

Peter Bowler visited Barcelona to talk about the making of the textbook *Making Modern Science: A Historical Survey* (Chicago: University of Chicago Press, 2005) written in collaboration with Iwan Morus. Before his talk for the series *Communicating Science: Pleasures and Pitfalls of Historical Narrative*, we interviewed him in “La Granja de Gavà”, Barcelona.

Interview to Peter Bowler, by Clara Florensa*

Peter J. Bowler is Professor Emeritus of the History of Science at Queen’s University Belfast, elected Fellow of the British Academy and the American Association for the Advancement of Science and corresponding member of the Académie Internationale d’Histoire des Sciences. He was President of the British Society for the History of Science during the period 2004-2006 and has written extensively on the history of evolutionary thought, the environmental sciences, and genetics. *Making Modern Science* (written in collaboration with Iwan Morus) has become a standard textbook in history of science courses over the world. His current research is on the production of popular science literature in early twentieth-century Britain, with particular emphasis on the role played by professional scientists.

WRITING THE BOOK

“History of science has a role to play in challenging misunderstandings that people have about the effects of science.”

In the preface of your book you declare that your aim was to write a history of science textbook for novices. How did the idea arise and what were the reasons to get involved in this project?

The origins of the book go back to a specific change in the way we taught history of science at the university in Belfast. For a long time we had taught quite specialized courses. Originally, there were three people in the department and our main job was teaching large numbers of first year science students mostly. But because they all had different timetables we had to fill many slots in order to target as many students as possible. We had three rather more specialized courses; one of them was in evolutionism, for instance.

But then, eventually, there were only two people in the department, Iwan Morus and myself, and the number of science students was diminishing, so it was no longer quite so profitable to cover multiple timetable slots. Hence, we decided we would just have a single course. In that case what made sense was a general History of Science course, not a specialized one.

Iwan Morus and I had two complementary interests, so we decided we would try to divide the work and develop a structure which would allow us to distribute our teaching commitment. We had a twelve week semester. There would be a two week introduction to help students understand what the subjects were about, and then a series of two week blocks. And this is where the chapters of the book come from: each chapter was used as the text for one specific teaching block. And because we were both teaching two weeks on, two weeks off, they had to be quite self-contained blocks. That’s why the book makes no attempt to be a sort of

continuous narrative of history of science; it is very much more compartmentalized. The original chapters written were the ones we needed to teach, the particular topics we had chosen for the course.

“The structure of the book is an expanded version of the structure of the first two courses we taught, and the idea that anyone teaching history of science could find in it what they wanted”

But when we decided to turn it into a book, it was obvious that other teachers in other universities would not necessarily want exactly the same lessons that we used, so we doubled or more than doubled the number of topics. We tried to cover a broader range, so that we felt that most people who wanted to teach a general survey of history of science could find, if not everything they needed, at least a significant proportion of the topics they would need. And because we had two semesters of the long course of two week blocks, we structured it in two major parts. The first one was called “Revolutions in science” which is on particular episodes of history of science; the second was “Science and society” and is more on general themes. Finally, the structure of the book is an expanded version of the structure of the first two courses we taught, with the idea that anyone teaching history of science could find what they wanted.

Since the two teaching semesters that are now part of the book are completely different, readers can cut across one part or another. People can use the book as they like, and use cross references. For instance, if you are doing Darwinism and you want to know which problems it has with religion, you can then move to the chapter on “Science and religion”. You can give the book to the students and tell them “this is the main reading on Darwinism or on science and religion”, and they will always find links to other parts of the book.

You addressed your book to students, but also to a broader public, not only scientists. So far, we know that it has become standard in history of science teaching. But, what about other readerships, have you got any feedback?

Well, we do not have a great deal. Most of the reviews or comments that we have heard about are usually connected to teaching, and although we did want it to be read by anyone else, it is very much structured as a textbook. We did not want it to look visibly like a textbook (with all those little boxes and questions and answers at the end of each chapter...); that would have made it really off-putting for a general reader.

But at the same time, the book is what it is: it is a textbook. It is not intended to be picked up from a bookshop shelf just like that... You need to be reasonably interested about finding out how the subject, the history of science, works nowadays, to want to pick it up. So it has a limited general audience.

And that thought of not wanting to make it look as a text book...?

It cost us 5 thousand dollars to do it this way! Because there was another publisher that would have given us a bigger advances if we had done it as a real textbook. We would have had a bigger advance if we had let another publisher to do it that way.

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You did not want little boxes and that type of page layout or narrative, but did you think about including a chronology?

