

NST Part IB History and Philosophy of Science
Senior Examiner's Report
20 June 2017

1. The examination process

As in previous years, the Part IB HPS examination consisted of two papers: History of Science (HPS/1), and Philosophy of Science (HPS/2). The examiners were Dr Salim Al-Gailani, Dr Andrew Buskell, Dr Helen Anne Curry (senior examiner), Dr Stephen John, Dr Richard Staley, and Dr Jacob Stegenga. There was no external examiner.

The History of Science (HPS/1) exam took place on Monday 6 June 2017, and Philosophy of Science (HPS/2) on Tuesday 7 June. There were no notable incidents during the examinations, to the examiners' best knowledge. All candidates with registered disabilities were accommodated appropriately, also to the examiners' best knowledge.

Drs Al-Gailani, Curry, and Staley read the History of Science scripts, and Drs Buskell, John, and Stegenga read the Philosophy of Science scripts. Each script was blind double-marked. On each paper, any given examiner read 2/3 of the scripts, the rota being arranged so that each pairing of examiners was assigned 1/3 of the whole set. A numerical mark out of 100 was given by each examiner to each script as a whole, and that mark was agreed between the two examiners in each case; in very few cases, agreement was reached with the help of the remaining examiner. Marks were not agreed question-by-question, though each examiner did make assessments of each answer and those assessments were discussed in some detail in some cases.

The HPS Part IB examiners' meeting was held on Tuesday 13 June, to agree all marks and discuss any issues. In preparation for this meeting, the three markers of each paper met together on Monday 12 June to discuss each script in detail. The examiners are to be commended for working to this tight timetable. Scripts from examinations that were taken at special locations were delivered quickly, which facilitated this turnaround.

Candidate lists were received separately for NST IB, Part II Physical Sciences, and PBS. The philosophy examiners received scripts (HPS/2) from two candidates who did not appear on any of these candidate lists. It took some effort for the HPS Senior Administrator, Tamara Hug, to identify the candidates as HSPS Part IIA students and to find out where their marks should be delivered. Ideally the department should have been made aware of these candidates prior to the exams; a clear channel for this should be established for future years.

As in previous years, there was some difficulty in deciphering the handwriting of a few candidates, requiring much time and effort on the part of the examiners. In one case, a candidate's handwriting was determined to be indecipherable (confirmed by two examiners and the senior examiner) and was sent for transcription. This candidate's scripts were thus marked and agreed separately from the rest of the candidates, as the transcribed scripts were only received after the examiners' meeting had taken place. They were able to be included, however, in the final electronic markbook delivered to NST IB.

In agreeing final marks, we followed the standard scaling regime in NST Part IB, requiring the following distribution (which applies unless an exemption is warranted by the 'cohort values' reflecting the group's performance level at Part IA): 20% of candidates in each subject to receive firsts in that subject, 40% to receive 2.1, and the remaining 40% to receive 2.2 or below.

2. The subject examiners' meeting, and recommendations arising from it

The HPS subject examiners' meeting on 13 June was attended by all examiners. Marks on the individual papers, HPS/1 and HPS/2, had all been agreed at the meetings on 12 June, and were combined to provide an overall mark. As the distribution of marks did not meet the desired default NST Part IB distribution of 20-40-40 (1-2.i-2.ii/3/fail), these were scaled according to the NST formula via use of the NST markbook.

The raw agreed marks missed the NST targets for the distribution of classes, producing too many 2.1's, but falling just short in terms of 1s and well below the required number of 2.iis. The senior examiner opened the envelope containing the cohort values after noting the failure of the raw agreed marks to match the desired distribution. As the cohort values were still further from the raw agreed marks than the default distribution, it was agreed that the default distribution should be used to preserve as much as possible the original marks. The scaling process affected the marks only slightly; the most significant adjustments in overall mark were roughly 2.5 points down at the 2.1/2.2 boundary.

3. Summary of results

A total of 71 candidates were entered for the examinations, of whom 2 withdrew from both exams, leaving 69. Of these, there were 10 PBS students, each of whom sat one exam only (3 History of Science, 7 Philosophy of Science). 2 HSPS students sat the Philosophy of Science paper. 3 NST Part II Physical Sciences students sat both papers. The remainder (54 students) were NST IB candidates. In the latter group, the distribution of classes, after scaling, was as follows: 70.0 or above (1st) 10 candidates (18.52%); 60.0 to 69.9 (2.1) 22 (40.74%) 50.0 to 59.9 (2.2) 21; (38.89%) 40.0 to 49.9 (3rd) 1 (1.85%); and 0 to 39.9 (fail) 0 (0.00%). The average mark was 63.41%, with a standard deviation of 6.36.

