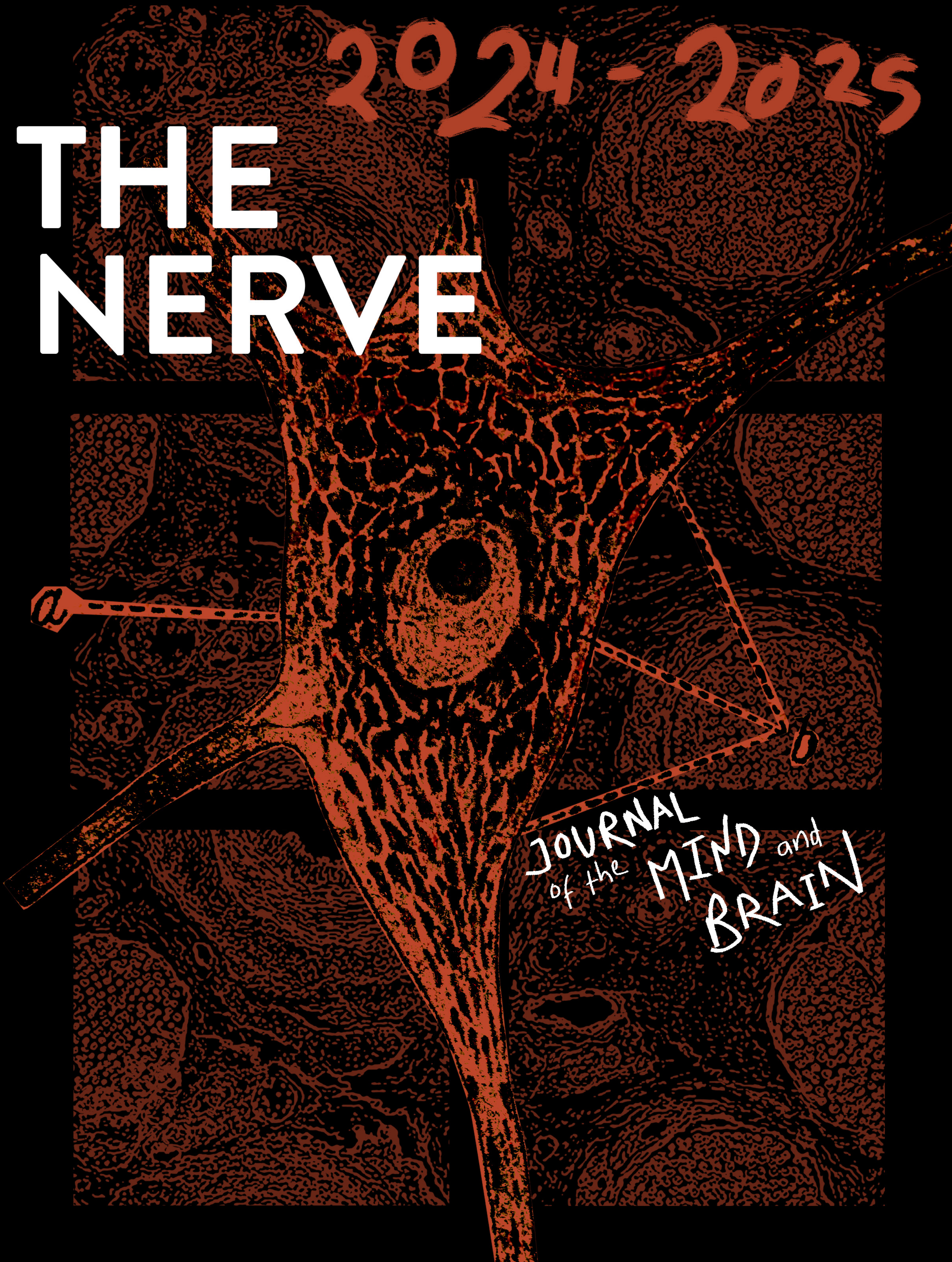
2024-2025
THE
NERVE
JOURNAL
of the MIND and
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EDITOR'S NOTE:

Dear Reader,

The fields of neuroscience and psychology emerged over the past few centuries in response to a uniquely human urge to understand ourselves. Long before these disciplines existed, however, we explored the nature of humanity through storytelling, artistic creation, and philosophical discourse. We at The Nerve believe that by combining analytical inquiry and creative expression, we can achieve a more whole understanding of what makes us human: the mind and the brain. Our publication exists to bridge the gap between these disciplines by providing a platform dedicated to making your ideas more broadly accessible.

What you hold in your hands could not have been created without the tireless efforts of our wonderful community of editors and designers, who deserve many thanks. In these pages, you'll find a dynamic range of work from Boston University's brilliant student writers, scientists, researchers, artists, and philosophers. Each piece offers a unique lens through which we can understand the mind and brain not just as objects of scientific study, but as living, evolving parts of ourselves.

Our goal at The Nerve is to inspire a curiosity and desire for a deeper understanding of yourself and humanity. In our current climate, more than ever, it is important that we be reminded of the value in the pursuit of knowledge. I hope this issue can serve you this purpose. Enjoy!

Sincerely,
Alexa Woodrow
Editor-in-Chief

EDITOR'S NOTE:

Dear Reader,

Where Alexa eloquently emphasizes our mission to unite science and storytelling, I'd like to highlight the spirit of experimentation that makes this publication possible. The Nerve thrives because it welcomes the strange, the daring, the half-formed idea that demands further thought. We don't just publish polished conclusions—we celebrate the questions that remain unresolved, the intersections that spark friction, and the voices that challenge easy categorization.

In these pages, you'll find work that takes risks, whether through detailed analysis of pathology, or though research with peer-reviewed data. As editors, our job has been to protect that spark while shaping it into something that can ignite others. I am proud of the fearlessness our contributors have shown in bringing their minds—and hearts—to the page.

So read curiously. Argue with what you find. Let it linger. That's where the real thinking starts.

With admiration,
Randall Erwin
Editor-in-Chief

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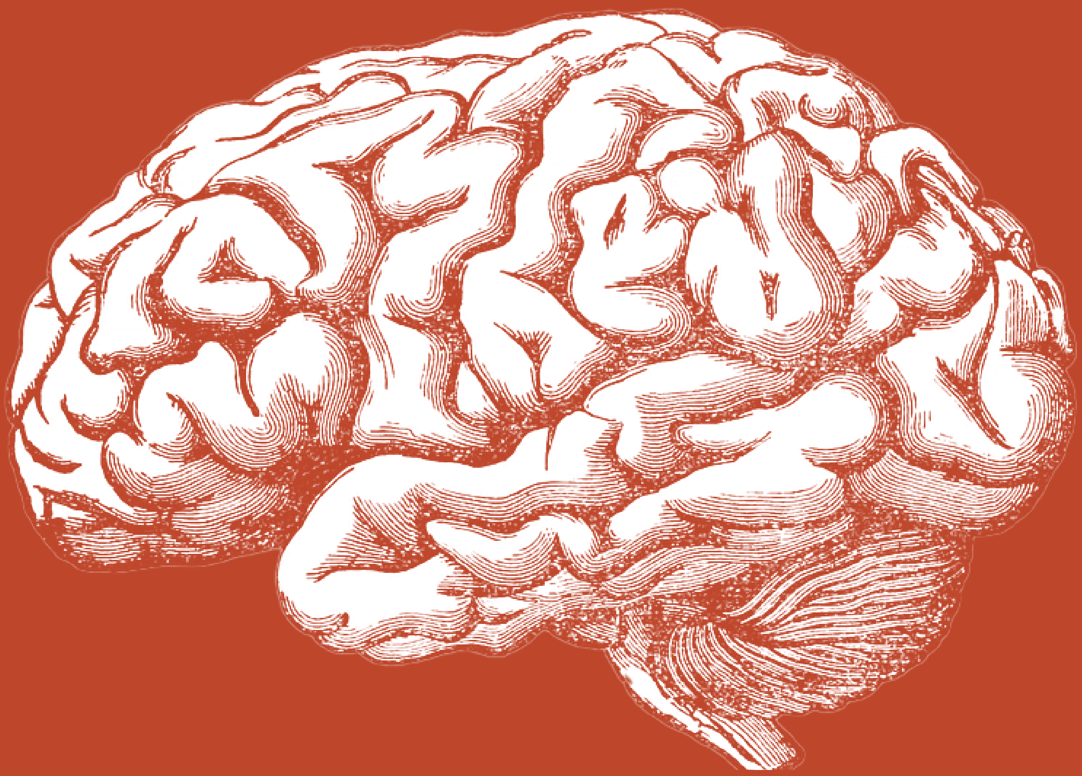
GENERAL ADMIS

Neural Overlap in Sexual and Aggressive Behaviors:

Exploring Focal Brain Regions and Implications for Psychiatry



Hailey Acosta, Somayya Upal

This paper delves into the identification of focal brain regions governing both sexual and aggressive behavior, with a specific focus on unraveling the neural networks that underlie their shared relation. We begin by providing a brief history on the study of sexual and aggressive behaviors, which further allows for a review of existing literature and empirical studies. We aim to pinpoint the mechanisms in key brain regions, namely the hypothalamus and amygdala, that play roles in the regulation of both sexual and aggressive behaviors. Building on these findings, we explore potential mechanisms that might explain the observed convergence in neural networks and its implications for understanding the complex interplay between sex and aggression. Furthermore, we discuss the broader implications of these findings for the field of psychiatry, proposing that a deeper understanding of the neural substrates of these behaviors could inform therapeutic interventions and shed light on the etiology of certain psychiatric conditions.

Abbreviations: VMH - Ventromedial Hypothalamus, PR - Progesterone Receptor, BNST - Bed Nucleus of the Stria Terminalis, VMHvl – Ventrolateral Subdivision of Ventromedial Hypothalamus, MBN - Mating-biased Network; ABN - Aggression-biased Network; SSRI - Selective Serotonin Reuptake Inhibitor; CSBD - Compulsive Sexual Behavior Disorder; SAJC - Structured Anchored Clinical Judgement Scale; GnRH - Gonadotropin Releasing Hormone

Keywords: Social behavior; Aggression; Sexual behavior; Hypothalamus; Amygdala; Psychiatry

Introduction:

Understanding the intricate connections between sexual and violent behavior is a complex endeavor that delves into the very primal acts of human nature. Prior research has implicated several key brain regions in the regulation of sexual behavior, such as the hypothalamus, amygdala, and prefrontal cortex, as well as hormones such as testosterone, estrogen, and progesterone. Similarly, investigations into the neural basis of violent behavior have identified the involvement of structures like the amygdala, hippocampus, and prefrontal cortex, along with hormones like testosterone and cortisol. It is through this research that scientists have found a discernable overlap between the neural circuitry governing both sexual and violent behaviors. However, an important question that emerges is why there exists an overlap in these neural networks governing seemingly disparate aspects of human behavior. The aim of this review is to identify and map the specific regions within the brain where this convergence occurs and to investigate hypotheses regarding the functional significance of this overlap. By integrating existing neuroscientific knowledge with empirical investigations, we attempt to contribute not only to our understanding of the neural regulation of sexual and violent behaviors but also to shed light on the broader implications for human psychology.