This is actually a very good idea; it didn't occur to us. We used to hand out chronologies sometimes to the students. A chronology for the whole think like that would be quite substantial...Chronologies for the individual chapters, would work, and I suppose you could do one for each; but trying to roll them all together to make a chronology for the whole book. It would be hard. You have to be very selective or it would be dozens of pages long. This is one of the practical difficulties that you encounter when you are trying to write a book like that.

Are you happy with the feedback you have so far received?

Yes, I mean, we had one very bad review in the *British Journal of History of Science*. Yes! When I was president of the British Society of History of Science, my own book gets a bad review in the Societies' journal! But never mind... All the other reviews were good and the feedback we had in conferences was from people that had used our book and told us it had been so profitable. So I think that it was clear that John Heilbron, who wrote the aforementioned review, was not writing from the perspective of someone who had to teach survey courses on the subject. He was criticising it as a rather old fashioned historian of science who was not bothered about the practicalities of teaching. But I do not think that this is a typical review.

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Which is, in your opinion, the aim of a textbook in history of science? I mean, do you think is important to communicate the discipline?

Sure, I think it is important, because science is important in the world we are living and people need to understand how it came out and how it has gained the position it has to influence our lives. And I think that history of science is a very good way of trying to introduce people to the effect that science has had; especially history of modern science. It is a little more difficult to do it with ancient science. This is why there is no ancient science in the book. But I think it is important.

History of science has a role to play in (and this is the theme of many of the chapters: dispelling popular myths) challenging misunderstandings that people have about the effects of science. Or ideas such as that science and religion are always in conflict. I think that history of Science is a very good way of trying to undermine that sort of misconceptions.

History of science has something to offer to change minds in terms of how people think about science today. If you understand how it has developed and the effects it has had, you are in a better position to grasp the sort of issues that are being raised today. So I think it is important.

And it is important to try and get across the ordinary people not just students. There is a real problem here, in the sense that this book is not very good for the man in the street, because it has not a narrative structure. But people tend to write grand narrative history of sciences and in the end I do not think they are getting across to the reader either...The important part, at least, it is much more difficult to get across.

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So what about the narrative? Did you think ahead what narrative strategies you were going to use or were more appropriate for the book?

In terms of a narrative strategy it is more a question of the structure we used in each chapter. The book itself, as I said in the epilogue (that I did afterwards because I was asked to), does not end with the triumph of modern science that solves everybody's problems; because that is not what happened. The whole point is that science is a much more complicated thing, which is much more interesting and dangerous. This is why the last two chapters are “Science and war” and “Science and gender”, a clear indication that what is going on here is not something that can be seen as how wonderful modern science is.

So the narrative is in the individual chapters. The lack of narrative of the whole thing is the point that if you want to understand the modern history of science you probably are not going to do it through a grand narrative. It is not a triumphalist sort of narrative that we are presenting...It is still aiming in a coherent direction but the whole point is that there are different sciences doing different things, different people with different obligations...and it is just a mess, an interesting mess, but a mess. And I think the more you try to simplify or to smooth it, you do some violence to the really interesting issues that arise. But if anybody can do it and get a grand narrative...I take my hat off....! We did not think we could do it.

Moreover, our starting point was a textbook, so for pedagogical reasons we were not trying to do that. But yes, I think there is a problem. I am not sure that if you want to get the message over to the general public, it's best done through a grand narrative; you are much better off doing as we did: you pick up a particularly controversial topic such as evolution or bioethics, and write about that, and show to people the complexities in that one area. You can tell a bit more through a narrative history. But trying to do it with the whole science is not going to be easy, and I think that you seriously risk oversimplifying.

Patricia Fara, she is good to do this kind of thing but there is one by Jeremy Cherfas, do you know it? Hopefully it has not been translated. It came out about the same time as this, and he is a scientist and science writer. Former scientist, now science writer. And it is awful! Because

it is just "oh, science is that great wonderful thing, and it goes better and better and better!". It's horrible! It is exactly what an academic historian of science does not do!

And did you think previously what narrative strategies could make the book more interesting?

