

Is it a Choice?

The Science of
Sexual Orientation

Executive Summary

The discussion about sexual orientation remains on center stage in the public arena as Americans debate how to treat gay and lesbian people. From the halls of state legislatures to the chambers of supreme courts; from the desks of city councils to the federal government in Washington, DC; and from the pews of churches to the dinner tables of ordinary families, citizens everywhere are confronting the question about how to treat the small minority of citizens who are gay or lesbian.

As author Chandler Burr said in our first white paper on the subject, "The raging debate about gay rights ultimately turns on one simple question—is homosexuality a lifestyle choice or is homosexuality an inborn biological trait? Put another way, does someone choose to be gay or are they just born that way?" As the following pages illustrate, we already know the answer to this question. This is an important question in the gay rights debate. If people understand that sexual orientation is an inborn trait, they are much more likely to support fairness and equal rights for gay people.

Overwhelming evidence indicates an innate nature to sexual orientation. Numerous scientific studies are indisputable. Research into the origins of human sexual orientation proves beyond any reasonable doubt that people do not choose their sexual orientation. Scientists don't yet know the exact origins, but they know that it's not chosen.

In these pages, we have attempted to provide an accurate summary of the known scientific evidence on this issue:

Genetic Evidence—The best evidence right now is that genetics play a significant but not determinative role in sexual orientation, and in this respect, it is similar to many traits affecting a minority of the population. Sexual orientation, as a trait, is similar to being left or right-handed; the genetic influence on both traits is estimated at less than 50%; and both seem to be established at an early age or before birth.

Hormonal Influences—There is evidence that hormonal influences in the mother's womb affect the sexual orientation of a child. One researcher finds a prenatal origin to sexual orientation. To put it simply, something was happening in the wombs of the mothers he studied to influence the sexual orientation of their later sons.

Brain Structure and Organization—Scientific findings strongly indicate that the brain structure of heterosexuals is different from homosexuals. Gay men's object location memory skills, for instance, exceed that of straight men.

Can A Person's Orientation Be Changed? — Science is firmly on the path of establishing the innate nature of the trait of homosexuality. The preponderance of the evidence would lead any rational person to conclude that biology, not choice, drives sexual orientation — both gay and straight. Despite the attempts of a tiny minority of therapists and pseudo-therapists to “change” a person's sexual orientation, they have not been successful. This minority attempts to repress outward behavior and claim this repression is evidence of a change in actual orientation. Countless national and international medical and scientific organizations are on record opposing this false and harmful “therapy.”

Introduction

"The Lord God is subtle, but malicious he is not!"

– Albert Einstein

No matter what we think or where we stand on the debate over gay rights, one reality is clear: a small percentage of humans are pre-disposed towards romantic relationships with members of their own sex. Although societies have held differing attitudes toward this minority sexual orientation, **it exists**. It has existed, in fact, for over 4,500 years, as evidenced by art history and archaeological findings,¹ from the beginning of recorded history, both in the animal kingdom and among human beings. It will exist long after we and our children are distant memories. Same-sex orientations are a routine part of nature.

A solid body of evidence shows that people don't choose to be straight or gay. Yet some institutions and people ignore the facts and cling to the notion that gay and lesbian people wake up one morning and decide to be attracted to the same gender.

But the doctrine of 'choice' finds itself quickly losing ground. Its former proponents are preparing for what now seems inevitable – the day when science conclusively proves that same-sex attraction is just a natural variation on human sexuality. Like opposite-sex attraction, it is innate.

Dr. R. Albert Mohler, Jr., President of The Southern Baptist Theological Seminary, the flagship school of the Southern Baptist Convention and one of the largest seminaries in the world, wrote in March, 2007, "...the fact remains that some persons are sexually attracted to persons of the same sex while the majority are sexually attracted to persons of the opposite sex...they simply have no idea where same-sex desire originated in their lives. They do know that they did not choose this pattern of attraction."

What follows is an unvarnished summary of the latest findings in the field of sexual orientation research. The studies cited have all appeared in peer-reviewed national or international scientific journals. Except where noted, each finding has been replicated by more than one researcher. ***There is much more to be learned, and research is ongoing, but here is what we know right now.***



Genetic Evidence

The Findings

- Sexual orientation has a strong physiological component. It appears to be influenced by both genetic and hormonal factors.
- The trait is similar to being left or right-handed; the genetic influence on both traits is estimated at less than 50%; and both seem to be established at an early age or before birth.
- A same-sex orientation is held by approximately 3-5% of the world's population. There are twice as many homosexual males as females.
- Sexual orientation is a complex trait² which appears to have multiple mechanisms acting upon it. It is unlikely that there is a single cause, although it is quite clear that the primary roots of the trait lie in biology.
- There is evidence of a pattern of maternal transmission for male homosexuality (for it being "passed down" by unknown means through the mother's side of the family.)
- The heritability of sexual orientation is estimated between 30% and 50%.³ By comparison, the heritability of left-handedness is estimated at 26% or lower.
- Significant genetic linkage to male homosexuality has been found on the X Chromosome at Xq28⁴ and on Chromosome 7 at 7q36,⁵ with two additional regions (8p12 and 10q26) identified as areas of interest for future study.
- Male identical twins are more likely than non-identical twins or ordinary siblings to share the same sexual orientation. Siblings are more likely to share the same orientation than non-siblings.
- The sexual orientation of adopted children is not influenced by that of their adoptive parents, which points to biology rather than upbringing as the defining influence.

