

SEX AND GENDER

Is Gender a Thing and, if so, what is it ?

Gender means type – French = genre derivation = type or sort

Latin: genus – type as in the taxonomy of plants and animals

Gender Identity – term coined by Professor John Money in mid-1950s

Relatively easy to define as a core belief or core sexual identity – which may be independent of one's Sex as assigned at birth.

For most of us, our Gender matches our Sex as assigned at birth and, again for most of us, our Gendered behaviour is a similar match. I shall argue that Gender, so very far from being a choice or fashion statement, is both linked to Sex and independent of Sex, so that when speaking about gendered behaviour, I may controversially include homosexuality.

Is Sex a Thing and, if so, what is it ?

Sex is much harder to define because the word has so many different meanings and associations. I shall not bore you with a complete list of definitions of Sex and Sexual, apart from pointing out that one speaks of Sexual Anatomy, Having Sex (sexual relations), Sexual Object Choice (Homo- versus heterosexuality), and having Sex on the brain, as just a few obvious examples.

A simple or oversimplified way of thinking about Sex and Gender is that Sex is between the legs, whereas Gender is in the mind. I add that the mind is in the brain, which is itself an organ of the physical body.

Given that Sex and Gender is a huge topic, I realised that it would be impossible to tackle everything in a single evening. We are aware how nowadays there is a great deal of contentious sexual and gender politics, generating much heat and little light. This evening, therefore, I may disappoint some of you now present. That is because tonight I shall be covering more science and psychology, than politics and philosophy.

When arriving in good time or early for a cinema performance, inevitably one sits through trailers for future films, and so it is tonight. On this principle, if people enjoy this evening's talk, I am open to being invited back to pronounce on Women only spaces, unisex lavatories, female prisons, Trans-Exclusionary Radical Feminists (TERFs), April Ashley, Jan Morris, JK Rowling, Professor Kathleen Stock, Eddy Izzard, and Grayson Perry.

But for now let's press on with some Science, stuff which I find exciting and intriguing. I may open up more questions than I can provide neat answers, and I hope to kindle enthusiasm in you here tonight, so that you end up wanting to come back for more.

SEX First – Gender later

Primary Sexual Characteristics are those differences present in girls and boys before puberty, including height, facial appearance, and size of hips and shoulders, sizes of hands and feet. Everyone here can doubtless list many more.

This contrasts with secondary Sexual characteristics (those triggered by puberty) in men and women, which again include facial appearance with changes in the voice (size and shape of larynx/Adam's Apple). Normal men are taller, have longer arms, bigger hands, and grow more muscle bulk.

Normal women begin ovulation and menstruation, also the development of breasts - while men have enlargement of their tackle, abilities to erect and ejaculate, different distributions of bodily fat, different patterns of hair growth and, sadly, different patterns of hair loss - not that I'd know anything about that of course.

The list is long and, in case anyone is interested, eunuchs (aka castrati) were taller and heavier than their normal male relatives, commonly more than 1m 90 (which is over 7 ft) whereas few Italian males ever reach 1m 80 (which is less than 6 ft). I wonder whether anyone in this evening's audience like to speculate or say why?

Before going further, when I speak about Normal, this is not a value judgement. Normal means the usual or standard, and nothing more while, in science, Abnormal means the unusual and nothing more.

To begin at the beginning, our anatomical sex is normally determined and assigned unscientifically - by external appearance, a posh term for this being the phenotype. Traditionally it is the midwife who holds up the slippery new-born infant by the ankles and declares to the traumatised parents that they have a lovely baby girl or lovely baby boy.

A scientific approach to assigning Sex would involve counting and identifying chromosomes by squinting down a microscope to establish the infant's genotype: 46XX for a normal girl, versus 46XY for a normal boy. Not offered unless some congenital abnormality is suspected – this investigation is called karyotyping. Congenital means something that one is born with, and it does not imply any kind of inherited condition.