Historical Background:

The scientific study of sexual behavior and aggression initially began as distinct and separate fields of study. Early investigations into sexual behavior primarily focused on elucidating the neural mechanisms underlying reproductive processes and biological sex differences, while studies on aggression delved into the circuits governing confrontational and defensive responses. More specifically, aggression research was primarily psychological and clinical in nature, whereas research understanding sexual behavior focused moreso on observing the effect of olfaction and hormones on sexual behaviors and ovulation.

A study published in 1849 is regarded as the first known proof of endocrine functionality and the necessity of the nervous system in modulating behavior (Berthold, 1944). In this study, six roosters were castrated and then half had one teste implanted into their abdomen (Berthold, 1944). For the roosters who had reimplanted testes, there were no deficits in any behaviors such as mating and fighting; this identified the testes as vital for behavior functions through means of some secreted "testicular sub stance", which would later be identifiedas hormones (Berthold, 1944). During the 1920s, the importance of the pituitary gland was observed through excising and reimplanting pituitary fragments in rats and observing the changes in sexual receptivity (Beach 1981). This paved the way for future understanding of the influence of the pituitary gland on the hypothalamus.

Lesion studies, rather than physiology studies, have also played an impactful role in understanding the very basis of sexual behavior and aggression. Kluver and Bucy investigated the effects of bilateral temporal lobe lesions in rhesus monkeys through which they observed profound alterations in sexual behavior as characterized by increased exploratory tendencies, indiscriminate mounting, and loss of species-typical mating patterns (Kluver and Bucy, 1937). Through these lesions, they also stopped exhibiting signs of fear and aggression (Kluver and Bucy, 1937). Though this study was rather invasive and nonspecific to a particular region, this was among the earliest lesion studies to identify the temporal lobe as necessary for modulating sexual and aggressive behaviors.

In the 1950s, the notable neuroscientist Dr. Paul MacLean began to explore behaviors like sex and aggression to understand the physiological regions responsible for primal behaviors and feelings. Maclean went on further to develop the concept of the visceral brain or the limbic system as a region controlling emotions (1952). It was from the identification of the limbic system that further research was then able to identify the hypothalamus and amygdala as key players in modulating the social behaviors of sex and aggression.

Overlapping Brain Regions for Both Sex and Aggression

Advancements in technology, such as neuroimaging and optogenetic techniques, have further propelled the field forward. Functional magnetic resonance imaging (fMRI) has enabled researchers to observe real-time neural activity during sexual and aggressive behaviors, providing a more dynamic and comprehensive view of the underlying neural processes. Optogenetic techniques have also become extremely important in modulating specific genes, allowing for the ability to knock in or out different neuron types. This has overall allowed for a more comprehensive understanding of the specific brain regions involved in modulating social behaviors, especially in animal trials.

The Amygdala

The amygdala, a complex and evolutionarily ancient structure within the brain, emerges as a crucial modulator in the intricate regulation of both sexual and aggressive behaviors. Functioning as a nexus for emotional processing, the amygdala integrates sensory information and plays a pivotal role in evaluating the salience and emotional significance of stimuli. Its role extends beyond mere emotional processing, as the amygdala forms interconnected networks with other brain regions, such as the hypothalamus and prefrontal cortex, to orchestrate a nuanced and context-dependent balance between sexual and aggressive responses.

Hormones exert a profound influence on the amygdala, with especially relevant steroid hormones being testosterone and estrogen. Testosterone, predominantly in males, has been linked to increased amygdalar responses to social and aggressive stimuli, implicating its role in shaping emotional and behavioral reactions. Similarly, estrogen, prominent in females, plays a crucial role in modulating amygdalar function, contributing to the regulation of social behaviors. The hormone oxytocin has also been shown to have an inhibitory effect on the amygdala in both humans and rodents, and entirely knocking out this hormone in rats has led to extreme aggression (Kirsch et al., 2005; Ragnauth et al., 2005). Hyperactivity in the amygdala hasion and violence. Comparisons of the amygdala volume, which corresponds with prominence of amygdala activity, following temporal lobe resections in epilepsy patients found a positive relationship between contralateral amygdalar volume and positive changes in sexual drive (Baird et al., 2004). This is evidence of the amygdala playing a role in regulating sexual behavior in humans specifically rather than just in rodents.

It has been shown that activity in the amygdala is a precursor to the hypothalamus, in particular "estrogen receptor alpha (Esr1)-expressing cells in the posterior amygdala (PA) [act] as a main source of excitatory inputs to the hypothalamus and key mediators for mating and fighting in male mice." (Yamaguchi et al., 2020). Esr1+ neurons have been shown to be essential for mating and fighting behaviors in mice, and especially play a crucial role in other areas of the brain such as the hypothalamus (Wei et al., 2018; Hashikawa et al., 2017).

The Hypothalamus

The hypothalamus was identified as a nexus for neuroendocrine control and autonomic functions, playing a significant role in integrating signals from various brain regions including the amygdala. Through analysis of lesion experiments on guinea pigs and rats, researchers in the 1940s were able to determine that certain regions of the hypothalamus were the most crucial brain region involved in copulatory behavior (Beach, 1947). By lesioning multiple regions within the hypothalamus, it was discovered that the ventromedial region in particular was necessary for copulatory behavior in mice for reasons both related and unrelated to hormone regulation (Kennedy 1964). However, it is still evident that hormones do play a large role in modulating sexual and aggressive behaviors.

Many different hormone-receptor neurons have been identified as being critical for modulating social behaviors. Estrogen receptor (ER) alpha has shown to be highly expressed in the hypothalamus along with other limbic brain areas (Shughrue et al., 1997; Pinzone et al., 2004). Knocking out ER-alpha in the ventromedial hypothalamus (VMN) reduced both sexual and aggressive behaviors in adult male mice (Sano et al., 2013). Ablation of progesterone receptor (PR)-expressing neuronal populations in the VMH leads to greatly diminished sexual receptivity in females, whereas corresponding ablation in males reduces both mating and aggression (Yang et al., 2013). This sex difference appears to be related to the differing function of progesterone in males and females, but this study also provided some insight into the mechanism of action of the VMH.

A focal region controlling aggressive behaviors was identified through optogenetic activation of Esr1+ neurons within the ventrolateral subdivision (VMHvl) of the ventromedial hypothalamus, wherein it was observed to induce aggressive behavior in male mice, leading to attacks directed other mice and inanimate objects (Lin et al., 2011). While activation of the VMHvl was initially only observed in male mice, further studies confirmed the presence of this phenomenon in females (Hashikawa et al., 2017). Subsequent optogenetic studies revealed that lower activation of ESR1+ cells in the VMHvL modulated mounting behaviors in mice (Lee et al., 2014). This discovery not only emphasized the multifaceted role of the VMHvl but also connected the two seemingly unrelated social behaviors.

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Regional Circuitry

In 1999, researcher Sarah Newman proposed the Social Behavior Network (SBN), highlighting regions of the amygdala, hypothalamus, and midbrain in regulating social behaviors. These specific regions share a commonality in that they are highly reliant on sex hormone receptor expression and are extensively interconnected (Newman, 1999; Guo et al., 2023). The proposition of the SBN laid the groundwork for understanding the larger neural circuits at play.

In a region adjacent to the amygdala, the bed nucleus of the stria terminalis (BNST) PR Esr1 neurons have been identified as orchestrating the transition from appetitive (the searching phase) to consummatory (stereotypic behavior completing an innate drive) phases of social behaviors by altering neural representations of sex and behavior in the hypothalamus (Yang et al., 2022). This brings up the question as to whether the observed overlap in the SBN was necessarily correlated with all aspects of sexual and aggressive behavior.

In pursuit of refining the SBN, researchers Guo et al. used cross-regional correlational analysis after multi-site optical records in mice to better establish the functional connectivity during the social behaviors of attack and mating (2023). This has led to the proposal of a mating-biased network (MBN) and an aggression-biased network (ABN) (Guo et al., 2023). The initiation of copulatory and violent behaviors have been characterized by remarkable increases in functional connectivity across various brain regions, indicating a heightened state of coordination; however, as these behaviors progress into its later stages, connectivity at a network level drops significantly (Guo et al., 2023). This suggests that the brain is entering a dissociated network state, which may represent a crucial shift in the neural dynamics governing copulatory and violent behaviors (Guo et al., 2023).

Furthermore, the observed dissociation in network states during the later stages prompts speculation on potential regulatory mechanisms or adaptations that might occur as behaviors progress. This phenomenon invites a closer examination of the temporal dynamics within these neural networks and raises intriguing questions about the functional significance of such convergence and dissociation. As we navigate this complex intersection, there are many philosophical and evolutionary hypotheses, offering perspectives on the integrated nature of these neural networks and their broader implications for our understanding of deviant human behavior.

Evolutionary Theories

David Anderson, a neurobiologist at the California Institute of Technology, notes parallels between sexual behavior and aggression in the animal kingdom. In an In an interview with Quartz, Anderson said, “[Sex and violence] both involve an initial approach and close investigation, a lot of sniffing and sensing, and in some animals you see that sexual behavior can be accompanied by aggression, for example, biting.” (Goldhill, 2016). This observation highlights the connections between the two behaviors in many species. Territorial aggression, mate competition, mate guarding, and complex courtship rituals are among the overlapping factors that contribute to an interplay between sex and aggression, showing strategies that have evolved across species to ensure reproductive success.

Anthropologists have attempted to explain the origin of human warfare using sociological and evolutionary theories but have struggled to find empirical evidence for such developments. One theory investigated is sexual selection theory, expanding from the idea of natural selection. Proposed by Charles Darwin, the sexual selection theory suggests that developed behaviors and traits offered an advantage in the competition for mates. Sexual behavior may have led to a need for combative behaviors, especially inter-male aggression. In a study done by Chang et al. in 2011, the association between mating and warring was neurologically investigated. With proximate cuing of opposite-sex stimuli, heterosexual male participants had a faster response time for war-related terms than generally aggressive terms (Chang et al., 2011). While these findings offer insight into a neuropsychological relationship between mating and warring, the research emphasizes the need for further neuroscientific exploration on the intricate interplay between war-related mechanisms and mating behaviors.

Another theory, the “Challenge Hypothesis,” suggests that testosterone levels exhibit changes from external cues, particularly during the breeding season. In 1990, while observing male birds' testosterone levels during different seasons and social challenges, Wingfield and colleagues synthesized this hypothesis to explain the impact of competition on endocrinology. Researchers observed low testosterone levels during the non-breeding season and an increase at the beginning of the breeding season, as well as during social conflict like territory or mate competition (Wingfield et al., 1990). The change is hypothesized by Wingfield et al. as caused by external cues like changes in day length (1990). The testosterone onset results in development of secondary sex characteristics, expression of reproductive viability, and aggressive behavior as an advantage against competition.

