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Processes First. Things Second or Third

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Good morning. Thanks so much to Roe for the invitation to come to this event and Judy Spitzer for organizing it, and everybody else at MIT who's made this wonderful venue possible. At one of my first meetings with SHOT, I was a beginning student. I was utterly intimidated by the people who had written books that I had read and was afraid to talk to them. One of the people who talked to me was Roe Smith, and he was entirely personable and welcoming. And of course that is true for many people at SHOT, which is a famously welcoming organization. So I want to express my gratitude to the earlier generations who made the younger generations welcome.

The sequence of talks works well. You're going to find that Alex Roland queued up what I have to say quite well. We disagree on some things, which scholars are supposed to do. So it will provide, I imagine, some food for discussion later.

The title of my talk is "Processes First. Things Second or Third," and I'll clarify that. Let me begin by talking about my understanding of the charge to the speakers here. When the invitation came out to present, it said, "History of technology seems to be at a crossroads. Major frameworks like social construction have powered the field for a while. Is there a new paradigm visible?"

I took that question as my starting point. It took it to mean that the field has done well with systems and networks and social construction. I've talked to a lot of people who feel that those frameworks have been sturdy and durable and are baked in and will continue to be useful, but they're not stimulating new ideas and insights the way they did when they were new and fresh. It's not clear to a lot of people what the new paradigm might be. This builds well on Ruth's comments about paradigms.

I think that all scholars want to have some frameworks to help generate new ideas, new insights, and attract new members to the field. So here's my modest contribution to that effort. I

set out to be provocative here. I'm going to say that I think one factor that might be narrowing the appeal of the history of technology are some habits inherited from thinking like engineers. I'm not saying we should abandon that. I'm going to instead argue for broadening the field. Not narrowing, and not replacing, but broadening.

Just to make this case, let's point out what common engineering fields are. You'll find departments with these names at most engineering schools: aerospace, chemical, mechanical, computers, civil, electrical. Now look at the interest groups within the Society for the History of Technology. There's one each for aerospace, chemical, communication, computers, electrical, military technology. So it's built around the engineering fields. That's the way of organizing the history of technology.

And even more telling, I think, is in the bottom right for the two interest groups that are built around occupations. There's one for museums, but it's specific to technology museums. And most telling of all, I think, is the education group, which defines itself as being interested in engineering education. Why is history of technology relevant only to the education of engineers? Shouldn't everybody study the history of technology? Shouldn't people studying it, teaching any field of history to any kind of student, be interested in this? I suggest that we've had some narrowing blinders that come out of being grounded in engineering in the early days that have blinded us to opportunities to reach wider groups.

I would suggest that we remove the word *engineering* from education. Keep it as education but not limit it to engineers. I speak as a supporter of engineering education. I teach in what's essentially a big engineering school now. I was in the engineering school at University of Virginia for 18 years and really valued what I did and the experience. So I speak as a supporter, but one who wants to see us broaden our range of concerns.

I think there are some implications for the engineering framework that are probably not obvious to people who are within them, but for somebody like me, who was not trained in engineering, sees. One implication is that if you organize the field around those categories of *things* -- technologies, artifacts -- it creates siloes. If you say this group is concerned with chemical engineering, it says, "Those of you already interested in chemical engineering will find something relevant to you here," but it doesn't speak to anybody else. It doesn't say why some aspect of chemical engineering might be of interest to somebody interested in other topics.

The second implication is that it buries the lead. Why is chemical engineering important? Or any other field of engineering? Here I'm thinking again about non-engineers. Why is any particular type of technology important to everyone other than engineers? If you say, "Our concern is mechanical engineering," you're not explaining to the broader audience why those

artifacts are important. I think it hides how our field is important in underappreciated ways to the fields that a larger number of historians would identify as their primary interests.

So for example, today, based on what I see at conferences and in papers and in discussions, the history of racism might be the single dominant interest among historians in general. What does the history of technology have to say about the history of racism?

Part of why I come at this from a different angle is that, as I mentioned, I was not trained in engineering. I was an undergraduate English major, so that's where I started, and then I got a PhD in biology, so both humanities and science are parts of my background. Within biology, I went to graduate school to study ecology, because I was interested in processes, how things work together, and interact with each other, and change each other.

I entered graduate school at a time when departments of biology were reorganizing themselves around new research agendas, which in some ways recognized ways their field had already been changing. Speaking of public universities, I went to Michigan, which was a fabulous place to study biology. It had had, for a long time, two departments, a department of zoology and a department of botany. They were organizing biology around two categories of things, plants and animals.

This organization of biology said we study plants or we study animals, and those are separate. I happened to arrive right when Michigan merged those two into one large department of biology and then sliced it at 90 degrees. Instead of dividing it by plants and animals, they united it by processes. There were two divisions. One was ecology and evolutionary biology. The other was cellular and molecular biology.

