Sex and gender in science: Why they matter
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First published in November 1869, the prestigious British scientific journal *Nature* is celebrating its 150th anniversary this year with a special issue called "150 Years of *Nature." In it, scientists from around the world offer a rich assortment of news features, commentaries, essays, profiles, review articles, videos, podcasts and "perspective" pieces on research and its role in society.

Among the latter is one penned by Université de Montréal's Cara Tannenbaum, a physician and scientific director of the Canadian Institute of Health Research's Institute of Gender and Health. Co-authored by colleagues at the University of Exeter (U.K.), Universität Bielefeld (Germany) and Stanford University (U.S.), the 10-page paper is titled "Sex and gender analysis improves science and engineering."

It's just the latest in a long history of contributions to *Nature* by UdeM researchers dating back to at least 1973, when a paper by pioneering endocrinologist Dr. Hans Selye became the first (according to records held today) of 190 from this university published in *Nature*. UdeM now ranks 265th out of 15,806 institutions who have met the journal's exacting standards and been deemed worthy of publication.

What sets Tannenbaum's paper apart, however, is its highly topical subject: as she puts it, "the potential for sex and gender analysis to foster scientific discovery, improve experimental efficiency and enable social equality." Before its publication Nov. 7, Tannenbaum elaborated on the theme in conversation with UdeMNouvelles, beginning with the issue of how scientific journals themselves have adapted to the changing times.

**Your paper was accepted in *Nature*, one of the world's top scientific journals. What does that say about how seriously sex and gender are being taken by the scientific establishment?**

It says a great deal. Journals are more in tune with the subject, starting with the editors themselves. The European Association of Science Editors, for example, struck a gender policy committee and came up with what they call the Sex and Gender Equity in Reporting (SAGER) guidelines, and they've posted them on the Equator Network's website, which lists all the checklists researchers must use to publish their work according to the highest standards. They've been encouraging journal editors to adopt SAGER so that all manuscripts appropriately report sex and gender variables.

**How does that work?**

You now have to be clear that you included men and women in your study, and if you do use only men or only women then you have to put that in the title to avoid generalizations. If you used cells or tissues, then for the benefit of subsequent research you have to say whether they were male or female; a lot of wasted expense can be avoided if research can't be reproduced because you didn't make the distinction. At the CIHR, we now make sure to ask: Do you account for sex, do you account for gender in your research protocol? Even the evaluators are required to make an assessment of the quality of integration, as appropriate. It's all in our YouTube
video; go take a look. We've also come up with training modules, and they've been completed tens of thousands of times around the world. In the U.S., the National Institutes of Health now have a sex-as-a-biological-variable requirement as part of its reproducibility policy. In Europe, the European Commission mandates consideration of the gender dimension. So the awareness is really widespread now.

**When did things begin to change for the better?**

It's really only been in the last five to 10 years. Does it take 150 years for equality to permeate journals? Probably! Twentieth-century science was really reductionist: scientists isolated one variable, the experiments were controlled, they had to be simple and clear and as objective as possible. Then, in the 21st century, we realized that life is complex, people are complex, science is complex; you can't just look at one variable and expect it to work in the real world. Nowadays we use terms like intersectionality and multivariable analysis, these incorporate competing perspectives and multiple variables simultaneously, sometimes requiring new qualitative methods or statistical techniques, and people even question whether research in animals can be applied to humans. We're definitely moving towards more and more complexity and diversity, and that reflects where society is headed. We know, for example, that when you have women on the research team, the science is more likely to have research results that are applicable to women.

**Isn't complexity costly?**

That's a really interesting question, and there are several answers. One is that you have to balance the cost of including more diverse samples in studies with the cost of the harm that occurs when you don't. In the U.S., for instance, there was an audit done of drugs that were withdrawn from the market in the 1990s and it showed that eight out of 10 of those drugs harmed or killed women only, and the reason is because the drugs were developed for men. If cost is a concern, researchers should consider conducting an initial exploratory study first; it may be underpowered but it will inform future work.

**Do funders take into account that cost versus harm argument?**

To my knowledge, no funder has ever said "Don't include women it will cost too much." The other thing is that we're coming up with more efficient designs; you can design a study so that you get more information using fewer individuals. Money is wasted when you include both sexes but don't separate the results. It's incredibly wasteful if you do experiments and don't include and account for variability and so can't apply the findings, or if you have the data and you don't use it.

**Your paper also takes a look at sex and gender in technology.**

It's a vast topic, but here are just few examples of where things can improve. Smart phones, for one, aren't gender-neutral; Alexa and Siri are women's voices; they're able to tell a man to get Viagra but they don't know what to do if a woman says "Help me, I've been raped." And then there are 'smart clothes' that don't fit women—remember those two American astronauts who couldn't do their spacewalk because their suits didn't fit. Car safety is another area: crash-test dummies are male by design, yet women are 47 percent more likely to be seriously injured in an accident. Transportation planning is another one: in general, woman multitask more than men so their route takes them down more small streets; some Nordic countries have adopted gender-balanced snow-clearing policies to make sure those small streets are cleared in order to reduce the number of slips, falls and injuries experienced by women. So there are solutions.

**How can universities help make things better?**

They already are. A great many now have diversity inclusion programs. The Canada Research Chairs program requires changes in the hiring and promotion of women, and that will change the type of research that is done and the decisions that are taken. Finally, a lot of universities are putting sex and gender analysis in the content of their curriculum; some professors are even making the online training like ours mandatory; and when they
complete a course students are now surveyed on how much attention was paid to sex and gender in their course materials.

So you're optimistic?

Absolutely. I mean, the very fact that Nature is including our paper in its 150th-year edition is a statement about the times: sex and gender in science and engineering has been mainstreamed, it's the new standard, and to not do it is unacceptable. There's still some debate about scientific excellence versus gender equity but I think that this paper shows that equity and diversity are redefining excellence. And that's all for the better. I don't know if you can write this, but the world is really getting woke here, you know?


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