



Born this way? Probing into Homosexuality

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Abstract:

The phenomenon of homosexuality incites a lot of discussions and debates across the globe. Much of the confusion arises when we ask why such a phenomenon has persisted in natural populations of numerous species through time. Expectedly, evolutionary biologists have been trying their best to understand same-sex behaviours to shed light on the causes and the reasons of its existence. In this article, we look at various ecological explanations for homosexuality. We also take a brief look into the idea of epigenetics, and how the field of epigenetics can help us answer some of the most burning questions surrounding homosexuality.

Keywords: homosexuality, ecology, epigenetics, epi-marks, ethology

“Here on one occasion I saw what I took to be a cock copulating with a hen. When he had finished, however, and got off, the apparent hen turned out to be a cock, and the act was again performed with their positions reversed, the original “hen” climbing on to the back of the original cock, whereupon the nature of their proceeding was disclosed.” -20th century naturalist George Murray Levick’s observation in his fieldnotes while observing Adelie’s penguins in Antarctica.

Homosexuality is a phenomenon that has confused scientists, pundits and general public all over. The fact that it is contrary to the more commonly prevailing heterosexuality, has generated long-lasting (and still continuing) discussions on whether or not it’s ‘unnatural’ or if it’s a ‘mental disorder’ or if it’s a ‘sin’ that needs to be purged from someone who is ‘indulging’ in it. A lot of evidence has accumulated over the years that suggest that this orientation is caused by a complex interplay of genetic, hormonal and environmental influences, and it is not merely based on ‘choice’. The American Psychiatric Association had marked

homosexuality as a 'mental disorder' in the '*Diagnostic and Statistical Manual of Mental Disorders*', but in 1973 it was removed from the list. At that time it was a particularly noteworthy decision. Most of the nations have scrapped off any prohibition of same-sex contact, provided that it is consensual and above the age of consent for that area. However, in various nations, homosexuality is still considered a crime. Quite recently, Indian government has also come under criticism from various sections of society when the previously de-criminalized Section 377 (which criminalizes sexual activities 'against the order of nature') was overturned for more review of the phenomenon (<http://www.thehindu.com/news/national/supreme-court-sets-aside-delhi-hc-verdict-decriminalising-gay-sex/article5446939.ece>). More recently, in 2018, the Supreme Court stated that consensual sexual acts between adults cannot be a crime. As it stands, the phenomenon continues to generate a considerable amount of confusion and debate.

In common usage, terms like 'gay' or 'lesbian' are anthropomorphic (or have been anthropomorphized for that matter). But terms like 'homosexual' extends to denoting non-human animals as well. It may mean same-sex sexual behaviour which may not be sexually explicit. It can also mean courtship or copulation over a short time. Conventional usage denotes long-term bonding between same-sex partners that includes combination of activities like courting, copulating, parenting, expressing affection, etc. that any average heterosexual couple would show.

As previously mentioned, the confusion regarding this same-sex sexual behaviour is obvious. Why would any otherwise dioecious (having male and female genitalia in separate entities) organism engage in sexual acts with someone of its own sex? The second question is even more perplexing: When such activities won't even result in reproduction, why has this even persisted in the population? Homosexuality was previously considered to be extremely rare in nature. However, as ethological studies have flared up, we have seen many published reports of same-sex sexual affiliations actually happening in the animal kingdom. Over the last two decades, much of the stigma regarding homosexuals in society has dissipated considerably. Globally, many people of alternate sexual orientations and preferences have come out in the open. As a result, progressive nations have embraced such people and their behaviours as their individuality, which makes them what they are. Consequentially, many such observations with relation to animals, which were recorded in the wild but kept hidden due to the inappropriateness and fear of its implications, are being discovered today. A classic example is that of the observations by Levick (quoted at the start). Levick spent

the Antarctic summer of 1911-12 by observing the habits of Adélie penguins at Cape Adare. During that time, he not only saw males having sex with males, but also saw males having sex with corpses of dead females, some of those corpses as old as 5 months. Naturally, Levick was alarmed at these sightings which did not conform to the sanity of nature. So he chronicled these findings in Greek, and hid it, and it was not before 50 years had passed when his writings were dug out (<https://www.theguardian.com/world/2012/jun/09/sex-depravity-penguins-scott-antarctic>).

