

## Studying the Cultural History of Victorian Science

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KZ: The first thing I want to know is how you came into the field of history of science.

BL: When I was an undergraduate at York University, I took a wonderful history course on science and religion in Victorian England, taught by Professor Sydney Eisen, which hooked me. Due to that course I decided that I would go to graduate school and study Victorian science and religion. But at that point, I thought of myself as doing intellectual history or history of ideas. I didn't see myself doing history of science, because in the 1970s history of science was different from the way it is now. History of science was done by scientists, or scholars with scientific training, and was concerned only with the scientific ideas, not with the cultural and social context of science. I did my Ph.D. at Brandeis University in Boston in the history of ideas program, which didn't take any new students the year after I got there. My dissertation was on the origins of agnosticism, and it dealt with scientific and religious ideas. When I finished my degree in 1979, there were no jobs in intellectual history because this was a period when social history was really taking off. All the jobs were in social history; there were none in intellectual history. And so I took a series of sessional or contractually limited jobs, meaning they were full time but only for a limited number of years. I was a gypsy scholar, moving around a lot, from place to place. And at some point I started to realize that if I identified myself as an intellectual historian I wasn't going to find a tenure track position. So about 1985, I started to redefine myself more as a historian of science, and I started going to History of Science Society meetings. I found the American Historical Association was too huge and it stressed social and political history. It was so large that I couldn't meet people. So I started to go to the smaller History of Science Society meetings, and found that I had a lot in common with historians of science because the field was changing dramatically. Historians of science were more interested in what I was doing since the field had started to move towards a serious consideration of the social and cultural context of science. But it took some time before I was fully accepted as a historian of science. In 1987 my first book, *The Origins of Agnosticism*,

came out. It was a vastly revised version of my PhD dissertation. The *Isis* review of my book was by my friend James Moore. In the review Jim referred to me as an intellectual historian, and he felt it was necessary to explain the importance of my work for historians of science. So I was not firmly established as a historian of science right away.

KZ: In the book you edited, *Victorian Science in Context*, you changed your approach. What you did is not intellectual history, but cultural history, focusing on the communication of science. So, why did you decide to do research on science popularizers?

BL: I had worked for so long on the agnostics and many of them were elite scientists. *The Origins of Agnosticism* focused on Huxley, Spencer, Tyndall, Clifford and Leslie Stephen. Stephen was the only non-scientist. I worked on this group for about ten years. When I started to think about what I wanted to do for my next big project, I decided that I wanted to shift to something completely new. Actually, it was James Moore who invited me to submit a chapter for the book he was editing, *History, Humanity and Evolution*, which helped me to come up with my new project. In that book he has his wonderful article on the death of Darwin's daughter, Annie, and how that shook his faith. This edited collection was produced in honour of John Greene. I had to think about what I wanted to do for that book, and there was a small section of *The Origins of Agnosticism* where I discussed Spencer's disciples in the 1880s, a group of former secularists. They were little known figures, who popularized evolution and agnosticism. So I wrote a chapter on them for Moore's collection, and that was the first time I started to think about the popularization of science as a possible book length project. I realized if there were people who popularized evolution in the 1880s, there must be other non-scientists throughout the Victorian period who popularized science, not just evolution. And I started to wonder who they were. In the early 1990's I started working on the new project and it took over 15 years before *Popularizers of Victorian Science* came out. But the first piece I did on that topic was the chapter for *Victorian Science in Context*.

KZ: Do you think the Public Understanding of Science movement influences studies in history of science?

