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"The research process must be more interdisciplinary, egalitarian and participatory than what it usually is"



Deborah Coen, historian of science at Yale University, visited the UAB recently to teach a seminar at the CEHIC about her latest book, entitled *Climate in Motion: Science, Empire, and the Problem of Scale* (Chicago, 2018), a historical research which helps to understand the complexity of today's climate problem.

Deborah Coen is considered to be one of today's most brilliant young historians of science. Before her latest book, she published *Vienna in the Age of Uncertainty: Science, Liberalism, and Private Life* (Chicago, 2007) and *The Earthquake Observers: Disaster Science from Lisbon to Richter* (Chicago, 2013). In her books, Coen explores the culture of science of the past and its connection with other intellectual and political spheres, as well as the role of non-experts in the construction of knowledge, mainly in the field of climate science. Both her first and most recent book use the 19th century Austro-Hungarian Empire as a framework of reference.

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- What does the Austro-Hungarian Empire have to offer to historians of science?

- For a long time, historians of science have been interested in the phenomenon of empires and the relationship between empire building and scientific knowledge production. In fact, empires were crucial in the making of modern science and modern science has been a key force to legitimating imperialism. However, most of those studies have paid attention to the British and French empires to oversee this imperialism. And the phenomenon of continental imperialism, or sometimes called internal colonization, has received much less attention. That is why I find the Austrian Empire of the 19th century a particularly fertile ground for pursuing history of science. There are relationships between this political structure and the structure of the modern sciences that has very much yet to be teased out.

In my first book, I was interested in political liberalism and the developments in the science that were tolerant or even enthusiastic about the recognition of a fundamental quality of uncertainty in nature. In my most recent book, I have been more interested in the infrastructure for doing science and governing empire in the Habsburg monarchy, plus the relationship between a state that operated at multiple scales and a science that pursued the multi-scaler qualities of atmospheric phenomena.

- What was the problem of the scale?

- In the early 18th century, circa eighteen hundred, the study of climate was bifurcated. On the one hand, there were a few people theorizing about the physical basis for the atmospheric circulation on a planetary scale. On the other hand, there were more scientific explorers, medical and agriculture researchers who were collecting very fine-grained information about the variability of climate across the surface of the earth and there was no way as yet to put those pieces of the puzzles together, to understand the relationships between those planetary scale forces and the microclimates that were being mapped throughout Europe and beyond as empires were spreading. There was no way to connect up the evidence for climate variability over the history of the planet as a whole as yet the weak evidence for climate variability due to human activities like cutting down forests, draining swamps or building cities.

Climate in Motion is about the effort of putting these together. I call the science that accomplished that "Dynamic climatology", which I would identify as modern climate science because it was multiscale, precisely because it managed to work across these dimensions of space and time. That to me seems a hallmark of modernity, being able to put the local, even the personal, into some kind of appropriate proportion with the impersonal, the global, or the planetary.

following through on that potential promise"

"We must engage the population very early in the research process and work hard to understand how they speak of the natural world surrounding them, so that something such as climate science can be useful to them"

- What will your next research project be?

- I've actually been studying contemporary climate science and talking a lot with people trained in that field and engaged in developing climate policy. Thanks to learning all this new information, I have two new goals. One of them is to write a longer history of climate science and link up what I have already learned about where modern climate science came from in the 19th century to its fate in the 20th century, in part to think about how we understand some of the disconnect between the science and political actions via its longer history.

My other goal is to think about what as historians could contribute to problem solving around the climate change crisis. The first project that I have started, which is very exploratory, is bringing together people of a wide range of disciplines (sociology, anthropology, science and application of science, etc.) and think together about the goals of the kind of climate knowledge that should be made today. How should we do science differently in light of the impasse that we face at an international scale? What does this suggest about the way in which our whole framework of modern science with its ideal of expertise and objectivity and the purity of research, its autonomy from the public sphere? How do we need to rethink all of those ideals?

Climate scientists at Colombia have organized a couple of workshops in order to begin this process of thinking through what we mean when, as many people are doing, we talk about making climate science usable. What are exactly the values that are being embraced under this rubric of usefulness, which often means bringing non experts into the process of designing, carrying out and evaluating the research? We need something new. If the research is for non-scientists as well, they need to be part of the process of assessing whether or not it is quality research. There's a lot that history can contribute to these kinds of questions. My own research has dealt extensively with the participation of non-scientists in the production of scientific knowledge.

- Would you describe this kind of participation you write about as "citizen science avant la lettre"? Can we draw lessons from those historical examples for our present?