The Studies

Bailey, J. M.; Benishay, D. S. "Familial aggregation of female sexual orientation" *American Journal of Psychiatry* 150: 272-277, 1993

Bailey, J. M.; Pillard, R. C. "A genetic study of male sexual orientation" *Archives of General Psychiatry* 48: 1089-1096, 1991

Bailey, J. M.; Pillard, R. C.; Neale, M. C.; Agyei, Y. "Heritable factors influence sexual orientation in women" *Archives of General Psychiatry* 50: 217-223, 1993

Blanchard, R., Cantor, J.M., Bogaert, A.F., Breedlove, S.M., & Ellis, L. "Interaction of fraternal birth order and handedness in the development of male homosexuality." *Hormones & Behavior*, 49: 405-414, 2006

Bocklandt, S.; Horvath, S.; Vilain, E.; Hamer, D. H. "Extreme skewing of X chromosome inactivation in mothers of homosexual men" *Human Genetics* 118: 691-694, 2006

Camperio-Ciani, A.; Corna, F.; Capiluppi, C. "Evidence for maternally inherited factors favouring male homosexuality and promoting female fecundity." *Proceedings Biological Sciences/ The Royal Society* 271: 2217-2221, 2004

Hamer, D. H.; Hu, S.; Magnuson, V. L.; Hu, N.; Pattatucci, A. M. L. "A linkage between DNA markers on the X chromosome and male sexual orientation." *Science* 261: 321-327, 1993

Hu, S.; Pattatucci, A. M. L.; Patterson, C.; Li, L.; Fulker, D. W.; Cherny, S. S.; Kruglyak, L.; Hamer, D. H. "Linkage between sexual orientation and chromosome Xq28 in males but not in females." *Nature Genetics* 11: 248-256, 1995

Mustanski, B. S.; DuPree, M. G.; Nievergelt, C. M.; Bocklandt, S.; Schork, N. J.; Hamer, D. H. "A genomewide scan of male sexual orientation." *Human Genetics* 116: 272-278, 2005

Pillard, R. C.; Weinrich, J. D. : "Evidence of familial nature of male homosexuality." *Archives of General Psychiatry* 43: 808-812, 1986.

Puts, D.A., Jordan, C.L. & Breedlove, S.M.; "O brother where art thou? The fraternal birth-order effect on male sexual orientation." *Proceedings of the National Academy of Sciences of the United States* 103: 10531-10532, 2006

The Details

Researchers do not expect, and have never expected, to find a single master "gay gene." Research shows many biological pathways which may lead to a same-sex orientation, including genes, hormone levels and the prenatal environment in the mother's womb.

Dr. Dean Hamer is the Director of the Gene Structure and Regulation Unit at the National Cancer Institute, a division of the National Institutes of Health. He is well-known for, among other genetic discoveries, uncovering the genetic roots of anxiety. In 1993, Dr. Hamer published the first major gene study on sexual orientation. He studied 110 families of homosexual men, and found increased rates of same-sex orientation in relatives on the mothers' sides of their families, suggesting a link to the X Chromosome transmitted by the mother to the fetus (the pattern of transmission of the trait of homosexuality from the mother is a consistent finding in multiple studies.)

Hamer then ran DNA analysis on a group of 40 families in which there were two gay brothers, and found a correlation between the gay brothers and markers on the X chromosome. Dr. Hamer found linkage in 33 of the 40 pairs

of brothers to markers on Xq28. The findings indicated a confidence level of more than 99% that at least one subset of the male homosexual orientation is genetically influenced. Other researchers duplicated the results in subsequent studies in 1995 and 1998. Not all of the gay brothers shared the link to the Xq28 marker, just a large majority of them. Some did not share the marker at all, yet they were as gay as those who did. There appear to be different pathways to a same-sex orientation for different men. Hamer's study found one of the pathways.⁶

In 2004, the first-ever scan of the entire human genome for sexual orientation was completed. The scan found three new regions of genetic interest besides Hamer's Xq28; one (7q36) in an area playing an essential role in



left/right brain hemisphere separation in early embryonic development, another (8p12) in a region involved in production of prenatal hormones, and one (10q26) associated with gene variations inherited from the mother but not the father. The study recommended future research using a larger sample.

An ongoing 5-year study at the National Institutes of Health is funded at \$2.5 million, the largest amount ever spent on such research. A team headed by Dr. Elliot S. Gershon of the University of Chicago is studying DNA samples from gay men with one or more gay brothers and the DNA of their family members, looking for regions where gay brothers tend to share the same genes. The results, due in 2010, will likely answer many questions and give direction for future research.

From a strictly evolutionary standpoint, why would a trait like homosexuality persist, even though it does not help to enlarge the population?

