

# I love you with all my brain: laying aside the intellectually dull sword of biological determinism

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**Background:** By organizing and activating our passions with both hormones and experiences, the heart and mind of sexual behavior, sexual motivation, and sexual preference is the brain, the organ of learning. Despite decades of progress, this incontrovertible truth is somehow lost in the far-too-often biologically deterministic interpretation of genetic, hormonal, and anatomical scientific research into the biological origins of sexual motivation. Simplistic and polarized arguments are used in the media by both sides of the seemingly endless debate over sexual orientation, equality, and human rights with such catch phrases as “born gay” contrasted against attempts of “reparative therapy” or “pray the gay away”. Though long abandoned in practically every other area of psychology, this remnant of the nature-nurture controversy remains despite its generally acknowledged insufficiency in explaining any adult aspect of the human condition within the scientific community.

**Methods:** This theoretical review article identifies three factors: 1) *good intentions* with regard to the argument from immutability; 2) *false dichotomies* limiting intellectual progress by oversimplification of theory and thus hypothesis, and most dangerously, interpretation and; 3) *Tradition*: a historical separation of the disciplines of biology and psychology, which, to this day, interferes with the effective translation of well-conducted science into good public understanding and policy.

**Results:** Studies clearly demonstrate that progress toward sexual-orientation equality is being made, if slowly, despite the apparent irrelevance of the “born gay” argument from immutability. Evidence is further provided supporting the inadequacy of polarized, dichotic theories of sexual development, particularly those pitting “blank slate learning” against a fated, deterministic biological perspective. Results of this review suggest that an emerging interactionist perspective will promote both better scientific progress and better public understanding, hopefully contributing to progress toward nondiscriminatory public policy.

**Conclusion:** Accepting that the brain is a highly plastic, modularly dimorphic, developmentally biased organ of learning, one which is organized and activated by *both* hormones *and* experiences across the lifespan, is essential for doing “good science” well. Interactionist theories of psychosexual development provide an empirically sound, strong, yet modifiable foundation for testable hypotheses exploring biologically biased sexual learning.

Keywords: *Brain; conditioning; controversy; dichotomy; differentiation; discrimination; equality; sex; sexual; orientation; learning; learned sexuality; born gay; hedonic evaluation; immutability; imprinting; incentive motivation; interactionism; predispositions; theory; therapy*

The most that can probably be said for bold single-process claims for the development of human sexual preferences is that they are easy to grasp. Such explanations have the same status as very long eyelashes – attractive perhaps but almost certainly false. P.P.G. Bateson (1978, p. 50).

‘It’s not true!’ ‘It’s not new!’ and ‘It’s not you!’ are the prosodically pleasing, often rhetorically dismissive allegations levied against any controversial original work.

Therefore, I will admit that my main purpose in writing this article is to convince the reader that the following premise *is* true: Psychological states of preference for stimuli associated with one type of goal object over another result from an organism’s biological predispositions interacting with learning from its experiences. Some experiences for which the organism is ‘prepared’ may only need to occur once, early in development, while other experiences may have little or no influence even if

encountered frequently. Yet, other experiences may vary in their potency across the lifespan. Regardless, the molecular, cellular, and systemic neuroplasticity underlying learning and memory shapes and reshapes the brain, continually changing how subsequent experiences will uniquely affect each individual. Preferences are motivational passions, which should *not* be confused with behavioral ‘choices’. By organizing and activating our passions with *both* hormones *and* experiences, the heart and mind of sexual behavior, sexual motivation, and sexual preference is the brain: the organ of learning.

Beyond this current and hopefully original attempt at supporting the premise above, there is nothing ‘new’ about taking an interactionist stance in a theory of sexual motivation; hence, I am neither first nor foremost to articulate related empirical and logical justifications. It is simply my turn to draw attention to earlier arguments that have been somehow forgotten or lost in oversimplified translation, repeatedly, in some cases for over a century. In order to clarify these arguments, which have already been clearly stated but perhaps not recognized in terms of their relevance, I must apologize preemptively for using appeals to numerous authorities repeatedly and for the perhaps-too-frequent use of quotes. To paraphrase the true experts would be an audacious dilution of their masterful articulation. In addition, wherever possible, I have attempted to minimize gratuitous citation for purposes of both clarity and brevity, and I, therefore, apologize to the many authors of related works who should not feel overlooked. In the age of scholarly web-searches and reference managing software programs, the interested reader can verify for him- or herself the accruing recent contributions to the empirical validity (or not) of the opinions expressed herein.<sup>1</sup> I certainly welcome continuing public discussion and private, courteous dialog on this subject.

<sup>1</sup>Because this controversial topic is subjected to interpretation and use by others who may not be as transparent about their sociopolitical objectives, I wish to be clear about mine, lest my intentions be misrepresented. As a human-rights advocate, I support the international extension of equal rights and protections of the pursuit of happiness, marriage, and family to all people regardless of the origins of their passions, or the ‘stimulus properties’ of the people they love. The term ‘learned sexuality’ refers to the interaction of biological predispositions and experience-dependent learning mechanisms in the brain on the organization and expression of sexual preferences and behavior. In no way is the term intended to infer that one’s sexual orientation is a choice, which can be ‘unchosen’ – reversed or erased while suppressing related behaviors through therapy or other approaches, nor that it needs to be. To use the term learned sexuality or the arguments laid out in this or any of my other articles in the attempt to deny equality to people on the basis of their passions runs explicitly contrary to this author’s clearly expressed intent.

<sup>2</sup>From Simons, J. A Year in Yosemite, 11/18/2011. Available online at <http://sierraclub.typepad.com/explore/2011/11/yosemite-frederick-law-olmstead.html>???

## The road to misinformed public policy based on misinterpreted science is paved with good intentions

While democracy cannot ignore public opinion, it must nevertheless be tempered by the rule of law to ensure fairness and equality for all individuals. Although in reference to an entirely different conflict (between industrial progress and the protection of the nation’s natural treasures), Frederick Law Olmstead, a landscape architect who designed New York City’s Central Park, addressed the patriotic issue of what a government is obligated to do when bad decisions are made by the majority of the voting public.

