

Scientists should have sex and gender on the brain

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Thinking about sex and gender would help scientists improve their research, a new article published today argues.

Writing in a special 150th anniversary edition of *Nature*, five experts say these factors are too often ignored.

They say incorporating sex (the biological attribute distinguishing females, males or intersex/hermaphrodite individuals) and [gender](#) (psychological, social and cultural factors affecting how an individual identifies in society) could improve experiments, reduce bias and create opportunities for discovery and innovation.

The article highlights a host of examples in which including sex and gender has led to advanced understanding or insight—from male and female shellfish responding differently to [climate change](#), to gendered social robots and to computer vision improvements prompted by evidence that facial recognition systems misclassify the sex of darker-skinned women more often than lighter-skinned men.

"It's striking to what degree sex and gender are overlooked in science," said co-author Dr. Robert Ellis, of the University of Exeter. "We need to include this at every level of research and in everything we do, or provide robust scientific justification as to why sex or gender are unimportant, based on experimental evidence.

"Things are certainly improving. For example, the original crash test dummies were based on a male physique, however a study found that as a result US female drivers were 47% more likely than males to suffer severe injuries in a comparable crash. Such insight undoubtedly helps

engineers design more sophisticated test platforms that will ultimately prevent major injury or save lives.

"Sex and gender are increasingly seen as important in research, but misconceptions and under-consideration still persist. We know, for example, that researchers' sex can affect how they interpret their observations, so this should be considered during the [research process](#)."

The paper focusses on four key areas—[marine science](#), biomedicine, robotics and artificial intelligence—but the authors say the lessons apply across scientific disciplines. They highlight scientific successes achieved due to consideration of sex and/or gender.

Dr. Tannenbaum from the Canadian Institutes of Health Research points to our deeper understanding of the genetic basis for sex differences in immunity.

"We now know immune cells function differently depending on whether they have XX or XY chromosomal complement or are exposed to different concentrations of sex hormones in the body. There are exciting implications for antibody treatments and new cancer immunotherapies. Who knows? One day men and women may be treated completely differently for the same health condition. Patients should ask their healthcare provider if the treatment being recommended works equally well for individuals with their same sex and gender. "

A study in mice showed, surprisingly, that pain levels the animals exhibited changed depending on whether a male researcher was in the room. Researchers concluded that the animals responded to a scent associated with men. What's more, whilst both female and male animals showed this response, female mice were more sensitive.

Marine biologist Dr. Ellis said: "Within the oceans there are many

examples highlighting the importance of considering sex differences within species. In marine turtles, incubation temperature determines the sex of hatchlings, so climate change could pose a major threat to this group and could lead to the total feminisation of some turtle populations.

"Marine biology also reminds us of the need to challenge the assumption that sex is binary and fixed. Clownfish, for example, are 'protandrous hermaphrodites' (they mature as male; some change to female). Living in a strict social hierarchy each family contains a single dominant female that mates with a single large male in the [social group](#).

"All remaining individuals remain juveniles. Removal of the alpha female results in the alpha male changing sex to female, with all subordinates moving up a rung in the [social hierarchy](#). This [natural phenomenon](#) certainly adds a fascinating plot twist to the Finding Nemo story, but it also highlights a key area of biology that requires further study in relation to things like climate change."

The paper says the goal is to "increase transparency, promote inclusion and reset the research default to carefully consider sex and gender, where appropriate". For instance, one would hardly assume that social robots are attributed a male or female gender.

However, as social psychologist and social roboticist Dr. Friederike Eyssel from Bielefeld University emphasizes: "People use mental shortcuts to evaluate nonhuman entities and through the process of anthropomorphising social robots, humans even ascribe gender to robots. Empirical and experimental research has shown that this impacts the perception of such novel technologies.

"Moreover, gendering robots has strong social and ethical implications that need to be taken into account by developers of [social robots](#) and by stakeholders who aim to deploy robots in various domains of use in

people's everyday lives. At the same time, clearly, further research is called for to explore the effects of gendered technologies in field settings. The existing literature marks a relevant first step to our understanding of the role of sex and gender in the design and uptake of novel technologies."

The Nature "Perspective" sets out a "roadmap" and calls on researchers, funding agencies, journals and universities to coordinate efforts to implement robust methods of sex and gender analysis. It concludes: "Eyes have been opened, and by integrating sex and gender analysis into their work, researchers can enhance excellence and social responsibility in science and engineering."

More information: Sex and gender analysis improves science and engineering, *Nature*, [DOI: 10.1038/s41586-019-1657-6](https://doi.org/10.1038/s41586-019-1657-6) , [nature.com/articles/s41586-019-1657-6](https://www.nature.com/articles/s41586-019-1657-6)

Provided by University of Exeter

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