One answer to that question came in 2004 when Italian geneticists at the University of Padua studied 4,600 people and found that female relatives of gay men had more children on average than the female relatives of straight men. Furthermore, the increased-offspring effect was only seen on the mother's side of the family, thus backing the earlier findings of transmission from the mother, and providing an answer to the 'evolutionary benefit of homosexuality' question. The study's author, Dr. Andrea Camperio-Ciani, said, **"We have finally solved this paradox. The same factor that influences sexual orientation in males produces higher fertility in females.** It is a combination of something on the X chromosome with other genetic factors on the non-sex chromosomes."

The Padua study also suggests something truly intriguing: that the same genetic factors may act on men and women in a similar way: to create an increased attraction for men. This would predispose the men towards homosexuality and the women towards a ramped-up sexuality, which would indeed lead to more offspring. In both cases the object of affection is men, with the evolutionary negative of decreased reproduction by the homosexual men offset by the increased reproduction of their female relatives.

Can a parent influence a child's orientation? Only in the womb.

**The same factor
that influences
sexual orientation
in males produces
higher fertility
in females.**

Astonishing fact: Each additional older brother increases the odds of homosexuality in a male by 33 percent, according to a 1996 finding by Canadian researcher Anthony Bogaert. In 2006, he published a follow-up study and reported that “only biological older brothers...predicted men's sexual orientation. These results strongly suggest a prenatal origin...”⁷ Decades of twin and adoption studies have provided solid evidence that parenting styles have no influence over whether a child grows up to be gay. So, the likely reality is that, while the so-called “distant-father, overbearing mother” scenario may indeed play out for some gay men, it is the gayness that *causes* that dynamic — not the other way around.

The best evidence right now is that genetics play a significant but not determinative role in sexual orientation, and in this respect, it is similar to many traits affecting a minority of the population. Asthma, for instance, shows a 30% to 70% evidence of heritability. We know it runs in families, but the specific genes responsible for it have not been identified (although like sexual orientation researchers, asthma researchers have identified certain regions of the human genome that they suspect contain the specific genes in question.) In both cases, it appears that genes may combine with other hormonal and prenatal factors to produce the trait.

Genetic research in non life-threatening areas is still in its infancy. The genetic mechanism that determines eye color was not discovered until 2006. Even in an obvious trait like handedness, there is still so much debate over the amount of genetic influence on left-handedness that some researchers reject any genetic influence on it. Yet we know that handedness runs in families and we know that humans, as well as primates, do have hand preferences that are so strong they seem to have been present at birth.

Where do such seemingly innate tendencies come from? Not genes alone, the science shows; nor our childhood physical environment; nor from any measurable influence by our parents. Some traits, as any new mother or father knows, seem to just *be there* from the beginning.

Hormonal Influences

The Findings

- There is evidence in many lesbian and bisexual females of brain structures that have been partially masculinized by exposure to high levels of the male hormone androgen before birth.
- There is evidence that prenatal androgen plays more of a role in homosexuality in women than it does in men
- Manipulating prenatal hormone levels has been shown to alter sexual orientation in laboratory mice and in sheep.

The Studies

Blanchard, R. "Fraternal birth order and the maternal immune hypothesis of male homosexuality" *Hormonal Behavior* 40(2): 105-114, 2001

Brown, W.M., Finn, C.J., Cooke, B.M. & Breedlove, S.M. "Differences in finger length ratios between self-identified 'butch' and 'femme' lesbians" *Archives of Sexual Behavior* 31: 117-121, 2002

Brown, W.M., Hines, M., Fane, B., & Breedlove, S.M. "Masculinized finger length patterns in human males and females with congenital hyperplasia" *Hormones and Behavior* 42: 380-386, 2002

Brown, W.M., Brown, Finn, C.J. & Breedlove, S.M. "Sexual dimorphism in digit-length ratios of laboratory mice" *Anatomical Record* 276: 231-234, 2002

Ehrhardt, A.A., Meyer-Bahlburg, H.F.L., Rosen, L.R., Feldman, J.F., Veridiano, N.P., Zimmerman, I., & McEwen, B.S. "Sexual orientation after prenatal exposure to exogenous estrogen." *Archives of Sexual Behavior* 14: 57-77, 1985

Dorner G, Staudt J. "Structural changes in the preoptic anterior hypothalamic area of the male rat, following neonatal castration and androgen substitution." *Neuroendocrinology* 3: 136-140, 1968

Dorner G, Staudt J. "Perinatal structural sex differentiation of the hypothalamus in rats." *Neuroendocrinology* 5: 103-106, 1969

McFadden, D. "Masculinization effects in the auditory system."
Archives of Sexual Behavior 31: 93–105, 2002

McFadden, D., & Champlin, C. A. "Comparison of auditory evoked potentials in heterosexual, homosexual, and bisexual males and females." Journal of the Association of Research in Otolaryngology 1: 89–99, 2002

McFadden, D., & Pasanen, E. G. "Comparison of the auditory systems of heterosexuals and homosexuals: Click-evoked otoacoustic emissions." Proceedings of the National Academy of Sciences of the United States of America 95: 2709–2713, 1998

Morris, J.A., Gobrogge, K.L., Jordan, C.L. & Breedlove, S.M "Brain aromatase: Dyed-in-the-wool homosexuality" Endocrinology 145: 475-477, 2004

Meyer-Bahlburg, H.F.L. "Sex hormones and female homosexuality: A critical examination" Archives of Sexual Behavior 8: 101-119, 1979.