Defining Sexual Disorder

The categorization of sexual disorders has undergone significant evolution throughout history. Early perspectives, influenced by religious and cultural views, often pathologized certain sexual behaviors like homosexuality and promiscuity. Sigmund Freud's contributions introduced the notion of the unconscious mind, adding a psychoanalysis perspective. Over time, there has been a notable trend toward de-pathologization, recognizing the diversity of sexual behaviors, and consideration of boundaries like consent.

During the 19th and 20th centuries, sexual behaviors, particularly in women, were heavily medicalized. The term "nymphomania" was used to label what was perceived as excessive or uncontrollable female sexual desire. Treatment strategies for nymphomania were often drastic, involving oppressive interventions like confinement in mental institutions, forced restraint, dietary restrictions, and even surgical procedures such as clitoridectomy (Goldberg, 1999). These historical approaches reflected patriarchal attitudes and lacked the nuance of contemporary understandings of sexual health.

From an evolutionarily functionalist perspective, purity culture can be viewed as a societal mechanism that addresses the challenge of paternal uncertainty (Kupfer and Gul, 2023). This cultural phenomenon places a strong emphasis on controlling women's sexuality. By promoting strict sexual norms and discouraging premarital or extramarital sexual relations, purity culture seeks to minimize uncertainty regarding paternal lineage. In ancestral environments, where resources and protection were essential for offspring survival, ensuring accurate parentage held significant adaptive value. While an infant can be easily recognized as related to the mother, asserting who the father is was less secure before genetic technology. Having multiple caretakers plays an impactful role on the child's survival, as resource acquistion and defense increases. Thus, purity culture, in the forms of male jealousy and mate guarding, may have evolved as a social strategy to enhance reproductive success (Kupfer and Gul, 2023).

In the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III), the term "nymphomania" was absent, with the concept considered within the broader category of sexual disorders not otherwise specified. Subsequent editions have shown a shift towards more specific diagnoses. In the current DSM-5, Compulsive Sexual Behavior Disorder (CSBD) emerged as a diagnostic category (American Psychiatric Association [APA], 2013). This disorder is characterized by an individual's constant preoccupation with sexual thoughts, urges, or behaviors (APA, 2013). The persistence of these patterns leads to significant distress or impairment in the individual's life, emphasizing the clinical significance and impact on overall well-being (APA, 2013). This transition in definition reflects a move away from vague and stigmatizing terms to more precise and clinically meaningful language. The diagnosis of CSBD also utilizes gender-neutral language, indicating a positive change from sexist stereotypes and oppressive norms.

One ongoing challenge in sexual disorder psychiatry is determining what qualifies as excessive preoccupation or too persistent libido. The criteria for compulsive sexual behaviors are outlined, but cultural norms and individual awareness about such play a crucial role (Levine, 1988). Despite progress in understanding sexual disorders, the neurobiological mechanisms underlying conditions like CSBD remain incompletely understood, so no testable biological marker exists for diagnosis. Ongoing research seeks to clarify the neurological underpinnings of hypersexuality, aiming to shed light on the complex interplay between biology, psychology, and cultural factors in defining and diagnosing sexual disorders.

Dysregulation of Circuits

Intermittent Explosive Disorder (IED) is a psychiatric condition characterized by recurrent, impulsive outbursts of aggression that are disproportionate to the stressors triggering them. While the etiology of IED is complex and incompletely known, research has found that childhood sexual abuse is particularly associated with development of IED (Nickerson et al., 2012). Sexual abuse may lead to alterations in the development and function of the intersecting sexual and aggression neural pathways, potentially causing vulnerability for dysregulation of emotional responses and impulse control.

Neurobiological changes may involve alterations in the functioning of neurotransmitters, such as serotonin, which play key roles in modulating both aggressive and sexual behaviors. In IED treatment, fluoxetine, a selective serotonin reuptake inhibitor (SSRI), was found superior to placebo in causing an anti-aggressive effect for patients (Coccaro et al., 2009). However, full or partial remission of impulsive aggressive behaviors occurred in almost half of fluoxetine-treated subjects, raising questions at its long-term efficacy (Coccaro et al., 2009). Dysfunction between the prefrontal cortex and amygdala may also contribute to an increased propensity for aggressive outbursts (Best, 2002). Understanding the neurological basis of IED with awareness of relation to childhood sexual abuse is important for developing targeted interventions that address both the underlying neural circuitry and behavioral issues from a larger context.

Psychiatric Treatment

Before the 1960s, sexually aggressive men were given estrogen therapy, many times without consent in psychiatric hospitals (Laws and O'Donohue, 2008). This practice was based on the early hypothesis that reducing testosterone levels by balancing with the primary female sex hormone might decrease aggressive behaviors. The practice was discontinued due to adverse side effects, inconsistent results, and ethical concerns. In the 1960s and subsequent decades, stereotaxic hypothalamotomies and amygdalotomies were used to treat behavior disorders marked with extreme aggression (Narabayashi and Uno, 1966; Schvarcz et al., 1972).

During this period, at least 70 men underwent stereotaxic hypothalamotomy for sexual offense or "deviancy" in West Germany (Rieber and Sigusch, 1979). These surgeries mostly consisted of destruction of the subdominant side of the nucleus ventromedialis hypothalamus, but other regions like the area preoptica and posterior tuber cinereum were sometimes also destroyed (Rieber and Sigusch, 1979). The surgeons regarded the hypothalamus as the "mating center" and control center of sexual feelings.

American critics, like Rieber and Sigusch, raised ethical concerns about such procedures, citing results as inconsistent and how the individuals operated on were not all criminal offenders (1979). Post-operation rating systems were utilized to gauge recovery and success but displayed explicit homophobic bias. The most "normal" and "healthy" outcome was described as the ability to maintain a heterosexual relationship (Rieber and Sigusch, 1979). While some individuals operated on were convicted offenders, some individuals only had a history of homosexual relationships with consenting adults, thus showing how the definition of "deviancy" has been subject to change and prejudice (Rieber and Sigusch, 1979).

Another concern raised with neurosurgery in addressing sexual disorders was that insufficient preoperative effort was taken before the risky surgery.

Most of the patients had no record of any psychotherapeutic treatment before surgery (Rieber and Sigusch, 1979).

Sexual offender cognitive-behavioral treatment programs have been found to have mixed results on the conclusivity of effectiveness in reducing recidivism. In 2002, Craissati et al. conducted a study on the reconviction rates of child molesters in the United Kingdom based on treatment type and length. Subjects completed the Structured Anchored Clinical Judgement Scale (SAJC), which tests risk of breach, and the Multiphasic Sex Inventory, a psychological assessment tool for sexual function and behavior. While SAJC was moderately accurate in predicting reconviction, Craissati et al. found that there were no significant cognitive changes pre- and post-treatment in prevention (Craissati et al., 2002). Instead, the reconviction rate was more strongly associated with whether the individual had been "sexually victimized" in childhood than any treatment variable (Craissati et al., 2002).

This finding is similar to Schweitzer and Dwyer's 2003 study conducted in Australia, which found no statistically significant recidivism reduction following participation in a cognitive-behavioral program. However, both studies had limitations of small sample size and attrition of post-treatment feedback from participants (Craissati et al., 2002; Schweitzer and Dwyer, 2003). Many other meta-analyses have found that CBT therapies are effective in reducing recidivism of sexual and violent as a societal mechanism that addresscombination behaviors (Alexander, 1999; Furby et al., 1989; Hall, 1995; Hanson et al., 2002).

In recent years, there has been a growing interest in exploring neuropharmacological interventions as a treatment of sexual offenders. This approach involves targeting the specific neurotransmitter systems and neural circuits explored earlier that are related to the manifestation of deviant sexual behaviors. Pharmacological interventions aim to mitigate impulsivity, reduce compulsive sexual urges, and address the underlying neurobiological factors contributing to offending behaviors.

SSRIs are noted as having four possible mechanisms of action in clinical treatment of sexual offenders: non-specific inhibition of sexual interest, reduction of impulsivity, decrease in obsessive-compulsive symptoms, and decrease in depressive symptoms (Garcia et al., 2013). SSRIs have been associated with a reduced sexual libido and decreased orgasm in 60-70% of individuals (Montejo et al., 2001). SSRIs therefore offer a regulatory influence on unwanted sexual urges.

The concurrent association of paraphilias and obsessive-compulsive disorder is a complex and controversial topic, as some psychologists hold theories relating the two disorders (Baylk, 1997), but such models are hypothetical, based on case studies, and lack robust research.

Beyond SSRIs, emerging research has also explored the potential of antiandrogenic medications and Gonadotropin Releasing Hormone (GnRH) analogs in the pharmacological treatment of sexual offenders. Antiandrogens target the endocrine system, specifically reducing testosterone levels, thereby diminishing libido and sexual drive. While the use of testosterone reducing drugs has shown promise in some cases, concerns about adverse side effects exist. Low testosterone can contribute to bone loss and osteoporosis (Orwoll and Klein, 1995). Other potential side effects of antiandrogens and GnRH include hot flushes, depression, weight gain and gynaecomastia, or the enlargement of male breast tissue (Laws and O'Donohue, 2008).

The complex interplay between neuropharmacological interventions and the multifaceted etiology of sexual offending underscores the need for further research to refine treatment protocols and enhance our neurobiological understanding of these behaviors.

Conclusion

The exploration of sexual and aggressive behaviors has evolved from distinct fields into an interconnected study, tracing historical perspectives, physiological understandings, and contemporary applications. Early investigations separated sexual behavior and aggression, focusing on reproductive processes and confrontational responses, respectively. Advances in neuroimaging and optogenetic techniques have allowed a dynamic view of neural processes during sexual and aggressive behaviors. The amygdala and hypothalamus, crucial in modulating emotions and integrating signals, play key roles. Understanding the overlapping brain regions regulating both sexual and aggressive behaviors provides valuable insights into the intricate interconnections within the human psyche and explanations into some of our most universal mechanisms.

Drawing from evolutionary theories, the coexistence of these behaviors in our ancestral past meant reproductive success and adaptive advantage. This neural understanding has modern, practical implications, particularly in the context of sexual and aggressive disorders. Recognizing the neural convergence underlying these conditions allows for a more comprehensive approach to psychiatric treatment, but the historical context also brings awareness to the necessity of ethical consideration.

As we navigate the complexities of psychiatric intervention, addressing sexual offenders requires a nuanced understanding of the neurobiological mechanisms and psychological patterns occurring. Overall, the exploration unveils a complex interplay of biological, psychological, and sociocultural factors, necessitating ongoing research for targeted interventions.