BL: The Public Understanding of Science is really meant to get people to understand science, to see the value of science, and, ultimately to support science. It can be uncritical as it tends to glorify science. So I think historians of science reacted against that. I tried to show that even the process of understanding science has a history, and it is much more complicated than just a scientist saying here is what science is all about, and then that is passively accepted by the public. So that is the work I do now on the popularization of science, trying to make the point that the public understanding of science is way more complex than is usually thought by supporters of the public understanding of science. In the Beijing conference on Darwin in Communication, one speaker discussed how scientific information was lost in the communication of evolution from Darwin to the masses in China. It was an old model of how

science is popularized. The elite scientist has the truth, they put it in their book, a popularizer of science comes along, summarizes and simplifies in the process--gets it wrong somehow--and then the reader gets it even more wrong. So the goal of the popularization of science, in this model, is to provide the public with 100% of the information in the *Origin of Species*, communicated through the popularizer of science. So there is supposed to be a direct line of communication from scientist, to popularizer, to reader. The work I have done on the popularization of science tries to show that popularizers don't even aim at giving their audience 100% of the *Origin of Species*. What happens is more like a process of translation. The popularizers of science are translating science into terms that their audience can understand, and in the process they were building into the scientific ideas some kind of sense of the larger meaning of science which may not be in the *Origin of Species*. Darwin famously refused in the *Origin of Species* to talk in detail about the larger implications of his work for religion and for understanding the nature of being human. But the popularizers realized that the audience wanted to know what those implications are, so when the popularizers popularize evolution, their primary purpose is to tell the audience what the scientific theories in Darwin's book means for them. We will help you understand the science, the popularizers told their audience, but we also want to help you to understand what the science tells us about our place in nature, about the meaning of life, and about the future of humanity. They are not getting 100% of the science in the *Origin of Species* because it alone is not the crucial thing. That is why I think the Public Understanding of Science notion, which has the idea of the diffusion of knowledge from elite scientist to passive readers, is a false, simplistic model. That notion of diffusion, I think, goes all the way back to the 1820s in Britain. There is an organization devoted to disseminating knowledge that was founded in that period known as the Society for the Diffusion of Useful Knowledge. It was founded by Henry Brougham, a Whig, who thought that the dissemination of knowledge was the key to progress. He believed that an audience existed who wanted to read about science in affordable books. He wanted to counter the influence of illegal books published by radicals that tried to make science materialistic. The books published by SDUK put science into a religious framework by drawing on natural theology. But Brougham's model was the diffusion model--the popularizer is supposed to sum up the scientific knowledge in the area being discussed and then the reader is supposed to passively take it all in. So the model behind the Public Understanding of Science movement is quite old. It doesn't provide a suitable model for doing historical research into the popularization of science.

Here I am reflecting the views of historians of science who have been working on the popularization of science, scholars like Roger Cooter and Stephen Pumfrey, who wrote an influential article in the 1994 issue of the journal *History of Science* titled "Separate Spheres and Public Places: Reflections on the History of Science Popularization and Science in Popular Culture." James Secord is another example of an historian of science with sophisticated views on the popularization of science. Jim's main point in his book *Victorian Sensation* is that

diverse groups of readers read the *Vestiges of the Natural History of Creation* very differently because they brought to their reading different sets of interpretive principles. Jim talks a lot about the geography of reading in mid-Victorian England. For example, one group brought the interpretive principles they used to read the Bible to everything they read, including the *Vestiges*. So Jim is very much interested in how readers were active in their reading, not passive.

Although it may sound strange, I think that there was no popular science prior to 1800. What has been taken for popular science by scholars in the past was actually books that had limited circulation and that were written for very highly-educated people. Before 1800 many people couldn't read. There was no mass reading audience, and there were no cheap books for such an audience to read. So the story of the emergence of popular science really starts at the beginning of the 19th century when publishers perform a series of experiments to see if a market for cheap books really exists. The Society for the Diffusion of Useful Knowledge is not the first, but it is one of these experiments in the early nineteenth century. There are others earlier than that, but by other publishers, and they all failed, including the SDUK. They failed because a mass reading audience did not yet exist. Let's not forget that the printing technologies needed to produce cheap books were just beginning to be developed. The conditions needed for the existence of a mass reading audience are not there until the 1840s and Robert Chambers' *Vestiges* sells so well that other publishers realize that now there is audience for cheap science books. So really you could say that popular science didn't emerge fully in Britain until the 1840s. Attempts to produce popular science books in the early 19th century were basically failures, or had very limited success. Certain conditions had to be in place for popular science to exist. You need to have high enough literacy rates to allow the existence of a large reading audience that can afford to buy your books, and for them afford to buy your books, you need to have cheap books, and you need printing technologies that allow the production of cheap books.