There are many chromosomal disorders and, of those which are compatible with life, the commonest and therefore best known is Down's Syndrome. This is usually Trisomy 21 which means that one ends up with three chromosomes number 21 instead of two. Down's Syndrome is said to occur in 1 per 1000 births across Western Europe – a figure much influenced, of course, by pre-natal screening and therapeutic terminations of pregnancy.

I do not plan this evening to speak in detail about human intersex conditions but, suffice it to say that there are XXY (Klinefelter's) and XYY more-or-less male folk, and that there are XXX women and XO women (Turner's syndrome). Please hang in there, however, because it's intersex conditions in many animals that are remarkable, and which I therefore plan to discuss later in this talk.

AND NOW FOR some GENDER

As a scientist with great interest in such matters, I asked both our daughter and our son when each was perhaps four years old, whether they were girl or boy. Both gave the standard respective response and, both being highly opinionated children, they protested vigorously, declaring that I was wrong to propose to our daughter that she might become a boy if dressed in blue socks, while our son insisted that he could never be a girl even if dressed in pink socks.

When pressed to say why they were so very sure of being respectively girl and boy, both gave the only answer available to them, which was: “because I am”. In my view this is a statement of Gender, not Sex.

That gendered behaviour is the norm is not in doubt. For example in the school playground, boys kick balls and punch each other, while clusters of girls stand around talking and bitching about each other, often discussing issues of fashion including clothes.

Today I shall not be dealing at length with UK current law on changing sex, known as the Gender Recognition Act. Applicants are required to complete a Statutory Declaration that they will live in their changed sex until death. This means for natively assigned males that they will live as a woman for the rest of their days; while natively assigned females undertake to live as a man until death.

That said, I know of no satisfactory definition of what living as a man really means, neither do I dare to begin to explain what living as a woman might mean. Nowadays the social and professional roles of men and woman have become so blurred that I find it hard to identify anything that a normal woman never does and equally hard to identify anything that a normal man never does. My one example of an activity never undertaken by a heterosexual man is to buy cut flowers only for himself. If any member of the audience can come up with other examples, I should be most grateful.

It is important to note that, while gender is not known at birth, it has already been determined in each and every fetus at a remarkably early stage. If the preliminary results of the 2021 census are anything to go by, about 99.5% of Natally assigned girls will go on to have a female gender, and 99.5% of Natally assigned boys will go on to have a male gender.

Putting this another way, our best estimate is that about 0.5% of the population (or 5 per thousand or 300,000 folk) have Gender Dysphoria (GD). By Gender Dysphoria is meant the distress of the disparity experienced by children and adults whose core gender identity turns out to differ from their Natally assigned sex.

To place these figures in some perspective, homosexuality in both sexes measured together is around 5% (or 50 per thousand or 3 million Gay folk in the UK). There are also said to be about 5% (or 50 per thousand or 3 million) Moslems in the UK – presumably not the same 5% although some overlap is absolutely inevitable. These are broad-brush figures, and I can no more address the prevalence of bisexual people than I can enumerate the various permutations of gender fluidity.

Intersex conditions, by which one generally means external genitalia of ambiguous appearance are much rarer, with current estimates being 0.018% of the population which means less than 0.2 per thousand in the UK.

I have neither the time nor the energy this evening to spend long on discussing intersex conditions, but what I find fascinating is that what persons with Gender Dysphoria who were born as a twin have in common with Intersex individuals is a greater prevalence of those conditions amongst twins whose fellow twin is or was of the opposite sex.

Sex is an accident of biology, called Meiosis. Depending in mammals upon whether the sperm from your father which fertilised your mother's egg, which is normally an X ovum, happened to be a Y sperm or an X sperm, this made you either a male XY child or a female XX child.

Gender is not a choice, and Gender is not a fashion statement. Like Sex, it is an accident of biology. Prof John Money was wrong to claim that gender was largely a social construct.