‘It is the main duty of government, if it is not the sole duty of government, to provide means of protection to all citizens in the pursuit of happiness against the obstacles otherwise insurmountable, which the selfishness of individuals or combinations of individuals is liable to interpose to that pursuit’.<sup>2</sup>

Olmstead, who believed the government had a moral obligation to preserve public access to beautiful places in nature, was appointed as the head of a commission that was to decide how the Yosemite land grant should be administered. Despite opposition (the commission disagreed with his vision and suppressed his report for years) Olmstead continued the fight. Eventually, the land in California that would become Yosemite National Park became protected by a law signed by Abraham Lincoln in the midst of the Civil War.

Despite decades of progress toward equal opportunities for people to commit to whomever they love without discrimination, biologically deterministic interpretations of scientific research into the origins of sexual motivation continue to be used as a weapon in the sociopolitical battle. Likewise, terms like ‘sexual conditioning’ or ‘learned sexuality’ are misused when they are improperly represented or when it is inadequately understood that, *such terms emphasize the interactions of the biologically predisposed organism with learning from experience*. Simplistic and artificially polarized arguments appear frequently in the media in a seemingly endless public debate over sexual orientation, equality, and human rights with such catch phrases as ‘born gay’ contrasted against attempts of ‘reparative therapy’ and attempts to ‘pray the gay away’. Though long abandoned in practically every other area of psychology, this remnant of the nature-nurture controversy remains viable in the court of public opinion, despite the generally acknowledged insufficiency of the argument from immutability in courts of law. Indeed, biological determinism is rarely considered a sufficient approach when explaining any adult aspect of the human condition within the scientific community.

Regardless of what we know academically – and likely take great care to write and talk cautiously about in our scientific circles – something essential is still being lost in translation to the public and to the policy makers who too often defer to public opinion. Clearly, there has been progress over the last decade in qualifying our statements regarding the roles of genes and hormones on sexual development, particularly in the areas of behavior-related journal articles and in textbooks (Jannini, Blanchard, Camperio-Ciani, & Bancroft, 2010). This is a clear improvement over the literature of the 1990's (cf. Woodson, 2002; for older textbook examples). Nevertheless, a sufficient portion of newer neuroscience literature continues to present a biologically deterministic attribution to various studies' frequently molecular-level results (Balthazart, 2011; Savic, Garcia-Falgueras, & Swaab, 2010). As has historically been the case in many areas of science, the 'danger' is mostly in the interpretation, but determinism can also underlie and undermine research hypotheses (Zietsch, Verweij, Bailey, Wright, & Martin, 2011). When new research findings about intracellular molecular events or anatomical sex differences in brain ultrastructure, for example, are discussed with regard to their potential influence on sexual orientation, there is, at best, only brief speculation of possible interactions with experience, for example, a single paragraph tip of the hat to experience in Cooke, Stokas and Woolley (2007). Rarely is the term 'learning' used. In the worst cases, obligatory generalities about some ambiguous role for 'experience' are curtly and dismissively acknowledged as though the brain was organized to do anything *but* learn.

The time has come for research experts in the sciences of genes, hormones, and sexual behaviors to understand the importance of, *and take the time to understand and properly acknowledge in their writings*, the critical relevance of decades of parallel research progress into the neurobiology underlying Pavlovian evaluative conditioning and instrumental incentive-learning. These learning processes shape and reshape what an organism 'likes and dislikes' and involve many of the limbic system nuclei found to be sexually dimorphic in structure or function, which therefore may underlie sexually dimorphic sex-related learning. Hence, understanding these learning processes is a critical element of understanding 'preferences', including those affecting sexual orientation. Large numbers of highly opinionated and vocal members of the voting public remain contently misguided by our well-intended but often oversimplified interpretations of our own and other's experimental research in the area of sexual motivation and behavior. We should not underestimate their power to continue engaging in a self-confirming bias toward over-simplistic, and falsely-dichotic, biologically deterministic explanations.

### *Progress toward equality: cautionary warnings amidst the optimism*

In her comprehensive article 'Marriage Equality for Same-Sex Couples: Where We Are and Where We Are Going', Jennifer Levi (2009) provides a survey of recent changes to the legal landscape in the United States with regard to civil unions, domestic partnerships, and the right for homosexual couples to legally marry. Certainly, there is broad disagreement about what those terms actually represent, and only ten countries now allow same-sex marriage nationwide. In the United States (not one of the 10), currently, only 6 of 50 states allow same-sex couples to marry. Over the last decade of arguable progress, there have been numerous legislative changes and judicial battles fought over the issue of what domestic partnerships and civil unions actually are as well as the issue of whether or not the term 'marriage' should be reserved for heterosexual couples. Most of these legal battles have been lost, with a large majority of the states (over 40 by 2008) passing constitutional amendments to ban same sex couples from marrying (Levi, 2009). At present, the supposedly 'united' states remain greatly divided on this issue with a particularly ironic paradox unfolding. As progress toward equal treatment under the law progresses for civil unions and domestic partnerships when compared to those rights afforded heterosexually married couples, the argument against the equal opportunity to enjoy access to 'marriage' takes on more strongly dismissive 'semantic' tones despite the disenfranchisement and 'second class citizenry' of those denied access to the primary institution and the respect accorded couples considered married. A few examples of the progress made, difficulties encountered, and hurdles remaining follow. This is not meant to be a comprehensive summary of the ongoing legal struggles.

Massachusetts set the precedent by allowing same-sex couples to marry even if they were from out of state, with many town clerks issuing licenses freely to out-of-state couples until former Governor Mitt Romney stopped the practice via a directive issued from the state's Attorney General. In July 2008, the legislature repealed the 'reverse evasion law', thereby allowing same-sex couples from other states to enjoy Massachusetts' non-discriminatory laws. However, marriage licenses issued to people residing in a 'void home state' – one which explicitly prohibits same-sex marriage – are not valid unless the participants intend to reside in Massachusetts.