KZ: I think in your book *Victorian Popularizers of Science*, and the book *Science in the Marketplace* that you edited, you want to challenge the traditional model of the professionalization process in the history of science.

BL: That's right. When historians of science looked at what was happening in the nineteenth century, the emphasis had been on the professionalization of science within the scientific elite. I decided that countering the emphasis on the professionalization process required two books. Tackling the topic of the popularization of science couldn't be done in one book. I thought that if I have a conference, and there are other people working in the area, we can look at a broader spectrum of subjects. So I could only touch briefly on topics like scientific exhibitions and museums in *Victorian Popularizers of Science*. But in *Science in the Marketplace*, you have other contributors. We are trying to look at the spaces where popular science took place. We also wanted to discuss the experience of the audience when they went to those locations and they encountered popular science. So that helped us to get away from the usual spots historians

used to deal with, such as books and periodical articles written by elite intellectuals. We chose to look at sites like the affordable museums people could visit, for example the Royal Polytechnic Institution. We could look at the electrical demonstrations that were open to the public. We could look at the guide-books for exhibitions, at natural history collections at country estates, and at public lectures. We just tried to find as many different kinds of sites where popular science was offered that hadn't been looked at before. This helped us get away from looking at people like Tyndall and Huxley. While I enjoy studying Tyndall and Huxley, if all we look at is those kinds of elite figures, then we miss how the public experienced science in different places other than the books written by Tyndall and Darwin. In other words, if you put yourself in the shoes of a regular member of the British public, when they think of science they don't just think of Huxley, Tyndall and Darwin. They also think of the museums they go to and of the cheap popular science books they read, where they get different message about what science is about. That is what *Victorian Popularizers of Science* about. I basically try to show that there were a sizable number popularizers of science, who did not share the same agenda as Huxley, Tyndall, and other elite scientists. Huxley and Tyndall wanted to secularize nature, get away from natural theology, and professionalize science. But things are different for these popularizers I look at, many of whom were not professional scientists. They wanted to retain natural theology, and they wanted to argue that anyone can be a scientist. You don't need to be an expert. You don't need to have professional training, which Tyndall and Huxley said you have to have. You don't need to have done work in a laboratory. So the question in the second half of the 19th century is: who gets to speak for science, and who is the scientific authority? Is it Tyndall and Huxley, or it is that those popularizers of science who also speak with authority about science and its larger significance?

KZ: But I have a problem. I think if we study the process of professionalization and the process of the popularization of science, we can get a complete view of Victorian science. But the question is: who won?

BL: That's a great question. The second part of your question would be "when"---when did the winners win---so you have to ask who wins and when. So the professionals win, we know that, we know the end of story. My argument is that they don't win until much later than we thought. Just because Huxley and Tyndall identify themselves and their fellow practitioners as professional scientists who are the only ones with the qualifications to speak with authority, I don't believe that the public accepted that. I believe it was not until nearly the end of 19th century, maybe the early 20th century, that the professional scientists finally established themselves as the sole authorities. Just look at what the Victorian public is buying and reading, and at who the best selling authors are. If they only bought the books written by Tyndall, Huxley, and the other professional scientists, then they won the contest for cultural authority. But in this period the reading audience is buying books by people who are not professional scientists. In fact, the best selling science book is written by an Anglican clergyman by the name of Ebenezer Brewer. His book *Guide to the Scientific Knowledge of Things Familiar*

(1847) more than tripled the sales of the *Origin of Species*. In the conclusion to *Victorian Popularizers of Science* I have a table of the sales of the most popular science books in the second half of the nineteenth century, and you will see that there are many non-professional popularizers who have books that are very successful that sell more copies than books by professional scientists. That tells me that the reading audience basically sees the popularizers as speaking with authority. I think they probably have difficulties deciding who the real authorities are. They do know one thing though, that if you read Ebenezer Brewer's book, you will find it's a more interesting read than some of the books written by the professional scientists, who are not necessarily the best writers. If you read Brewer's book you will get an answer to the questions: what do contemporary scientific theories mean to me as a member of the public, or what is the larger significance of science, because sometimes professional scientists don't deal with those questions.