People point at the rising numbers of adolescents with gender dysphoria. It is true that society gives permission to people to speak about their troubling gender issues and, if present, to identify as a young person distressed by their assigned sex. The obvious analogy is that millions of men now identify openly as homosexual, whereas it was criminal and therefore covert before 1967.

Nevertheless gender dissonance remains a very hard road to travel for children and adolescents - given that normal behaviour includes a desperate craving for conformity and peer acceptance. Whose child exactly wishes to stand out as different and be bullied for that? I should add that it has always been easier for tomboys (who are girls with male gendered leanings) to get along in school, than it is for Cissies (who are boys with female gendered traits).

What we now know is that because gender is fixed long before birth, changes in the hormone environment for the fetus in utero are tremendously important. The developing brain is highly plastic, and I consider that the case for understanding Gender Dysphoria as a form of Neurodiversity to be increasingly compelling. By 'neurodiversity' one signals a wide range subtle hard-wiring brain defects with complex origins, being part genetic (one's chromosomal inheritance) and part environmental including exposure to unusual hormones or other neuro-active substances in utero.

We are not reptiles and we are not fish, but please stay with me, because they are our evolutionary ancestors. It is known, for example, that changes in the temperature of the egg or changes in the temperature of certain new-born reptiles and fish determines the sex of the adult reptile or fish. Temperature influences levels of the Aromatase hormones to which the unborn reptile or fish are exposed (in egg of course, not in utero), and these changes can be replicated in experiments in which one administers confounding or cross-sex hormones.

No matter how scientifically desirable, it would undoubtedly be unethical to administer hormones of the opposite sex to human fetuses - by way of an experiment to establish whether this might produce more gender dysphoric children or trans humans.

Reptiles and fish are all very well, but we can learn so much more from our fellow mammals, with whom we share considerably more genetic material. In both cattle and sheep there is a condition, known as Freemartinism in which the sexual development of the female fetus in an opposite sex twin pregnancy is weakened in utero by male hormones that pass across in the fetal circulation from the developing bull calf.

The freemartin heifer becomes a chimera, by which I mean that certain cells have XY chromosomes instead of XX. She develops a prominent clitoris with a prominent vulva located between the hind legs where a normal bull calf would have its scrotum and penis dangling.

The bull twin remains XY and may have reduced fertility, but the Freemartin heifer twin is always infertile because her ovaries fail to develop properly, together with other genital tract malformations. About 5% or 1 in 20 of cattle pregnancies are twins and, of those, about half are opposite sex pairings.

Freemartins were known to the Romans and first described scientifically by the 18th century surgeon John Hunter. Apart from studying bones and how fractures mend themselves, work which involved the dissection of executed criminals allegedly supplemented by grave robbery, he was fascinated by venereal diseases. For example, he is believed to have injected himself with pus from a patient with gonorrhoea in order to satisfy himself that it was a different disease - distinct from syphilis.

Hunter described that Freemartins were always the female half of an opposite sex twin pregnancy, and he had a drawing on his wall of a Freemartin belonging to a Mr John Arbuthnot of Mitcham in Surrey, which he later dissected. We are told that Mr Arbuthnot himself remained intact, and I gather that he can be greeted most days as a fellow passenger on Bus 200 - en route to the meat counter of Waitrose in Raynes Park.

My talk today is on Sex & Gender, and now you know something about the sexual characteristics of certain intersex cattle. But what about Gender which, as I explained earlier, is in the head and not between the legs? This takes us into the world of Freemartin sheep and their similar origins in twin opposite-sex pregnancies where, as in cattle, male sex-determining hormones (or 'androgens') interfere with the normal development in utero of female lambs.