In a 2006 ruling (cited in Levi, 2009), the Connecticut Supreme Court acknowledged that the distinction between marriage and civil unions is not 'constitutionally insignificant' and furthermore, 'because the institution of marriage carries with it a status and significance that the newly created classification of civil unions does not embody, the segregation of heterosexual

and homosexual couples into separate institutions constitutes a cognizable harm'. Partly due to the court recognizing that sexual orientation is an 'essential component of personhood', little threat to marriage equality remains in Connecticut. On October 1, 2010, all existing civil unions were automatically transformed into marriages.

California has had a much more volatile time with the issue, with legislation allowing same-sex marriage passed twice but vetoed by then Governor Arnold Schwarzenegger in 2005 and 2007. When the issue was addressed by the California Supreme Court, the research-relevant issue of immutability – the 'innate characteristic' argument over whether or not homosexuality and heterosexuality are 'immutable', literally, 'unchangeable' traits will be addressed in more detail below – arose. Importantly, for the thesis of this current article on sexual learning as a contributing factor to sexual orientation, the court said 'immutability is not invariably required [for] equal protection purposes'. Citing international law, the California court found that sexual orientation, *whether or not immutable*, is such a 'deeply personal characteristic that [it] is either unchangeable or changeable only at unacceptable personal costs'.

Nevertheless, in November 2008, over 51% of Californian voters passed Proposition 8 (only a majority of voters' support is required to pass), defining marriage as exclusively between a man and a woman in the state constitution. Both sides received record funding (around \$40 million each) during the campaign exemplifying the fervor surrounding this topic. Proposition 8 is currently under a judicial stay pending further legal action after being overturned in August 2010 in a US District Court ruling. Nevertheless, California remains a pointed example of how overlysimplistic public (mis)understanding of biology, psychology, and sexual behavior can result in legislative changes greatly affecting equality and the ability for people to freely love and commit to one another on the basis of their passions.

Levi concludes her article by predicting that the movement to extend marriage to same-sex couples will eventually succeed, but there are still reasons for concern regarding possible US Constitutional revision defining marriage as exclusively between a man and a woman at the national level, given the clearly articulated intentions of several Presidential candidates during the televised 2011 Republican Party debates. Therefore, despite the very best of intentions, caution is clearly warranted in what we (the academics) say formally in our publications, 'informally' to the press, and in our instructional capacities with the minds that will shape the decisions, and freedoms (or lack thereof) of tomorrow.

### *Gay genes, gay brains, and the argument from immutability: the double edged sword of biological determinism can cut both ways*

The argument from immutability, despite good intentions on the part of equal rights advocates, has been unknowingly corrupted, as it were, by a fundamental confusion over the basic meaning of the term. Immutable does not mean, 'innate or inborn', rather, it literally means 'fixed or unchangeable'. This distinction is important, as it will become central to the argument regarding the impact of sexual learning in the genesis of sexual orientation after first discussing the terms legal relevance. Despite the widespread belief, either explicitly stated or implicitly implied, that the 'born gay' perspective helps foster equality (e.g. Wood & Bartkowski, 2004), there is little evidence that it does so above the interpersonal level with individuals who, simply put, do not want to have to think about the issue very much. Perhaps surprisingly, it appears that immutability is *not* a requirement for successful litigation in the legal pursuit of gay-rights equality. Indeed, the experts on this issue suggest that litigators invoking the argument from immutability risk misrepresenting and dividing the community they intend to assist by doing so (Halley, 1994). Therefore, concern over finding or interpreting scientific evidence to foster this viewpoint is unnecessary at a minimum. Concerns over the immutability argument should not color our theories, determine our hypotheses, or somehow pit learning against genes, hormones, and other developmental influences on the brain in the formation of emotional states in adulthood. Sadly, this information is not new either but can be easily missed by setting one's search criteria too narrowly in PubMed while mastering the molecules of the mind.

The fact that the double edged sword of biological determinism can cut both ways and be used not just *for* but also *against* the legal arguments for gay-rights in the new millennium is only one of many detailed and highly referenced conclusions in a masterful work from Professor Janet E. Halley published in Stanford Law Review (Halley, 1994). Halley's remarkably thorough cross-disciplinary review 'Sexual Orientation and the Politics of Biology: A Critique of the Argument from Immutability' was written in the immediate aftermath of the inordinate impact on science, law, and society by the 'big three' biological basis of homosexuality studies: (1) Michael Bailey and Richard Pillard's twin study, 'A Genetic Study of Male Sexual Orientation' (Bailey & Pillard, 1991), (2) Dean Hamer and colleagues' *Science* article reporting on 'A Linkage Between DNA Markers on the X Chromosome and Male Sexual Orientation' (Hamer, Hu, Magnuson, Hu, & Pattatucci, 1993), and, (3) Simon LeVay's (1991) *Science* article on the hypothalamic nucleus INAH-3, 'A Difference in Hypothalamic Structure Between Heterosexual and Homosexual Men'

(LeVay, 1991). Halley's review integrates legal, scientific, and public media references thoroughly describing how the works above were originated, described (LeVay & Hamer, 1994) and interpreted within the 'nature versus nurture' mindset of the period, remnants of which may linger, undermining progress within the behavioral neuroscience community today.

Halley (1994) argues that equality-intended legal arguments from biological causation should be abandoned and, instead, details the impasse reached in the *essentialism* versus *constructionism* debate over the cause(s) of homosexuality, arguing against strong, exclusionary adherence to either radical perspective. Halley ultimately suggests that, on the explanatory middle ground – by taking what I would call an *interactionist stance* – sexual orientations including bisexuality, whatever their causes, acquire sociopolitical meaning due to each individuals' material and symbolic contributions to society. She recommends that essentialists and constructionists work together to design legal strategies that emphasize the dynamics that ultimately attend sexual orientation identity, which has the right to stand on its own merits.