Notice how those names are about processes. Ecology is about processes. Evolution is a process. It's not the department of cells and molecules. It's the Department of Cellular and Molecular Biology. It's how cells and molecules function, how they operate. Those are the key ideas.

Training in ecology created certain habits of mind. There was self-selection in choosing to go to graduate school in this field, but there also were habits of thought that I picked up while there. One of the most important is thinking about processes first. At the broadest level, I defined myself as an ecologist. I was interested in the processes of interactions among organisms. Second, within ecology, I got interested in predation, which is also a process. Third, within predation, I was interested in predators and their role in sustainable agriculture. I was looking at insects in agricultural fields. So the third level down was things, but the first two levels in my hierarchy were processes.

Organizing around processes made it easy for a biologist who studied similar processes in very different things, categories of organisms, to find commonality. There's predation on animals, but there's also predation on plants (when something eats a seed that's killing the individual, so that's a form of predation).

This 90-degree reorientation of biology enabled people interested in a certain process to talk to other people interested in that process no matter what thing they happened to study, whether it was a plant or an animal or a microorganism. This way of organizing biology is true at other major departments of biology. It is the standard way of organizing now.

I think that SHOT might take some inspiration from this example. Again, I'm not talking about abolishing anything but rather building on and expanding.

My first suggestion is that we organize some interest groups around processes. That step could broaden the appeal of the field and help generate new ideas. I think one advantage is that we could lead with a process that is explaining why a certain technology is interesting and important to people in any field of history.

If somebody's interested in invention or innovation, then it wouldn't matter whether they're studying mechanical engineering or aerospace or chemical engineering. If we have an interest group about innovation and invention, no matter which category of things scholars study, those people find each other more easily. It helps invite scholars from other fields.

Here are just a few examples of candidate interest groups. They're meant as stimulation to thought, not firm things. If your area of interest is not here, I hope you suggest it.

One candidate interest group would be capitalism, socialism, and technology. Why is technology important to those major economic and political systems? What about international cooperation and conflict in technology? What role does technology play in war and peace?

A second candidate interest group would be justice, injustice, social movements and technology, which happens to be one that Alex mentioned. I think it would be great to have historians of justice/injustice/racism appreciate more about how technology has been essential in creating the structures of racism. Think about the role of technology in Jim Crow segregation. Think about drinking fountains as the symbol of Jim Crow segregation, segregated spaces, segregated restaurants, segregated movie theaters. Those are all technological divisions that were hugely important in many people's lives. I think that the history of racism would benefit by paying closer attention to the history of technology. I think we as historians of technology would benefit from thinking about ourselves in the widest possible way.

A third candidate interest group would be wealth generation, distribution and technology.

A fourth would be invention/entrepreneurship and management and technology, so basically business and technology.

A fifth would be governance and technology. I would put Dan Kevles's comments in that category. He was talking about the goals of government and how it used technology to achieve those goals. I think if we had interest groups organized around processes, it would be easier for us to advertise the lead, draw people in, and help set exciting research agendas and then pull in ideas from cognate fields.

My second suggestion is that the program committees at SHOT require the titles of papers to include a thesis. I made up a typical paper title, "Hard Road: Arizona Highways in the 1930s." This is fictional, but this is the kind of title you often see at a SHOT conference. What does this tell somebody attending the conference? It tells you that if you're already interested in highways, Arizona, or the 1930s, you might want to hear the talk, but it doesn't explain how it's of interest or important to anybody else.

A title like this, which focuses on things, enables the speaker to avoid stating a thesis when they present. For my money, thesis-less talks are generally dull, dull, dull. My solution is to make the speaker state a thesis in their title or subtitle. The example title could become something like "A Hard Road: How Tourism Convinced a Tax-Averse Legislature to Invest in Highways in Arizona in the 1930s." I don't know whether that argument true or not. I know that Arizona invested a lot in highways because of tourism, but whether this is precisely correct I don't know. But when we frame the talk like that, with a clear thesis, we're saying this is of interest to people interested in governance, in conservatism, political philosophy. It helps integrate the history of technology with these larger social processes.

In conclusion, I think that the history of technology needs to attract new scholars and new ideas. I think that thing-oriented interest groups are valuable but come at a cost. They create silos and bury the lead. A concrete example of a revision of a thing-oriented discipline, biology, shows us that organizing around processes, and then putting things second or third, was hugely successful. Think about the size of biology departments at universities. They're hardly suffering as a result of putting processes first.

If we highlight processes in the interest groups and in conference papers, it might advance this broadening agenda. If we put processes first, it helps invite scholars from a variety of fields and approaches. Cross-fertilization would help generate new ideas and numbers.