About 100 species of birds have been known to comprise of individuals showing homosexual behaviour. Laysan albatross in Oahu islands showed 31 % incidence of female-female pairs (Young *et al.*, 2008). In graylag geese, 15 % of the males participated in only male-male bonding, whereas 37 % were bisexual (Kotrschal *et al.*, 2006). Barnyard sheep is now the model system for neurophysiological studies concerning homosexual behaviour because almost 8 % of them are known to be strictly homosexual (Ramagopalan *et al.*, 2010). In bonobos, same-sex sexual bonding has been seen to actually ease out quarrels and is a way of reconciliation among group members. Examples encompass organisms like dolphins, frogs, penguins, guppies, beetles, even nematodes and many more (Bailey and Zuk, 2009). The scientists all over have been brainstorming over the adaptive and evolutionary significance of this phenomenon. Theodosius Dobzhansky had rightly said “nothing in biology makes sense except in the light of evolution.” It seems likely that in-depth understanding of same-sex relationships in nature will reveal a lot about how organisms maintain their social structure and relationships (which can mirror a lot of things we human beings apply or can apply for ourselves).

Ethology, or the science of animal behaviour, is no doubt extremely tough (we wish animals could speak in a language that we understand). However, in matters like sexual preferences or orientation, it becomes even more difficult to come to a definite conclusion. We the human beings can directly respond to the researchers about our preferences or orientation. But what about animals? Just to put things in perspective, let us clearly outline what sexual ‘ORIENTATION’ and sexual ‘PREFERENCE’ mean because they are very similar in meaning. Orientation refers to the individual’s internal predisposition towards one sex or the other. Normally when we refer to the ‘sexual identity’ of a human, we are talking about their orientation. It might happen that the individual is homosexually oriented, but indulges in sexual acts with the other sex. Preference refers to the gender with which an individual would want to have sex with at a particular time,

given the choice. Therefore, it is a dynamic behavioural property. This muddles up the scenario. It is also useful to keep in mind that homosexuality is not discreetly separated from heterosexuality. There is a continuum of levels between exclusive attractions for opposite sex to exclusive attraction for the same sex. Another difficulty which often presents itself is: we don't know for what period of time an organism will show a particular preference in its life. All of these factors make the categorisation of individuals very confusing. A very simple example of this is: a new user opening an account on Facebook is faced with 50 options for denoting the sex of the individual (options include Agender, Androgyne, Androgynes, Androgynous, Bigender, Cis, Cis Female, Cis Male, Cis Man, Cis Woman, Cisgender, Cisgender Female, Cisgender Male, Cisgender Man, Cisgender Woman, Female to Male, FTM, Gender Fluid, Gender Nonconforming, Gender Questioning, Gender Variant, Genderqueer, Intersex, Male to Female, MTF, Neither, Neutrois, Non-binary, Other, Pangender, Trans, Trans female, Trans Male, Trans Man, Trans Person, Trans*Female, Trans*Male, Trans*Man, Trans*Person, Trans*Woman, Transexual, Transexual Female, Transexual Male, Transexual Man, Transexual Person, Transexual Woman, Transgender Female, Transgender Person, Transmasculine, Two-spirit). Looking at such a huge list of options would obviously make us unsure what our own sexuality is, and where do we lie in the continuum.

Let's get back to the question which was confusing us at the onset: why would any otherwise dioecious organism engage in sexual acts with someone of its own sex? By this we are referring to the apparent paradox to the basic laws of nature that we know. Our understanding of biology tells us that 'SEX IS AN ACT WHICH RESULTS IN REPRODUCTION'. But let's think about it. Is reproduction the only purpose of sex? We humans indulge in sex to derive pleasure (perhaps a majority of the sexual acts among humans going on in the world right now might be for the attainment of pleasure and not for reproducing). We human beings have a tendency to impart our own biases when we try to find inferences for animal behaviour studies. Sex is an act of love and affection. It may be that this behaviour is like a rein which hold and strengthens social relationships among individuals of the same sex. In case of bottlenose dolphins, it has actually been seen to be a possible explanation (Mann, 2006). Even more astonishing is the example of some males of the dung fly *Hydromyza livens*, which mount other males to deny them mating opportunities with females, thereby increasing their own chances of getting a female which would otherwise have been

courted by the other (Preston-Mafham, 2006). The subordinates grab this opportunity to sneak copulations with females. Homosexual encounters might be a good way to practice for courtship behaviours. This practice can come into effect later when a heterosexual partner is available later on for mating. Evidence for this idea has been found in *Drosophila*. It has also been suggested that such behaviour may arise among individuals of same sex living in proximity for a substantial amount of time (examples include gazelles who are lekking). This particular idea is not something foreign to general public. In many movies or books, we see depictions of homosexual behaviour sprouting in hostels or prisons or anywhere where people of the same sex are confined to for a long time. In scientific literature it's often called the 'prison effect'. We can imagine various other reasons as to why this prevails. An organism may not be able to actually differentiate between sexes. An organism might be sexually hyper-responsive or over-active. The possibilities are huge and quite interesting.