For purposes of clarity, it is important to define a few terms used in Halley's review: An *essentialist* view (one she later defines as a *strong essentialist* view) posits that sexual orientation is a deep-rooted, fixed, and intrinsic feature of individuals, assuming that it is *determined* (by nature or nurture), not *chosen*. The *constructivist* view claims that sexual orientation is a contingent, socially malleable trait that arises as the individual manages their world, its meanings, and their desires. Halley furthermore uses the terms 'pro-gay' and 'anti-gay' in intuitive ways that align with modern-day public policy debates. Thus, the pro-gay argument from immutability is, on her definition, essentialist. To be more specific (my adapted paraphrasing):

*Pro-gay essentialism* posits that (homo)sexuality is fixed, immutable, and definitional; thus, it should be protected from discrimination.

*Pro-gay constructivism* posits that (homo)sexual orientations are mutable, once acquired at some point across the lifespan, recognized personally at some moment of choice, or recognized culturally across historical periods, and that social policy should not impede these variations.

*Anti-gay essentialism* holds that homosexual orientation is fixed, immutable, and normatively bad or sick, either in itself or its manifestations. Accordingly, society should encourage and enforce normative sexual conformity or cure the malady through eugenics, hormonal interventions, brain surgery, etc. Heterosexuality, by this view, is normal and healthy.

*Anti-gay constructionism* holds that *heterosexuality* is mutable, implying that homosexuality might be an alternative choice, thereby using fear of 'learning to

be gay' to justify heterosexuality's protection, anti-gay discrimination, and programs designed to 'help' by converting homosexuals to heterosexuality through 'unlearning' it or relearning to be straight rather than gay.

What is clearly conveyed in these four categorical distinctions (clearly there could be more) is that the argument from immutability – *whether conceived as biological determinism (i.e. 'born gay') or as a fixed characteristic, however it might develop or be acquired through learning* – can be used to promote, as well as to fight, anti-gay discrimination from the essentialist perspective. With a cautionary eye toward eugenics and artificial selection of offspring on the basis of sexual propensity, Halley makes a legitimate warning at later points in her review. What may not be as evident, however, is that with regard to mutability (either across the lifespan or across cultures), the poorly defined term 'choice' and the oversimplified concept of 'preference' are conflated.

As famously said by Zajonc (1980), 'Preferences need no inferences'. Zajonc argued that the rapid and often dominant affective reactions of an organism can be precede and be independent of those higher level perceptual and cognitive processes that we (people) prefer to appeal to as causing our preferences when experienced consciously. Regardless of their origin, preferences are subsequently shaped by experience, and our choices are impacted by numerous internal and external factors. Nevertheless, in a world full of behavioral options, I can 'choose' to order the salad but I cannot deny that I will almost always 'prefer' the filet-mignon. I must, however, have experience with both *at least vicariously* to form any sort of rational opinion on the matter. To say otherwise would be to imply that one was born with an innate representation of the stimuli associated with salad and with steak. In agreement with complex neurobiological theories on this matter, basic behavioral research on innate representations suggests that we are *not* (reviewed in Balleine, 2001).

### ***Pro-equality interactionism and the hedonic neuroscience of behavior***

Strictly defined then, immutable means 'unchanging' but not necessarily 'inborn' or even 'unlearned', and regardless, it appears to be of minor consideration in effective legal arguments. There is plenty of evidence that some aspects of sexuality appear unchangeable or fixed while other aspects are certainly more fluid, so mutability itself needs better definition with regard to the scientific study of sexuality. Where then is the explanatory middle ground where 'pro-gay' essentialists and constructivists can form an interactionist plan to help foster equality? I suggest the answer lies in a new synthesis between developmental neuroendocrinology and the complex theories gaining

support from research into the neurobiology of Pavlovian and instrumental learning and memory. The resulting hedonic neuroscience of behavior should embrace the brain's ultimate predisposition: *biologically biased adaptive learning*. While the two fields have separate histories and perhaps employed differing approaches or levels of analysis, there is no reason to think they stand in opposition to one another simply based on the historical nature versus nurture debate.

### For the love of false dichotomies: our 'innate' love affair with the nature versus nurture argument is not over but should be

#### *History of the nature-nurture distinction*

Across most Western cultures at least, we speak of opposites of day and night, light and dark, male and female, homosexual and heterosexual, right and wrong, good and bad, etc. Our tendency toward such polarization or binary thinking may indicate that we possess an innate tendency (a *predisposition*) toward learning to see the world in an oppositional, dualistic manner. Perhaps, there is a perceptual bias of sorts, which allows the human psyche to paint its own contrasting designs on the existential canvas of our mind. Psychotherapists Wood and Petriglieri (1995) drew attention to this tendency in the *Transactional Analysis Journal*:

Reducing complex phenomena or choices to a binary set of alternatives is part of human nature, a fundamental mechanism deeply engraved in our nervous tissue and passed on from generation to generation for our survival. But it can continue to exert an archaic hold on us beyond its usefulness if it prevents us from looking beyond the polarity of "opposites." . . . We fall in to the habit of speaking in dualistic categories—in part for linguistic convenience, of course, although we say these sort of things so often the we can come to believe that reality is defined by two mutually exclusive categories. (p. 32)

This tendency may be all well and good for children still dealing with complexity, but what about when such binary thinking leads to constraints on our thoughts (consciously or not) such that we design our well-intended theories around false dichotomies, for example, the idea of male and female brains (challenged in Woodson & Gorski, 2000) transposed to explain (likewise imaginary) polar opposites of gay and straight sexual orientation (LeVay, 1996)? Well, in that case, there is indeed a hypothetical monster hiding in the metaphorical closet! Despite the gravity of these observations, Wood and Petriglieri (1995) are both quite pragmatic and yet optimistic in their predictions of four possible outcomes when psychic tension or (in groups) social conflict revolves around such polarities:

- 1) The psyche/group splits, dissociates or otherwise ends its relationship.
- 2) A complete annihilation of one position by the other occurs.
- 3) The two positions deadlock in a balance of perpetual strife.
- 4) A novel synthesis emerges from the two originally conflicting positions, which includes elements of both, resulting in essence from resolution of the original tensions caused by the polarity.