Meyer-Bahlburg, H.F.L. "Psychoendocrine research on sexual orientation. Current status and future options." Progress in Brain Research 61: 375-398, 1984

Simon, J.A., Jordan, C.L. & Breedlove, S.M. "Steroid hormone masculinization of neural structure in rats: A tale of two nuclei" Physiology and Behavior 83: 271-277, 2004

Williams, T.J., Pepitone, M.E., Christensen, S.E., Cooke, B.M., Huberman, A.D., Breedlove, N.J., Breedlove, T.J., Jordan, C.L. & Breedlove, S.M. "Finger-length ratios and sexual orientation" Nature 404: 455-456, 2000

The Details

In a 2006 broadcast of the CBS television program *60 Minutes*, reporter Lesley Stahl sits in the lab of Dr. J. Michael Bailey and researcher Gerulf Rieger, who are in the midst of a study to try and determine if signs of childhood gender-nonconformity (a term to describe play and behavior patterns common to the opposite gender and one reliable predictor of homosexuality) could be seen in the childhood home movies of gay and straight subjects. As the nation watches, Stahl tries to guess, based on the images of very young

children, which ones grew up straight or gay. "Isn't this interesting?" she muses as she guesses correctly time after time⁸...

If gay people are, in any sense of the over-simplified term, 'born that way,' is there early evidence of it? Do gay people speak, act, move, hear or think any differently than straight people? Are they 'different' in any way other than their instinctual sexual behaviors?

Researcher Anthony Bogaert, in the conclusion of his study confirming the older brother birth-order effect, wrote: "These results strongly suggest a prenatal origin..." To put it simply, something was happening in the wombs of

the mothers he studied to influence the sexual orientation of their later sons.

But what? Were some mothers' bodies, as Ray Blanchard of The University of Toronto⁹ proposed in a 2001 study, actually reacting to the male's Y Chromosome as an unknown invader and producing antibodies to it - repeating the process and building immunity to Y with each male pregnancy until, finally, a homosexual son is born? As bizarre as the idea sounds upon first hearing, it makes scientific sense, as Blanchard wrote:

"According to this hypothesis, anti-H-Y antibodies produced by the mother pass through the placental barrier to the fetus and affect aspects of sexual differentiation in the fetal brain. This explanation is consistent with a variety of evidence."

How should a non-scientist read all this material? *60 Minutes'* Stahl gave the best available summary in the conclusion of her report:

"Psychologists used to believe homosexuality was caused by nurture — namely overbearing mothers and distant fathers — but that theory has been disproved. Today, scientists are looking at genes, environment, brain structure and hormones. There is one area of consensus: that homosexuality involves more than just sexual behavior; it's physiological."

As far back as 1969, some of the first modern-era scientists to look at the origins of homosexuality were proposing what they called a "prenatal hormonal theory;"¹⁰ the idea that the brains of some fetuses do not become sexually differentiated in the way most fetuses do, and that the

Psychologists used to believe homosexuality was caused by nurture —namely overbearing mothers and distant fathers—but that theory has been disproved. Today scientists are looking at genes, environment, brain structure and hormones.

result is a partially-masculinized brain structure in girls or a partially-feminized brain structure in boys. To test that theory, researchers have looked for lingering signs of the gender-atypical prenatal hormones. And they have found some.

In 2000, Dr. Marc Breedlove and Dr. Cynthia Jordan of Michigan State University looked for physical signs of prenatal androgen exposure. The levels of androgen received by the fetus are responsible for most physical characteristics that differentiate men and women. Other than the genitalia, all of the obvious differences we observe in men's and women's bodies are believed to be a result of androgens which masculinize the male fetus.

One of these physical differences is finger length. In women, the index finger is almost the same length as the ring finger. In males, the index finger is usually shorter than the ring finger. The difference is most pronounced on the right hand. It is evident in girls as young as two years old.

Breedlove and Jordan led a team which examined the finger-length ratios of 720 men and women, straight and gay. The findings¹¹ were surprising.

The right-hand finger-length ratio of homosexual women was significantly more masculine than that of the heterosexual women. It did not differ significantly from that of heterosexual men. The male results, meanwhile, lent strength to the birth-order effect (the finding that some gay men may reach their orientation as a result of something happening in the mother's womb in relation to prior male births.) Only the gay men with more than one older brother differed from their straight male counterparts¹², and the difference was a significantly more masculine finger-length pattern. In other words,

The study concludes: **"our results suggest that events before birth (or even before conception in the case of older brothers) influence sexual orientation."**

**...events before birth
(or even before
conception in the
case of older
brothers) influence
sexual orientation.**

The Breedlove/Jordan lab built upon the findings in later studies that showed (a) that other mammals [mice] also have a sexually-differentiated difference in their 'finger' lengths,¹³ (b) that persons with a condition called Congenital Adrenal Hyperplasia which results from an over-abundance of androgen show significantly masculinized finger-length ratios¹⁴ and that a large percentage of the women with this condition are also lesbian.