Well, yes, the way to try and make it interesting, we thought, was to challenge myths. If students come in first year of university, they do not know any history of science, really. Or if they do, it is just common ideas that circulate around, what you can hear on the radio or in TV... Historians of science have mostly shown that these ideas do not hold up. So what you can do is try and ask directly "What do you think about Darwin or about science and religion?". And they will start saying "Oh, well, Darwin is all materialistic" or "Science is always materialistic", whatever. And then you say, "all right, hang on, what about this example there?". The narrative is built in terms of saying: "Well, there is a misconception and here are a number of examples. I wish you can read them together to make a story to show you that here is that example such as in the case of Darwinism or evolutionism, which does cross over the religion, but here is this other where it does not. And this is how things change the course of a subject in time, but fifty years later things might have changed again and taken a different shape". You can build a narrative within the topic.

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Where all your students future scientists?

Mostly scientists and a small number of humanity students. Probably they were not historians, but from all social subjects. But the vast majority initially was from various different sciences and so they had no formal history at all. Not even very much sort of ordinary history of their own countries, for instance. They learn some history a little bit earlier on at school, but they would not have done it afterwards.

The UK educational system tends to be very specialized: the last two or three years before you go to university you basically become a science student or a humanities student and you stop doing the other side. They are trying to break that down now, but for a very long time this is the way it was. It is not a good thing but those are the sort of things students are dealing with.

Do you think that the background of the students makes any difference in challenging the idea of a triumphalist history of science?

We mentioned this probably in the introduction of the book: Strangely, it was actually easier to do it in Northern Ireland than anywhere else, because there are two traditions about Irish history, and they are completely different from each other. So if you are a Protestant, then Oliver Cromwell is a hero, but if you are a Catholic he is a villain. You have two entirely different historical narratives about exactly the same event and the point is that even if all

students came from one side or the other, at least they are aware that the other side has a different story than them.

In that sense, without doing any academic history, just appealing to what they know from their everyday lives, it was easier to alert students to the fact that history is not just a series of names and dates. You have to put a meaning on the events, and there are many possible different meanings. What looks like a hero to one is a villain to the other. As exactly “is Darwin a hero or a villain?”. For biologists he is a hero, but for a fundamentalist Christians he is a villain. And you can find a lot of fundamentalist Christians in Northern Ireland...

“In Northern Ireland...it was easier to alerting students of the fact that history is not just that series of names and dates. That you have to put a meaning on the events, and there are many possible different meanings.”

Overall, one could use that tension to just introduce this sort of reasoning. If you go to that course thinking that you are going to have to memorize dates and names, forget it, that’s not going to happen! Of course we will provide some names and dates but what we are really doing is to encourage students to think about some quite important issues in science, and realise that, because they are important and they have consequences, people can disagree.

So are you doing history of science based on controversies?

Well certainly this is one issue. We do tend to focus on revolutions. And revolution is supposed to be good all the time. But some revolutions maybe are not quite so clearly good. There is science and technology, with technology getting lots of good ideas from science. But then comes the scientist saying “what the hell, this damn thing works”, because to do science maybe he has to know how this machine works. And again you are challenging conceptions.

How did you divide the work with Morus?

Well, the division of labour was in general obvious. Here there is history of medicine, and Iwan came to teach history of medicine. There were huge amounts of money given for universities to teach history of medicine. Iwan was not a historian of medicine, but like a lot of historians of science, he realized he had to do it because there is where the jobs were. But his real interest was electricity and popular science in the nineteenth century. So all that had to do with science and technology and medicine was always dealt by him. I did science and religion because I worked on Darwin, so of course I had to do that; and the human sciences was my share too, as I was teaching anthropology students by that time.

There are one or two subjects where probably you would not guess which one wrote them: Who do you think wrote “Science and war”?

I would say you.

Yes. And who did “Science and gender”?

I would also say that you.

No, Iwan wrote that one. Because he had a minor interest in women and science.

And in the difficult chapters we said, “OK, you should do it. I will do this one, you do that one”. But we did not combine chapters. Each one is written primarily by one of us. We wrote the chapters and then we obviously showed them to each other, but we did not collaborate in the initial writing.

Your publisher is Chicago University Press. Did you contact them with the idea or did they contact you and commissioned you a book like that?

We contacted them, it is an interesting story. I had been publishing with the Chicago University Press. They had done my previous two books, I think. I fell out with John’s Hopkins University Press because they would not paperback my books so I went to Chicago, by far the most active English language press for the history of science.

Cambridge wanted to turn the book into a real textbook and Chicago let it go how it was. So we sacrificed 5 thousand dollars and the text is pretty much as we wanted it to be.

My contact was Susan Abrams, who was the history of science editor. And we sent her the chapters that we had written up first to use in our own teaching (which was like a third of the total it would be) to show her the sort of thing we were doing. She very much liked the idea and said, “yeah, carry on, write all the other chapters”. And then she died; she had cancer. So we finished the other chapters. But, you know, we had been dealing with a single editor, and then we wrote a couple of people I knew in Chicago University Press but they said, “no, we did not know anything about this”. And they kind of pushed us away. They were not interested.

