NST Part IB History and Philosophy of Science

Senior Examiner's Report

30 June 2016

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 Adrian Boutel, Dr Mary Brazelton, Prof. Hasok Chang (senior examiner), Dr Helen Curry, Dr Marta Halina, and Prof. Simon Schaffer. There was no external examiner.

Drs Brazelton, Curry and Schaffer read the History of Science scripts, and Drs Boutel, Chang and Halina 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 some 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.

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.

The History of Science exam took place on Monday 30 May 2016, and Philosophy of Science on Tuesday 31 May. The HPS Part IB examiners' meeting was held on Tuesday 7 June, to agree all marks and discuss any issues. In preparation for this meeting, the three markers of each paper met together on Monday 6 June to discuss each script in detail. The examiners are to be commended for working to this tight timetable. As in previous years, there was some delay in the delivery of scripts from examinations that were taken at special locations. There was also a good deal of confusion as the candidate list initially received did not contain all the candidates who sat HPS/1 or HPS/2, and in some cases it was also not clear whether a candidate included in the list was taking both papers or only one (and which paper, if taking only one). The NST administration has promised, from next year, to pull together a full list for each subject at the outset and pass it on to the appropriate Senior Examiner.

There were no notable incidents during the examinations, to the examiners' best knowledge. All candidates with registered disabilities were accommodated appropriately, to the best of our knowledge. As in previous years, there was some difficulty in deciphering the handwriting of some candidates, requiring much time and effort on the part of the examiners.

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

The HPS subject examiners' meeting on 7 June was attended by all examiners. Marks on the individual papers had all been agreed at the pre-meetings on 6 June; however, the examiners agreed to make slight adjustments in order to reward those candidates who performed consistently well on both papers.

The scaling according to the NST formula was made after this initial adjustment. This process took an additional day, with apologies from the Senior Examiner, as the scaling spreadsheet sent by the NST administration had several defects; this problem was reported to the overall NST IB examiners' meeting. Very prompt and helpful assistance from Jane Clare has been crucial in handling this difficulty.

The raw agreed marks missed the NST targets for the distribution of classes, producing the required proportion of 1sts but too many 2.1's. The scaling process was straightforward, and affected the marks only slightly; the maximum adjustments in overall mark were roughly 2 points down at the 2.1/2.2 boundary (62 to 60).

The scaling was done only on the candidates who sat both papers. A question arose as to whether the marks for the candidates who only sat one paper also ought to be adjusted similarly, and this question was brought by the Senior Examiner to the NST IB examiners' meeting. There it was agreed that it was correct that single-paper candidates' marks were not scaled; furthermore, the NST view is that it would be acceptable, even advisable, to report to other triposes the unscaled marks for their students who borrow NST papers, as the scaling is mainly done for the sake of parity among NST IB subjects.

The senior examiner notes the following from the 2014 report: "A clear majority of the examiners agreed that there was no pressing need to maintain our instruction to candidates that they should write only one side of the paper. It was agreed that we should omit this instruction in future years, thereby leaving candidates with the University-wide instruction that they should write on both sides of the paper (unless instructed otherwise)." This change in the instruction has not been made, and should be actioned from next year. The 2014 report also says: "It was also suggested that the handling of scripts would be easier if each script came in one bundle, rather than in 4 separate bundles topped by a loose yellow cover sheet." However, there was no decisive agreement on this point, so it warrants further discussion.

3. Summary of results

There were a total of 62 candidates entered for the examinations, of whom 3 withdrew from both exams, leaving 59. Of these, there were 10 PBS students, each of whom sat one exam only (4 History of Science, 6 Philosophy of Science). 1 HSPS student sat the History of Science paper. 1 Education student sat both papers, as did 3 NST Part II Physical Sciences students. The remainder (44 students) were NST IB candidates.

In the latter group, the distribution of classes, after scaling, was as follows:

70.0 or above (1st)	9 candidates (20.45%)
60.0 to 69.9 (2.1)	18 (40.91%)
50.0 to 59.9 (2.2)	15 (34.09%)
40.0 to 49.9 (3rd)	2 (4.55%)
0 to 39.9 (fail)	0 (0.00%)

The average mark was 63.48%, with a standard deviation of 7.06.

Among the other candidates, it is notable that all of the PBS students achieved 2.1 or 1st-class marks. Even if the NST scaling had been applied to them, only one of these results would have been pulled down to the high-2.2 range.

In previous years we have monitored the distribution of results by gender. This year the information on the gender of the candidates was not provided to the Senior Examiner in a convenient format. It would be possible to tabulate the results by gender, if necessary.

