

## History and Philosophy of Science Courses for Science Students

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Published online: 31 August 2017

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I enjoy having discussions about history and philosophy of science (hereafter HPS) with faculty members in science departments (hereafter FMSDs). Things get interesting when I argue that science undergraduates must have compulsory HPS courses in their curriculum. Usually, before I even get to the main verb in the sentence, the response that I receive is that this is not necessary. Many FMSDs find HPS irrelevant to science teaching and learning. There are several reasons for this: some think that this is outdated, if not useless, material that is of no use to scientists doing lab- or field-work but only to armchair scholars; others think that there is so much science content to be taught that there is no time for anything else, let alone HPS. Interestingly, even those who might devote a few minutes to listen to my arguments about why HPS is useful to science, usually seem to have already reached the conclusion that there is no need to teach Popper and Kuhn to science undergraduates—interestingly nobody mentions Lakatos or Laudan or any other philosopher of more recent times. Therefore, whereas I am trying to make an argument on the importance of metascience for science students, the FMSDs I am talking to probably think that I should have better things to do. Of course, there are also those who would not listen to me at all.

Why is this happening? Why this lack of interest for HPS on behalf of FMSDs? Before answering these questions, I must note that I am not suggesting that all FMSDs find HPS useless; I am only writing about those who have explicitly told me so, who in my own experience are the majority. But perhaps, other people have had a different experience. Anyway, my own experience suggests two reasons why FMSDS, most of them currently in their 50s and 60s, might not be interested in HPS. The first reason is that they have not realized its importance, and they are not themselves aware of their own reliance on HPS. Whereas they develop scientific models and use them for predictions or explanations, they may neither be self-conscious that they are doing this, nor aware that this is what HPS is about. This is likely the case because none of them ever attended a course on HPS to realize this. The second reason is that several of these people have actually attended HPS courses or lectures, which

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were from totally boring to really traumatic experiences that drove them away from HPS. I have heard people explaining to me how they happened to listen to someone giving an HPS lecture, either listing who said what (and this is how they remember Kuhn and Popper—when the presenter arrived at Lakatos, the FMSDs had either left the room or fallen asleep), or presenting a topic in very complex and technical language that they could not understand.

Therefore, my point is that the FMSDs are not to blame if they dislike HPS. This raises the question of whether HPS scholars communicate HPS to scientists in a comprehensible manner, but this is not the problem. The problem is that university science education may have not helped scientists and FMSDs become aware of the usefulness of HPS for doing and understanding science. This then becomes a larger issue of what kind of education universities offer to future scientists: science courses only, or some humanities courses as well? For instance, many people would likely agree that all healthcare professionals must have strong foundations and a good understanding of ethics. There is an underlying utilitarian argument here, but I see no problem with that. However, university science education should not only provide future scientists with what they will need, but also with a broader culture that will make them better scholars and better teachers. Apparently, this requires fundamental changes in university systems; we do not need curricula that lead students to extreme specialization early on, but inter-, multi-, and trans-disciplinary curricula that provide students with rich educational and scholarly experiences. But, these are policy decisions, and changes are often difficult to bring about.

I am always impressed by how different are the views of people like me (and many of the readers of this journal) who first got degrees in science but then continued with PhDs in science education or HPS, and people who got science degrees and continue to do research in science. I would probably share the views of science people had I continued to do research in science and not in science education, because I would not have realized what other disciplines, such as those related to HPS, add to my understanding. Therefore, it is perhaps us who speak the language of both worlds, of both science and the humanities, who should communicate the message for change. We should try to convince our science colleagues that a person who gets a degree in science should not only know the details of numerous scientific models, but also be able to explain what a scientific model is; not only know the explanations for various natural phenomena, but also analyze and explain their structure; not only know the current scientific theories, but also the older ones from which the new ones evolved; and a lot more. This is what HPS is about.

There is a long way to go, but we can try.

#### **Compliance with Ethical Standards**

**Conflict of Interest** The author declares no conflict of interest.