The Issues

Inside the mind of a man

Science tells us that men's brains are different from women's – but that doesn't mean we should not be equal. By *Simon Baron-Cohen*

In the heady, revolutionary days of student sit-ins in Paris in the 1960s and 1970s, the message about gender was that all differences were socially constructed. The idea was that, with re-education and social change, these differences would melt away, opening the way for equality between the sexes. "Sociobiologists" were the enemy because they claimed that gender had something to do with genes and evolution. The battle lines between nature and nurture were drawn, with those on the political left firmly allied with nurture and those arguing for nature typecast as being on the extreme right.

One might hope that – 40 years on – such black-and-white thinking would have been replaced by a more nuanced understanding. There has been progress. Today's students of gender do not feel that their former champions (such as Germaine Greer, who wrote in 1991 about "centuries of conditioning of the female") have a monopoly on the truth, and they show a new willingness to learn what scientists have to share. Those scientists who acknowledge the partial role of biology in the creation of gender differences are not banished: it is no longer about nature *v* nurture.

My own research into gender differences stems from my interest in the neurodevelopmental condition of autism. "Neurodevelopmental" is a fancy word that means every person's brain – from foetal life, through childhood and adolescence – develops differently. In the case of autism, this is partly for genetic reasons, as autism runs in families and has been associated with over 200 different genetic variations. Many more boys than girls develop autism (or the related condition of Asperger's syndrome), so I wanted to understand why the biology of maleness predisposes a child's brain to end up in the condition's extreme state.

What we know is that girls, on average, make more eye contact than boys from at least 12 months of age and that, on average, language develops faster in girls than in boys, measured at 18 and 24 months of age. The question is: "Why?" Given that reduced eye contact and delayed language are two of the signs of classic autism in preschoolers, it seems necessary to consider whether autism is an extreme form of the typical male pattern of development.

New genes

When scientists conduct studies on the nature of the male and the female brain, they put people into two groups, based on their sex. I prefer the word "sex" to the word "gender" because your sex refers to your chromosomal status: whether you have one or two X chromosomes. This starting point, at the moment the egg is fertilised, sets in motion a cascade of consequences for the physical development of males and females because, in place of their second X chromosome, males alone have a Y chromosome. Situated on the Y chromosome is a critical gene called SRY (shorthand for the "sex-determining region Y") that tells the embryo to either grow a pair of testes (and thus become male) or not (and thus remain female).

Once the testes start to function, they pump out the hormone testosterone. There is a surge in the production of this hormone by the foetus from the 12th to the 20th week of pregnancy. The baby's testes are not the only source of testosterone: it is also made from the adrenal glands, which explains why females also have some testosterone but males produce at least twice as much.

Animal experiments have shown that how much testosterone a foetus produces influences the "masculinisation" of the brain and (post-natal) behaviour. This is also true of human beings. We measured hormone levels in the amniotic fluid (the liquid in the womb) during pregnancy and found that the higher the baby's testosterone is pre-natally, the less eye contact the child makes at 12 months of age and the smaller the child's vocabulary is at 18 and 24 months. The puzzle of why, on average, girls talk earlier than boys and spend more time looking at people's faces is solved by this unique experiment. As a psychologist, however, I acknowledge that the influence of testosterone is only part of the explanation, as the more a child looks at faces or talks, the more such behaviour will be reinforced by the reactions of others – nature and nurture interacting.

Hormones are not the only biological factors that contribute to observed sex differences in the brain and behaviour, because these are under genetic influence, too, and there are many genes that are "sex-linked". Finding hormonal or genetic effects also says nothing about where in the brain these effects take place.

We know that the male brain is on average 8 per cent bigger than the female brain, even at as early as two weeks of age. But probably more important is that girls' brains tend to develop faster than boys'. We know from studies using magnetic resonance imaging (MRI) that girls peak about four years earlier than boys in terms of when they reach their maximum total brain volume and about two years earlier in terms of when they reach their maximum amount of "grey matter" in the brain. This important discovery tells us that, on average, girls mature at very different rates from boys.

Using MRI, you can find sex differences in other regions of the brain, too – a notable one being the amygdala (the "emotion centre"), in both size and activity. In addition, one of the language areas (the planum temporale) is, on average, larger in the female brain. Such findings say nothing about whether the differences come from biology or learning but, from everything we now know, it is a safe bet to say that they come from both.

Law of averages

Throughout this article I have used the phrase "on average", because sex differences cannot be extrapolated to individuals but emerge only when statistical averages of two groups (males and females) are compared. This small caveat is hugely important if stereotyping generalisations are to be avoided, as individuals may be typical or atypical of their sex.

It is equally important not to confuse science with politics. The science of sex differences was once feared, as if even asking the questions was part of a conspiracy to repress women and perpetuate inequalities. Like most conspiracy theories, this one is mythical. The scientists I have met who conduct these experiments are of every political hue.