In general discussion, the examiners noted the strong patterns of clustering around particular questions and wondered whether exams might be set differently in the future to encourage students to engage with the entire range of course material. On the history side, very few students drew on course material that had been introduced in the past five years (e.g., ecology, colonial medicine, science and technology in China); this suggests that students are not preparing this material. On the philosophy side, it appeared that the set of exam questions developed lent itself to a rather narrow set of essays, typically a mix of questions 1, 4, 6, and 8. There was plenty of opportunity for students to use content between these questions, which exacerbated the narrowness of these exams (e.g. students could talk about falsification in questions 1 and 4; induction in questions 4 and 10, etc.). Examiners proposed that this issue be discussed by next year's IB examiners well in advance of the exam-setting meetings in Lent, and that potential revisions to the exam structure be

considered. (It was noted that students' choice of exam topics is also an issue of supervision; however, it was felt that little could be done by the examiners or even the department to directly change supervision norms as these are college-run.)

4. Comments on performance on individual questions

As in previous years, there was some unevenness in the distribution of candidates tackling different questions. On the History of Science paper, responses were evenly distributed between Questions 1 and 2 in Section A, but in Section B there was an overwhelming preference for Questions 3, 5, 6, 7 and 10. Questions 9, 11, and 12 were answered only very infrequently. On the Philosophy of Science Paper, Question 1 was far more popular than Question 2 in Section A, while Questions 4 and 8 stood out as attracting many more responses among Section B questions.

History of Science (HPS/1)

Section A

1. How and why has training in the sciences changed over the centuries? (28 responses)

A common error in responding to this question was failure to focus on the history of training in the sciences. Successful answers targeted training and/or education, rather than general changes in science. The best answers linked patterns seen in training to changes in the social identities of practitioners and accounted for disciplinary diversity. Weaker responses offered observations about training in distinct periods without connecting these fragmented examples into a synthetic account.

2. Does history show that industrial and commercial growth foster the sciences, or vice versa? (32 responses)

Nearly all responses recognized symbiosis between commerce and science, and noted the challenge of identifying one or the other as prime mover. However, simply listing examples that indicated a complex exchange between the two was not sufficient for a first; the strongest answers integrated specific examples from different historical periods with an account of change over time and attempted to identify different patterns (e.g., commercial activities creating new opportunities for scientific investigation, versus scientific investigation generating unforeseen opportunities for industrial development).

Section B

3. How did new kinds of instrumentation change astronomy and natural philosophy in seventeenth century Europe? (30 responses)

Good answers extended beyond listing new knowledge created through instruments, and avoided recapitulating standard biographies of individuals, to think about how instruments changed various practices within science. The strongest responses treated astronomy and natural philosophy as distinct areas.

4. What was the difference between medical and philosophical inquiry in early modern Europe? (10 responses)

This was a difficult question for students to answer well. Many respondents saw significant commonalities between the two domains but were unable to identify meaningful differences. The best answers explored both institutional and intellectual features as these changed over time.

5. What effect did the French Revolution have on the development of the natural sciences? (35 responses)

It was hard to do well on this seemingly straightforward question. Weaker responses reproduced standard narratives about the events of the French Revolution without thinking about how these affected the development of the natural sciences. Better answers connected the specifics of the narrative history to broader interpretations of how these affected scientific training, career opportunities, and the content of research. The very best answers looked beyond France to describe the effects in Britain and the German states.

6. Is 'The Age of Discovery' a good label for the eighteenth century? (24 responses)

Good answers showed awareness of the distinctive features of the period and evaluated the label 'Age of Discovery' in light of these features. Many candidates ignored global travel altogether, and this omission on the whole generated less convincing responses than those that recognised such travel as the origin of the label. Weaker responses tended to focus on discovery as equivalent to 'scientific findings' and therefore to list a sampling of research findings of the period as a justification for it being called the 'Age of Discovery' (or to list findings of other periods as a reason why it should not).

7. What do the histories of evolution and/or energy show about the relations between science and religion in the nineteenth century? (24 responses)

Very few students considered this question through the lens of the history of energy even in comparison; nearly all addressed evolution exclusively. Respondents were very good on the whole at showing the role of religion in the history of evolutionary ideas. However, they rarely extended that analysis to consider the relations between science and religion (beyond the evolution story) in society more broadly as the question requested. Weak answers reproduced standard narratives about the history of *Origin of Species* and its reception.