Choice 4 seems clearly preferable. The authors are quite clear that, in its most acute form, polarization in a group occurs when a single group member assumes – or is assigned without being aware – the role of a scapegoat, voicing a deviant position while the rest of the group sits in opposition (e.g. The 'that's a red herring' or 'he's setting up a straw man' or some other means of denying that there is a problem group). They conclude that 'healthy' groups are not those that never succumb to binary thinking, rather, that healthy groups allow a third element to emerge as a result of the tensions caused by the polarization.

I have a penchant for old literature and with the passing of time what is new somehow becomes remarkably 'old'. If there is anything truly good educationally about the digital 'information age', it is the immediate availability of old literature for those so informed as to recognize its value. In my recent search for information on false dichotomies and their blasted persistence, I came upon an article – now 25 years old – which traces the phenomenon across nearly 120 years of literature. Timothy D. Johnston records a historical summary of 'The Persistence of Dichotomies in the Study of Behavioral Development' (Johnston, 1987). His article traces the inadequacies of dichotomous perspectives falsely opposing learned and innate behavior (or genes versus environment). Johnston starts, perhaps not surprisingly, with the notable ethologist, Konrad Lorenz pitted against the early interactionist perspectives of Daniel Lehrman. Johnston shows that the interactionist perspective does not (a) rely on radical environmentalism, (b) attribute all behavior to learning, or (c) interpret development as an interaction between genes and the environment. Rather, Johnston points to an interaction between the *organism* and the environment. This is an important distinction assuredly.

Johnston (1987) first draws attention to the possibility that 'terminological adjustments' – new ways of saying essentially the same old thing using the phraseology of the newer 'technical' times – can obscure a continued reliance on dichotomous thinking, rejecting the learned-innate dichotomy in one paragraph while subsequently embracing the phylogenetic-ontogenetic opposition in the next. He insists, appropriately I think, that metaphors

and shorthand, while time-honored utilities, need to be periodically reexamined to ensure an end result of illumination rather than obfuscation.

[The] road to confusion is paved with compelling but inaccurate metaphors'. (Johnston, 1987, p. 149).

In the 1930's and 1940's, Lorenz and Nikolaas Tinbergen developed the main tenets of ethology around a theory of instinctive behavior – stereotyped, species-specific, experience-independent behavior determined by genes. Not predisposed, *determined*. Learned behavior, by contrast, was highly variable and experience dependent. Deprivation experiments were critical to distinguishing between the two. If an animal, reared from an early age in deprivation of the hypothesized experiences related to learning, showed normal behavioral reactions to 'releasers' or 'sign-stimuli' at the normal age, the behavior was instinctive. If not, well, it might be learned, but the more frequent diagnosis was that the experimental design was wrong or the necessary subunits of the behavior were not yet identified. Notably, much of the deficit observed (when observed) had to do with coordinated motor-responses, which were not oriented properly so as to be 'efficient', despite their general completeness of form.

Keep in mind that the premise of this current article revolves around emotionally influenced preferences for stimuli associated with a particular type of goal object (here, a male or female sex partner, or perhaps blondes versus brunettes) and the 'preference' is expressed by an emotional reaction to such stimuli when given a choice to approach and interact with one of multiple incentives and not around motoric or 'consummatory' responses elicited by contact with said incentive or 'goal object'. These are not only distinctly different responses in terms of emotional versus neuromuscular pathways but moreover often involve different sensory attributes and reflexive rather than volitional behaviors, respectively.

With regard to deprivation effects on 'instinctive' behaviors, Johnston recounts a study by Eibl-Eibesfeldt (1956, cited in Johnston, 1987) in which squirrels were reared without access to hazelnuts. Once supplied with them, their gnawing patterns were identical to those made by nut-experienced squirrels. This is not unlike the sexual mounting and thrusting patterns of sociosexually deprived male rats raised in isolation which, though experientially naïve, still approach, investigate, and mount induced-estrous female rats. The naïve males do however have some – directional – incapacities; mounting off to one side, facing backward, thereby thrusting at the female's head, essentially missing the mark rather than properly intromitting from the correct angle. After trial and error learning takes place, they are fairly proficient from that point on having figured things out. This consummatory learning happens quickly and once learned is not (apparently) overly sensitive to its outcome.

Thus, directly consummatory (motor) behavior-related learning differs from measures of partner preference without contact, or more formally instrumental behavior reflecting appetitive sexual motivation (Everitt & Stacey, 1987; Woodson & Balleine, 2002; Woodson, Balleine, & Gorski, 2002), which are more sensitive to goal-object value and which appear sensitive to outcome devaluation, as evidenced by subsequent reductions in those behaviors.

According to Johnston (1987), initially, the nut-inexperienced squirrels had similar problems with nut-orientation (manipulating the nut appropriately), requiring practice to orient their gnawing efficiently. 'Hence, in squirrels the motor patterns involved in gnawing are instinctive, but the orientation of gnawing is learned'. (p. 150). Few, I think, will find strong argument with that rudimentary description of sensory-motor integration and naturalistic instrumental (trial and error) learning. Yet, most astute readers will, with an inner eye toward the initial premise related not to motor learning or to 'orientation' with regard to efficiently interacting with the goal object, recognize the 1956 study's irrelevance to choice behaviors, emotional valuation of the goal object and the formation of likes, dislikes, and preferences.

This is exactly my point then: deprivation studies, by definition occurring in the absence of prior consummatory experience, cannot evaluate true preferences. They can evaluate sensory-perceptual mechanisms involved in a naïve approach to biologically relevant stimuli, for example, attraction to olfactory or pheromonal chemical cues (cf. Kohl, Atzmueller, Fink, & Grammer, 2001), and perhaps, they can be useful in determining whether or not the neuromuscular development of consummatory responses to such incentives or objects are experience dependent. They cannot, however, assess any emotional value assigned to stimuli that have never been encountered without employing a preformationist view that emotional valuation of specific objects is in the genes.