4. Comments on performance on individual questions

As in previous years, there was some unevenness in the distribution of candidates tackling different questions, though this was not considered particularly worrisome by this year's examiners. On the History of Science paper, the choice of Section A questions was distributed almost equally between the two questions, but in Section B there was an overwhelming preference for Questions 7, 8, and 12, with questions 5, 9, and 10 answered only very infrequently. On the Philosophy of Science Paper, the distribution was somewhat more even (exact data are available if necessary).

Paper 1: History of Science

Section A

1. 'Change in the sciences has been driven more by theoretical than by practical innovations'. Assess this claim.
Good answers reflected the range of things that might be considered either theoretical or practical innovations; unfortunately, the key word "innovation" (as opposed to "approach") was often neglected. Poorer answers assumed that "practical innovation" simply meant instrumentation, and some students confused practical innovation with experimentation or empiricism. Stronger essays recognized that it is difficult, if not impossible to disentangle the two categories, while weaker answers oversimplified historical examples of scientific change to show them as driven exclusively by either theoretical or practical innovation.

2. When did modern science begin?
Answers to this question were, overall, stronger than those to Question 1. Good responses considered both "what is modernity" from the point of the view of the history of science and also reflected on the difficulty of assigning a beginning to modernity. The strongest answers acknowledged that it was difficult to precisely define or date modern science, but did not let this get in the way of offering a clear response; mid-range responses chose a few features of contemporary science that are thought to be important and explored the origins of these at different times. Among weaker answers, there was a marked preference for discussing the definition of modern science rather than answering the question about chronology.

Section B
3. What did natural philosophers and physicians learn from books that they could not learn from experience between 1500 and 1700?
This was a difficult question with few good answers. The question asks about material from print that is not available through experience; many candidates instead focused almost entirely instead on the complementarity between print and experience. Some answers neglected to keep within the specified range of years, while others only talked about part of this period. There was a distressing custom of assuming that Copernicus was mainly an observational astronomer.

4. 'Throughout the scientific circles of western Europe in the first half of the seventeenth century, we can observe what appears to be a spontaneous movement towards a mechanical conception of nature' (R S Westfall). Why did any seventeenth century natural philosophers adopt the mechanical philosophy?
Few candidates addressed the main concern raised by the question, explaining the appeal of mechanical philosophy especially in contrast with prior natural philosophies. Most rather documented the widespread adoption of the mechanical programme. Weaker candidates offered information about early modern cosmology and natural philosophy without being specific about mechanical philosophy.

5. 'To discourse of God from the appearances of things, does certainly belong the Natural Philosophy'. Discuss the relation between religion and science in Newton's natural philosophy.
Very few candidates attempted this question but, by and large, answers were good. Successful responses showed how Newton's religious views related to his natural philosophical work.

The best answers also considered the subsequent status and understanding of Newtonianism and how later interpretations differed from Newton's own views.

6. Why was there public support for the work of natural philosophers during the eighteenth century?
Strong answers addressed questions of patronage and audience, and perceived the use of "philosophers" as opposed to "philosophy" in the question. There was somewhat too much emphasis on the electricity among responses. A significant number of responses confused "natural philosophy" with "natural history," discussing global travel and collections rather than material related to natural philosophy specifically.

7. To what extent was Charles Darwin's work and career typical of British science in the period?
This was an extremely popular question. Good answers to this question recognized that it was a question about British scientific careers in this period as much as one about Darwin, and addressed what was typical and what was changing with regards to British scientific careers at this time. Many students instead offered a brief biographical sketch of Darwin's career with little or no effort to explore the larger context.

8. How and why did theories about the cause of disease change between the mid-19th and the early 20th centuries?
A very popular question. Good answers addressed both the how and why aspects of the question; rather than simply recount the biographical stories of Koch and Pasteur they placed these scientists and their ideas in the broader historical context and emphasized the importance of communication and publicity. Stronger answers appealed to colonial and global developments in the period as well.

9. 'Pathological anatomy around 1800 and bacteriology around 1900 were much the same, except that in the latter case disease entered the body from outside'. Assess this claim.
Very few candidates responded to this question; they may have been concerned about an overlap with the scope of Question 8.

10. What objections to scientific and technological development t were raised in the 1960s and 70s? Why did they arise?
Very few candidates responded to this question, despite the fact that it invites a range of responses drawing on the course material. Most responses described anti-nuclear and environmental concerns.