Freemartin ewe lambs are rarer than are Freemartin heifer calves, but any sheep-farmer can tell you about them. Freemartin ewes (if allowed to become adult sheep of reproductive years) will, as if they had male tackle (which they do not have), mount other ewes. But what I find truly fascinating is that normal ewes tolerate being mounted by Freemartin sheep. And Freemartins themselves do not tolerate being mounted any more than do rams. In other words, not only do Freemartins show undeniably male-gendered behaviour, but the gendered behaviour of normal ewes includes their acceptance of Freemartins as if they were rams with male tackle. On the other hand, most normal ewes are known as TURFs, on account of their outspoken opposition to allowing Freemartin sheep to piss and shit in the same field as they themselves use to piss and shit.

By the way, in case any of you, my audience this evening, have been waiting for me to say something philosophical this evening, you have heard it just now. But just before we revert to some more Science, I should explain that I do not like the term 'Transgender' although this has become popular.

This is because Natally assigned males who become Transwomen change their Sex but affirm or reaffirm their Gender. Similarly, Natally assigned females who become Transmen use the law to change their Sex and affirm their Gender.

Hence I adhere to using words like Transsexualism and Gender Dysphoria, while Cis-Men and Cis-Women mean those men and women whose Genders conform to their Natally assigned Sex - which doubtless includes the great majority of you, my audience, this evening.

When speaking about Autism and Autistic Spectrum Disorders (“being on the Spectrum” in normal parlance) to a lay audience, I cannot be sure whether the term is understood. In brief, therefore, Autism appears to be a Neurodiverse condition characterised by anxieties, a heightened sensitivity to noise, language and communication difficulties, and an inability to tune into how people around them are thinking or acting – the so-called Theory of Mind.

Neurodiversity sounds pretty weird, but I am certain that a significant minority of you present this evening are Neurodiverse. So anyone here who knows what I’m talking about? Yes it’s left handedness, by which I mean left sided preference for many motor and sensory activities. Probably the commonest yet poorly understood form of Neurodiversity in humankind is Left-handedness.

While I am not a great lover of audience participation, please can I ask each left hander to raise their left arm in a manner which fails to resemble a Nuremberg salute? Please can I now ask each of you who regards him or herself as ambidextrous to raise their partially dominant arm? Thank you to my Neurodiverse audience Generally accepted prevalence figures are for Left-handedness in 10% plus another 1% of ambidextrous folk, as consistently measured in varied populations across the globe. For those few of you who perhaps do not appreciate my point: even though the causes of Left-handedness are not known, that Left-handedness is a form of Neurodiversity cannot be denied.

This is similar to our knowing remarkable little of the causes of Homosexuality, by which I mean Cis-men in their core gender identity but Cis-men who show female-gendered behaviour in many or most spheres of life. Again, this is true Neurodiversity, and Gay men really do buy cut flowers for themselves on their way back from work each Friday evening.

Bisexual men and women probably belong to different respective groups, but the gay man will explain that he was born gay and that this was never a choice. I don’t have the scientific evidence, but I understand that some explicitly gay women do exercise choice, although they were unwittingly bisexual from the outset.

Left-handed children in previous generations were coerced into writing and using tools with the right hand, practices now frowned upon, which owe their origins to various superstitions which persist in the language. Hence Right versus Wrong gets conflated with Right versus Left, or Sinister in Latin - while Left in French remains gauche, and Link in German slang means underhand or treacherous. Islam forbids using the left hand which is meant to specialise in cleaning one's posterior anatomy, and a Left-Footer is obsolescent English slang for a gay man.

As mentioned earlier, the brain is plastic in fetuses and young children. When our left-handed son started using computers, the mouse was always to be found to the right of the keyboard, and I encouraged him to use the mouse in his right hand – so that he could write notes simultaneously with his left – a practice which he continues to this day. Of course he always strikes a match held in the left hand, places his left eye to camera viewfinder or telescope, and kicks a ball with his left foot.