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In Defense of Objectivity

Pursuing Truth with Respect to Core Cognition

Cameron Chieppo

It is a necessary truth of human existence that every experience we are able to perceive must be filtered first through our senses, which must then be interpreted by the brain. Our perceptions are inherently biased by our very biology; each individual's reality is merely an approximation of events that are limited and altered by their body's biological hardware. We obtain information from experience which we necessarily must integrate within individual conceptual frameworks, as our own perceptions are all we may ever know. But there are universal qualities that are retained across all humans—including our unique ability for higher-order logical reasoning and complex inquiry. Logic and reason themselves draw their sources from our external environments; the existence of the outside world underlies all things, even if we may not ever be able to fully understand its intricacies as biological beings. Even still, the consciousness that our brains have bestowed upon us struggles to understand how we may arrive at objective truths in a world that is necessarily filtered through perceptual bias. Modernist thought in the philosophy of science explains that there exists objective truth which we find coherent, even in spite of our inherent cognitive limitations. Reaching objective truth is only possible because we are rational beings—it is our capability to use reason which defines a central "core cognition" retained across the human species. This cognitive core is an intrinsic quality within all humans that allows us to understand the outside world separately from our lived experience by using logic and rationality. We may accept the existence of coherent, objective truths describing reality despite our brain's subjective interference by maintaining that our consciousness allows us to justify empirical observations in relation to a rational cognitive core–a trait which itself lies central to the universal human experience.

Progress and the Pursuit of Objectivity

We may define objective truth as those necessary and apparent facts describing reality that exist outside of human observance; our quest to coherently understand these facts does not change their function or place in the universe. At the basis of all human experience lies basic, fundamental truths about reality that shape the very core of our conceptual frameworks. Indeed, there are certain natural phenomena that remain true across all humans, and which create the basis of understanding for our species. When a force is applied to an object, it will proceed along an approximately predictable trajectory; more broadly, any action in any context requires a reaction. We are only able to observe the world as a series of relationships between a cause and its supposed effect. The existence of an action and its reaction remain empirically true even when the mechanism underlying their relationship remains unclear.

However, our interpretation of how and why these phenomena occur is in a constant state of flux. Our brains, for all their complexity, could never compute or understand the infinite number of factors influencing the exact trajectory of the object; the limitations of our sensory organs set the baseline for what information the mind is able to interpret at all. Yet the brain is still able to make inferences about these effects despite being presented with incomplete information. For instance, the middle temporal visual area in the occipital lobe can approximate a moving object's path despite limited visual input [1]. The innate rationality of human cognition endows us with the capability to look beyond separate sensory inputs to piece together an accurate picture of reality.

The perceptual limitations of an individual can still allow for many conclusions to arise even from identical empirical observations of the same phenomenon, conclusions which are equally plausible to the brain. One individual may understand the discovery of a new species to be evidence of a god's creative ability, and another individual might use the same discovery as proof of Darwin's theory of evolution. In the absence of objective truth, this underdetermination between observation and theory would make science dependent on the perspective of the viewer. Most humans are born with similar sensory systems; neuroscience shows us that each of our brains integrate information from vision, audition, olfaction, etc., using similar neural pathways. It is due to unique differences in higher-order brain regions which results in differing interpretations about identical stimuli. Observations are influenced by conceptual frameworks, and it becomes logically impossible to escape our a priori assumptions about reality. We must find a way to understand reality beyond bias in order for objective truth to be reachable.

Theories may require subjective imposing for their creation, but they must withstand attempts at falsification to be accepted. Our core cognition seeks to understand relationships between events; when we can discount the existence of certain relationships between phenomenal causes and effects, we can narrow our scope for what objective truth might be. Karl Popper explained that falsification offers us certainty against the threat of underdetermination—even if we may not be able to ascertain the true nature of reality from induction due to our perceptual limitations, we can rule out those theories we know are false in pursuit of the truth [2]. The current epistemology of science operates under the assumption that our experiments today may be proved false in the future, and in doing so presents a bulwark against the idea that science is a social construction while acknowledging our subjective biases. The brain is able to recognize the absence of a relationship between events far more effectively than it is able to identify the exact nature of a relationship between a cause and an effect. Even still, there remain numerous empirically consistent theories with equal claim and predictive power to reality—science must distinguish between these theories for a cohesive objective truth to exist.

Natural resistance to theory proves that objective truth does exist and suggests the direction that science must act toward in pursuit of an accurate explanation of reality. Anomalies within theories are the incarnation of resistance; through resistance we may pursue understanding of reality independent of conceptual schemas. The threat of underdetermination dissolves when we possess criteria for theory formation which determines the efficacy for a particular idea to explain apparent facts about reality. For example, Newtonian physics' inability to accurately describe objects in motion near light speed gave Albert Einstein the platform to propose his theory of relativity. Not only did Einstein account for the same empirical evidence that Newton had, but Einsteinian physics extended its explanatory power to account for empirical evidence that Newtonian physics failed to explain. In this way, progress is rational; paradigms shift because new theories reach beyond the limits of old ones. The continued existence of anomalies in current accepted science does not mean science is false, or that the apparent truth of theories is simply explained by subjective relativism. To the contrary, anomalies point to those areas of thought that have not arrived at objectivity yet and require further exploration to do so.

Given that we only have access to the world through our conceptual schema, those facts that resist subjective truth prevent science from resting purely on relativism. Even if our knowledge is colored by our perceptions and neurological biases, there are necessary and apparent facts about the world that cannot be reconciled by any amount of subjective imposition. If something exists, it will make a deliberate verdict to the conceptual scheme of all humans—it shapes the cognitive core. Even acknowledging that our definitions of terms within theories are clouded by subjectivity, those definitions must satisfactorily explain the relationships we are able to observe in the world. Perhaps the language, visualization, and conceptual framework used to explain an electron might vary between cultures possessing different schemas—however, the physical existence of a negatively charged subatomic molecule, as well as the fundamental relationships between the dispositions of observables associated with that molecule will be retained. To reduce apparent facts about the world to perceptual illusions founded on bias assumes a level of arrogance about humanity's place in reality as a whole and ignores apparent truths independent from human perception.

Progress as a phenomenon may be best understood when we compare our current collection of knowledge in relation to that which we held at any arbitrary point in the past. Accepting that we are confined by our perspectives does not disprove the existence of objective truth, it only explains why we must use our rationality to arrive at those truths unbiased by subjectivity. In doing so, our conceptual schemes themselves evolve as we gather more objectively true facts about reality—we cannot move backwards from these truths. The discovery that the Earth revolves around the sun ensured that scientific thought could not regress into heliocentrism. When science arrives at truths that are separate from human perception, we must integrate those facts into new theories. In this way, our understanding of reality evolves increasingly closer to objective truth over time. To argue otherwise rejects human rationality, which is central to our collective cognitive core.

Conceptual schemas are the precursor for any knowledge, but knowledge must still be integrated within those schemas in a logical way. This fact separates science from pseudoscience or religion; the ability to update our understanding of reality is crucial to obtain more accurate knowledge of the world over time. Similarly, constant modification to accommodate new information or changing environments is an important component of cognitive functioning. Neuroplasticity shows us that synapses continuously undergo long-term potentiation or depression, strengthening or weakening connections in response to changes in activity–the fundamental process underlying learning and memory. Scientific progress can be understood to be a form of collective learning, where outdated cognitive categories are sacrificed to accommodate new insights about reality. It is these fixed and agreed upon concepts that the collective cognitive core of the human species revolves around and objective truth can exist.

We can define truth relative to the human species as a whole to account for perceptual biases inherent to any particular individual. Modern science rests on the idea of corroboration; any conclusion derived from an individual experiment must be replicable and obtainable by any scientist, regardless of the conceptual schemas that cloud their perceptions. Experimental design rests on hard data that is independent from bias. For example, statistical correlation suggests a causal relationship between smoking and the development of cancer. The methods through which that data is obtained, as well as the conclusion that cancer is directly caused by smoking (rather than cancer being a related side effect of smoking) can be challenged because those factors are determined by subjective human ideas. But when numerous studies using many different methods obtain similar results and arrive at identical conclusions, science can safely assume a causal relationship. It is through species-wide agreement that we can reach objective truth and account for illusions that cloud the neurobiology of individuals. When the same conclusions can be determined by many scientists possessing a diverse array of conceptual schemas, we can hold those conclusions to be accurate representations of reality.

Totality & Human Neurobiology

Objective truth must be understood in relationship to the totality of all human knowledge to account for the perceptual differences inherent to individuals. Hegelian philosophy proposes that reality can be best understood not as a collection of isolated events, but as a dynamic and interconnected whole that relates each part together [3]. Just as individual conclusions must be understood in relationship to species-wide agreement through corroboration, so too must our perceptions be understood in relationship to all other observable phenomena we have experienced within our unique conceptual frameworks.

Within the context of our individual neurobiology, perceptual evidence is integrated into the totality of our experiences. Rather than serving as an argument for relativism, it is this fact that explains how each subject can arrive at objective truth by relating apparent facts about reality to a cognitive core that centers around rationality. The brain does not process sensory information in isolation but integrates those perceptual signals with higher-level cognitive reasoning. For example, the orbitofrontal cortex is a neural structure in the frontal lobe which plays a key role in decision-making by integrating sensory inputs from visual, auditory, somatosensory, taste, and olfactory stimuli . Evidence is accumulated and related to a larger conceptual framework that accommodates all experiential knowledge to make a choice, allowing or inhibiting a response. The validity of any individual perception is determined in relationship to a holistic network of experiences, which themselves are founded on fundamental truths about reality. The validity of our perceptions is not decided solely by the strength of any one piece of evidence. Rather, the integration of sensory evidence must fit into the broader context of cognitive understanding about objective reality. Objective knowledge is more than the summation of experiences because experiences are dynamically understood in relation to core truths about reality. Truth is apparent in the whole, and the dialectical synthesis of evidence within the framework of the mind allows an objective reality to be coherently understood.

Consciousness itself is far more complex than the sum of all the physical processes that make up individual neural structures. The brain is composed of physical matter and therefore is founded on physical principles that characterize each neural substrate. Although consciousness is dependent on physical phenomena, it cannot be fully understood by simply appealing to the interactions between simpler elements. Instead, consciousness is an emergent phenomenon deriving from neural activity—the complex and dynamic nature of consciousness forms the basis of the cognitive core and allows for unbiased rationality. We are not slaves to subjective experiences because we possess the ability to look beyond them in pursuit of objective truth. The brain can recognize its own limitations to separate illusion from truth in the face of contradictory or novel evidence. Thus, human beings are able to acknowledge and therefore account for their own subjective biases. In doing so, we can search for neutral phenomena that exist separately from human perception and arrive at objectivity.

The physicality of human neurobiology imposes limitations on what can be known; therefore, objective truth must still be defined relative to the human species itself. Acknowledging these limitations does not imply that objective truth cannot be understood by human beings, only that we have an obligation to pursue those objective truths we have access to with respect to our cognitive abilities. We can never know the subjective experience of other organisms—to attempt to understand the worldview of an amoeba is impossible because they operate solely within an entirely foreign experiential context. Like amoebas, humans are similarly confined by their subjective perspective of reality. Through rationality we can pursue objective truth and separate apparent facts about reality from bias, but only regarding truths that are understandable from the human vantage point. If truth is derived in relation to the whole, we are intrinsically prevented from fully comprehending how our experiences relate to the macro-scale of the universe or the micro-scale of the sub-quantum realm. We possess the ability to understand objective truth only at the level of human experience because of the biological hardware we are endowed with. Unless we can create technology that reaches beyond the bounds of our cognitive limitations, we are relegated to pursuing objectivity only within the context of human experience which we can understand.