Then I was dealing with the Cambridge University Press because I was editing volume 8 of *The Cambridge History of Science*. So I went to Cambridge and I said, “look, Chicago is not interested in this any more, are you interested in it?” and they said “Oh yeah, yeah, yeah, we like this!”. And then somebody else from Chicago said, “hang on, this is a good idea...”.

We then ended up with the two: both presses wanted it! They realised there was money in it. And they started offering us advances. There started a bidding war. But Cambridge wanted to turn the book into a real textbook and Chicago let it go how it was. So we sacrificed 5 thousand dollars and the text is pretty much as we wanted it to be.

An American publisher, perhaps the major academic publisher in the world, is surely interested in their market. Did they not suggest changes in your manuscript for this reason?

No, they were pretty good. They accepted it almost as it was. So all we had to do then was to get the illustrations. I think with the illustrations they helped a bit, they found a few of them for us, we had to negotiate to get permissions to publish them, and so on.

ON HISTORIOGRAPHY

“If you think that all is pure knowledge gained by objectiveness of the nature, it is not! If you think that all is made of the contrary...it isn't! It is an interaction between the two. And the trick of history of science, I think, is to get that balance.”

Which were your historical and historiographical aims in this book?

In some aspects they are very basic, very primitive. As I said, undermining popular prejudices about history of science is really the main purpose. Trying to explain to students that the history of science is a much more complicated thing than they think. One way we do that in the introduction is talking about how the history of science has changed over the last 50 years or so, for different interests have come in, and we just do not do it the same way anymore, and also explaining why people have changed their models of analysis. And then you find this approach illustrated in each of the individual chapters.

What do think about the current state of the history of science? Could we say it is mature or is it still in a young stage?

I think it has matured a lot, if you compare it with the way it was when I came into the subject in the 1960s. It was when Kuhn's *Structure of Scientific Revolutions* was just being published. There was a long tradition still in place of the rather old fashioned, triumphalist, “science is pure, abstract knowledge”. They still thought that practical application of science was something kind of separate. “Real science” is in the head. And then if it turns out that you can apply it somehow they said “OK but this is a secondary thing and we are not terribly interested in it”. It was a very different way of doing it, and so many things have changed, too. All the perspectives of what scientists do, what are the real driving forces, and so on. So it is a much more mature field now.

In a sense, the problem is that communicating this mature perspective to scientists and to other people is not easy; they do not want to know. Just to give an illustration:

There is a biologist that teaches at Leeds, and he publishes short articles on Darwin, mostly in science journals (some science journals do these little popular pieces on history of science). He is one of these guys who think that Darwin has been overrated because there are other people who got evolution besides Darwin. And then he complains “why can I get not this published in the history of science journals?”. I e-mailed him back and answered: the reason is because historians of science do not believe all these stories! You may publish it in the science journals because they have learned this nonsense. But if you submit this to a history of science journal, of course they will throw it out and not even consider it because they know these are matters being discounted.

“Scientists prefer to stick with the nice comfortable old stories and they do not like being challenged and proved. This is our job, but getting through them is not easy.”

This is just an illustrative case but there are many. This guy is of these people that think that Darwin should be pulled off his pedestal. He has this sense of priority: who discovered natural selection? Well, not Darwin, because Patrick Matthew in 1831 published five paragraphs

describing the basis of it, and this is the first publication, so he is the real discoverer. Yes he is! He is in one sense. But not in any important one. We are not in the job of just assigning priorities the way we are doing modern science in which the first who is getting to print that is all matters.

You distinguish a lot between history of science done by historians of science and that one done by scientists. Do you think it is possible that scientists do good history of science?

Oh yeah!! There is always the example of Stephen Gould who did very good history of science. So this is certainly not impossible. But there is a big resistance in a lot of them. They prefer to stick with the nice comfortable old stories and they do not like being challenged and proved. This is our job, but getting through them is not easy.

I was under the impression that you were a defender of the new historiographies (the sociology of knowledge and the STEP and gender sensibilities)...

Up to a point!! I think Iwan Morus is probably more into the sociology of knowledge than I am. But I think both would not want to go the whole hog...

"If you are in a plane flying at 30000 feet and you are a sociologist of science saying that all that science is really imagination...why are you sitting in that plane?"