8. How, and with what consequences, has the science of human heredity changed since 1850? (15 responses)

The range of responses to this question varied widely. The best answers extended from *Origin of Species* to the Human Genome Project, and identified at least some changes in knowledge of heredity, applications of this knowledge (as in eugenics), and/or modes of hereditary or genetic investigation. Breadth of approach was helpful; weaker answers spent most or all of the response on just one historical moment such as the debates over mechanisms of heredity at the end of the nineteenth century, the pursuit of eugenics in the early 1900s, or the study of Sickle Cell Anaemia.

9. What was colonial about colonial medicine? (6 responses)

Only a few candidates attempted this question. Better answers were able to clearly articulate the ways in which colonial medicine reproduced patterns of exploitation and assumptions about racial and cultural superiority seen in imperial histories more broadly; the best also displayed awareness of the historiographical debates in this area.

10. Why was the oral contraceptive pill made for women to take? (27 responses)

This was a very popular question and, on the whole, responses were good if fairly standard. The best answers managed to recognize and address several facets of the question: (1) What motivated the development of the pill? (2) Why was the pill made for women and not men? (3) Why did this contraceptive take the form of a pill? Better answers managed to deploy specific historical evidence to support claims about each of these elements while weaker responses reproduced lecture material and other rote narratives about the development of the pill without sufficient attention to which aspects were relevant to answering the question.

11. 'The history of ecology shows that it is inseparable from politics.' Do you agree? Why or why not? (6 responses)

Only a few candidates attempted this question. Better answers showed a firm grasp of the historical events they marshalled as evidence and, as a result, were able to sustain a clear argument.

12. How did science and medicine in post-1949 China reflect Cold War politics? (3 responses)

Very few candidates attempted this question. Those who did were, by and large, reasonably successful at identifying at least a couple elements of science and medicine in Mao-era China that reflected international alliances and tensions in the Cold War period.

Philosophy of Science (HPS/2)

Section A

1. Is science special? (52 responses)

This was a very popular question. Most students focused on issues around demarcation; better answers were careful to specify contrasts to science (for example, the humanities or religion), and interrogated different senses of 'special' (e.g. the extent to which science provides a particularly robust process for gathering evidence; whether it has a distinctive manner for managing disputes or corraling criticism; or whether the perceived 'specialness' applies to all sciences or just the natural sciences). The best answers discussed both the methodological and the sociological aspects of 'specialness'. Most students tended to mention a methodological demarcation, finding problems with this; more sophisticated ones suggested there may be other means of adding that special sparkle, perhaps by mentioning some structural aspects of science (e.g. peer review).

2. If you could change one aspect of scientific practice on the basis of philosophy of science, what would it be and why? (14 responses)

Answers to this question were mixed. Some students gave very impassioned answers, but a few took the opportunity simply to provide an essay on a topic not elsewhere on the exam, without a clear sense of why this topic was the most important lesson. In general, those that were more effective were those that highlighted specific aspects of scientific practice; several seemed to give rehearsed responses that were not adequately tied to the question. Students should remember that the function of Section A is to draw together material from

across the paper.

3. Does Kuhnian incommensurability imply that science cannot attain truth about the natural world? (25 responses)

This was a popular question. Good answers were careful to distinguish different ways in which incommensurability might threaten the notion of truth. Many decent answers put incommensurability in the context of Kuhn's overall theory of scientific change. The very best answers also noted the various notions of incommensurability in Kuhn. A dispiriting number of answers raised general issues around theory-ladenness, rather than incommensurability specifically; as always, students were rewarded for answering the set question. Weaker answers often focussed on successions of paradigms and the implications for progress in science—often, but not always, cashed out in terms of the accumulation of true statements—without much mention of incommensurability.

4. Does falsificationism offer a viable alternative to inductivism? (49 responses)

This was the most popular question. In general, it was well answered, although even the best answers did not go far beyond the lecture material. Good answers were distinguished by careful attention to the question of whether falsificationism is an alternative to inductivism at all, as well as questioning its viability. Many students simply identified inductivism with the inductive method; more sophisticated responses gave a fuller characterisation, highlighting various ways inductivism might factor into hypothesis generation, prediction, and confirmation. Mid-range answers tended to focus on the problem of induction and Popper's proposed solution, without much further interrogation of the role of inductive generalisation.