The relevant question for our purposes then, left unaddressed by Eibl-Eibesfeldt (1956), was not 'Would experience deprived squirrels chew novel hazelnuts efficiently?' but rather, if given a selection of novel nuts to choose between (perhaps environmentally relevant 'natural' versus environmentally irrelevant 'unnatural' nuts?), 'Upon which nuts would the choosy chewers chew if the chewy choosers chose to chew nuts?' Furthermore, would chewing change the nut-naïve squirrelly choosers' post-chewing choices causing a biologically predisposed palatable preference for natural nuts or not?

Eventually, an answer to such a silly question would have to be achieved using measures of preferential behavior and the study of 'likes' and 'dislikes'. It turns out that questions similar to these have been answered about the assignment of emotional value to stimulus properties of various incentives (though mostly in rats rather than squirrels, unfortunately). There is a huge and

exciting current literature on the topic discussed almost exclusively (or so it seems given the jargon) amongst members of the neurobiology of learning and memory (L&M) crowd. In order to understand how learning from experience affects sexual preferences, we have to get beyond simple motoric reflexes, sensory-motor coordination, copulatory responses, and the like. We need to leave the S-R psychology of the strict behaviorists back in the first half of the 20th century and get into the 21st century mindset by addressing the issue from the standpoint of mental representations, evaluative conditioning, and incentive learning. The 20th century field of hormones and behavior (H&B) has already evolved into the study of hormones, *the brain*, and behavior, by recognizing that the intervening variable between the original two is the physical brain, which produces a hopefully functional mind. Perhaps, H&B researchers of sexual behavior, less frequently addressed by the L&M crowd precisely because of its logistical complexities (i.e. organizational and activational interactions), are ready to choose to give animals back their ‘minds’ just as the representational learning theorists have done? Or, are we, anthropomorphically speaking, just hormonal nuts?

### Tradition Be Damned: the historical separation of these disciplines is history

#### *Biological preparedness: erasing the tabula rasa*

Resistance to integration of the numerous roles for different kinds of learning into studies of hormones and their effects on behavior has resulted not only from sensible space limitations or the reductionist need for control over extraneous variables in the laboratory but also from the historical origins of the H&B discipline, which are arguably more aligned with ethology than with experimental psychology. This contrasts greatly with the L&M crowd, which traces their history back to the early psychological behaviorists whose ‘blank-slate’ (or *tabula rasa*) learning theories were diametrically opposed to the ethological theories embracing (perhaps over-embracing) species-specific specializations and limitations on learning sometimes called ‘biological preparedness’.

But that was then and this is now. For over 40 years, animal learning researchers have incorporated the principles of biological constraints and predispositions on learning into their theories, hypotheses, and interpretations (Domjan, Cusato, & Krause, 2004; Domjan & Galef, 1983). Essentially, this concept involves the idea that some species are predisposed to learn some things easily and other things with great difficulty if at all (Breland & Breland, 1961; Garcia, Lasiter, Bermudez-Rattoni, & Deems, 1985). The particular learning that occurs, then, results from an interaction of biological predispositions with the experiences to which the organism is exposed resulting from an evolutionary ‘pretuning’

of the nervous system to allow for the rapid and effective learning of what will be necessary to survive and reproduce in the organism’s specialized niche. For that reason, biological preparedness is sometimes referred to as ‘adaptive specializations in learning’.

Aside from ‘biological predispositions’ limiting *what* is learned or how efficiently/easily a learned response is acquired, there seems to be a free floating misunderstanding, again perhaps in the general public more than amongst academics, that learning and ‘unlearning’ are bidirectionally equivalent. That is, people think that something easily learned is just as easy to ‘unlearn’, which they furthermore equate to ‘forgetting’. This faulty assumption pervades the anti-gay constructivist arguments related to protecting heterosexuality from being unlearned or corrupted and converting homosexual behavior to heterosexual behavior through therapies sometimes involving counterconditioning approaches. Decades of research on learning, memory (enhancement or impairment), and extinction demonstrate that this assumption, that what is easily acquired is just as easily extinguished, is simply and completely wrong. The bidirectionality assumption is a throwback to the days of the *tabula rasa*, once again a blank slate upon which anything written can be just as easily erased. Moreover, there is strong behavioral evidence in animals and people that extinction involves new learning superseding, but not erasing, older learning, which may not be forgotten for a long time, if perhaps at all. Extinction studies clearly demonstrate that previously predictive information is not ‘unlearned’ rather, a new predictive relationship is learned that is inhibitory to the old one (Bouton, 2002).

Biologically biased inequalities in learning, where a strong emotional memory can last a lifetime and be highly resistant to extinction, are highly relevant to studies of drug addiction, panic disorder, and posttraumatic stress disorder (PTSD). These rapidly learned phenomena are associated with an impaired or delayed extinction of autonomic, experiential, and behavioral responses to conditioned stimuli (Blechert, Michael, Vriends, Margraf, & Wilhelm, 2007; Brenhouse & Andersen, 2008; Michael, Blechert, Vriends, Margraf, & Wilhelm, 2007). Notably, researchers frequently integrate hormone-relevant questions about developmental stages such as adolescence, brain laterality differences, and gender-related factors when studying the neurobiological underpinnings of these disorders. Brain systems underlying sexual learning appear to overlap greatly, though not entirely, with the addiction and emotional memory circuits, given the likelihood of strong emotional memory formation during sexual conditioning, which appears to be similarly resistant to extinction.