The results led the Breedlove/



Jordan team to conclude that "There is indirect evidence that heightened exposure to early androgen may increase the probability that a girl will develop a homosexual orientation in adulthood."¹⁵

A University of Texas study¹⁶ found that involuntary auditory differences present from birth "are more masculine in lesbians than in heterosexual women," suggesting "that homosexual women were exposed to more fetal androgen than were heterosexual women." A 1998 study headed by the same researcher¹⁷ had previously found that otoacoustic emissions (spontaneous sounds emitted by the inner ear which are different in men and women from birth) are significantly more male-like in homosexual women than in heterosexual women; a further indication that lesbians may have been exposed to higher fetal androgen levels than heterosexual women.

So do more men arrive at a homosexual orientation by a genetic path and more women by a hormonal one? Research continues.

Dr. Marc Breedlove showed Lesley Stahl how he could, by altering the hormones a rat fetus is exposed to, make a male rat display a lifelong tendency to exhibit mating behavior only with other males. Similar results have been found in sheep. Obviously, there is no direct correlation between these experiments and human beings, but a quote from a 2004 article in the journal *Endocrinology* may be worth a moment's rumination. Writing about research into male-male orientation in sheep, the authors conclude that ongoing research may:

"strengthen the notion that steroids affect the human hypothalamus to influence sexual orientation in adulthood. If the results pan out this way, it's going to be increasingly difficult to condemn homosexuality as a lifestyle choice rather than an ingrained property of the human heart."¹⁸

Brain Structure and Organization

The Findings

- Gay men and lesbians are more likely than straight men and women to be left-handed. Since hand preference can be observed in the womb, this suggests a prenatal influence.
- Gay men's object location memory skills exceed that of straight men. Gay men's skill level in this involuntary indicator of brain organization between the sexes approaches that of straight women.
- Both lesbians and gay men outperform heterosexual men and women in verbal fluency from early childhood.
- There is strong evidence that the structure of the anterior hypothalamus in mammals influences sexual orientation in males.
- A small group of cells in the anterior hypothalamus known to be involved in the generation of male-typical sex behavior in animals is, on average, smaller in gay men than in straight men. The same area in sheep is smaller in male rams that mate exclusively with other rams than it is in 'straight' rams.
- PET Scans show that the brains of gay men and lesbians process some scents differently than straight men and women; a clear difference in an involuntary brain process.

The Studies

Berglund, H., Lindstrom, I., Savic, I. "Brain responses to putative pheromones in lesbian women" *Proceedings of the National Academy of Sciences of the United States of America* 103(21) 8269-74, 2006

Byne, W., Tobet, S., Mattiace, L., Lasco, M.S., Kemether, E., Edgar, M.A., Morgelo, S., Buchsbaum, M.S., Jones, L.B. "The interstitial nuclei of the human anterior hypothalamus; an investigation of variation within sex, sexual orientation." *Hormones and Behavior* 40: 86-92, 2001

Lalumière, M.L., Blanchard, R. & Zucker, K.J., "Sexual orientation and handedness in men and women: a meta-analysis" *Psychology Bulletin* 126: 575–592, 2000

LeVay, S., "A difference in hypothalamic structure between heterosexual and homosexual men." *Science* 253: 1034–1037, 1991

Lippa, R.A., "Handedness, sexual orientation, and gender-related personality traits in men and women" *Archives of Sexual Behavior* 32: 103–114, 2003

Mustanski, B.S., Bailey, J.M., Kaspar, S., "Dermatoglyphics, handedness, sex, and sexual orientation, *Archives of Sexual Behavior* 31: 113–122, 2002

Rahman, Q., Abrahams, S., & Wilson, G. D. "Sexual-orientation related differences in verbal fluency." *Neuropsychology* 17: 240–246, 2003

Rahman, Q., & Wilson, G. D. "Large sexual-orientation-related differences in performance on mental rotation and judgment of line orientation tasks." *Neuropsychology*, 17: 25–31, 2003

Rahman, Q., Wilson, G. D., & Abrahams, S. "Sexual-orientation related differences in spatial memory." *Journal of the International Neuropsychological Society* 9: 376–383, 2003

Roselli, C.E., Larkin, K., Resko, J.A., Stellflug, J.N. & Stormshak, F
"The volume of a sexually dimorphic nucleus in the ovine medial preoptic area/anterior hypothalamus varies with sexual partner preference." *Endocrinology* 145(2): 478–483, 2004

Savic, I., Berglund, H., Lindstrom, P. "Brain response to putative pheromones in homosexual men" *Proceedings of the National Academy of Sciences of the United States of America* 102(20): 7356–7361, 2005

The Details

Many traits of brain function, brain anatomy and cognition ordinarily differ between the sexes. Yet research shows that gay men and women often do not fall into the expected pattern of male/female differences in these areas. Because brain functions and anatomy are involuntary and not under the con-

scious control of subjects, these results add weight to the argument that gay men and women do differ biologically from their straight counterparts in significant ways.