5. 'Objectivity of science comes from its communal norms rather than from its method.' Discuss. (10 responses)

Rather ironically, many answers to this question uncritically assumed a Feyerabendian position on the existence of a scientific method. Good answers pointed to the ways in which accounts of communal norms in science may not distinguish science from other pursuits. The more sophisticated essays focussed on specific aspects of Longino's account and analysed whether they were unique to science, or functioned in a unique way in the scientific setting. The best essays combined aspects of Longino's account with considerations around evidence gathering, justification, or falsificationism. Several students seemed slightly confused on Longino's constitutive/contextual distinction.

6. How does physics make progress, despite the fact that most of the objects treated in physical theories are unobservable? (18 responses)

There were some very good answers to this question, although too few students looked at the issue of progress specifically (as opposed to realism more generally). Better answers tended to question the very notion of a strong distinction between observable and unobservable and linked scientific work on unobservables to notions of progress, typically structural realism or entity realism, or some proxy such as precision. Standard answers tended to repeat arguments surrounding Hacking's entity realism and van Fraassen's constructive empiricism without much further analysis.

7. How should we understand the meaning of mental state terms, such as 'beliefs' and 'desires'? (16 responses)

Answers to this question were rather mixed. The best answers noted that the question focused on a semantic question, rather than broader issues around the mind/body problem. A surprising number of students discussed the example of 'pain', which does not obviously fit well into the categories of 'belief' or 'desire'. There was a considerable amount of tangential material, with trails leading off to the Turing Test, anomalous monism, and phenomenal consciousness. Sophisticated answers tended to highlight the predictive success that comes with using terms like belief or desire, and attempted to account for such success. Unfortunately, even otherwise strong answers often read as if the student was simply running through positions outlined in the lectures, rather than engaging fully with the philosophical conundrum.

8. 'Smokers are more likely than non-smokers to get lung cancer; therefore, smoking causes lung cancer.' Discuss. (29 responses)

Most answers to this question cleaved quite closely to the lecture material. Satisfactory essays tended to be a laundry list of different accounts of causation, without much analysis of the central claim. Better essays noted the strengths and weakness of probability-raising accounts (typically accompanied by sophisticated accounts of Salmonian screening-off) and highlighted the evidential nature of probability-raising. A depressing number denied the probability-raising analysis of causation without discussing the fact that, even if causation is distinct from probability-raising, probabilistic relationships are still excellent evidence of causation. The question was deliberately framed to allow an answer to focus on either the metaphysical or the epistemological issues, but students overwhelmingly preferred the former.

9. When and why should scientists tolerate dissent? (14 responses)

Quality among responses to this question ranged very widely; poor answers simply trotted out some familiar themes from Mill, while the best made detailed use of good case studies and drew on lectures across the syllabus. The better essays tended to highlight the epistemic value of dissent, but weighed this against potential harms—whether these harms were epistemic (undermining scientific testimony; increasing scepticism of science) or moral (undermining participation, reinforcing stereotypes).

10. Is 'inference to the best explanation' a distinctive form of inference? Is it justifiable? (16 responses)

The best answers to this question tackled both parts, whereas weaker answers tended to focus solely on the question of justifiability. The best answers were marked by their use of unusual examples across the range of scientific disciplines, and by their clear articulations of what it meant to get the likeliest and loveliest explanation.

11. Should the results of medical science be protected by intellectual property laws? Why or why not? (5 responses)

There were too few answers to this question to generalise. The few responses given jumped into discussing potential harms of IP laws without articulating the motivation or justification of those laws. More sophisticated essays highlighted how the incentive structure under IP laws ended up undermining this justification, or how such laws did not adequately address

the best interests of a global population.

12. 'Modern evolutionary accounts of human origins continue to reflect the belief that there is an essential human nature, the nature all people share through their common root.' Discuss. (14 responses)

There were some very sophisticated answers to this question, showing a good grasp of a difficult literature. However, very few students noted that the question did not ask whether modern evolutionary theory undermines accounts of human nature, but, rather, whether modern evolutionary theory rests on such a concept. More sophisticated answers tackled modern evolutionary versions of human nature, whether Evolutionary Psychology or Machery's nomological account of human nature. Better answers tended to criticise specific features of these account (usually, assumptions around variability). Standard answers danced around questions of human nature, often setting up essentialism as a foil to anti-essentialist accounts of species.