Homosexuality and Science

Is homosexuality innate or learned? Is it genetically determined, or a life-style choice that can be rejected and/or repented of? Or, to use the technical terms, is it essentialist, or constructivist?

The prevailing view of homosexuality has changed over time. For much of human history it was considered an essentially moral issue, and this prevailed until the middle of the last century. Freud considered it an abnormality, and thus therapeutised it: while he did not consider it an illness, he did see it as something to be changed. Arising from an overly intimate relationship with a mother, could with a distant or absent father, it was a developmental aberration. This view is widely discredited today, not least because while that family system dies characterise some homosexuals, there are others for him this does not apply.

From the early days of the Gay Liberation Movement, it has been politicised, and the aim has been to 'normalise' it within Western society, so that it becomes a legitimate and 'healthy' difference. Part of this strategy has been to demonstrate that homosexuality is simply one end of a spectrum of sexual preferences, and that it has a genetic origin, or a genetic predisposition. This transfers it from 'sickness' to be cured, to either a 'disability' to be carried (there being no 'cure') or a difference to be celebrated.

It is clear that exclusive homosexual it or bisexual attraction is not the majority sexual position on the spectrum. Most people (probably 95%) are exclusive heterosexual or weakly bisexual in their attraction. Claims that homosexuality is a more widespread phenomenon is overstating the position (probably for political reasons) although when groups of human beings are single gender for any lengthy period, the sexual activity amongst and between them increases (in prisons, for instance, where sexual favours are used as means of oppression between the dominant inmates and the weaker.)

Much of the science has been rooted in statistical correlation (between, for instance, the incidence of homosexuality in males increases with Fraternal Birth Order, FBO) but some caution should be expressed here. There is a well-known statistical correlation between the annual birth rate in Sweden and the annual migration of storks over that country, although no causal links have been found. Swedes appear to be conceived in the normal way, and storks play no part in the arrival of babies, not even in Sweden!

1. DNA and Genes

Every human cell contains a double set of genes, one from the mother's egg, and a second from the father's sperm. Each set of genes is the result of a halving of the number of gene-sets (*meiosis*) during maturation of both sperm and egg. When the sperm and egg fuse during fertilisation, the two halved

gene-sets combine to form a new, and unique, full set of genes in the fertilised egg (*zygote*) All the cells of that person will contain the same diploid gene-set, which is copied exactly.

Genes are composed of DNA, the double-helix discovered by Watson and Crick in 1953, and this is replicated exactly, and so our genetic identity was forged at our conception.

In humans, and other higher organisms, thousands of genes are contained in enormously long pieces of DNA known as chromosomes. The human diploid set consists of 46 chromosomes, with the haploid set (in sperm and in egg) consisting of 23. During the development of the egg, the woman's parent's chromosome-sets become partially scrambled, and the same thing happens for the man's sperm. So, we do not receive any one of our grandparent's chromosome-sets intact, but a recombination occurs during *meiosos* that confers a unique and unrepeatable genetic identity for all of us.

Where non-identical twins (dizygotic)are conceived, this is the result of two fertilised eggs sharing the same womb, and there is no greater genetic identity than in any other brothers or sisters, but where the zygote splits within 15 weeks, two separate but identical genetic beings are carried. Identical twins (monozygotic) share the same genetic make-up. They are genetically identical.

The way that genetic mutation gives rise to differences in the proteins is not important here, but it should be noted that mutations in the DNA sequence gives rise to altered proteins, and this is where genetics gives rise to illness (e.g. an altered form of haemoglobin that gives rise to sickle-cell anaemia, where both parents carry the altered gene) If only one parent carries it, it gives rise to an increased resistance to malaria, and this genetic difference is particularly prevalent in West African populations. This explains the prevalence of sickle-cell anaemia in those whose genetic origins are in the region (such as Afro-Caribbean's, as well as West Africans) the resistance to malaria is called a heterozygote advantage.

Sometimes one or more genes may confer a genetic disposition towards the development of a particular disease (such as the BRCA-1 mutations that leads to breast cancer). These multi-gene disorders, and their patterns of inheritance in affected families, are always much more complex, and it is in this regard that multiple-genes may influence homosexuality.

In humans of the 46 chromosomes, 2 are sex chromosomes. Female cells carry two copies of the X chromosome, whereas male cells contain one X chromosome, always derived from the mother's egg) and one much smaller Y chromosome, always derived from the father's sperm. Thus females are XX and males XY chromosomally. Broadly speaking, Y chromosomes impose a male sexual identity upon a default female state. Genetic mutations give rise to an intermediate state where the person is neither wholly male nor female. A person's apparent gender (their sexual phenotype) can be at odds with their chromosomal sex (XX or XY)

The other biological influences upon sexual development are the hormones, such as testosterone in males and oestrogens in females. These give rise to secondary sexual characteristics and behaviours, and can be manipulated externally to alter a person's sexual characteristics.

2. **Nature/nurture**

Twin studies give a unique window upon the debate as to the origins of homosexuality. Is it a genetic predisposition or determination, or is it the result of upbringing, choices or other influences?