The first finding of an anatomical difference in brain structures was reported in 1991. Neurologist Simon LeVay examined the brains of deceased men, straight and gay. He concentrated on the hypothalamus, an almond-sized region located just above the brain stem. The hypothalamus is found in the brains of all mammals. It is linked to the limbic system, which is involved in the control of sexual activity and emotions. The anterior (frontal) section of the hypothalamus contains a small group of cells which LeVay knew, from previous studies on animals, was involved in male-typical sexual behavior. In humans, this group of cells, known as the INAH, is generally larger in men than in women.

In the first-ever comparison of this area between males of differing sexual orientations, LeVay reported¹⁹ that INAH3 was smaller, on average in gay men. The finding was replicated 10 years later by another group of researchers. Most of the gay men whose brains LeVay studied in 1991 had died of AIDS, and there was some question as to whether the disease accounted for the difference, but a 2001 study by another group of researchers not only replicated the finding²⁰ but showed no evidence that AIDS had any effect on the size of the area studied. **LeVay's work, and William Byne's later study, lend credence to the theory that some men become gay through atypical hormonal levels in the womb.**

Changing the hormone levels in laboratory mice while they are still in the womb causes the same area of their hypothalamus to be smaller, and causes males to display courting behavior towards other males. In 2004, a study on sheep at Oregon Health Sciences University²¹ found the sheep equivalent to LeVay and

Byne's INAH3 results: the same area of the male sheep brain was smaller in rams that mate only with other rams (as about 8% of rams consistently do.)²²

In 2005, a team of researchers in Stockholm, Sweden generated headlines with this finding: **Gay men's brains process odors differently than straight men's do.**²³ The announcement of a pronounced difference in what was clearly a completely involuntary brain function received extensive media coverage. The Swedish team,



led by Dr. Ivanka Savic, had been testing the hypothesis that humans have some unconscious olfactory system that is a rough (if less sensitive) counterpart to the pheromone system that sends and receives sexual attraction signals by smell in animals.

True animal pheromones are processed in the anterior hypothalamus. The researchers speculated that the same area of the human brain under PET image scans would show stimulation when the subject was exposed to sexually-arousing smells. They extracted an estrogen derivative (EST) and an androgen derivative (AND) as their test odors (or 'putative pheromones') and begin testing of heterosexual men and women. The results were encouraging: the EST compound lit up the expected area of the hypothalamus in the straight men, while the AND compound (derived from male sweat) was processed as an ordinary scent in another part of the brain. The opposite results held true for the straight women.

But when gay men were added to the group of subjects under study, a surprising result became apparent: the gay men's brains processed the two odors like the straight women had, rather than like their straight male counterparts. In the gay men, the AND compound lit up the hypothalamus, and EST was processed as an ordinary scent – the exact opposite of what would be expected from a brain that was "hard-wired" in a male-typical fashion. In 2006, the experiment was repeated using lesbian and straight women subjects,²⁴ with similar results.

In the words of its authors, "the major finding of this study was that the preferred pathway in relation to the presented compound was associated with the responder's sexual orientation rather than the biological sex."

Of course, the ability of the brain to reorganize itself according to life experiences (called 'neural plasticity') is well-documented, so any findings of brain structure difference between gay and straight people can always be questioned on this basis: were they born that way or did they make themselves that way? Have gay men, for instance, come by experience to associate the scent of the male AND compound with sexual arousal and involuntarily trained their brains to respond to it accordingly? Does being a gay man somehow affect the relative size of the group of nuclei LeVay and Byne studied?

The honest answer is, we don't know. Yet. But these findings do throw another log on the fire of the accumulating evidence for a biological basis of homosexuality. At the very least, they cast a cloud over the doctrine of choice.

**Gay men's brains
process odors
differently than
straight men's do.**

Can A Person's Orientation Be Changed?

Science is firmly on the path of establishing the innate nature of the trait of homosexuality. **The preponderance of the evidence would lead any rational person to conclude that biology, not choice, drives sexual orientation - both gay and straight.**

However, a tiny minority of therapists and pseudo-therapists still engage in the outdated practice of "therapy" aimed at changing a person's sexual orientation. This so-called "reparative" or "reorientation" therapy runs the gamut of techniques; from sending electrical currents surging through the genitalia, to attempts at visualizing a different object of attraction just prior to orgasm, to talk sessions.

It has not, in any of its forms, been successful.

Efforts to change a person's sexual orientation are not new. Victorian doctors recommended that parents who suspected same-sex arousal on the part of their sons should "repeatedly strike his genitals with a stout stick while reciting wholesome literature of a normal romantic nature."²⁵ Nazi doctors in the 1930's experimented with various methods on the homosexual men they arrested and placed in concentration camps, including forced castration and surgically implanting testosterone packets inside their bodies.