Now we come to the second question that was confusing us from the start: "When such activities won't even result in reproduction, why do these even persist in the population?" In technical terms we need to understand the evolutionary significance of this behaviour and needless to say, it is quite difficult.

Let us try to imagine a situation here. There is a population of organisms consisting of male and female individuals. The male contributes the sperm and the female contributes the egg which unites to form the zygote. The female investment towards the zygote is certainly more. As such there is a limit to the number of offsprings a female can generate over the period of its life. Males can technically produce a huge number of offsprings in its life because the sperm production is cheap, and sperms are produced in huge quantities. As stated by Richard Dawkins in his spectacular book "*The Selfish Gene*", an individual would normally want to leave as many copies of his/her genes in this world as possible. So it would want to have more offsprings and has to ensure maximum survivorship of the offsprings. From the point of view of the female, it becomes a bit murkier. The female cannot reproduce throughout its life continuously. It can give birth in discrete time intervals. Added to this constraint is the fact that the female can lay only a few individuals at a time. Therefore, the mind-set of a female would be to give birth to 'quality' individuals and invest energy in rearing them up so that they are able to survive well in nature. The males would tend to increase its

progenies in 'quantity' by trying to be polygamous (because the female it has mated just before is, for the time being, blocked from the prospects of mating). However, there's another catch. Successful rearing of the new-born is more probable when both the parents cooperate in the activity. If the male is out hunting for more females to mate with, it cannot be available for bringing the offspring up. Therefore, it would be intuitively sensible for the female to court another female and share the parenting responsibilities. This can help increase the fitness of the growing offsprings, as well as allow the males indulge in copulations elsewhere.

If we consider our human society, adultery is a reason why many marriages end up in divorce. It would be interesting to know if animals know or believe in the concepts of marriage or breakups or divorce in the way we perceive it. Let's take a leap of faith and say that animals are tolerant of adultery and promiscuousness. Then we can argue that same-sex pairing of females would engage those un-mated females of the population who would have otherwise created a pressure on the males to leave their current partners. This can somehow explain the observations by MacFarlane *et al.* (2007) which showed that female-female sexual pairings were more common in certain birds giving rise to developed chicks. If we extend our thoughts we might also expect male-male bondings to increase in a population of polygamous individuals. It won't be an exaggeration to say that population demography, social structures etc. do take part in determining the ecological and evolutionary significance of this behaviour. How it happens, is still a question we are grappling to answer.

Many homosexual advocacy groups have long immersed themselves in trying to prove that homosexuality has a genetic basis that will get discovered someday. Genetic or not, one thing is pretty clear that homosexuality can have many indirect genetic effects that improves the fitness of other individuals in the populations. But another problem comes into the foreplay: if homosexuality imparts some benefits to the group or community and is handed down through generations, there has to be a heritable basis on which the whole behaviour is actually operating. This scenario is not too different from the scenario in which we talk about altruism between organisms. Is there a gene for homosexuality? If there is, it will put an end to all the on-going debate of if it is a 'sin' or if it is a 'Western influence'.