Which is exactly your position in this sea of historiographies?

I am a moderate. I think we do have to accept that what scientists do is shaped by a political, social and cultural environment. In a sense even the harder sociologists of knowledge do not think that everything is in our head, you cannot just put it all in our head, because it has to work! Richard Dawkins has illustrated this well: "if you are in a plane flying at 30000 feet and you are a sociologist of science saying that all that science is really imagination...why are you sitting in that plane? You are sitting in that plane because you trust the scientist who designed it!". And the point is that of course they have to admit this. It has to work. Wherever the ideas come from, at a certain level, you have to be able to test them.

There are different ways of testing and different strategies, and what seems to make sense in one paradigm – to use old fashioned terms – may not in another. But at the same time you cannot go too far down a route that generates things that cannot be tested. There is a real world there that is filtering the idea and there is an interaction between the testing and it. If you think that all is pure knowledge gained by objectiveness of the nature, it is not! If you think that all is made of the contrary...it isn't! It is an interaction between the two. And the trick of history of science, I think, is to get that balance.

But you said that Iwan Morus is a little more into the sociology of science than you are.

I think that's probably true...

Did you have problems for that reason?

Oh no, we never found us in particular difficulties; just interested enough to be a slight tension in there but nothing serious.

“We are still dealing with many of the old issues plus new ones. You do not get rid of the old issues; you do not get rid of the big names. We may think about them differently.”

Reading your book, I had the impression, if I may, that perhaps it was not that different from other histories of science which are considered less “new”. Do you think that it is difficult to leave behind the classical way of doing history of science?

We are still dealing with many of the old issues plus new ones. You do not get rid of the old issues; you do not get rid of the big names. We may think about them differently. Historians of science are still doing Darwin but the way we interpret Darwin now is not the way we interpreted it when I came into the field. You reposition Darwin and then you realise that to understand how evolution has developed, you have to recognize – regarding the professionalisation of science and the way evolution theory was taken out by the next generation of professional scientists – that Darwin was not the professional. And this has a big impact on the way the subject develops.

But at the same time, I do not think we should lose sight of the big issues like evolution or cosmology. I suppose, this is where I am a conservative. There are some sociologically inclined historians that would say “well, we should just throw all these big theories out. That is part of our work”. Well, no, it is not!

At the same time people still care about the big issues, so I think that it is a mistake to get rid of them altogether. We may have to think about the big issues in very different terms. But particularly, if you are interested in how science works outside, in the general public, evolution is a big issue! You cannot get rid of it because it raises topics and problems that concern everybody. And I do not think we should lose sight of this.

So is this what you would pick up from the old historiographies?

Well, I would not say from the old historiographies, but from the old priorities. I think that what we should be doing is handling new priorities but not in a way that completely displaces the old work. Some of the old priorities make sense. As Iwan quotes in his chapter “Scientific revolutions”, Steven Shapin says in his book, “there was no such thing as the Scientific Revolution, and this is a book about it”. We do not think about it but it is still there. In a way, something happened there, that we care about, this is exactly the point.

Do you think then that Shapin and Schaffer are a little too radical?

I do not know Shapin very well at all. But I think the fact is that in the end, to write a book about it, he might have to believe something happened ending in the Enlightenment. The reason why it was given the name ‘scientific revolution’ is all wrong. But it still has its sense reflecting something that we care about happening there.

"I refuse to use sociological jargon. When I hear the word 'hermeneutics', I reach for my gun."

Could it be possible that this kind of historians of science are emphasising too much that their way of doing history of science is new and crucial only to consolidate themselves, their profession and its need?

I think that a good way of tackling this question is the language you use. I refuse to use sociological jargon. When I hear the word 'hermeneutics', I reach for my gun (metaphorically, or course). I do not use those kind of words, I write in ordinary English. Because I know that if I use that jargon, scientists and other readers do not understand it. If you are not careful you end up writing for your small little select group in order to use that language. This is for instance where Donna Haraway seems to go Haraway writes about human sciences and her books are very good. But they are impenetrable because everything is done in this sociological jargon. It annoys me, and I will not use it, because I do not want to be seen as somebody just writing for a little group of academic initiates. I want to write for ordinary people and larger audiences. I wonder sometimes if the jargon is sometimes a way of preventing you from thinking about things, because concepts are so subtle. And you say, "OK, I want a clear answer to this question". I think it allows a weakness of thinking.