Reorientation therapy's results are anecdotal and based on self-reporting, with no measurement of the reported shift in sexual orientation beyond the subject's self-reported results. **No verifiable findings or peer-reviewed studies have testified to a single case of successfully altering the inner orientation (as opposed to merely repressing the outward behavior for a time.) In other words, a small number of people disguise the behavior, but the orientation is unchanged.**

Many national and international scientific and medical organizations are on record opposing this ineffective and harmful "treatment:"

- The American Medical Association
- The American Academy of Family Physicians
- The American Academy of Pediatrics
- The American Psychological Association
- The American Psychoanalytic Organization
- The American Counseling Association
- The American Association of School Administrators
- The National Association of School Psychologists
- The American Academy of Physician Assistants
- The American Federation of Teachers

It is not necessary to list here the number of well-publicized cases of proponents of reparative therapy who have themselves reverted to same-sex behavior after a supposed "cure." The statements of major medical and health organizations are universally condemning of efforts to change sexual orientation; a deeply rooted and complex trait, the signs of which are present in early development. Here are four such statements, which speak for themselves:

The American Medical Association

"The American Medical Association opposes any psychiatric treatment, such as 'reparative' or 'conversion' therapy, which is based on the assumption that homosexuality is a mental disorder or based on the assumption that the patient should change his/her homosexual orientation. The AMA believes that the physician's nonjudgmental recognition of sexual orientation and behavior enhances the ability to render optimal patient health care..."

The American Psychiatric Association

"There is no published scientific evidence supporting the efficacy of reparative therapy as a treatment to change one's sexual orientation. Anecdotal reports of 'cures' are counterbalanced by anecdotal claims of psychological harm. The potential risks of reparative therapy are great, including depression, anxiety, and self-destructive behavior."

The American Psychoanalytic Association

"The American Psychoanalytic Association affirms the following positions: Same-gender sexual orientation cannot be assumed to represent a deficit in personality development or the expression of psychopathology. As with any societal prejudice, anti-homosexual bias negatively affects mental health, contributing to an enduring sense of stigma and pervasive self-criticism in people of same-gender sexual orientation through the internalization of such prejudice. As in all psychoanalytic treatments, the goal of analysis with homosexual patients is understanding. Psychoanalytic technique does not encompass purposeful efforts to 'convert' or 'repair' an individual's sexual orientation. Such directed efforts are against fundamental principles of psychoanalytic treatment and often result in substantial psychological pain by reinforcing damaging internalized homophobic attitudes."

The American Psychological Association

"For over three decades the consensus of the mental health community has been that homosexuality is not an illness and therefore not in need of a cure. There is no scientifically sound evidence that orientation can be changed."

Conclusion

At the heart of the political and social debate over what to “do” with gay and lesbian people lies the question, “Is sexual orientation a choice?” Studies show that what people believe about whether or not we choose our sexual orientation has a lot to do with where they stand on fairness issues.

There is now a solid body of scientific, peer-reviewed evidence, stretching back almost 20 years, that sexual orientation is not a choice.

As Lesley Stahl noted on CBS's *60 Minutes*,

“Psychologists used to believe homosexuality was caused by nurture — namely overbearing mothers and distant fathers — but that theory has been disproved. Today, scientists are looking at genes, environment, brain structure and hormones. There is one area of consensus: that homosexuality involves more than just sexual behavior; it’s physiological.”

The science is sound. But science can only bring us facts. We must convert the facts into truth. What will we do with knowledge?

Over a decade ago, Andrew Sullivan wrote in his book, *Virtually Normal*,

“The homosexual experience may be deemed an illness, a disorder, a privilege, or a curse; it may be deemed worthy of a ‘cure,’ rectified, embraced, or endured. But it exists. Given a choice, many homosexuals along the way would have preferred that this were not so, which is a good piece of evidence that it is. Men happily married for years eventually crack and reveal the truth about themselves; people dedicated to extirpating homosexuality from the face of the earth have succumbed to the realization that they too are homosexual; individuals intent on ridding it from their systems have ended in defeat and sometimes despair; countless thousands have killed themselves in order not to face up to it, or often because they have faced up to it. They were not...facing a deception; they were experiencing something real, whatever it was.”²⁶

As the research continues, we are finding that a variety of biological factors, both genetic and hormonal, correlate with same-sex orientation. It seems to be a trait arrived at through a number of different sets of circumstances in the body and brain. We are gradually discovering what those circumstances are, and marveling at their complexity.

Perhaps it is not too much to hope that, given the fragility of life, and the heart-breaking-short duration of our journey on earth, we might make our peace with this relatively minor item of biology: Gay people don't choose their orientation any more than straight people do.

Truth matters. As a wise man once said: *"The great enemy of truth is not the lie. It is the myth."*