Lastly, there is evidence from other species (Red-winged Blackbirds and Common Grackles) that food preferences and aversions can be acquired vicariously

through observation of conspecific interactions with the food, and while both are similarly acquired, in these avian species, at least, food aversions are more resistant to extinction than food preferences (Mason, Arzt, & Reidinger, 1984). Clearly, there are many rules of learning yet to be discovered, and our minds come prepared to alter not only our perceptions of experiences but also how and what we learn from them, impacting the durability of the memories we form and their motivational impact on our future behaviors.

***Interactionism in the 21st century: Biological predispositions, evaluative conditioning, and incentive learning underlie 'learned sexuality' and the experience-dependent formation of mature sexual preferences***

*Causa causae est causa causati*

~The cause of the cause is to be considered as the cause of the effect also ~

Learning is why the brain exists. While I make no claim to expertise or unique insight regarding the impact of Edward C. Tolman's (1949) discourse, 'There is more than one kind of learning' (Tolman, 1949), it clearly paved the way for current theories of learning and memory, which rely on internal representations of stimuli to explain phenomena such as latent learning, relational or 'cognitive' mapping (Tolman, 1948), and the assignment of emotional value to stimuli during conditioning. Tolman separated learning into the following six types: (1) cathexes, (2) equivalence beliefs, (3) field expectancies, (4) field-cognition modes, (5) drive discriminations, and (6) motor patterns. Several of these paved the way for phenomena we now call by far different names, for example, Tolman's 'equivalence beliefs' set the stage for mental representations of external events, and his 'field expectancies' are clearly an attempt to explain what we now call relational or cognitive mapping by the hippocampus as it forms representations of episodic-like memories or assists in spatial working-memory. Central to the issue here, however, are Tolman's 'cathexes' or the learning of a 'cathexis', which he described as the acquisition of a connection between a given type of goal-object (a particular type of food, drink, or sex-object) and the corresponding 'drive' of hunger, thirst, or sex.

'That is, the learning of cathexes is the acquisition by the organism of positive dispositions *for* certain *types* of food, drink, or sex object, etc. or of negative dispositions *against* certain *types* of disturbance object'. (Tolman, 1949, p. 144, italics are original author's emphasis).

Clearly, Tolman is referring to the formation of likes and dislikes for certain types of things and not others, which is fundamentally the basis of learned preferences, includ-

ing those *for* or *against* certain *types* of sex object. In Tolman's view, this was an experience dependent process:

It would seem that animals or human beings acquire positive cathexes ... by trying out the corresponding consummatory responses upon such objects and finding that they work ... [to] ... reduce the corresponding drives. (p. 146).

Tolman goes on to admit he has no actual evidence for his speculative theories but, nevertheless, proceeds to describe in great detail the specific experiment with a dog-preparation that would confirm or reject his premise and likely provide opportunity to work out the exact quantitative laws, mathematically determined curves, magnitudes of the constants, and other 'precise techniques of the quantitative method' that could 'bring about closure for all those psychologists who are probably at heart mere physicists or perhaps mathematicians gone wrong'. (p. 147).

Tolman's railings are at once audacious and self-effacing, and although humorous, they serve as a warning in today's age of high-tech reductionism and the accruing mountains of molecular data overshadowing mole-hills of theory, at least with how a vast majority of modern research results relate to anything reminiscent of the human condition. Tolman was a bold theorist, unconstrained by the unavailability of supportive data and without 'politically correct' regard for the dominant theories of the time, stating quite clearly 'I do not hold, as do most behaviorists, that all learning is, as such, the attachment of responses to stimuli'. (p. 146). The concept of 'attachment of responses to stimuli', whether by learning or by biological predeterminism, still seems to be politically correct both in and out of scientific circles. Unfortunately, this sort of mindless explanation (i.e. no mental representations required for goal directed behavior to occur) still holds sway with the general public, thereby greatly affecting their understanding of the human condition and of our research results. To make progress, we first have to break free of this mindlessness approach to hypothesis formation.

Research hypotheses based upon modern day Tolman-esque theories have been quite fruitful in furthering our understanding of what learning is (and is not), how discrete events are represented in the brain, and how the neurobiological networks across grossly interconnected brain regions work and change together, thereby modulating our likes and dislikes based on our experiences. Across the lifespan, neuroplasticity allows the adaptive learner to continually update the reward value associated with a stimulus as a function of their internal state when the stimulus is (re)experienced. Hence, preferences – however, predisposed – are mutable at least with regard to the affective value of specific stimuli associated with them (i.e. the reward value of a stimulus is *not* an immutable, intrinsic property of the stimulus).

This phenomenon is sometimes called the ‘outcome reevaluation effect’. (cf. Dickinson & Balleine, 1994; Balleine, 2001). But, the larger argument seems to revolve around how they are formed in the first place. Is it by genes affecting development in the absence of experience or is learning somehow, even momentarily and irreversibly, involved?

Using ‘taste preference’ formation as an example, wherein a flavor (US) or other natural stimulus characteristic of liquid (e.g. its viscosity) is associated with the biological value (i.e. beneficial consequences) of its ingestion, Balleine (2001) points out that *Pavlov himself explicitly rejected the existence of innate representations of the unconditioned stimulus* (p. 309) and then thoroughly describes the incentive-learning processes occurring in instrumental conditioning, which unavoidably involve Pavlovian conditioning as well. Being at the time quite well versed (or so I arrogantly thought) in evolutionary theory, I remember being quite surprised to learn that neonatal rats have to *learn* about the relation between fluids and dehydration before they acquire the necessary emotional value, which ultimately motivates their later (appetitive and consummatory, respectively) responses to approach and drink water. Because this learning is biologically predisposed to occur in a single trial during which water is paired with dehydration, it is easily mislabeled as an innate characteristic (cf. Hall, Arnold, & Myers, 2000; cited in Balleine, 2001). It is exactly this type of biological predisposition in rapid, perhaps single trial-, possibly irreversible and therefore ‘immutable’, *learning* about the stimulus properties of a sexual incentive that underlies the formation of sexual preferences for particular types of stimuli associated with specific sexual goal objects. This is what I have meant when using the term ‘learned sexuality’. The most simple and direct argument against this subtle but meaningful learning process is to claim that organisms are born ‘straight or bisexual, gay, etc.’. Such individuals would require innate representations of their preferred unconditional stimuli (USs), which elicit the emotional unconditioned responses (URs) they experience when in love, or less ideologically, during or after having sex with their preferred goal object type.

