Visions, needs and requirements for Future Research Environments: An Exploration with Computer Scientist and Science Fiction Author Cory Doctorow

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We live in remarkable times: the world is changing at an increasing pace, our societies face challenges that extend across national and geographical borders, and we are flooded with (dis)information. The scientific process has already changed extraordinarily in the past half century with research environments evolving from isolated and loosely connected islands to dense networks of researcher and institutional cooperation.

Still the world is changing and we need to ensure that science remains a global effort. Building a global network and infrastructures to support that aim, however, takes time. We need to start such building processes now and – most importantly – we need to develop and explore visions for research, science and society that give us ways into desirable futures. Thus, we launched an exploration series to elaborate visions on how research will be conducted in the future and to explore different perspectives on research.

"The difference between science and alchemy is whether you tell people what you've learned"

TU Wien: What can we learn from Science Fiction when planning future research environments?

CD: When I write Science Fiction and when I think about the future, I think about it as allegories for the issues that both concern me, and that give me hope for our current moment. Thus, I want to frame my views on two crises that we're undergoing right now. Those crises are bigger than the research issues, but they touch on research. I think that they're going to be the elements that weigh most heavily on the direction that our research faces, and that most other factors will amount to rounding errors on them.

The first crisis is the climate crisis. I think that we are going to see institutions under stress – especially in the research world – being asked to produce results very quickly under terrible constraint as well as being asked to produce results that have bearing on immediate crises.

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The second crisis is the epistemological crisis, and there's a lot of concern today about people with false beliefs such as a police, about 5G and coronavirus, race science, the resurgence of eugenics or the flat-Earth theory. We over-theorize the different beliefs that people have and we under-theorize the mechanism by which they arrive at the beliefs and test new beliefs.

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That crisis is based on a collapse in our ability to trust the institutions that adjudicate conflicting research claims made by experts whose domains we cannot understand. Thus, irrespective of how good the conclusions of the research communities are – our ability to act on scientific results will be severely hampered by the lack of consensus about whether those conclusions are trustworthy.

TU Wien: Which mechanisms can help us to meet these crises?

CD: We need a legible process where regulators adjudicate conflicting claims from partisan experts and come to a conclusion about them, publish those conclusions and publicly show their work. The provisional truth that we believe in requires that we have a good adjudication process and the current adjudication process is bad. Its badness has an obvious cause: It has been corrupted, which is to say, industries that are highly concentrated are able to solve the collective action problem of everyone getting together to decide what the truth should be. Everyone who is qualified to regulate them is drawn from that industry.

TU Wien: It seems that trust in whatever institutions, powers, or arguments out there is decaying. How could we re-establish or reintroduce trust in institutions and science?

CD: We would have to repair our institutions and address the market forces that created concentration, reduced the pluralism and took institutions that were supposed to be neutrally adjudicating among a wide field and turned them into insider clubs, where regulators and everyone in the industry already agreed on what they need. We'd have to start breaking monopolies, which is hard to do, but we should get a start on it: We could prohibit mergers; we could prohibit acquisitions of nascent companies by large firms; we can prohibit vertical monopolies. Then we could start to pursue monopolistic conduct aggressively. When you look at the science and research publishing world, for example, the dominance of firms like Elsevier and the conduct that they commit in service of maintaining that dominance is so obviously bad. There is no future for research that doesn't address this market concentration issue.

TU Wien: Which would be the most decisive and influential actions, in your opinion, we need to consider in terms of initiatives, rules, regulations etc. when building future research environments that might help us to avoid market dominance within such systems?

> "There are some pretty well structural problems in research today, such as the fact that we don't publish negative results"

CD: In terms of institution building and things you can do, I think that initiatives that require Open Access from day one are important. You'd need something like a research norm that says

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that the researchers in this project believe that it's not science if it's not auditable by the public because the difference between science and alchemy is whether you tell people what you've learned.

In addition, there are serious structural problems in research today, such as the fact that we don't publish negative results. As a consequence researchers do the same research repeatedly. Statistical malpractice is another structural problem. Obviously, machine learning could do a lot to spot statistical malpractice, but also machine learning could presumably be used to create effectively adversarial perturbations against human statistical analysis to e.g. massage statistics in ways that would be very hard for humans to catch. You would need some formal set of criteria that you use to evaluate and re-evaluate stats to find statistical malpractice, because it is such a recurring theme in both the actual problems with science and the critique of science.

Credits: Portrait by Jonathan Worth http://jonathanworth.com

Cory Doctorow holds an honorary doctorate in computer science from the Open University (UK). He is an MIT Media Lap Research Affiliate and a Visiting Professor at the Open University (UK) and the University of South Carolina's School of Library and Information Science. He is most reknown for Down and Out in the Magic Kingdom *and* Little Brother. *Doctorow won several awards for his work, including the* John W. Campell Award *and the* Sunburst Award.

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