Endnotes

1. Ancient Mayan cave-paintings of same-sex couplings dating back 3,000 years were discovered in 1979 in Naj Tunich, Guatemala. The earliest representation in art dates from 4,500 years ago at the Egyptian 5th Dynasty tomb of Niankhkhnum and Khnumhotep, two men buried in a joint tomb, described in inscriptions as "one," and depicted in wall paintings holding hands and nuzzling noses (the preferred ancient Egyptian method of kissing.)
2. Geneticists define complex traits as those whose properties are controlled by many genes, and whose inheritance does not follow the simple rules of Mendelian genetics (the laws defined by Gregor Mendel involving dominant and recessive traits.) In a complex trait, different versions of the same gene (called 'alleles') can have a major effect on a trait in a person with one genetic background and no effect at all in a person with a different genetic background. The relative effect on the alleles on a trait depend on the context of the genetic environment, and so are said to be 'context-dependent.' Spina bifida and same-sex orientation are two examples of complex traits resulting from genes plus environment. Both spina bifida and same-sex orientation run in families, but not in predictable patterns. Both are studied using twin studies and adoption studies. An example of a complex trait that affects identical twins similarly to same-sex orientation is cleft lip or cleft palate syndrome. If one twin has cleft lip/palate, the other twin has about a 35% chance of also having it. The correlation for same-sex orientation is about 25%, as found by Dr. J. Michael Bailey of Northwestern University in his extensive twin studies.
3. Twin studies by Bailey, et al (2000); Kendler, et al (2000), Kirk, et al (2000) and Bearman, et al (2002)
4. Hamer, et al (1993). The findings were replicated by Hu, et al (1995) and Sanders, et al (1998).
5. Mustanski, et al (2004) NOTE: Genomewide significance is measured by means of a Log of Odds Score (or LOD.) If the LOD is at least 3.5 (or 4.0, depending on the criteria being used), it means that the likelihood of observing the result if there were no genetic linkage would be less than 1 in 1,000 and that there is strong evidence of a significant genetic link. The LOD score for 7q36 was 3.45. Hamer's peak LOD score for the Xq28 marker was 4.0
6. Hamer did not discover a gay gene,' nor did he ever claim to have. What he did do, in his own words, was to "narrow the search to an area with several hundred genes, equivalent to limiting a search for a needle in a haystack. We do not expect to find a gene that is the same in every gay man – we already know that sexual orientation is more complex than that – just one that is correlated to sexual orientation." Dr. Hamer has repeatedly said that he believes male homosexuality (his study included only males) to be "a complex trait probably shaped by many different factors, including multiple genes..." [Dean Hamer & Peter Copeland, "Living With Our Genes," Doubleday 1998]
7. AF Bogaert, "Biological and non-biological brothers and men's sexual orientation" PNAS 0511152103, 2006

8. "60 Minutes," CBS. Original airdate: March 12, 2006
9. R. Blanchard "Fraternal birth order and the maternal immune hypothesis of male homosexuality" *Hormonal Behavior* 40(2): 105-114, 2001
10. Dorner G, et al, (1968)
11. Williams, et al (2000)
12. Neuroscientist and researcher Simon LeVay writes: "Interestingly, so far there has been more evidence that early androgens might play a role in homosexuality in women than in men. There are recent reports of three previously unsuspected body markers that seem to reflect fetal androgen in humans. The markers are quite varied, involving the ears (the production of tiny sounds by the cochlea), the eyes (eye-blink reflexes), and the fingers (the pattern of relative finger lengths). Yet in each case, there is a sex difference in function or structure, and in each case lesbians display characteristics that are more male-like compared with heterosexual women. These same putative somatic markers of early androgen have provided conflicting results when comparing homosexual and heterosexual men. The conflicting results in men suggest that some boys may turn out homosexual as a result of lower-than normal fetal androgen, some may result from higher-than normal levels, and some may turn out homosexual for reasons having nothing to do with androgens." (members.aol.com/slevay/page22.html#_Hormones, 2006)
13. Brown, et al (2002)
14. Brown, Hines, Fane, et al (2002)
15. *ibid*
16. McFadden & Champlin (2002)
17. McFadden et al (1998)
18. Morris, et al *Endocrinology* (2004)
19. LeVay (1991)
20. Byne, et al (2001)
21. Roselli, et al (2004)
22. *ibid*
23. Savic, et al (2005)
24. Berglund et al (2006)
25. "A Physician's Guide To Sexual Diseases and Abnormalities" Roman Publishing 1908, p. 79
26. Andrew Sullivan, "Virtually Normal" (Vintage/Random House 1996 p.17)

About the Liberty Education Forum

The Liberty Education Forum (LEF) is a nonpartisan educational foundation based in Washington, DC. LEF educates people about the importance of achieving freedom and fairness for all Americans, regardless of sexual orientation. The Liberty Education Forum's educational mission rests on the principle that knowledge has the power to transform our nation. LEF conducts a variety of educational outreach efforts on issues such as faith and sexual orientation, HIV/AIDS, Don't Ask, Don't Tell, family protections, and issues of basic fairness for gay and lesbian Americans. LEF conducts groundbreaking research on issues of importance to gay and lesbian Americans. Our highly acclaimed white papers have influenced government policy on employment non-discrimination, HIV/AIDS, and other issues.

The Liberty Education Forum's Reaching the Heartland Program is developing new allies in Middle America and the South. LEF conducts grassroots training and educational programs to help increase support for gay and lesbian equality among Republicans, conservative Democrats, fair-minded independents, and people of faith. This new initiative is changing hearts and minds across our country as LEF spreads a message of freedom and fairness for all Americans, regardless of their sexual orientation.

Contact

Liberty Education Forum
1901 Pennsylvania Ave. NW
Suite 902
Washington, DC 20006

Email: info@libertyeducationforum.org
Web Site: www.libertyeducationforum.org
Phone: 202-371-2974



THE LIBERTY EDUCATION
F · O · R · U · M

1901 Pennsylvania Ave. NW, Suite 902

Washington, DC 20006

info@libertyeducationforum.org

www.libertyeducationforum.org

Phone: 202-371-2974