Speaking for myself, I strongly oppose any form of discrimination or inequality, whether based on sex, ethnicity, social class or disability. Knowing a person's sex tells you nothing about his or her abilities, aptitudes or interests and making any assumption about that person on the basis of their sex would be sexist, scientifically inaccurate and morally wrong. But science helps us to uncover the mysteries of nature, including the nature of sex differences. Handled sensitively, it can teach us a lot about why we turn out the way we do. ●

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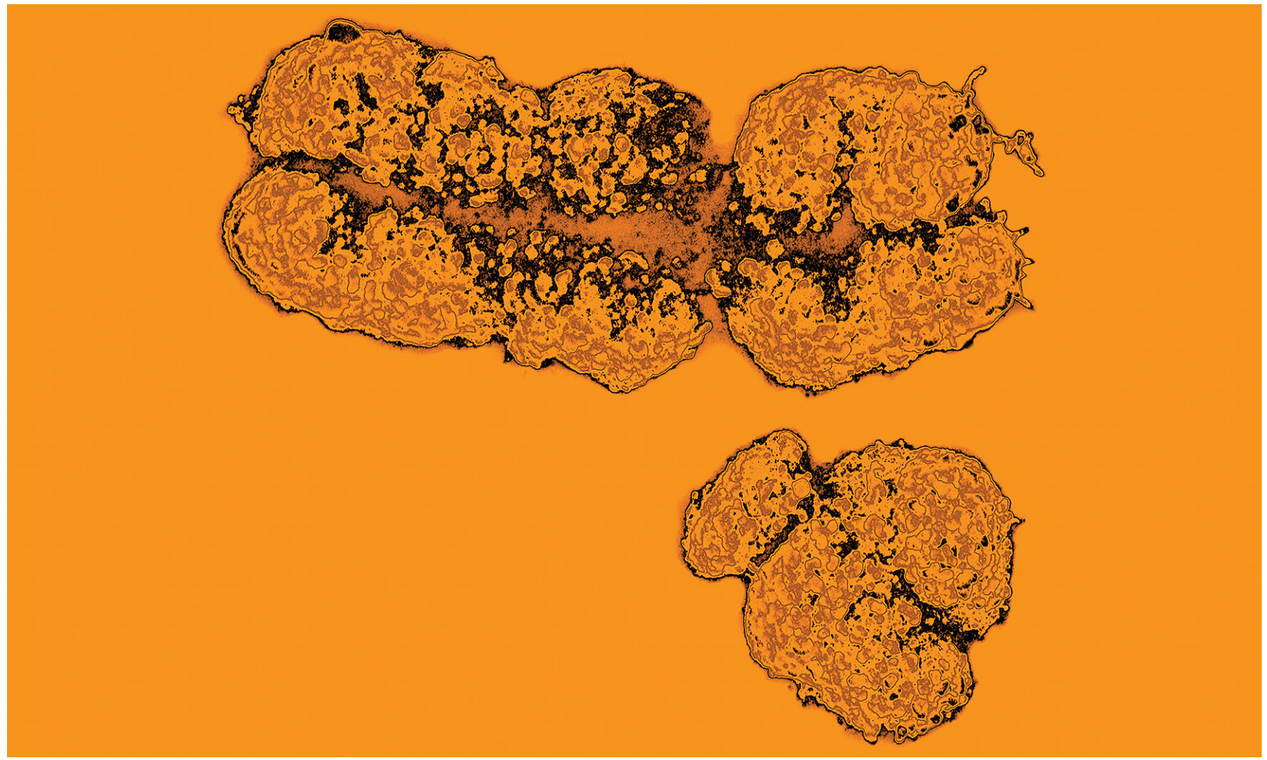

Research suggests doubling the X chromosome (top) leads to faster language development than X+Y

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He said, she said

Men are from Mars, women are from Venus – and bad at maths, according to the former president of Harvard Lawrence Summers. When asked at a conference in 2005 why more women were not engaged in high-level research in mathematics, science and engineering, Summers argued that it could be down to "issues of intrinsic aptitude". Such a statement reveals the curious evolution of thought on gender and biology through the 20th century.

When psychologists such as John Money first separated the notion of biological sex from that of gender in the mid-1950s and early 1960s, a consensus quickly emerged that gender was a social construct. Differences in the abilities of men and women were the product of social pressures and expectations, rather than innate, biological differences.

In recent years, however, gender has been pulled back again from the social to the scientific. Biological determinists contend that, far from being a cultural construct, the distinctions between the minds of men and women are innate.

This discourse, however, does not go unchallenged. Writers such as Cordelia Fine in her book *Delusions of Gender* contend that the evidence put forward is flawed. As for Summers, his comments led to a vote of no confidence and he eventually resigned. Perhaps men aren't as clever as they think. ●

Duncan Robinson