The Post-Modernist Threat to Objectivity

During the late twentieth century, the philosophy of science began to reject the possibility that we have access to objective truth at all due inherent subjective bias present in all human experiences. The Strong Program holds that science is the outcome of social, political, economic, and other external factors that necessarily cloud scientific ability to accurately understand the world. In this view, reality itself is a social construction; postmodernists use the symmetry thesis to argue that theory formation requires the negotiation of experiential observations with sociological & psychological factors that determine the direction of science itself. If scientific findings are constructed only relative to societal norms, then any claims put forth to describe reality are underdetermined. The idea that truth cannot exist independently from subjective bias rejects that humanity possesses the capacity for reason and threatens science's ability to determine objective truth at all.

The problem of induction is a foundational issue for the Enlightenment Project that is based in empirical observation. Acknowledging the circularity of induction explains the significance of the underdetermination threat in theory formation. In David Hume's famous example, we cannot assume that a billiard ball striking another is causally related to the second ball's motion, simply because we observe the two events in relation to each other [4]. We can never know for certain that the resulting motion was not caused by an infinite number of other factors beyond our perceptual abilities, and we rely on our a priori assumptions to predict the outcome. Willard Quine attacked the two pillars supporting logical empiricism as he argued for the impossibility of reconciling specific observations with theory [5]. Our experiences are necessarily informed by prior conceptions; pure forms cannot exist because they must be organized and explained relative to human experience, which is inherently colored by bias. Language is our best means for describing pure forms and establishing nuance, but is inherently subjective in its formulation; thus, form cannot be distinguished from biased content. Conversely, apparent and necessary truths can only prove their consistency within their own system—which is logically impossible according to Gödel's incompleteness theorem. Gödel explains that if math can only be verified using math or induction can only be verified through induction, then even our baseline understanding of truth is colored by immediate experiences. To followers of Quine, our perceptual limits deriving from our sensory experience and our cognitive integration of those experiences prevent us from establishing objective truth in relation to individual events. The Enlightenment Project collapses under its own weight because it always relies on subjectivity to establish truth, owing to the fact that communication itself cannot establish pure definitions.

However, language can still be used as a tool for rational discourse in pursuit of objective truth even if we accept the presence of subjective interference in relating form to content. To discard human rationality outright assumes that a pathway cannot exist to separate objective truth from perceptual bias. Jürgen Habermas attacks this notion and offers a solution through the concept of communicative interaction [6]. He argues that formal universal norms exist within communication that define the bounds of rational discourse. Individuals are able to make claims about reality determined from their conceptual frameworks and based on reason. Although these claims are based on subjective experience, engaging in rational discourse with individuals who maintain their own antithetical claims about reality ultimately allows language to facilitate the comparative analysis of differing claims in pursuit of agreement. Falsification and corroboration are central to this thesis; participants in discourse can falsify the claims of others and discard irrelevant ideas in pursuit of compromise between individuals who maintain a variety of conceptual frameworks. Communication of ideas is central to core cognition because it allows human rationality to be compared between experiential networks. It is for this reason that the brain evolved complex and distinct brain regions dedicated to both speech production and language comprehension. Humanity itself has obtained its evolutionary success through its proficiency at engaging the collective whole, rather than relying on any individual subject. Through rational discourse we are able to understand those truths that persist through many different perceptions of reality intersubjectively. It is these retained truths that we may maintain to be the best representation of objective fact.

Post-modernist thinkers reject the existence of general progress within science. Thomas Kuhn explains that progress can only be made in relation to the reigning paradigm of an age. A scientific revolution only expresses a shift in the questions that science seeks to answer, which are determined by the historical context in which they are posed. To followers of Kuhn, cognitive knowledge of the world has no inherent direction of development;

instead, changes in worldview dictate shifts in scientific thought with respect to external motivations and ideas. Paradigms are incommensurable with each other in that they have no common measure to reduce or translate the meaning of one paradigm to another. Progress is possible only within the paradigm of a given age as a measure of human ability to solve the context-bound questions they pose. Fragmentation within scientific thought is central to the postmodernist thesis that rejects progress toward a singular, overarching, objective truth. Instead, postmodernists argue that knowledge is reflective of the collective experiences that make up each individual's conceptual framework, each claim equally accurate in describing reality as the subject perceives it. Within postmodernism, different interpretations of reality deriving from diverse perspectives are determined by fragmented experiences—these truths are incommensurable with one another. Thus paradigm shifts are more akin to religious conversions in the sense that choosing between them is a matter of subjective preference, rather than a pursuit of coherent objective truth.

To place science at the same level of religion or pseudoscience rejects the fundamental fact that science gifts humanity unparalleled predictive power and utility. We cannot escape our perceptual biases—they are the foundation upon which all our cognitive abilities rest. But reason itself is fundamental to the human experience and is retained between the conceptual schemas of all people. There exist concepts that are fixed and agreed upon independent of subjective experience—and through communicative interaction, we are able to identify these concepts. We must come to terms with progress through history; the rationality that characterizes our collective cognitive core allows us to understand that science has provided the structure for the advancement of modern society as we know it. In the totality of our knowledge lies objective truth, which we have an obligation to pursue despite subjectivity that necessarily clouds our access to reality. Fragmentation, like anomalies, identifies the restrictions of our current collective knowledge. Disagreement suggests falsity, and falsity suggests the existence of truth. We must reject incommensurability as we attempt to reconcile observations with theory, such that we may accurately classify that which we perceive individually within categories that humanity as a whole can agree upon. In doing so, we may safely reject relativism as a threat to rationality and to our cognitive core as we seek to reduce differences in meaning and pursue true species-wide agreement.

Humans struggle to identify their place within a reality that can never be directly comprehended. We are at once too limited by our neurobiology and perceptual organs to see beyond ourselves to understand the totality of all relationships in the universe, and simultaneously too fragmented by our creativity bestowed by consciousness to collectively agree on every apparent truth we experience. We are little more than thinking meat all things considered—our ability to question a reality beyond our understanding is what gifts humanity its unique capacity to conduct science. Science itself is the tangible representation of our pursuit for coherent, objective truth. Only by incorporating our individual experiences into the larger whole of the human species itself will objective truth reveal itself. Although reality is clouded by bias, our collective cognitive core endows us with reason that is retained between all humans. Rationality entices us to attempt to understand a universe far more complex than our biological hardware was ever intended to comprehend.

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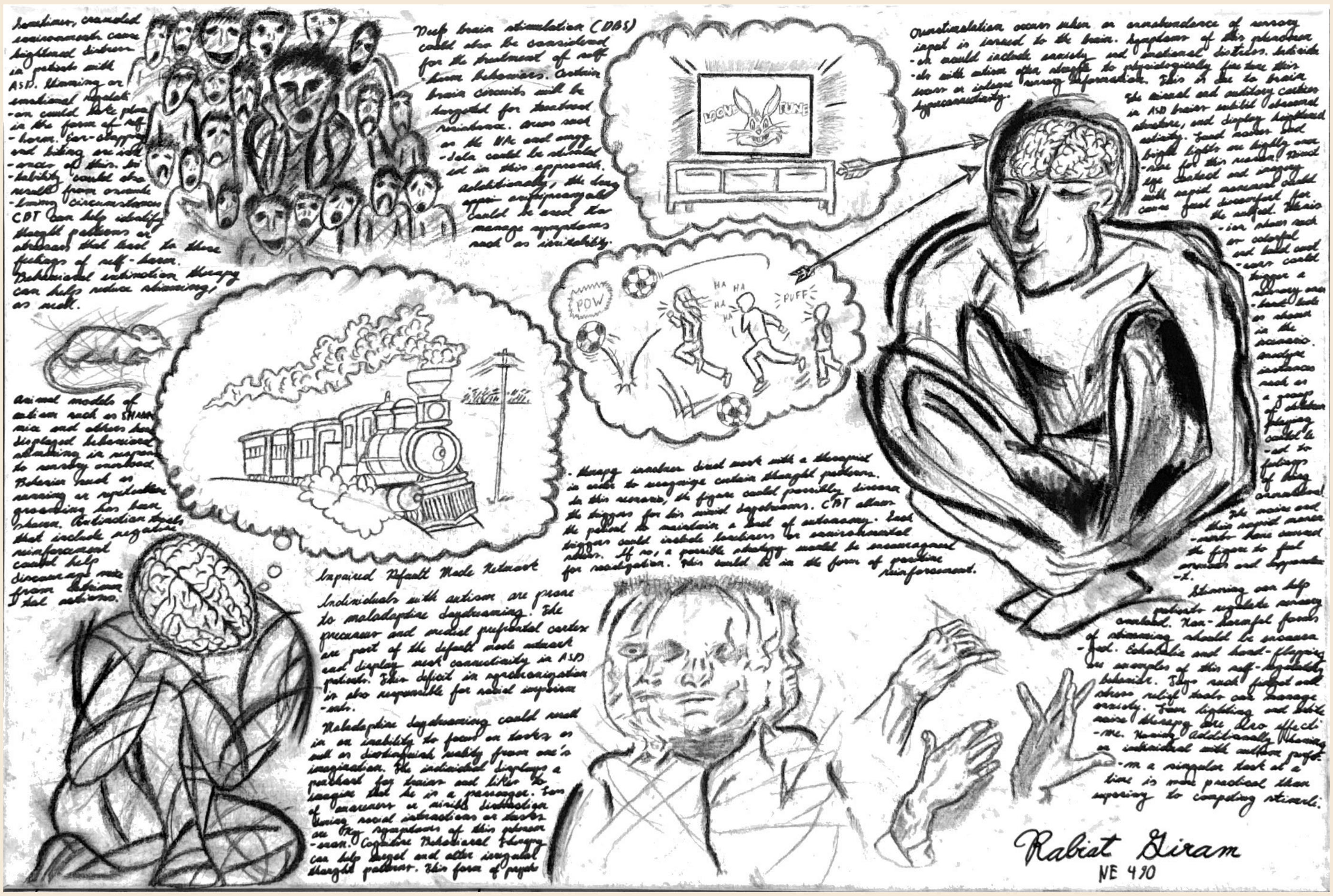
INSIDE THE SPECTRUM:
THE DIFFERENT FACES OF AUTISM

RABIAT GIRAM



"This nuanced charcoal and black chalk drawing captures the complexities of Autism Spectrum Disorder (ASD) through a series of expressive figures, each embodying different aspects of the spectrum. The composition highlights the individuality of those with ASD, emphasizing that no two experiences are identical. Varying in intensity, the depicted traits range from non-verbal communication and sensory sensitivities to hyperactivity and subtle social difficulties. The artwork also integrates elements representing management strategies, offering a visual exploration of support mechanisms such as structured routines, therapy, and sensory accommodations. Through its layered textures and dynamic contrasts, this piece conveys both the challenges and the diverse strengths of individuals on the spectrum."