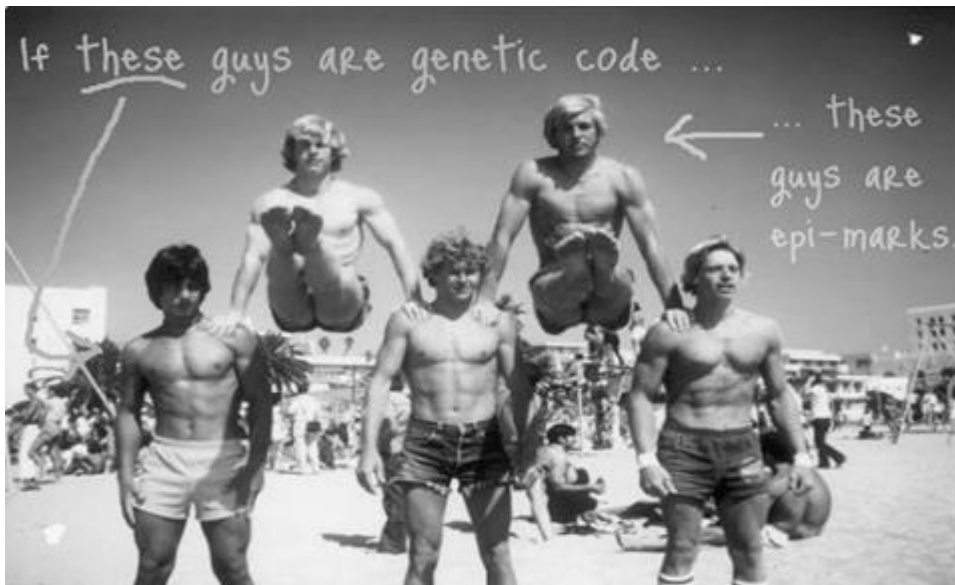
Perhaps the most notable noteworthy explanation of the phenomenon was given by Rice, Friberg and Gavrillets in 2013. They proposed a model which explains homosexuality on the basis of epigenetics. Epigenetics is relatively a newcomer in the field of biology. Literally it means ‘above’ or ‘on top’ of genetics. Basically it relates to the study of trait variations which are caused by external factors that switch genes on and off thereby affecting how cells actually read those genes. Some of the reasons why they thought epigenetics can be a worthy candidate for an explanation are:

- a) Homosexuality has been found to be fairly heritable, yet it has very low concordance between monozygotic twins.
- b) Linkage studies trying to scour through the genome for a “homosexual gene” has not turned up with anything.
- c) The prevalence of homosexuality is quite higher than what would normally be expected in a situation of mutation-selection balance.

All these observations cannot be expected if it had been a genetic trait.

In a nutshell, various epigenetic marks (epi-marks) originate in embryonic stem cells which can regulate the androgen sensitivity of a foetus. During the period of foetal and perinatal development of an individual, the foetus is influenced by high (in case of males) or low (in case of females) levels of androgen which result in the sexual dimorphisms of brain and genitalia as well as sexual behaviour in early childhood. Now the cells have a “memory” of this prenatal exposure when puberty strikes, and this memory helps in the development of secondary sexual characters. Now, normally, these epi-marks are not transmitted to the next generation. However, some epi-marks can sneak into the next generation by chance. These epi-marks become antagonistic when they find themselves in the offspring/s of the opposite sex. Now homosexuality would occur when an epi-mark (influencing preference) is transmitted to the offspring of the opposite sex and is paired up against a weak native sex-specific epi-mark. To say as an example: a heterosexual female would have epi-marks which influence its sexual orientation/preference towards males. If this female transmits her epi-marks to her male offspring, and if those epi-marks turn out to be stronger than the epi-marks produced

in the male offspring, then the maternally transmitted epi-marks would show a pronounced effect. So, although the offspring is a male, it would show sexual preference towards males, just like the mother.



(Image courtesy: <https://nothinginbiology.org/2012/12/18/epigenetics-gay/>)

Quite naturally, this report had caused widespread excitement among people who had been fighting for gay rights. But we need to be careful, because this was just a model that poses testable hypotheses. Epigenetics also says that lifestyle and environment can bring about changes in the epigenome of an individual (<https://www.genome.gov/27532724/epigenomics-fact-sheet/>). In other words, our epigenomes may change on the basis of what we drink or eat or do, what pollutants we are exposed to, what physical activities we are involved in, so on and so forth. Our experiences which will leave marks on our memories and behaviour, may also leave a footprint on our epigenomes. Here we need to draw a line between “homosexuals by birth” and “practicing homosexuals”. A practising homosexual is an individual who may otherwise be oriented towards the opposite sex, but indulges in same-sex behaviour (maybe by influence or choice or curiosity or pressure). Now it would be interesting to see if these individuals give rise to offsprings who turn out to have same-sex tendencies from early childhood. Only then we can gain more trust in the epigenetic basis of homosexuality.