So I don't think such professional scientists as Tyndall and Huxley won the contest for scientific authority in their lifetime, and keep in mind also that the professionalization of science is happening at the same time as the emergence of popular science. The professionalization of science is not complete by the end of 19th century. Even the notion of professionalization that Tyndall and Huxley have is different from our contemporary notion. Their notion of professional was more fluid and flexible than our notion now.

KZ: You are the general editor of the Dictionary of Nineteenth-century British Scientists, which is very helpful. My question is: how did you do it? More and more Chinese historians are studying Chinese scientists in the early 20th century. Maybe one day we will edit a biographical dictionary like yours. So, we want to learn how you went about putting it together.

BL: I like trying to figure out how to take an impossible logistical task, like obtaining entries on over 1200 important nineteenth century British scientists. Actually, we didn't start off thinking we will have 1200 entries. We started with 600. Our publisher said: two volumes, 600 scientists. Here's how we did it. First of all, I decided that I would find scholars in the field who were specialists in the different scientific disciplines. So, I knew there were a lot of geologists in this period, so I found three historians of 19th century geology willing to act as supervising editors for the project. The same thing for other scientific disciplines, such as biology, physics, natural history, and natural philosophy. I tried to think of all the different types of science that were done in the 19th century. I thought of scholars who were experts in those areas, got them agree to be supervising editors, and I asked them to give me a list of all the scientists who worked in their particular disciplinary area in the 19th century. And they came up with long lists. That is why we ended up with 1200 names, and four volumes rather than 600, and two volumes, because they thought of way more names than I could. So the first task was to compile the list of entries. I had a big excel sheet, with the names of the scientists in alphabetic order, their birth and death dates, and what scientific area they worked in. Then I had to divide the list up, so all the people who were recruited as supervisory editors all had

about 50 names each. They recruited contributors to write the articles. I had very little contact with the people doing entries. Contributors submitted completed entries to the supervisory editors, who did their editing, and then they sent the entries to me. I spent an entire summer doing final edits.

KZ: Both you and James Moore deal in your work with the relation between Victorian science and religion. Both of you challenge the conflict model and provide a different historical picture. But it seems to me that conflict still was there. Could you say more about that?

BL: When James Moore and other scholars started to challenge the conflict model, I think what they were trying to do is to say that there has been an overemphasis on conflict. I think Jim would say there was conflict. But to make that the key to the interpretation of the whole period, or to the whole relationship between science and religion throughout western thought, distorts what really happened. Jim's *The Post-Darwinian Controversies* is a wonderful book, which came out just about the time I finished my dissertation. So Jim was there before me. I learned a lot from him. But I think what Jim wanted historians to do was to realize that beside the conflict there were key figures who did not see a conflict between evolution and Christianity. In his *The Post-Darwinian Controversies* he discussed a number of important Protestant figures who thought they could reconcile evolution with Christianity. He divided them into two groups: one group does it without distorting evolutionary theory, and one group does it by distorting evolutionary theory. The latter group made evolution into a God guided process. And there is a third group of Protestants who did see conflict. So you have to put the conflict side by side with the groups who were looking for harmony between evolution and Christianity. By doing that, Jim gave us a much more complex picture of the relation between science and religion. There was conflict, but that's not all of what was happening. When I wrote *The Origins of Agnosticism*, I was also trying to undermine the conflict thesis by showing that even the agnostics argue that there wasn't a conflict between science and religion. They argued that there is potential conflict between science and theology, not science and religion, because science and religion belong to two different spheres. Science is in the realm of sheer fact; religion belongs in the domain of feeling and emotion. And when we talk about religion, the agnostics believed, you use poetry and art to express your feelings. As long as religion sticks to what it's doing, talking about feelings, and science sticks to facts, then there can't be any conflict. According to Huxley and his friends it is theology that tries to make statements of fact. Therefore it is a branch of science. I don't think that the agnostics' presentation of the two-sphere model for science and religion was just a strategy to repel charges that they were atheists. I think they really believed that religion had an inherent validity. If you read Tyndall's diary, it sounds like he has a religious revelation when he climbed up an alpine peak and looked down from the top of it. He was so overwhelmed by the natural world that he wanted to write poetry to express the religious feelings he experienced. So even for the historical figures who have been accused of being responsible for the conflict model, such as Huxley and Tyndall, they didn't conceive of science as being inevitably opposed to religion. I think if you take that into

