

Editorial

Inclusion, complexity, and not being able to do it all alone

There is pervasive stereotype going around that says that scientific and technical progress rest solely on the shoulders of the lone genius. Whether that's Archimedes in his bathtub, Jeff Bezos starting Amazon from his garage, or Albert Einstein armed only with a piece of paper and a pencil, it is too tempting to think of great moments of genius as solitary things. As anyone who has ever done scientific research can tell you, it's not true. Science is done by groups of people, working together toward a common goal.

Thomas Edison is famously quoted as saying "Genius is one percent inspiration and ninety-nine percent perspiration." (If anything, I personally think he overestimated the proportion of inspiration there.) Ideas are important, absolutely, but where the real effort comes in is implementation. It's easy enough to see this in real life—anyone who's had the inspiration for a really great sandwich, for example, knows that the concept is easy enough to come up with, but before the sandwich can exist, there's a lot of work involved in collecting ingredients and putting them all together. This work is done by a diverse range of people, from the farmer who grows the wheat, to the baker who makes the bread, to the shopkeeper who sells it, and the creators and distributors of all the different fillings.

To deal with the complexity of the problems we're investigating, science has become big and industrialized and deals with complicated, mechanized processes, large machines, large computing, Big Data, and big models. Processes are becoming standardized, which on the whole is a good thing but can lead to unintended consequences and, in some cases, unintentional harm.

The way we anticipate unintended consequences is by being imaginative and by inviting input from people with differing viewpoints, with differing lived experiences, and with different perspectives. Mixed and diverse groups help us to see issues from different angles and hopefully spot potential problems before they become actual ones.

There are plenty of examples of unintended bias in our world, ranging from sensors on soap dispensers that don't register dark skin, to recruitment algorithms that screen out female candidates based on their university, to image-generating AIs that autocomplete headshots of women with bodies wearing bikinis. (https://www.theregister.com/2021/02/01/ai_in_brief/).

One might say that these are small examples, trivial and easily identified after the fact (I would disagree), but there is an underlying bias revealed by them that we need to be aware of, and deal with, in our work. It's not just about the algorithms either—it's about the underlying data and the fact that we have to face up to historical bias and correct it now, in order to stop perpetuating it.

The problems that we are facing as a species are bigger than any one of us, and they need solutions that are bigger than any

one of us can create, or potentially even imagine. We need diversity in our thinking and in our experience, to ensure that we come up with solutions that are useful, practical, and equitable.

Science is biased; we already know this. The first step to sorting out this problem is to identify it and understand where we're starting from, with the aim to track and make changes to improve on the current situation. It's for this reason that **Cell Press has launched a new Inclusion and Diversity initiative** that gives authors a mechanism to share with us information related to inclusion and diversity that is relevant for their paper. *Patterns* is very pleased to be part of this initiative, and we very much encourage our authors to provide this information. It's very simple—just a straightforward checkbox-based form that asks about a series of different topics related to inclusion and diversity, with the option for authors to include an inclusion and diversity statement in the paper itself.

This information will be aggregated periodically so Cell Press can report in an anonymized way about the items covered on the form. Of course, all participation is completely voluntary—while we will collect a completed form for all accepted articles, it is up to the authors to decide whether to provide any information at all on the form, as well as whether to add a statement to their paper (<https://scholarlykitchen.sspnet.org/2021/02/03/the-cell-press-inclusion-and-diversity-statement-an-interview-with-deborah-sweet/>).

Inclusion and diversity are just some aspects of the process of doing science. For data science in particular, we also have to consider the societal impact of our work, along with ethical and privacy issues. I am very glad to say that this is an issue that has gained a lot of discussion in the past year, with steps being taken in the right direction to ensure that researchers not only consider the potential impact of their work but also how to address those impacts. The prestigious Neural Information Processing Systems (NeurIPS) meeting in December last year required presenters to submit a statement on the broader impact their research could have on society, including any possible negative effects (<https://www.nature.com/articles/d41586-020-03611-8>).

In the process of doing science, we learn by asking questions of ourselves and others. By asking about inclusion and diversity, we start thinking more about those topics. By asking about societal impact, or data and code sharing, or how methods can be applied in other domains, we see things from a new perspective, and new perspectives give us new insights.

Patterns is all about sharing—sharing data science solutions across domain boundaries and sharing experience and knowledge. This includes practical, lived experience from many different points of view. Fundamentally, we do research to solve problems and make the world a better place for us all. To do that, we need inclusivity and diversity, because these problems are too big for any one of us. Together we are stronger.



WEB RESOURCES

"AI-generated pixelated photo of AOC in a bikini pulled from paper highlighting danger of AI-generated pics," https://www.theregister.com/2021/02/01/ai_in_brief/

"The Cell Press Inclusion and Diversity Statement," <https://scholarlykitchen.sspnet.org/2021/02/03/the-cell-press-inclusion-and-diversity-statement-an-interview-with-deborah-sweet/>

"Prestigious AI meeting takes steps to improve ethics of research," <https://www.nature.com/articles/d41586-020-03611-8>

Sarah Callaghan

Editor-in-Chief, *Patterns*

<https://doi.org/10.1016/j.patter.2021.100223>