Epigenetics is a fascinating branch of science that has recently come into limelight. However, just like genetics, we have to be careful about the inferences we draw from the use of epigenetics. Suppose we have a lady who smokes and smoked during pregnancy. By the principles of epigenetics, there would be some changes in her epigenome, which can be transmitted to her offspring/s. So if her offspring catches the habit of smoking and is requested by a well-wisher to abandon smoking (assuming that smoking is harmful), he/she will have a valid excuse to defend himself/herself with: he/she is epigenetically predisposed to smoking because his/her mother was a smoker. In fact many paedophilia advocacy groups (indeed they exist) have started coming up with such kind of arguments to validate their nature. In a large number of non-human animals, polygamy is quite common and turns out to be a necessity. In case of humans, adultery is generally looked down upon as a manifestation of a flawed character. But someone who is involved or wants to be involved in adultery can create the excuse that he/she may have been epigenetically curated to practice it, thereby giving credibility to the nature. This issue came to the forefront when polygamy was decriminalized in Utah state as it was not 'unconstitutional'.

We often study animal behaviour and try to draw parallels between them and humans. While this often leads to better insights about our own behaviour, we should be alert as to when we strike upon some animal feature that may counter our moral and ethical make-up. As Levick had guarded (and quite sensibly, hidden) his observations from public eye, we need to be wise about extrapolating inferences from one aspect to another. He saw penguins indulge in sexual acts with corpses of penguins. What if a person actually does that? Normally that person would be ostracised on the grounds of being a "necrophiliac". The person, on the other hand will have a defence: "If the victim is someone who is dead, how can it be called a breach of dignity? Where does dignity come into question if the person ceases to exist anymore? If a penguin, who is also a member of the animal kingdom, can do it by its nature, why can't I? What if I'm epigenetically like this?" These might sound exaggerated, but on a second thought, it is not really so. The homosexual's supposedly unanswerable argument is "That's who I am". Now what if the others who are necrophiliacs/paedophiliacs/adulterers/rapists etc. come and say "That's who I am"? Where do we draw the line??

For an ecologist, it would be interesting to understand the role of same-sex sexual behaviour in sexual selection. Sexual selection often manifests itself in increased variation in mating successes of individuals, brought about by intrasexual competition (for mates) and intersexual mate choice. How can same-sex sexual behaviour influence the sexual selection? Or does it influence at all? The phenomenon which has been described in dung fly (previously mentioned) is not the only example of such a strategy, it seems. A similar strategy is often employed by various male cockroaches, where they mimic female behaviour, and facilitate mountings by other males (Wendelken and Barth, 1985). This ‘pseudofemale’ behaviour turns out to be advantageous for the males who express it because they can now tire out the males who are mounting them and copulate with the female who was being courted by the male. Same-sex behaviour, apparently, is not a choice for those cockroaches. It’s a necessary strategy which ensures their reproduction. If we look at the non-human animals, same-sex behaviours are deployed in a variety of contexts. The contexts might be as alternative reproductive tactics, cooperative breeding strategies and catalysts for social bonding among members. For humans though, as mentioned before, sexual acts can also be a source to satisfy their carnal hunger. The biologist Jeremy Yoder said “....it’s hard to reconcile that with the fact that gay men and lesbians aren’t by definition, particularly interested in doing what it takes to pass on any genes that might have contributed to creating their orientation...” Although there are instances where animals indulge in copulations where conception was not possible, it is to be seen if they actually knew that conception was not possible or if it was just for the sake of pleasure (or if it is indeed pleasurable for them) (<http://www.bbc.com/future/story/20140613-do-animals-have-sex-for-fun>).

In conclusion, it can be said that science needs to explore sexual behaviour of animals in an evolutionary framework and needs to avoid the subtle pitfalls as our knowledge of this field matures. It’s good to see that we are making headway into this field. Even if we cannot figure out the pinpoint of origin of such behaviours, we should not ignore the evolutionary effects they bestow on phenomena like aggression or conflict in communities. In order to ensure that, there needs to be a stronger link between the researchers who are working on non-human animal systems and those working on human systems. It is expected that the biological mechanisms underlying these behaviours would slowly be unravelled with time. But most importantly, we should avoid politicising research results and drawing parallels between animal behaviour and human sexual identity when such comparisons are clearly not merited. We often profess ourselves to be

the most intelligent species on earth. This issue is one such which would test our intelligence based on how we are able to deal with this homosexuality debate, because the general public still have deeply ingrained distaste or disgust for such people. What we make of the scientific observations that we come up with now, will determine the society's attitude towards homosexuals in the coming years. Will we become more tolerant towards them, or will we continue ostracising them for their idiosyncrasies? That's an issue which has its answers hidden from plain sight, and only science can unravel it.

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