When you are writing this kind of book you cannot be vague: you have just 20 pages, whatever chapter is, to tell what Darwin really did, and you cannot go into the clouds about all this very nonsense! You need to have clear ideas to state them precisely in a few words. And I think that this kind of elaborated academic jargon is a way of not doing that. I sometimes say, "OK, well, how would you put it into a reference book like *Making Modern Science?*" and the answer is that they do not know how! Because they have not really thought about it that clearly and the language allows them to be ambiguous.

I actually came up with this problem at a very early stage in my career, in Cambridge, when I was an undergraduate. In my final year I did a History of Science course that was taught by Bob Young. Bob is a historian who I think does tend to do this kind of academic jargon, and I distrusted it, so my first article on Malthus and Darwin was really a response to his article on Malthus. And he said: "Oh, you completely misunderstood my article!" and I said "well, I am trying to make sense to what you said actually in words that a normal person could understand and then respond to it, and you now say that sounds too simple. I am trying to simplify it to everybody so that they are able to handle this. I think we have to make decisions about what we believe and we do not believe, and your language is preventing you doing that. You prefer to keep it flexible and vague. Well I am sorry. This is alright for your kind of very highly trained academic audience, but does not work with anybody else. And for a Marxist! I thought a Marxist had to care about common people! So why do you treat this as bloody academic elitism?!". I think that if you say "oh well, what I am doing is so refined, complex, sophisticated", you lose contact with the issue. I cannot do that. When I hear that endless amount of palaver, I suspect you do it because you haven't really thought the issues through well enough.

“It is not necessarily important for history of science sounding sophisticated. Sometimes sophistication can be a cover of the lack of clarity.”

If I can tell you a story, from many many many years ago, after my text book in the history of evolution had been circulating for some years, I got a letter forwarded by the publisher, by a woman living in a small middle western town in America, where everybody else was fundamentalist Christian. And she said “You have saved my life. I thought I was the only person in the world who had any doubts about these things. And suddenly I came across your book and I realised that there were other people out there who do not believe in all this”. This is what I want to do here!

This is the first part of the story. The second part of the story is that shortly after I got this letter, I was in a conference in Edinburgh and John Henry, who teaches there, had a party at his flat. There were a number of Americans there, including a woman – I cannot remember her name now – but she was in this kind of Donna Haraway very sociological school. I told the story while she was sitting behind me. John Henry told me the next day: this woman came up to me and she said “Oh, he writes for ordinary people! This cannot be any good for the academic area”. She was disgusted that I could write at a level that could affect the life of an ordinary person. And my response was “To hell with her, then!!”, using some obscene English words. I was angry! That someone who was so sophisticated could think that to write for ordinary people language is beneath them. That makes my blood boil, really does! I do not use that kind of jargon even in my actual research monographs. If academics want to do that, I have no time.

Is it then a matter of time?

It is not just a matter of convenience, but a matter of suspicion that sometimes that kind of language hides slack thought.

Or another, Michel Foucault. Now I will tell you another story about Foucault. I read French fairly well: I wrote my thesis in French as my PhD was on French science,. I was teaching for three years in Penang (Malaysia) when I heard about this book of Foucault that was very important. A friend went to Paris and I asked him to bring me a copy. But I could not read it! Then I got back home to Canada and got an English translation. But I could not read the translation either! So it was the language: it is obtuse. There is an important message there but it is hard to get it. And I do not think you ought to make it hard to get it. In some cases I am not sure there is any message there. In Foucault there is, but with some of the others I wonder whether the message is really there, but because the language sounds so clever, you have to pretend you have understood a very important message that is obvious. I will not do that. It is not necessarily important for history of science to sound sophisticated. Sometimes sophistication can be a cover of the lack of clarity. There’s a danger in it. It certainly prevents communication to ordinary people, and I think that we do have the duty of writing so that ordinary people can understand us.

“In many cases I wonder whether the message is really there, but because the language sounds so clever, you have to pretend you have understood a very important message.”

So in this context, what do you think about PUS, the dominant view, the deficit model... ?

The scientists that went through this phase thought that if they taught science they would always be respected and understood. But that is clearly nonsense. I think even scientists have begun to realise that if you want support of people you ought to try an engagement. It is not always obvious that what scientists think is the best, will be seen as the best by the ordinary people, so there is probably a better relationship emerging slowly.

Scientists, I think, now realise that they cannot just do what they want to do, and expect ordinary people to accept it quickly and smoothly. They wanted, though, and they disguised their scientific experiments. At the same time, of course, there are clearly movements against science which, I think, are dangerous; antiscience in a prejudiced way.