- Today "citizen science" is a very funny term. It is used to mean so many different many things. Sometimes it means programs where citizens are going back into their backyards and looking around more carefully than they would usually do, keeping track of phenomena like bird migrations, the timing of the flowering plants, water levels... I see a lot of parallels between that kind of work and the 19th century reliance on non-scientists for environmental information. In both cases, there is a real benefit not just to the science. This is the only way we have to gather that kind of fine-grained information on environmental change. Satellites or monitors are not going to provide that level of detail. But, at the same time, I think there's a huge benefit for environmental consciousness, for a widespread attention to what matters in the non-human world, its vulnerability, and to simply keeping track of the degree of instability.

At the same time, there are many other activities that go under the name of "citizen science" these days, which include things like using your computer when it's idle to do calculations that benefit some scientific laboratory or playing a video game that folds proteins in order to help biologists. I think those kinds of abstract forms of engagement with science serve some of the purposes that scientists today attach to citizen sciences; they may do the work of public communication and engagement, they seem at least to build support for scientific research and I

think it is important, because we do need to let the public know that basic research matters. But I am little skeptical of calling that "citizen science" because I do not really see the citizens as participants in the research, I see it as a kind of a dumbed down version of research that they are engaging in.

So, I'd really love to see the expansion of those citizen science programs that are really letting non-scientists get their hands dirty producing information that is really going to feed back into the models, the predictions that the scientists are making about environmental change. That really becomes a two way street, I think that is the ultimate value of this kind of participatory research. The scientists begin to ask new questions because they have the public asking them new questions. There is a metaphor that an early 20th century philosopher of science used to illustrate this concept: science is like a river and the riverbed is the public. The riverbed is constantly changing and shaping the course of the river. We need to think the science and its public as a hydrological system changing together.

- Could you give us some actual examples of citizen science?

- There are very innovative programs in climate research that, on the one hand, are trying to provide seasonal forecast to people in rural areas where life is very vulnerable to fluctuations in rainfall, not just for agriculture, but also for water supply and even for public health.

Some of these programs have realized that is not enough to just provide predictions and expect that a community in a very different place and culture will act on them in some anticipative way. Actually, this needs to be a collaborative process. Colombia's Earth Institute has been a pioneer doing these kinds of services and they realized very early that they needed to get involved in every step of the process of implementing the forecast, not just delivering it. So they had sociologists and political scientists on their team working with farmers and policy makers on the ground in America, Africa, and South Asia. All to make sure that the information is useable.

There are other programs, like "Tracks" in the Netherlands, which has taken a step further trying to tailor the terms of scientific research to the cultures where the information is going to be provided. For instance, one of the big questions is, if you are working with local farmers in a place like Bangladesh, which depends for its agriculture on the monsoon, what exactly is the definition of the monsoon that the farmers themselves think about. You could provide predictions, but if your predictions don't take into account what local people mean when they talk about it, those aren't going to be useable at all. So, you have to involve the non-scientists very early in the process and work very hard to understand the way they talk about the natural world, plus their political structures, authorities, etc. All of that needs to be part of the scientific research process. A far more interdisciplinary process, and a far more egalitarian and more participatory process than modern science is used to. And I am not saying that all needs to go in this direction, but for the sciences that have usability as their goal. Like the research around the impacts of climate change. This is the next step for science.

- How can we get the attention of the public or the "non-scientists" to participate in science?

- These days scientists are getting a lot of negative attention and part of what I learned from my research on the 19th century is just how well respected scientists were back then. A scientist

was a leading member of a local community and part of what was driving public participation was that nonscientists admired the scientists. So, they wrote a letter to him -usually at him, right?- to say: "look, I have something to contribute, I made these observation in my backyard". So, we do have the difficulty of the relative decline of scientific authority, and it's really only by contrast with the 19th century that we see scientists as less authoritative, but actually they do still carry a lot of authority in our world.

I think it is a matter of outreach. However, we need to be honest with ourselves about it. Every major funding agency in the US and Europe requires grant proposals to explain what the broader impact of the research is going to be. Usually, scientists have to include some plans for outreach. But some scientists are not going to put much effort into that part of the grant project. We actually need to build some sociology or some political science into the training of scientists themselves to understand what they can do. I think that, in a lot of cases, scientists are just trained to do the research in the lab or the field, and not trained to engage with the public. If we could give a little bit more exposure to disciplines like communication or social anthropology into the training of the natural scientist, it could go a long way.

- In times of negativism, is it more important than ever to maintain this collaboration with the public?

- I believe so. We saw it with the March for Science in the US. There is the potential for a very powerful alliance between scientists and nonscientists for the political impasse that we face today. It is about following through on that potential promise. We need to make sure there is a vision for science that corresponds to the widest platform possible. That that is partly about working on this participatory side, the communication side, the training of scientists and that two-way dialogue that can come. I've seen it through my historical research, through reaching out to nonscientists for a collaborative participation in the research process, and that is one way to set up an avenue of communication that can really keep scientists and the public on the same page.

Júlia Massó Descarrega

Communication Department

Universitat Autònoma de Barcelona

premsa.ciencia@uab.cat

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