In most studies, concordance rates for MZ twins (sharing 100% of their genes) are much higher than for DZ twins (who share 50% of their genes, but the same womb and family environment) This implies that genetic factors are important. However, since concordance rates for MZ twins never reach 100%, there must be environmental factors as well. The sample sizes are very small, and the results should be treated with caution (1-5% of twins will have one or both twins homosexual)

In 2007 the distinguished geneticists Francis Collins concluded that the heritability of homosexuality may be as low as 20%.[1] We are all dealt a set of genetic cards, but how we play them is up to us. This is the very new science of epi-genetics. The way that nature, choice and human habits influence the way in which the genetic legacy influences behaviour is interactive. It is becoming clear that there is a complex interaction of genetic and environmental factors at play.

For some the genetic influence may be very strong, while for others it is weak, and the choice of responding to same-sex attraction is much greater than the strongly determined sexuality of others.

There may be some hormonal influences where DZ twins are different in gender (a twin brother and sister), suggesting the womb environment is influential, but more likely it is post-birth childhood gender roles that are influential.

3. **Hormonal Influences**.

The influence of sex hormones (androgens such as testosterone in males or oestrogen in females) acts by entering cells and switching on sets of genes responsive to that protein.

There is a gradation of human sexual phenotypes from androgen-dominated (aggressively male) to oestrogen-dominated (female), which are loosely correlated with psychological and behavioural traits. Androgen exposure may contribute to female homosexuality (e.g. congenital adrenal hyperplasia) The incidence of homosexuality is about 5 times higher among CAH women, suggesting that pre-natal exposure to androgens has influenced later sexuality. It is over-simplistic to suggest that androgens impose a masculine

[1] Groves (ed) 2008, p.278

identity upon the human brain, but they do exert a strong masculinising influence upon psychosocial as well as physical development.

4. Homosexuality and the brain

The brain is an organ that changes with use. Those aspects of knowledge or experience that have greater development are matched by growth in brain structure. A number of studies have suggested differences between the anatomical structure of the brains of women and men, and some that the brains of homosexual men show greater anatomical similarities to those of women than of men. This is much disputed, but what is clear is that brain function must differ between homosexual men and heterosexual: exclusive homosexual men are attracted to men, not women. There is some research also into pheromone responses in homosexuals, which are, as expected, attracted to the pheromone of the same gender.

At the heart of this debate is whether these responses are 'hard-wired' (laid down in early development, and thereafter immutable) or 'plastic'. The fact that the brain remains plastic in adult life means that the re-ordering of sexual orientation in later life should not be entirely dismissed.

5. Fraternal Birth Order.

Both genetic inheritance and prenatal hormonal exposure are stronger pre-disposing factors in women than in men. Fraternal Birth Order is applicable only to male homosexuals.

The chances of a male child becoming homosexual increases with the number of older brothers (but not sisters) within a family. A recent meta-analysis of 14 separate studies concluded that this FBO affect is statistically robust. The likelihood of homosexuality in a younger brother increases by roughly one third for each older brother. So, if the mean prevalence for homosexuality is about 3%, then the probability of a second brother becoming homosexual is 4%, for a third brother 5%, and so forth. For men with three or more older brothers, the FBO effect could outweigh all other factors. This implies that the overall mechanism is social rather than biological.

The mechanism could be a form of sex typing, where younger brothers adopt more feminine roles, or it could arise because of sexual abuse by older siblings. This postnatal psychosocial approach has been questioned through a recent study that has shown the FBO effect does not apply to adopted older brothers. This would suggest a biological reason.

A possible biological reason could be progressive immunisation within the mother to male-specific proteins with each pregnancy. A baby is, in many ways, a 'foreign body' within the mother, but powerful immunosuppressive processes generally protect the foetus from rejection. An exception is the Rhesus syndrome. In a *Rh*-negative mother, the first Rhesus –positive foetus (after fertilisation by a *Rh*-positive father) usually causes few problems. However, during pregnancy and especially during birth, some of the Rh-positive cells will enter the mother's circulation, and as these cells are

perceived as foreign, (since the mother is *Rh*-negative), the mother's immune system will produce antibodies against the Rhesus antigens. Immunological memory cells ensure that anti-*Rh* antibodies are produced quickly (this is why vaccines work) Foetal death in subsequent pregnancies increases with each pregnancy. Something similar may be happening with subsequent male foetuses, with a reaction by the mother to those proteins that ensure masculinity, pre-disposing the child to homosexuality.

6. Conclusions.

Biology is complex, and human beings are complex. Over-simplistic explanations (' the gay gene', or a feminised upbringing) lack the sophistication to account for the multiple reasons why homosexuality exists. Homosexual behaviour is varied, from stable-faithful partnerships to risky promiscuity (variants also seen in the heterosexual population) and some may choose same-sex attraction from a range of personal options, while others are most likely innately homosexual. Some might be susceptible to change over time, while others remain fixed in their orientation.

For most homosexuals, male and female, a multiplicity of factors, biological and social, nature and nurture, apply. The recent study in epi-genetics reveals that the genetic dispositions themselves are to change with environment, which is why there are MZ twins where one is exclusively homosexual, while the other is heterosexual.

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