- Rabiat Giram

VALUES IN PSYCHOTHERAPY:

A CATALYST FOR BEHAVIOR CHANGE

SAMUEL KINCH

There is nothing more important for humans than the pursuit of what gives our lives meaning. Our personal values can serve as our guiding principles, defining who we are and directing where we go next. For the most passionate of our values, many would face great suffering or even death in the knowledge that they would be fulfilled. In 2011, a street vendor in Tunisia doused himself in paint thinner and lit himself on fire in an effort to stand up against decades of oppression and corruption in his country, setting off the Arab Spring. Many activists have since followed, trying to change a world they would never see. Values have the power to guide our behavior without external reinforcement, allowing ordinary actions to bring us deep satisfaction (Berghof et al. 2018). No other motivator has the ability to make actions as extreme as death seem reasonable. It is not surprising, then, that the identification and use of personal values are essential in understanding psychological well-being and for motivating meaningful change in our lives (Hoyer et al. 2019).

Psychotherapy can provide this ground for positive movement. Not only do clients and therapists work on the symptoms that are causing distress and problems in normal functioning, but also they assess the values of the client and connect the broader therapy goals with their greater life fulfillment. In working toward their most important goals, clients are able to endure demanding and unpleasant experiences (Vyskocilova et al. 2015). One of the most challenging realizations in the therapy hour is that usually, at some level, we must willfully experience our unwanted feelings to strive toward our life's meaning. This encounter could mean a socially anxious father arriving early to his daughter's soccer game, having to speak with the other parents, or a girlfriend with a history of trauma deciding to be intimate with her partner despite the flashbacks it causes (Hayes et al. 2012). In fact, our fears relating to our past experiences often get in the way of forming meaningful relationships in the here and now. For instance, a client with persistent beliefs regarding their worthlessness and anticipated rejection will struggle with their goal of finding a sustaining life-partner. To truly strive for the intimacy of a long-term relationship, that client must to some degree face one of their biggest anxieties.

The alternative to avoidance–committed, intentional, value-based action in the context of psychotherapy–offers the potential to bring overwhelming positive growth to our lives. In one study, clients with generalized anxiety disorder who underwent an acceptance and values-based treatment reported a significant increase in valued behavior, with that change in valued action predicting better quality of life outcomes from treatment (Michelson et al. 2011). In another study, this time with clients with treatment-resistant panic disorder, increases in functioning were associated with increases in valued action. Interestingly, clients with worse panic symptoms pretreatment had the largest increase in valued action, and generally all participants reached similar endpoints in that regard (Wersebe et al. 2017). A third study displayed that reductions in cognitive fusion (treating thoughts as literal truths) and increases in values-based action are related to improvements in depression and general mental health. (Bramwell & Richardson 2018). The values clarification process itself can be therapeutic and lead to a boost in multiple facets of quality of life and subjective well-being (Diener & Suh 2000, e.g. Ge et al. 2019 as cited in Kulich & Chi 2023). Even GPA can be positively impacted by values training, compared to students who received a goal-setting-only intervention and a waitlist (Chase et al. 2013). Dozens of other studies have demonstrated the power of values work in enhancing important domains in our lives (See Rahal & Gon 2020 for a systematic review of values interventions in one treatment framework).

For effective use in psychotherapy, a client's values often need to be explicitly spelled out. Clinicians across modalities use a number of values clarification exercises–some more direct than others–in order to bring these often-repressed drivers to the surface. Traditional cognitive behavioral therapy (CBT) focuses on goals, defined as the concrete, measurable, more practical results of therapy, but informs them using the client's values, i.e. "what is really important to them in life" (Beck 2021, p. 20). For Abe, a case example used by CBT expert Judith Beck, a few of his values were being responsible, competent, and helpful to others. A few of his goals were to be a better father and to get a job. CBT clinicians elicit these values using open-ended questions such as "What do you want your life to be about?" After these values and other presenting issues are discussed, the therapist works with the client to develop the goals that might help the client move toward their values. Other clinicians might spend more time on value work, going through more profound exercises to obtain more deep-rooted, transcendental value statements, then using them to reaffirm adherence through the months of difficult sessions ahead. The most moving of these is the eulogy exercise, where the therapist has the client imagine attending their own funeral and asks them what they would like most for their loved ones to say about them, even if they have not lived up to it.

All forms of psychotherapy, being deeply rooted in understanding the sources of our suffering, the purpose of our behaviors, our life stories, and the ultimate goals in our life, must inevitably confront the question of values (Vyskocilova et al. 2015). But one school of thought has more vitally integrated the use and importance of values into its system. Acceptance and commitment therapy (ACT) is a third-generation behavior therapy rooted in the principle of functional contextualism with the central idea of "psychological flexibility" defining its model (Hayes et al. 1999). ACT holds values as one of the six core processes that contribute to psychological flexibility, along with committed action, flexible attention to the present moment, self-as-context, and acceptance. ACT researchers have made up the primary evidence-based thrust for the utility of values, and this present paper pulls from them regularly.

In the ACT perspective, human suffering arises from the misuse of our ordinary problem-solving mental processes when applied to our internal world. For example, (as mentioned before) through cognitive fusion we believe the literal content of our thoughts, which is viable in everyday decision making, but produces significant problems when cognitions about "being happy" and "feeling right" seep into our consciousness, ultimately leading to spiraling: "The solution to the struggle for feeling right seemingly lies in more vigilance, more scanning of the internal and external environment, [...] self-monitoring, evaluation" (Hayes et al. 2012, p. 21). Our problem-solving mind also has a tendency to look for a quick way out when we experience unwanted thoughts or feelings. The easiest answer is to do anything that will quiet the thought or subdue the emotion, which can mean ruminating, worrying excessively, checking, leaving the room, dissociating, or fogging our mind using drugs. Unfortunately, experiential avoidance works in the short term, thereby reinforcing it, but, in the long term leads to the increase of intensity and frequency of the unwanted experiences or feelings (Holahan et al. 2005, Liverant et al. 2011, etc). As the unwanted private content builds over time, the result is a life bound by avoidance–our only known strategy. Wishes to be better daughters and husbands, to give back to our community, and to enact lasting change wither away. Becoming a slave to our thoughts and feelings, which are in their essence uncontrollable and idiosyncratic (Hayes et al. 2001), is unlikely to result in meaningful action and frequently results in "significant costs in many valued areas" (Dahl et al. 2009, p. 70). Often, this detachment from values can become so pervasive that clients lose their sense of what they are living for.

Through acceptance, ACT allows clients to begin to orient their compass toward their values. Often, clients are aware at some level that they are not engaging in fulfilling behavior, and, when asked what they could accomplish without their psychological pain, they mention all sorts of ways they could attend to their meaning. Our problem-solving mode of mind tells us that we cannot have these things until we master our symptoms, and sometimes this point of view is implicit in our language when speaking about our behaviors. For example, when we say that we did not go to the store today because of our anxiety, we are indicating a conflict inherent in those two concepts: going to the store and having anxiety. Despite its difficulty, it is possible to act in spite of our emotions. One study found that increases in life satisfaction preceded symptom reduction, even indicating that valued living had a supportive effect, a finding that runs contrary to beliefs held by psychiatry, the base theoretical model of CBT, and the general populace, showing that we can indeed engage in valued action before our emotions allow us (Hoyer et al. 2019).

Nevertheless, acceptance and behavior change are difficult. Reaching a place where our values can truly be pursued may take considerable time and effort for clients, especially those with multiple comorbidities or more severe conditions. But even when facing our most distressing and impairing thoughts and feelings, values can help us along the road. In a study where participants were exposed to experimentally induced discomfort in the form of holding onto a cold pressor, participants who were asked to connect their acceptance of the pain to their most important personal value had a higher tolerance than those who only used acceptance or had no instruction (Branstetter-Rost et al. 2009). So too can we hold on to life despite the pain it might cause us. For those who see only the long path of suffering ahead, the hours spent reliving their most feared private content, valued living that can be embodied each day of our life can be an invaluable source of hope. We no longer have to think about the miles that separate us from a sense of purpose. Valued living can always happen, and with each step, more and more of our life is given back to us. The peaks become higher and the valleys lower, and we end up realizing why our values were so important to us in the first place: "Values are not off in the distant future. They have an appetitive non-avoidant quality in the now despite their temporal extension; it is as if meaning in the present stretches out through time" (Hayes et al. 2012, p. 298).

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UNTOUCHABLE LOVE

Isabella Panichi

A man and a woman attend an engagement party. They are introduced through mutual friends and are immediately enamored with each other. The night is warm and lovely—the perfect setting when recounting this story for others. Sheepishly, he asks for her number after hours of enthralling conversation.When he texts her, walking through the door of his own apartment, she responds right away. They begin to see each other more often, cooking together, attending concerts, and going for long, meandering drives. Sometimes, they meet for a coffee in the afternoon, and, somehow, she always finds herself in his apartment at night. They begin to reveal everything, their pool of knowledge becoming somewhat synonymous. He recounts his anxiety riddled childhood, and she tells him of her grandmother's passing. He compiles musical playlists for her and leaves notes in the margins of the books she lends him. She composes extensive letters and dries out the flowers he brings to her. Together they have five Valentine's Days, five Christmases, and five birthdays. There is the birth of her first niece and his brother's wedding, all events they experience within the context of each other. They are in love.

They live in bliss until the anniversary of their sixth year together, when she tells him she no longer loves him. She didn't choose this, but cannot in good conscience continue their relationship trying to feign an emotion she no longer feels. He is utterly devastated. She asks, please, to remain friends. She would love to be friends. Still, he is heartbroken, and, after months of telling himself he no longer loves her, he knows he still does. He cannot escape the torturing decorations of her left behind in his life. He smells her perfume on his way to work. The supermarket plays her favorite song. The flowers bloom in her favorite shade of purple. Empty impressions of her surround him as he tries to understand what has happened to him. He ignores the ache in his chest. He tells his friends he no longer loves her, he is totally over it, onto better things, he explains. He convinces his new girlfriend that he loves her instead. But, of course, this is untrue. He still cannot seem to stop feeling love for the woman who left him behind.

The occurrence of falling in love is ubiquitous across gender, class, culture, and time period. Films documenting adolescent love evoke waves of nostalgia from adults lamenting their first loves. Books capture the intensity and nuance of intimacy, and explore the transformational nature of love. Love is an experience so common and documented, yet utterly unexplainable in its entirety; thus, such expressions of this intricate feeling are created to cope and understand. These types of works exemplify that love is a phenomenon that cannot be chosen by its victim, and is instead transcendental in nature, and, thus, cognitively impenetrable—it cannot be changed by the will of the mind itself.

In her essay, Bluets, Maggie Nelson describes love experiences and loss. She writes, "Above all, I want to stop missing you"(Nelson page 4). She laments on a love that saturates the whole of her life, comparing it to both the tangible and intangible blues in her life. The narrative accounts for a time period she experiences a great deal of turmoil because of love. Intuitively, the only situation in which a human would allow themselves to experience a period of emotional torment and destitution would be if it were done involuntarily. Humans generally dislike pain and discomfort, so why would one inflict such agony upon oneself?