Things like opposition to genetically modified food, which clearly is not a rational issue. There is no evidence that could conceivably change some people's minds on this – they just have an emotional objection to it. And this is very dangerous. Creationism is another example of this kind.

Of course, scientists tended to be a bit overconfident and they do need to be told to be a bit more careful. But at the same time, if you have these violent antiscience movements that do not even listen to reason, this is dangerous too, so it is a complicated situation, as always.

“I think that we do have the duty of writing so that ordinary people can understand us.”

So, do you think that there are some things in science that should not be communicated?

No, I think you have to try. If you do not communicate, then you certainly will get people opposed. You may not be able to convince them anyway but I think you have to try. And hopefully, there is a general public that is very well prepared and cannot be misled. On the other hand, I also think that it is becoming more difficult in the modern world, with the Internet and Twitter and all the rest, because it is much easier for these irrational movements to flourish.

And what is your opinion about the production of knowledge by the publics of science?

This is an interesting idea that you do see: nowadays there are many efforts to try to involve ordinary people, and it obviously works better in some areas than others. It is pretty hard to get banners in the streets for new ideas on nuclear physics. What about the colleges? Yes they do, people sometimes can get involved in different ways. It is not an impossible option in some areas. But in others it is very difficult.

But you had not had this in mind, when you did your book, I think...

No, no...

And what do you think about STEP (Science and Technology in the European Periphery) movement in history of science? Do you think your book is sensitive about this question?

Probably not. Despite living in Ireland which in course is treated like European periphery. There was a meeting in Galway last summer but I could not go, I was somewhere else. So we probably are not too sensitive to that then...Well I could imagine putting another chapter on it on central metropolis and periphery and all that kind of thing.

"I think that science and periphery would be an extra chapter that worth doing, but there would be any number of others as well."

Do you think that a chapter on this issue would be worth?

The trouble is that there are so many chapters that if you get into that level, there would be any number of extra chapters we could write. But the publisher said that they could not take any extra chapters. If you throw it out to everyone else in the field and say, "what extra chapters do you want?", you would get a list of hundreds and hundreds. I think that science and periphery would be one of them worth doing, but there would be any number of others as well. Maybe in a translation for a peripheral country you could put a chapter on that subject, but originally we aimed the book at a public more American or English.

But as a whole, I have seen there is much about England, France and Germany...

And America

...and America, yes. Don't you think that there could be a bias in the history of science you present in the book, for this reason?

Well, there probably is but this is because if you are aiming at students most of whom are going to be American or British, I am not sure that those students would be interested in other national contexts. To give you an example: teaching in Ireland, I tried to introduce some Irish science, a lecture or two about Irish scientists, but they were always badly received by students. They were not interested, they did not see the point of trying to do it; it was seen by Irish students as too peripheral.

What a pity, because if they do not do research on it, who will do it?

Well, there is a lot being done, quite a lot of it by scientists who work in Ireland that do history of science as a side line, sometimes very badly, sometimes quite better...But the students did not like it at all. So I would have been reluctant to do anything like that.

"Teaching in Ireland, I tried to introduce some Irish science but it was always badly received by students. It was seen by Irish students as too peripheral."

So do you think that 'peripheral' history of science has to be done in and for the periphery?

Well not necessarily. It is clearly going to be of greater interest there, but I think that it is hard to get ordinary people to realise that there are significant things that might not be done by the big names in all the textbooks. It throws light in the way science is done: it is not universal and this is probably a good lesson we could learn from this, against the universalism of science. But of course, this is also a message that you get by comparing German genetics and American genetics, in the 1920s and 1930s, they were completely different, so that message does not have to come from the periphery, although studies on the periphery could provide good illustrations.

One example, when you talk about the circulation of blood in your book, you mention Harvey but not Miquel Servet who explained minor and major pulmonary circulation in the first half of 16th Century, have you heard of him?

That was Iwan's chapter, so I don't know who comes in there...

Or Ramon y Cajal who first built the theory of the neuron?

You have to be careful, there. You need to be aware that the idea they promoted had some impact or influence. And I think it is the same case as people who try to say that Darwin was not the first discovering the natural selection because you can find those five paragraphs in some epilogue of a book. Unless it had a really big impact, it is an interesting point to know, but it is not going to find its way in a book like this, unless it is something that was inspirational to the next generation. So I need to know more about these individual cases.

Do you remember some Spanish thing reflected in the book?

Probably not. Maybe Italian. But this is an issue apart of the big countries. When you are writing this kind of a book I think in the end you have to miss some things...

