' influence on postwar biology and noted interest in biological effects of radiation, use of radioisotopes in biology and ecology; and the emergence of molecular biology.

12 (3) Where did electronic computers come from, and how have they altered scientific research?

Hardly any answers to this question. Answers were rather journalistic, with little reference to historical study. Again, the topic may need stronger supervision.

Philosophy of science examination:

Question 1 (36) “Philosophy of science is about as useful to scientists as ornithology is to birds” (attributed to Richard Feynman). Discuss.

> There was a wide range of answers to this question. Some of the best answers noticed differences between scientists and birds, although this angle could be pushed too far. Another strength of some essays was a distinction between different kinds of contributions made by different areas/styles of philosophy of science.
> Many students interpreted the quote as indicating the uselessness of both ornithology and philosophy of science. They then drew on debates over realism and induction in order to illustrate the uselessness of the latter. Others objected by pointing out that accounts of informed consent are valuable—something that philosophers might be good at developing. Stronger answers drew on the literature to describe more impactful contributions from philosophy of science, such as understanding and managing non-epistemic values in research, illustrating their cases with specific examples. One of the best answers pointed out that even plants change their growth patterns in response to classification. Some weaker answers gave an intelligent discussion but without making connections to the course material.

Question 2 (39) Does it still make sense for philosophers of science to search for the scientific method?

> It was slightly disappointing that more students didn't question the use of the term "still" in this question - those who noticed the temporal aspect tended to do best. Too many students treated this question as an excuse to run through Popper, Kuhn, Lakatos and Feyerabend material; some then moved on to either a Feyerabendian or a pluralist position. Good answers focused the problem before answering (e.g., framing it in terms of the demarcation problem) and then considered whether a unified account would likely be descriptively adequate and/or valuable. The best answers showed a clear awareness of the fact that there may be different purposes to philosophy of science.

Section B (expected number of answers per question: 22-23)

Question 3 (49) Does the fact that most scientists do not usually try to falsify their own theories invalidate Popper’s philosophy of science?

> This was a popular question, which was often well-answered. Good answers queried the alleged "fact" that scientists don't try to falsify their theories, pointed out that criticism can take the form of one scientist

trying to falsify the theory of another, distinguished descriptive and normative versions of Popper's views, or defended the descriptive view by drawing on contemporary accounts of the importance of a critical attitude in science (Longino) or limited dogmatism (Lakatos). Weaker answers too often listed several problems with Popper's thought (e.g., to present examples of dogmatism in science), rather than addressing the specific issue the question raised.

Question 4 (42) What does it mean to say that "smoking causes lung cancer"?

This was another popular question. Unfortunately, far too many students treated it as an excuse to repeat the lecture material. Better answers settled on and argued for a particular account of causation, rather than declaring that it is very complex. Many students gave an OK answer to this question by running through various accounts of causation (regularity, probabilistic, counterfactual, interventionist) and pointing out objections along the way before settling on their favored view. Better answers established the intended audience of the statement in question and focused on which of these accounts best captures the use of causal concepts in that context.

Question 5 (22) How should scientists solve problems of inductive risk?

A surprising number of students treated this question as asking about the warrant of induction in general, rather than the specific problem of inductive risk. Among those who focused on inductive risk, key terms - such as "non-epistemic values" and "value free ideal" were often left undefined. Good answers relied on use of examples, and clearly and correctly described the problem of inductive risk and defended the best approach for solving it. A common answer was to argue that scientists should solve it by not passing it on to policymakers. How good of an answer this was depended on how much was said about what happens after it's not been passed on.

Question 6 (2) What purposes are served by classifying organisms into species?

Very few students answered this question. Those who did rarely gave much thought to the "purposes" issue, focusing instead on the difficulties of vague species boundaries or the question of whether species were real.

Question 7 (14) What is the best argument against the possibility of a social science? Does it succeed?

Answers to this question often relied very heavily on the lecture material, running through the same set of arguments based on free will, inner life, and complexity, though some did this very well. Better answers tended to be more focused on one of those arguments, and several students made interesting and innovative cases in favour of the social sciences. Other good answers brought in less standard problems like looping effects. The

best answers were notable for their use of examples from actual social scientific research.

Question 8 (17) Is scientific research based on paradigms? Discuss with reference to a particular area of science.

This was a popular question, but many students either failed to specify an area of scientific research or relied too heavily on Kuhn's own examples. Some of the best answers used close study of some field of science, such as psychology or biology, to argue against Kuhn. The best answers provided a clear and nuanced account of paradigms and analysed a specific area of science in terms of this account. Weaker answers gave standard critiques of Kuhn.

Question 9 (14) Why is it valuable to have multiple competing explanations for the same phenomena?

This question was not particularly popular, and answers ranged widely in quality. A remarkable number of students didn't focus on "explanation" specifically, but on the advantages of different "theories". Better answers did a good job of combining material from different lecture courses. Standard good answers to this question discussed the benefits of competing explanations in the context of Inference to the Best Explanation or the limitations of monism.

Question 10 (19) All cognition is information processing. Do you agree?

This was a popular question, but too many students seemed to confuse the claim that cognition is complex with the claim that it cannot be a form of information processing (as opposed to simply a very complex form of processing). Also, some answers suffered from citing research and studies (for example, on insect cognition) without fully explaining how this material related to the question set. Many students drew on research taken to demonstrate cognition as dynamic and/or embodied without explaining how this poses a problem for the information-processing approach. Good answers made this clear. Another effective strategy was to draw on the philosophy of mind to argue for the inability of standard models to account for phenomenal consciousness.

Question 11 (25) Is Kuhn’s view of scientific revolutions incompatible with scientific realism?

Answers to this question were variable. A worrying number of students seemed not to define "scientific realism" in any detail before discussing Kuhn. Weak answers used this as an opportunity to describe paradigms and paradigm shifts without explaining how they related to realism. Stronger answers drew on the pessimistic induction to make the latter point. The best answers adopted a particular account of realism and answered the question with respect to that account. Some of the best

answers noted differences between realism as an attitude scientists hold towards their theories and as an attitude that we might hold as observers of scientific research.

Question 12 (6) Are the physical sciences special in having a method for learning about unobservable entities?

This was not a popular question, and the answers were slightly weak. Some students took the opportunity to write down a lot about Hacking without taking the time to discuss the issue of the "specialness" of the physical sciences. Good essays answered “no” on the basis of there being no clear distinction between observable and unobservable entities, or no relevant difference between the physical sciences and other sciences.