11. Assess the strengths and weaknesses of describing change in the life and medical sciences since 1900 as 'molecularisation'.
The best answers to this question recognized that it asked for a judgement to be made about the strength of the historiographical claim and demonstrated understanding of the relationship between the life sciences and medicine. Most candidates assumed that molecularisation began in 1953 with the elucidation of the double helix. Weak answers missed the significance of the phrase "describing change" and simply assessed whether molecularisation was "good" or "bad" for biology; other weak answers focused almost entirely on the story of Linus Pauling and sickle cell anaemia.

12. In 1945, the White House proclaimed the atom bomb was 'the greatest achievement of organised science in history'. Was that true then, and is it still true now?
The most popular question. The most common error was to obsess over the meaning of the term "greatest" to the exclusion of other historical or comparative reflection. Strong answers engaged in an analysis of the rationale for the statement made about the bomb in 1945 by the Truman administration, or considered the responses of the physicists who participated in its

creation, rather than confining their remarks a personal assessment of the bomb's consequences. Better answers addressed the question of large-scale organization, as well as its antecedents and later history. Some weaker answers restricted themselves to finding historical (and often early modern) precedents for Big Science.

Paper 2: Philosophy of Science

Section A

1. Is the method of physics applicable to all other sciences?
Most students answered "no" by first arguing for (or adopting) an account of "the method in physics", such as falsificationism, Kuhnian paradigms, or the DN model of explanation. They then went on to show that the adopted account did not apply to other sciences. Good answers focused on a particular method and a particular science. Some also problematized the idea that there is one unified method attributable to physics or that physics can be easily distinguished from other sciences.

2. Are there revolutions in science?
Most answers began with an account of Kuhnian revolutions (paradigms, normal science, crisis, etc.). Good "yes" answers involved presenting and defending historical examples of revolutions in science. "No" answered presented similar cases but went on to argue that these lacked one or more features of a Kuhnian revolution.

Section B

3. Can science do without induction?
Many answered this question by presenting Popper's account of falsification (as an example of science without induction) and then argued for or against it. Strong answers presented the problem of induction before going on to directly argue for or against the necessity of induction in science. Some made the interesting move of arguing that induction is important in some contexts (such as discovery), but not others (such as justification). Weaker answers spent too much time on Popper's account of falsification.

4. Does it matter for a theory of scientific method that science is a communal activity?
Not many answered this question. Most answers took the form of arguing for or against some communal element in the accounts of Kuhn, Popper, or Lakatos.

5. If the Kuhnian scheme of scientific development is correct, can there be Popperian falsification of theories?
The most common answer to this question was a qualified "yes". Many noted the tension between dogmatism and falsificationism before proceeding to argue for their compatibility. The best answers presented views that built on a nuanced understanding of Kuhn and Popper and were careful to distinguish theories from paradigms.

6. "The only principle that does not inhibit progress is: anything goes." (Paul Feyerabend) Discuss.
Many answers lacked an explicit discussion of Feyerabend. The best answers presented Feyerabend's views on method and evaluated arguments for and against them. Weaker answers evaluated whether one or more methods (that of Kuhn, Popper, or Lakatos, for example) inhibited progress before agreeing (or disagreeing) with the quote presented in the prompt.

7. Is a realist attitude justified towards the theories of modern physics?

Many of these included good discussions of realism (e.g., the miracle argument, underdetermination of theory by data, the pessimistic induction, etc.) but failed to address the prompt of how a realist attitude is justified in the particular case of theories in modern physics.

8. Can the social sciences be truly scientific?
This was a popular question. Few students defined "truly scientific" and instead listed reasons for setting the social sciences apart from the natural sciences (complexity, intentionality, multiple-realizability, looping kinds). Weaker answers described these features without explaining why or why not they might affect the status of the social sciences as a science.

9. Is understanding the brain sufficient for understanding the mind?
Most students answered "no" to this question. Surprisingly few did so on the grounds of embodied cognition. Instead, a common theme was to argue against neuroscience providing insight into phenomenal consciousness. Strong answers in this latter category explained clearly the distinction between access and phenomenal consciousness.

10. Does modern evolutionary theory show that 'human nature' is a myth?
Few answered this question. Those who did tended to argue that "human nature" is a myth. Good answers opened with a particular view of human nature and used specific examples from modern evolutionary theory to argue for or against this view.

11. Should moral or political values inform science?
Strong answers to this question distinguished epistemic from non-epistemic values and discussed inductive risk within the context of one or more particular views on values in science (Kitcher, Douglas, Longino). Weak answers defended the objectivity of science in ways that failed to engage with the literature.

12. Is it ever reasonable to believe the truth of P on the basis of the fact that P is the best explanation of *Q*? Discuss with reference to at least one example.
Many students focused on inference to the best explanation (IBE) in answering this question, defending criteria for successful IBE. The strongest answers directly engaged the question about truth, as well.