



**Gender Gap Persists in Science  
Interview with Prof. Cassidy Sugimoto**

**For podcast release  
Monday, May 22, 2017**

KENNEALLY: Recent estimates put the number of academic papers' journal articles published in a single year at more than one and a half million worldwide. But if you want to know how many of these are written by women, the answer is it's complicated. Welcome to Copyright Clearance Center's podcast series. I'm Christopher Kenneally for *Beyond the Book*.

What sounds like a straightforward question opens the door for many others. As one elementary question, what is an article written by a woman anyway – or by a man? How do women fare when it comes to publishing their scientific research? In principle, science should be indifferent to gender. But in practice, are women working on a level playing field?

Professor Cassidy Sugimoto of the School of Informatics & Computing at Indiana University, Bloomington examines the formal and informal ways in which knowledge producers consume and disseminate scholarship. She has edited and co-edited four books and published numerous journal articles on this topic. She currently serves as president of the International Society for Scientometrics & Informetrics. Earlier this year, Professor Sugimoto and Vincent Lariviere of the Universite de Montreal responded to a report, *Gender in the Global Research Landscape*, asserting that women and men in the global research community were approaching parity.

As Sugimoto sees it, however, a gap persists. Professor Sugimoto joins me now from her Bloomington office. Welcome back to *Beyond the Book*.

SUGIMOTO: Thanks for having me back Chris.

KENNEALLY: Well, this was an interesting report that we saw, and I wanted to hear more about it from you directly. And I guess the place to start is to ask you to summarize your reading of the report, which is the *Gender in the Global Research*



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*Landscape*. We'll link to that from our *Beyond the Book* website. And it asserted a fairly optimistic and encouraging view of the publishing landscape when it comes to women and men. But you saw things a little bit otherwise.

SUGIMOTO: Yes. Thank Chris. Well, let me go back a little bit and just give context for this report. We've had so much research on gender and science. And most of it's focused on disparity or difference. We know that there are less women overall in the scientific workforce, and fewer women as you move up in the academic ladder. There are fewer women who receive elite prizes and fellowships, and women have a smaller piece of the pie in terms of research funding.

Women produce less on average than their male counterparts, and the work that they produce is cited less. Now, the Elsevier report was very exciting for us. It was impressive in coverage, relying on Elsevier's Scopus database, and covered a longer period of time than most previous studies. And it demonstrated the growth of women over time. This was a really important finding, and one that hadn't been done in previous studies.

And it also, surprisingly, as you noted, demonstrated that there was no significant difference between men and women in terms of receipt of citations. This was potentially a groundbreaking finding, given the decades of studies demonstrating a disparity in citations, which, as you know, is a critical currency in the academic environment. We were so surprised, in fact, that we sought to replicate their findings. And unfortunately, we found that disparities had not dissipated. Rather, this was an artifact in their measurement.

KENNEALLY: Well, expand on that a bit. Because this is really where your expertise is so critical. You can kind of get to the heart of things. You read through the headlines and go straight to the real numbers. And so, can you explore with us those questions I raised in the introduction? What does it mean for an article to be written by a woman or written by a man?

SUGIMOTO: Sure. So Elsevier used something that we call full author counting. This measurement gives all authors on a paper a full count for the paper in terms of both production and impact. And there are many situations where this is a useful way to count – if you were counting how many papers were written by your faculty in collaboration with another country, for example. But this doesn't work so well when you're counting and making averages for gender.



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So imagine all the papers that have at least one woman author. Now, imagine all the papers that have at least one male author. Now, think of all those papers that have both a female and a male author. And this represents the majority of all publications – about 60%. Now remember, those female papers – 94% of those also have a male author. So Elsevier found no difference between average citedness for papers.

And you can guess why. Because of the overlap, they were essentially measuring the same set of papers as both male papers and female papers.

KENNEALLY: Well, it's pretty remarkable. And it's especially important when you got further. It's not just the names that appear on the tops of the articles, but how these articles sort of live out their life in the scholarly community. And that's what's known as citations and impact factor. And for listeners who may not be familiar, perhaps you can tell us a bit about why that is critical. It is obviously important for researchers to publish in the best journals they can. But it is even more important to their careers, and to science generally, that their work be cited thereafter.

SUGIMOTO: Absolutely. This is the currency of the realm. This is what establishes, for many researchers, the quality of their work, the quality of individual papers – but also the quality of them as scholars. Now, for better or for worse, this persists in scholarship. Now, there are two different indicators, as you mentioned, that tend to be the most prominent. Now, citations are for a particular work. That's the receipt of your work by other scientists who then use it in their work and cite it.

The journal impact factor is a different kind of measurement. Now, many people have derided this measurement and suggest that it shouldn't be used to evaluate an individual scholar. And I would be in that camp. But it's still an interesting indicator of a selection bias. It demonstrates when people are able to get into a journal, to publish in a journal of a particular level of reputation and a particular acceptance rate.