account, you will have a much richer picture of what was happening in that period. So in one of my articles on Victorian science and religion, I finished it by saying you can compare the sounds emanating from Victorian intellectuals to an orchestra that can't play in tune. So you have Huxley and Tyndall on percussion, and Protestants who harmonized evolution and Christianity playing in the horn section, and popularizers of science handling the string instruments. The brass instruments play flawlessly as a unit while the strings are in perfect harmony with each other. Led by Huxley on the cymbals, the percussion section is in sync. But the various sections of this imaginary orchestra just cannot play together and it seems that all you hear is a cacophony of sound. So my point was that if you listen just to Huxley and Tyndall playing their instruments, it would sound very harmonious. And if you listen to the horns, it sounds nice too. But when you put them together in the same band, all you hear is noise, and it sounds like conflict. So there is harmony inside the conflict. That's what I'm trying to show.

KZ: The last question is about your sense of the field, viewed from your position as editor of the journal *Isis*. What's the trend in the history of science during the last several decades?

BL: The most important new trend in history of science started when I began to redefine myself as a historian of science. From the 1990s on, historians of science began to pay a lot more attention to how the cultural and social context shaped science. They got away from just focusing on the scientific ideas and theories themselves, and that was a huge change. I lived through that and saw all the fights within the History of Science Society over the new historiographical approach. This was part of a larger event called the "science wars". Scientists were attacking historians of science, feminists studying science and gender, and scholars working on the social studies of science, and saying, why waste your time looking at such things as the social and cultural context of science? That's not what is important. The important thing, according to scientists and their allies within the history of science, is the great scientific heroes and their ideas. Why bother with religion? Opponents to the new historiography argued that religious ideas are obstacles on the way to discovering scientific truth. But more and more historians were doing history of science during the 1990's and fewer and fewer scientists. So there was a professionalization of the history of science in the 1990s. And after that, when the science wars died down, historians have accepted the integral role of the social and cultural context in the history of science. That was one of the big shifts.

But what happened since I took over the journal in 2004? People became more interested in recent history. Fewer historians of science are looking at ancient science, the Middle Ages, and even the early modern period and the so-called Scientific Revolution of the 17th century. More and more historians of science are looking at the 20th century. I get many manuscripts submitted to *Isis* on American science. Over ten years ago, hardly any one was working on 20th century American science. Now it has become a central area of interest. In *Isis* we publish at least one article on American science in each issue. The other interesting thing is



that there is more attention to the history of the social sciences, and how they relate to the natural sciences.

So the focus of the history of science has shifted in the early 21st century. The nineteenth and twentieth centuries have taken center stage. And there is more and more interest in the very recent history of science from the 1950s on. Cold war science is a big area. I think people just get naturally interested in the 20th century science because it seems more relevant to the present. The 20th century seems to play a much larger role in shaping the 21st century than the 17th or the 16th century. But, at the same time, there is also more and more interest in the development of science beyond the west, including the history of Chinese science.

KZ: Thank you very much, Professor Lightman, for sharing your valuable experiences and ideas with us!