I am pretty sure that folk who used Left footer to mean a homosexual man were thinking neither about Neurodiversity nor about a child's brain plasticity. However it is truly remarkable that modern studies have shown gay men to have 34% greater odds of being non-right handed (left plus ambidextrous), and that gay women are 91% more likely to be non-right handed. These are enormous Sex disparities which, in my view, can only be explained as Neurodiverse, although the basis of that Neurodiversity remains unclear.

So where are we with Sex and Gender? Recent studies also show that transsexual individuals are between three and six times more likely to be on the Autistic Spectrum than those who are Cis-gender, by which is meant the 99+% of folk who do identify with their Natally assigned sex.

Notwithstanding concerns that Autism in girls and women is sometimes underdiagnosed, it is known that Autism occurs predominantly in Natally assigned males, and that there is often evidence of family inheritance down the male line. What I also find interesting is that the incidence of Gender Dysphoria (GD) in persons with Autism is equal between Natally assigned males and Natally assigned females.

A killer statistic for me is that individuals on the autistic spectrum are two and a half times more likely to be left-handed than people without Autism. Looking at these figures another way, 28% of those on the Spectrum are left-handed, as compared to some 9% or 10% of left handers in the general population – which is three-fold difference.

To return, however, to gendered behaviour in humans - activity interests and participation – from childhood toy preferences to adult hobbies and occupations – that these are strongly linked to prenatal androgen exposure is confirmed by two recent studies.

Of these, the former study describes the effects of exposure to androgens on interest and engagement in male-typed occupations. This was seen to have economic consequences – so that women with exposure to high levels of prenatal androgens due to congenital adrenal hyperplasia (CAH) were more likely than controls to have income in the top 20th percentile, reflecting employment in male-typical, higher-paying jobs – and this despite normal women having, on average, lower educational attainments and greater psychosocial problems.

Speculations about the affective and cognitive processes that underlie children's sex-typed toy preferences have also been stimulated by evidence that those preferences are paralleled in rhesus monkeys. Male monkeys, like boys, strongly preferred wheeled toys, whereas female monkeys, like girls, had variable preferences, including a preference for cuddly (plush) toys not seen in male monkeys or boys.

Recent work has documented early sex differences in propulsive movement (hitting versus cradling an object), with sex-typed activities suggested to develop “from socialization mechanisms that build on a male predisposition to imitate propulsive motion”.

Furthermore, sex differences in occupational choices, such as male-predominance in science and engineering, versus female-predominance in caring occupations, appear to be driven in part by androgen effects on interest in things versus people.

The latter study (Karamanis et al in August 2022) is based on registry data from a large Swedish population-based cohort. The prevalence of Gender Dysphoria (GD) among twins and non-twins was compared over a 16 year period (2001–2016).

Absolutely no same-sex twins both with GD were identified. The prevalence in different-sex twin pairs was not only much higher than the prevalence in same-sex twins, but also higher than that in non-twin sibling pairs.

Among the different-sex twins there were 10 (37%) with GD. Interestingly, there were only 4 full siblings with GD (0.16%) among the 2534 non-twin siblings, a striking difference in concordance compared to the different-sex twin pairs, considering that they are genetically similar. Because this difference cannot be explained by genetics or shared childhood environments, the evidence again points to the effect of intrauterine exposures to androgens.

I was asked to speak for 45 minutes, and 45 minutes is what you've had so far from me this evening.

But just before I end tonight's talk, and we all enjoy some wine and nibbles, I issue a warning that, if invited back, I could happily address the trans-preoccupations of William Shakespeare and the origins of Pantomime, both during the 16th century - before looking back to the overheated demise of Joan of Arc some hundred years earlier - and then moving forward to the fascinating cases of Dr James Barry and the Chevalier d' Eon during the 18th century.

I would also talk about hormone treatments, how to get your gender affirmed, how to get your sex changed by surgeons (including what changes they can and cannot achieve surgically), how to get your sex changed in law, together with the constantly evolving picture of Gender-related law in Scotland and England.

Therefore I may be wearing pink socks when next we meet.

You have been warned !!