So in our subsequent study for the Elsevier report, we wanted to push it further – not just to see whether there was a disparity in citations, but to play around with that notion of the journal impact factor – and to test whether men and women were being accepted to journals of similar prestige. And we found, actually, that there was very little difference. Women and men tend to publish in journals with similar impact factors.



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In fact, in many disciplines women were publishing in journals of higher impact factors than their male colleagues. However, within these journals, women's papers were cited less. And this gap was particularly pronounced in journals of the highest impact factors. That is, women were making it through the selection process at journals like *Science*, and *Nature*, and *PNAS*, but they weren't seeing the citation advantage of their male colleagues. So this suggests we need to look more deeply at issues of bias when examining gender disparities in science.

KENNEALLY: Well, obviously that's what you're here for to help us do Professor Sugimoto, but one thing is there is research – and this is over time – that shows that in science, if an applicant comes before a research manager and the applicant is clearly, by name, a woman – she has less of a chance of being hired than a male counterpart with the same qualifications. Flip that and make things sort of gender neutral, or disguise the genders, and there is this kind of parity.

So we do know – or we have some evidence. I should put it that way. We have some evidence that in the scientific community at large, there is some bias towards women. And it may be that it is beginning at that hiring stage and continuing throughout the process towards publication and beyond.

SUGIMOTO: Absolutely. And the study that you mentioned I think is a really important one showing that male or female candidates are not judged for lab manager positions. There was, similarly, a study that examined the contribution of computer programmers who published on the GitHub platform. And they showed that women's work was rejected more by peers only when their names were visible. When just initials were visible, their work was actually accepted more than their male counterparts.

And in terms of citation, we've seen this as well. A work that looked at astronomy used machine learning to control for all the variables on paper – the number of tables, and figures and references – information about the journal and non-gender attributes such as publishing history. And controlling for all these attributes, author found that women's work was indeed cited significantly less. Now, despite all of this, Chris, many people still claim that any citation difference is due to some other factor of quality.

Right? Women's work is just not as good, or women's work is on topics that's not as interesting, or is not as valuable, or is not as interdisciplinary, right? There are all of these claims that have been made to try to justify that what we're seeing is



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merely a difference, a disparity – but not really a bias. So I think we need to think of more designs, better ways to be able to expose this, to show this, because the research right now is not persuading those who are in positions to make policies and to change the scientific landscape.

**KENNEALLY:** And this is not a new dilemma. This is something that is referred to in circles like yours there, as well as at the International Society for Scientometrics & Informetrics, as the Matilda Effect. A really quaint term for something that is rather serious in its implications for all researchers. Tell us about that.

**SUGIMOTO:** Yeah, so the Matilda Effect has been around for decades, and it was coined by Rossiter. And what it was trying to play on was being the mirror to the Matthew Effect. And the Matthew Effect refers to the biblical phrase in Matthew that “To him who hath shall be given more.” And it’s this idea of cumulative advantage for someone. So you get cited once – you’re more likely to get cited twice. If you have one highly cited paper, you’re more likely to have another highly cited paper.

And it is no surprise that that tends to accumulate around certain socio-demographic characteristics such as being a white male from a European or U.S. country. The Matilda Effect was to try to show that mirror – that women are perpetually and cumulatively disadvantaged, under-represented. Minorities fall into that category as well. The Global South also falls into that category. So we have a lot of ways where science is an unequal playing field for many people, not just women.

**KENNEALLY:** So Professor Sugimoto, in conclusion then, the way that you and your colleague Professor Lariviere have reviewed this report and sort of seen the picture in a larger way – does this amount to neglect of women when it comes to science? And if so, what can be done?

**SUGIMOTO:** Absolutely. I think that this report is dangerous in claiming that these gender disparities have dissipated when they have not. I think it’s important for us to bring light to these issues of an unequal playing field. We’ve demonstrated that not only is there disparity, but there are grounds for finding bias in this. And I think it’s really important we take this into consideration when we are evaluating scholars using citation metrics, whether it’s for hiring, or for promotion, whether it’s for awarding and fellowships – that we don’t continue to perpetually disadvantage women in science.



KENNEALLY: Well, indeed. And Professor Cassidy Sugimoto of the School of Informatics & Computing at Indiana University, Bloomington – thank you for joining us. And we will link to the article that you and Professor Lariviere published. It’s called *The End of Gender Disparities in Science, If Only it Were True*. Professors Sugimoto, thanks for joining us on *Beyond the Book*.

SUGIMOTO: Thank you.

KENNEALLY: *Beyond the Book* is produced by Copyright Clearance Center, a global leader in content management, discovery, and document delivery solutions. Through its relationships with those who use and create content, CCC and its subsidiaries RightsDirect and Ixxus drive market-based solutions that accelerate knowledge, power publishing, and advance copyright. *Beyond the Book* co-producer and recording engineer is Jeremy Brieske of BurstMarketing. I’m Christopher Kenneally. Join us again soon on *Beyond the Book*.

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