“This is a book written primarily for English language readerships, British and American. And we tend to focus on what we think will interest those.”

My concern is that maybe historians of science with more impact were from these countries also (England, France, Germany and America) so their national contexts might be more reflected in the tradition. But maybe other countries have something to say which could contribute in relevant ways to this general view of history of science.

There is always the question of science going out to non western countries. This is another question that has been raised. There is a bit in the book about European expansion and exploration, about how other countries responded to western science, but it raises similar issues. I guess in the end I just have to say “sorry, we cannot include this”. This is a book written primarily for English language readerships, British and American. And we tend to focus on what we think will interest those. I can quite appreciate that for another audience there are other things that could be said. The only answer would be to have translators who do additional chapters of their own and then add to it. I suppose I would be happy to see that

done, but we could not incorporate many of these things in the main text, because there are so many things we had to do...

The first part of the book is like a big picture. What do you think about ‘Big Pictures’?

Well, in fact I am a big pictures sort of person as I came to Evolution as my first interest. I did tend to like big controversial subjects. The framework of revolutions was very convenient to use in that part of the course and the book, so that turns to be the ‘big revolutions’. Obviously, if you don’t do revolutions, if you choose some other way of trying to get it out, then you might not have to use ‘big pictures’. I think that the second part of the book is much less focused on these general views and more on particular cases. So I think this is fair enough, you have a bit of both and this makes sense.

What question would you like to be asked about the book?

In a sense we have covered a lot of it. The question really is that we do not deal directly with the academic as a communicator and with the role of the academic as a public intellectual, which is much more common in European countries than it is in the English speaking world. And I do like to think that we have a duty to communicate, but I also think that people do not realise that there is actually a career in this context, and that there is money to be made. And many academics are so isolated people. That’s weird. I suppose, to be really cruel, that the question you should have asked me is how much money I made from the book.

“We do not deal directly with the academic as a communicator and with the role of the academic as a public intellectual. And I do like to think that we have a duty to communicate.”

Well, then how much money did you make from the book?

The point of that gross cruel question is that, if you want to be a good communicator, you should earn money from it and you should expect to earn money from it. I was coming through the words of Samuel Johnson, the man who wrote the first English dictionary, who said “no man but a fool would write except for money”. Why would you spend all this time writing if you are not going to earn money from it?! And you earn money because people are reading it. I think that you have to think in that practical way.

But Darwin wrote a lot and he had already money...

Well yes, but the interesting point for me is that people will read about Darwin, and you would sell more books about Darwin, so it is easier to make money writing about Darwin than with anybody else.

I am always amazed by the lack of...Well, I do not see myself as a journalist, but there is a lack of any sense of practical writing, which is in fact a skill that academics ought to have. And if you got it, you can earn money from it. I am astounded that most of my colleagues do not

have it and do not seem to recognize that if you did that, you can earn money. They always complain about their poor salaries. Well, it is a way to make extra money!

“There is a lack of any sense of practical writing, which is in fact a skill that academics ought to have. If the editor says, “please, send me 5000 words on this topic by the 31st of July”, the average academic would send him 10.000 words by Christmas time.”

I think most of them write for money, at least they live from it, so they already do it...

Most of them I think cannot write, they do not know how to write; not in the way that a journalist does. If the editor says, “please, send me 5000 words on this topic by the 31st of July”, the average academic would send him 10.000 words by Christmas time. I would send 4999 words for the 30th of July. And the publisher would appreciate that. And this is what I mean by being journalist: writing to specification, to word length, to audience level, to timetable, to deadline. Most academics do not. I could tell you a story about the eighth volume of *The Cambridge History of Science*, which came out fifteen years late!! Thanks to that kind of attitude. I think it happens. People have to learn to write. They often say, “Oh, I have to write four or five drafts to be satisfied”. No! you only have to do one draft and it’s done!! Why do you have to revise it? Learn to write, learn to write!! You learn to drive a car, why don’t you learn to write? It’s a skill you have to pick up! And most academics don’t, and they do not want to learn. But I think we should.

I was lucky, I learned it early on, I learned it at a very early stage in my career, when you were taking insecure jobs, when you did not know if the next year you would be driving a taxi cab. My job lasted one year. I did not know what was happening beyond that. I have to get this article finished now or I could never have the chance to finish it, so I learned to finish things on time. When I had a word processor for the first time, I had it for a year before I used the ‘cut and paste’ function. Why would you copy and paste? Do it right the first time! It is so much easier. Of course, I use it from time to time...but you should learn to write without it.