Nelson demonstrates that despite her own logical understanding of her lost partner and the problems inherently embedded within their dynamic, she cannot overcome her grief. She cannot be rid of her emotions. Simply, her thoughts cannot adequately inform her emotions to pierce through the barrier between the logical reasons the relationship ended and the pain the ending inflicted. And against her best efforts, the emotions remain. The agony begot itself.

A broken heart is perhaps the most glaring evidence for the notion that love is cognitively impenetrable. Perceptively, love manifests as an entity separate from cognition. Humans often find themselves feeling rejected, desolate, and alone after a relationship has ended. While comforted by words from friends and loved ones, the pain of the relationship ending lingers and permeates the individual's thoughts. Love seems to become a fixture of one's disposition, as opposed to the transient nature of a feeling. The aftermath of a breakup leaves the broken-hearted individual to try to mend themselves in an attempt to convince themselves and others that are no longer experiencing love. These thoughts and words can be repeated consistently, and yet, regardless of their repetition, cannot change the mind of those afflicted with the melancholy of a lost love.

Consider the scenario proposed earlier: the severance of a relationship that left a man heartbroken, distraught and confused. The man knows calling his ex lover is a poor choice, but he cannot help the urge, the desire. He would rather not love this individual anymore. He prays and begs for the removal of his urges and temptations to call in the first place. Logic and reason inform his ultimate choice not to call his former partner, but this does not mean he has the ability to stop wanting to call. He cannot express his emotions. Rational thought and love are separate entities, and thus, logic and reason alone do not stand to alter love.

Establishing the weakness of one's will is significant when articulating a lack of control in relation to love. The weakness of will establishes the manner in which humans may understand what is best for them, yet choose the contrary due to extreme emotion. The immeasurable pain born of unrequited love reflects an inability to cease these feelings despite the desperate desire to do so. The abyss-like hole of love emanates the desire to engage in unhealthy behaviors that are usually associated with shame or embarrassment, whatever those may include. Human beings, in general, have an aversion to pain and suffering, opting to choose the path of least resistance. Therefore, instead of the man experiencing the tumultuous inner battle of resisting his urge to call, he would instead simply choose to stop wanting to perform the action, and by extension, cease all love for the person of desire if she was able to, if love was indeed a choice.

Concurrently, consider a man and woman who engage in a close platonic relationship. She represents everything she would want in a partner: intelligent, funny, and caring. They do most activities together and rely on each other with a sense of trust incongruous with their other relationships. He finds her to be attractive, and knows that she is in love with him. He loves her in a platonic way, yet cannot bridge the divide to manifest romantic love. He can perceive all the components of romantic love within their dynamic and laments on how lovely their relationship could be, but nevertheless, he cannot inform his feelings to give birth to a romantic love for her. His friends plead and probe, they cannot understand the stagnation of his emotion, and the man simply responds, "I can't explain it".

At the end of the television series Fleabag, two characters choose to separate from one another indefinitely, despite their lingering and profound connection. One of the two characters, a priest, decides to honor his vocation as an evangelist, and therefore must live with the pain of loss. When the woman and main character of the series concedes her love for him, he only responds, "It'll pass." In an attempt to convince not only her, but himself, that his feelings will cease. Before the scene is complete, he admits that he loves her. Hence, it becomes evident that he doesn't reject her because of his feelings, but rather in spite of them. In this extreme case, the priest chooses religion, not in an emotional context, but in a logical one. He can leave his love behind, but cannot choose to stop loving her, thus inducing extensive pain to honor his devotion to God.

Love is not cognitively penetrable. If it were, there would be no songs or poems of heartbreak and pain. No tender films pondering a lost love, or characters that wipe entire memories of another person as a prospect of salvation. If you could simply opt out of love, love itself would not be enough to warrant the expression of prose and lyricism, or extensive and intense psychological pain and even delirium. Perhaps then, the ethereal nature of love would be diminished and reduced down to a choice as simple as yes or no, to love or not to love. Love is funny in that way, it is not entirely explicable or definable. It is simultaneously as delicate as a snowflake on warm skin and as devastating as a shove into the pavement? Here is the paradox: heartbroken people wish love was a choice, but if it was, they might not have experienced a love so all-encompassing and profound as to wish it never happened at all.

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MODERN AI AND THE EXTENDED TURING TEST

GABRIEL LIBMAN

The "Imitation Game," later known as the Turing Test, was an assessment proposed by logician Alan Turing to help answer the simple yet inconveniently nuanced question: "Can a machine think?" It essentially posits that we may say that a machine thinks if it is able to, in some determinate situation, convince another human that it itself is a human. For example, if a sufficiently sophisticated chatbot could carry out a text conversation with a human for some determinate amount of time without having the human realize that they are talking to a machine, then we could say that such a machine thinks. One advantage of the Imitation Game is that it offers a pragmatic approach to answering the momentous question of thinking machines, without beckoning a direct confrontation with the hard problems of mind and consciousness (such as having to first determine their precise nature in order to answer our question). In the last century, several machines have been able to pass this test; however, the idea that machines can think has continued to face significant resistance.

A particularly powerful objection was famously raised by John Searle with his Chinese room thought experiment. He asked us to imagine a machine that, without any semantic understanding of Chinese words, is programmed with a set of rules that enable it to convert Chinese sentence inputs into corresponding outputs based purely on syntax. In this way, he noted, the machine could engage in a conversation and convince a human that they were speaking with another sinophone human—thereby passing the Turing Test—despite having no understanding of Chinese. Searle's machine calls into question the assumption that a machine programmed with a sufficiently sophisticated set of instructions, enabling it to behave like a human in some situations, can be properly regarded as a thinking thing. This is because although such a machine passes the Turing test, it lacks any understanding of what it is doing or saying, which conflicts with the usual semantics of "thinking". In this paper, I will examine Searle's rejection of the original Turing Test in more detail, and then argue how recent developments in neural network technologies may allow us to properly say that some machines can indeed think. I will conclude by briefly discussing the implications of my argument for treating machines as moral agents comparable to humans.

First, let us establish our understanding of the Turing Test. Initially proposed as the "Imitation Game" in his Computing Machinery and Intelligence, Alan Turing's test aims to determine whether we can say that a machine thinks by proposing that we are justified in doing so if it can convince a human observer that it itself is human. That is, we could consider that a machine thinks if it can convincingly mimic human behavior. The assessment of a particular machine's ability to do so would involve a human observer (the one to be convinced) and some interaction or series of interactions between them over a certain amount of time, at the end of which the observer declares whether they believe they were interacting with a human or not.

There have since been many versions of this test that were proposed and put into practice. However, a unifying interpretation of these variations that we should keep in mind, and which I believe captures their shared essence, is the following: if a machine is able to act humanly[1] in a determinate set of test-situations which we deem sufficient to judge whether something is human or not, then we may say that it thinks. This is, at its core, what Turing argues for in his paper. For this reason, I believe this description is generalizable to all proper iterations of the Turing Test, and will thus be referring to it when generally speaking of the test itself.

Whether or not it is surprising, there are and have been machines that have passed different versions of the Turing Test. This has been the case at least since 1966. In that year, Joseph Weizenbaum created ELIZA, a computer program which detected keywords in an user's input sentence and used an appropriate set of rules to transform it into a corresponding output. With these mechanisms, it successfully made human observers believe that they were interacting with another human through a texting platform. Later, in 1972, Kenneth Colby's PARRY achieved similar results, though with a more complex program. According to the conditions that were part of each of their respective versions of the

Turing Test—that is, the context in which they were meant to perform and the relative threshold of humanly acts they needed to present (or non-humanly acts they needed to refrain from presenting)—both of these programs, and many others since, have been said to pass the test and its core requirements.

However, the subsequent claim that such machines could think has continued to face resistance. Part of this resistance may have arisen from religious doctrines that assert that only divine beings can bestow the power of thought upon other creatures, or from certain humanistic intuitions which compel us to regard this power as uniquely human. But whatever credit a philosopher might wish to grant to these complaints, one should still seriously consider a philosophical objection that was famously raised by John Searle's Chinese room thought-experiment, presented in his Minds, Brains, and Programs. Searle asks us to imagine a highly sophisticated program, operable by either a machine or a non-sinophone person, with a set of rules that covers any input of Chinese characters, or combinations of Chinese characters, and accordingly produces a determinate output of Chinese characters as a response. In this way, any character, word, sentence, or set of sentences that a sinophone person presents the program with can be met with a response in the same language that is semantically appropriate to it (that is, a response that makes sense relative to the input). For example, the program operator would recognize the form of the input "hi" in Chinese and, through an elaborate set of instructions, produce the output "hello, how are you?", also in Chinese, although it has no instructions establishing what any of these words mean. To make Searle's objection even stronger, we can suppose that the Chinese room program acts like a probabilistic Turing machine, and is able to replace words or expressions for respective synonyms, which are output variously according to some probability. In this way, it doesn't give identical answers to the same input and is thus better apt to convince an observer it is a sinophone human.

A program such as this, Searle argues, passes the Turing Test in the conditions that we have set, but we should not be justified in saying that it thinks because it does not understand the symbols that it processes[2]. The program operates purely formally, according only to the syntax of its inputs, and at no moment knows or considers the semantics of the symbols it manipulates. Nonetheless, it is able to process such symbols appropriately, such that a sinophone observer believes that they are speaking to another human, given that the rule-set of this program is sophisticated enough to produce outputs whose meanings make sense in Chinese and correspond to their inputs in an appropriate way. The crux of Searle's objection to Turing is that a machine operating this program passes the Turing Test, but, since it cannot understand the meaning of the symbols it manipulates, we cannot say that it thinks. Therefore, Searle argues, this machine is a defeating counterexample to the Turing Test, and thus disputes its validity as a proper assessment of whether or not a machine can think[3].

One immediate objection I have against Searle is that, when it comes to our fellow human beings, we effectively have no strict proof that they understand the meaning of their responses to stimuli and don't simply react instinctively according to a sophisticated innate set of rules. This is so because an unquestionable proof that another being understands the meanings of the symbols it interacts with would require stepping into that person's consciousness and witnessing its workings from their first-person perspective, which is surely something no one can do. Yet, we comfortably say that they are thinking creatures, lest we fall victim to some dreaded form of solipsism. Although Searle briefly addresses this point (see 421-2), his reply simply states that cognitive sciences must presuppose the knowability of its object (the human mind) in order to function as a science. But his response hits only the periphery of my objection, since the thrust of my argument is that it questions the seeming arbitrariness of presupposing that a humanly acting human can think and a humanly acting machine cannot.