The ‘born gay’ argument is thus a preformationist view, which relies on genes and developmental processes (likely involving hormones) in the exclusive absence of (in its view unnecessary) experience. As such, it is subject to the harsh criticisms of evolutionary theory regarding the consequences of natural selection on a ‘gay gene’ and its inflexibly manifested phenotype. Those arguments can be handled by others, elsewhere. What differs critically in the learned sexuality account here is the inference that any evolutionarily stable form of sexual learning mechanism which reliably conferred, on average, a *learned heterosexuality*, would, even if somehow altered

by some yet-unidentified experience or factor to produce a differing sexual orientation, still result in an emotional sexual preference, which, despite being learned, might also be *immutable* (fixed or largely inflexible and unamenable to change), certainly would be *biologically based*, and from the standpoint of volitional, conscious decision making, could be considered *unchosen*.

## Conclusion

The single-trial learning effect described in the paragraphs above as learned sexuality (Woodson, 2002) represents a biologically predisposed, evolutionarily adaptive form of greatly biased evaluative learning in which otherwise arbitrary stimulus properties of an object are rapidly and durably associated with the biological consequences of interacting with it. Balleine (2001) refers to this as an ‘evaluative process’ in which a connection is formed between the stimulus properties of the substance and a biologic system sensitive to nutrients or another biologically relevant consequence. Perhaps, then similar evaluative systems exist for non-nutritive, purely hedonic social and sexual experiences. If so, they likely involve neurotransmitter systems such as the opiates, dopamine, and hypothalamic/pituitary neuropeptides in subcortical regions such as limbic and striatal systems that are accessible by, but independent of, executive consciousness. Evaluative processes, then, appear critical for acquiring and expressing the relationships in Pavlovian conditioning and may turn out to be at least equally critical with regard to what is learned in instrumental conditioning related to sexual learning. Both Pavlovian and instrumental learning are known to play roles in the appetitive learning, contributing to drug cravings affecting addiction, sobriety, and relapse, and it is not a far leap to apply similar principles to Pavlovian and instrumental influences on sexual behavior, including paraphilias, fetishes, addiction, and the conditioned cravings associated with such states. If drugs can result in ‘good learning gone wrong’ in the addict, why should we deny the existence of evolutionarily adaptive learning, which can be co-opted similarly by arbitrary stimuli in sexual likes and dislikes, which sometimes extend beyond the boundaries of social norms? This is not said to equate differences in sexual orientation to fetishism or paraphilia where objects may substitute for people as targets of affection. Clearly, our interpersonal passions are biologically normal manifestations of emotional responses, learned or unlearned. But to deny that experiences have any basis in shaping our expectancies regarding at least the specifics of who we love and enjoy making love to is essentially to deny that we have any consciously accessible, rational reasons for our attractions at all.

Learning changes behavior. Changing the brain changes how learning occurs. Hence, when we change the brain (be it *via* genes, hormones, natural selection, or

prior learning), we change how subsequent learning occurs resulting in behavioral change. Brain plasticity (the biological basis of learning) is the intervening variable between the existing organism and its future behavior. Acknowledging that the brain is a highly plastic, modularly (not globally) dimorphic, or perhaps with regard to sex and gender, more accurately ‘multi-morphic’, developmentally biased organ of learning – one which is organized and activated by *both* hormones *and* experiences across the lifespan – is essential for doing good science well. Interactionist theories of psychosexual development provide an empirically sound, strong, yet modifiable foundation for testable hypotheses exploring biologically biased sexual learning.

Non-interactionist perspectives voiced in science and society represent a form of socioscientific theopolitical extremism, which can stand in the way of progress in all four areas (societal, scientific, spiritual, and political progress). They do so by unnecessarily prolonging the last battle of the otherwise abandoned nature-nurture controversy. Those proposing that preferences are choices that can be later altered through therapy or counseling incorrectly assume the brain engages in bidirectional, unbiased blank-slate learning and unlearning, contrary to the evidence that some things easily learned may never be forgotten. Not all forms of learning are equally acquired and extinguished or forgotten. To the contrary, some forms are biologically ‘prepared’ and learning flows with ease, while others are ‘counter-prepared’ and learning proceeds with great resistance, if it occurs at all. Whether for food or for females, experience-dependent, learned preferences likely remain for a lifetime whether expressed when accepted, or latent while goal-related behaviors are suppressed by threat, guilt, or other societal pressures. Behaviors can change rapidly due to conscious intent or outside pressure, but once formed, preferences, to the extent that they change at all, change at their own pace and on their own terms as we learn and grow from experience.

It is time for science to lay down the dull, pseudo-scientific sword of biological determinism and take the higher ground with the bold, unqualified promotion of an interactionist perspective that supports sexual orientation equality as an essentially constructed, durable, highly personal characteristic of great value to a civilized society. With regard to science, I would like to take credit for this ‘initiative’ toward interactionism between the disciplines (Woodson, 2002), but the idea has been around for nearly 120 years in various forms by various authors (reviewed in Johnston, 1987). It is not new, and it is not just me, but it certainly is true that the two (H&B and L&M) disciplines, particularly with regard to brain sexual differentiation and sexual learning, are not yet optimally integrated. Our mutual colleagues in the area of stress and related hormones and memory have paved

the way with great interactionist, theory driven progress recently, so it is time that we catch up by first forming a consensus on the sexual-brain learning issue. Then, we can start getting our ‘hedonic neuroscience of behavior’ together. Certainly, this special Learning and Sexuality issue of Socioaffective Neuroscience and Psychology shows that there is already an appropriate venue for exactly this sort of interactionist discipline in the post-preformationist era, whatever we prefer, or choose, or just *like* to call it.

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