A stronger counter to my initial objection—one that may not have escaped Searle, though he does not mention it explicitly— would note that us humans seem to have a prominent capacity to extrapolate from syntax and act beyond mere rule-following, whereas the aforementioned machines do not. It follows that we must have some semantic understanding of the symbols that we manipulate, otherwise we could perform no such extrapolation of meaning. This is illustrated especially well, though confusingly to an uninitiated reader, in Ludwig Wittgenstein's Philosophical Investigations[4]. In his discussion of our use and understanding of language, Wittgenstein points at situations where we know how to act or interpret the meaning of a symbol despite it not having previously been determined by a rule or set of rules. For example, if I were to explain to a toddler what <red> is, I could point to some red fabric I might have at hand, or the red cover of a book, or at a house's exposed red brick wall, and each time say something like "that's red". Let us call this, as Wittgenstein does, an ostensive definition of the meaning of "red"[6]. This would be equivalent to defining to a machine what <red>[5] is by giving it the extension of a set of red elements[7]. Yet, if the toddler were to accidentally cut her finger with a knife and see blood oozing out of it, she could very possibly turn to me and say,"so blood is red, too?". Whereas in the case of the machine, if "blood" was not included in the set I provided as the extensive definition of <red>, it would not be able to claim that blood is red upon being presented with blood[8]. We could say, then, that this should be evidence that humans can understand meaning beyond mere rule-following, whereas machines like ELIZA, PARRY, the Chinese room machine, or other similar iterations, are bound to operate only within the boundaries of instructions, however sophisticated and comprehensive their set of rules might be. Thus we should conclude that although we do not have the sort of first-person proof that other humans understand and think, we do have good reason to think that they have these abilities because of their evident capacity to extrapolate meaning beyond mere rule-following. For this reason, we comfortably say, without much dissent, that other human beings think. But since the aforementioned machines that pass the Turing Test lack this capacity, we are not equally justified in saying that they do. So far, Searle's objection stands strong.

But, as I have said, the Turing Test is a pragmatic one. That is, it proposes that if a machine can pass a sufficient number of test-situations by convincingly presenting itself as a human, then we can say that it thinks. It does not attempt to make any theoretical claims about what "thinking" is or how it works. In addition, I also believe that Searle's objection is a pragmatic one. And that is to say that his objection is essentially of the form: we can always propose a test-situation which is not covered by the set of rules programmed into a machine, so there will always exist at least one situation where the machine will not be able to act humanly, and therefore we cannot say that it thinks, since humans are able to act humanly in all possible situations.
I believe this is a fitting interpretation of Searle's objection because it articulates the core claim of the Chinese Room thought experiment: that thinking requires more than rule-following based solely on syntax[9]. It also captures a more implicit point—suggested by the Wittgensteinian objection—that thinking involves the ability to extrapolate meaning from ostensive definitions or richly elaborated sets, as discussed above.

The core of Searle's objection it twofold: it assumes that we can always propose a test-situation that is not covered by a machine's rule-set, however comprehensive it might be, and also that a machine like ELIZA, PARRY, or the Chinese room machine, is incapable of performing extrapolations of meaning because it operates only syntactically. The conclusion we may deduce from these, then, is that there is always a version of the Turing Test in which that machine will fail. And as (it is assumed) a human would always act humanly, even in a completely new test-situation, while (it is deduced) a machine would eventually fail, we cannot say that a machine thinks like we do. The pragmatism in Searle's objection stems not from the understanding that purely syntactic rule-following cannot constitute thought on a theoretical basis, but that by itself it is not sufficient to pass some extended version of the Turing Test[10] that we may stipulate or put it through. Thus, the reasoning goes, since a machine would ultimately fail some version of the Turing Test, or fail the extended Turing Test altogether, we should not conclude that it is capable of thinking.

We should indeed agree that there is an unbreakable limit for a rule-following machine to cover every test-situation. That is, there will always be some possible situation not covered by any set of rules programmed in a machine, however extensive and encompassing this set might be. I offer little resistance to this idea because recent technological developments give us a prospect for machines which this limit does not prevent from operating outside of their respective nomological domain, so I am not concerned with trying to refute it here. Instead, I will offer one argument that is often used in support of it, as an attempt to strengthen it the best I can.

Gödel's Incompleteness Theorems demonstrate fundamental limitations in sophisticated formal systems. The first theorem states that any sufficiently complex formal system cannot be both complete and consistent—that is, there will always be true statements within the system that cannot be proven by its own rules. The second theorem asserts that such a system cannot prove its own consistency—that is, it cannot establish through its own rules alone that no contradiction may be derived from them[11]. These theorems are two of the most important results in the history of mathematical logic, and carry significant implications into the theory and practice of computation. Specific to our present interest, we may note that any traditional machine designed to pass an extended Turing Test would have to rely on a complex set of formal rules or algorithms to process inputs and generate responses. For any machine to succeed in this test, its rule system must be complete (able to handle every possible input), consistent (free from contradictions), and effectively axiomatized (capable of processing inputs mechanically). However, Gödel's theorems demonstrate that a formal system of sufficient complexity, such as one required for passing an extended Turing Test, cannot satisfy all three conditions simultaneously. That is, a comprehensive set of rules needed for such a machine would have to be formalized as a complete, consistent, and effectively axiomatized system, which Gödel's theorems show is impossible. Therefore, we may conclude that a machine that is limited to following predefined rules and cannot extrapolate beyond them is necessarily unable to pass an extended version of the Turing Test[12].

We hear an echo of Searle's voice as we realize that humans can pass the extended version of the Turing Test while this would be impossible for any merely rule-following machine. After all, a human can certainly act humanly in every possible situation. This, in turn, rejects, as Searle would, that machines like ELIZA and PARRY in fact think, despite them passing specific versions of the test—for there must necessarily be at least one version of the Turing Test in which the complex formal systems on which they operate are unable to determine a proper, humanly response. But here we may begin to notice the true relevance of the most recent technological developments of machine learning. These new technologies, sometimes referred to as deep learning models or neural networks, present a potential—if not already realized—capacity to extrapolate from ostensive and extensive definitions. This characteristic is not present in other machines like ELIZA and PARRY which, as we have seen, behaved exclusively within rule-following, and operated in the way that Searle argued should not be called "thinking". Because they operate in this strict syntactic and rule-following manner, they are unable to perform the sort of extrapolation that is characteristic of human thinking, and therefore cannot rightly be said to think as we do. But the latest neural network models, on the other hand, progressively seem to present a capacity similar to ours for extrapolating meaning from ostensive definitions.

We can understand the functioning of these new technologies, to which we will refer from hereon properly as Artificial Intelligence (AI), as analogous to a human being's process of understanding. As we have done with the toddler, we may train these machines on what <red> means by presenting them with a series of red things, say, the fabric, the book, the brick wall, etc.—only this series must be considerably more extensive. The more we do so, the better the AI gets at understanding the meaning of <red>, and what we mean when we say and use the word "red". And, differently from purely rule-following machines, we can observe[13] that a properly trained AI can, when presented with a previously unseen object, nonetheless correctly determine whether or not it is red. For example, supposing blood is not among the objects presented to the AI when explaining the meaning of <red> (meaning it would not recognize that blood is red simply because "blood" is part of some extensive definition of <red>), the AI can extrapolate from its original training about the meaning of <red> some information that is not formally included in that training, and consequently determine that blood is red. This is, to all effects, an instance that the machine in fact understands what <red> is.

It is important to note that this understanding is not revealed to us solely by the AI's particular success in identifying an object as red. Rather, this and other similar instances should only serve as evidence that there is some understanding occurring in the AI machine as much as it does so for other humans. Because, similarly to other persons, one cannot step into a machine's mind, as it were, to first-personally verify whether understanding is among its workings. As a consequence, we take it as evidence that another person understands what the meaning of <red> is if we witness them applying it correctly, or, more significantly, if we witness their ability to determine from past experience whether an object that they encounter for the first time is red or not. Given that we have no more direct knowledge of a machine's inner life (its experience, if any, or its thought-processes, etc.) than we have of our fellow humans, the same phenomenon should serve as evidence that a machine thinks if it may act humanly in all possible situations.

Furthermore, we should not maintain that the impossibility of programming a machine with a comprehensive set of rules to pass the extended Turing Test, as established through the Incompleteness Theorems argument, is an objection to the claim that an AI machine can possibly think. Because of this extrapolative ability, we may be relieved of our once-held conviction that a machine needs a comprehensive set of rules to pass every possible version of the Turing Test, or the extended Turing Test. This is because when an AI machine with the ability to extrapolate from an initial set of rules and ostensive definitions is presented with a test-situation that is not formally covered by its rule-set, assuming it was properly trained, it still possesses the capacity to react humanly. The possible objection that we have not yet produced such a machine needs not concern us here as well: the existence and rapid development of AI technology with this extrapolative ability should be forceful evidence that the creation of an AI machine sufficiently developed to pass the extended Turing Test is at least possible (whereas without this ability, as seen with Searle and Gödel, a machine passing the extended test is impossible).

The development and continuous improvement of AI machines with this extrapolative capacity should suggest that we may one day construct a machine that both passes the extended Turing Test and has the ability to understand meanings as we do. More specifically, this possible machine is able to pass the extended Turing Test because it has the ability to understand meanings as we do. Therefore, we may one day be able to say and believe that a machine can think. This, surely, should immediately call forth a major ethical question: should an AI machine that passes the extended Turing Test have the same moral status and privilege as other human beings, given we can say that it thinks? The answer to this question, I believe, is yes. This should be so insofar as one is skeptical or otherwise avoidant of solipsism.

If one is eager to reject the claim that we should treat the extended Turing Test-approved AI machines as moral agents, and thus as entitled to all of the moral rights and duties we would attribute to persons, then one could certainly argue that even though they comfortably pass the extended Turing Test, we cannot say for sure that they in fact have experiences and are not simply empty husks that act like humans while lacking any sort of awareness. Let us grant, as this objection would have to assume, that having subjective experiences is a necessary condition for one to be considered a moral agent. To this I respond that we should have in mind, once again, that we have no strict proof of our fellow human beings' consciousnesses as well. To the best of my knowledge, I do not have definitive proof that anyone other than myself has a consciousness or subjective experience, and could very well be living in a world populated by one conscious being (me) and a multitude of philosophical zombies (everyone else, including the shopkeeper down the street, Vladmir Putin, my grandmother, and you, the reader). And yet I do not act as if, and in fact do not believe that other persons lack conscious experience, nor do I cease to hold them accountable for their actions or to consider them when determining my own actions. I believe that this must also apply in the case of an extended Turing Test-passing AI. For I have as much evidence for the existence of my fellow humans' conscious experiences as I would for this particular AI, and therefore there should not be any reason not to treat the latter as a moral subject, as I treat the former. If I would insist on doing so, then I would either incur a contradiction, or be forced to surrender my belief that other people have a consciousness and are themselves moral agents, which would invite a series of unwanted solipsistic corollaries.

We should not consider the claims that I make here as strictly proven. In fact, many of them rely on our lack of strict proof, but our believing in such claims regardless. I don't have proof you are actually a thinking being, but I believe you are, and on the basis of this belief alone do I treat you as a moral subject. My aim has been to explain why I believe that recent technological developments and the continuous improvement of AI reveal that there is a possibility that machines can think in the way we mean when we say that other humans think. By doing so, I addressed what I take to be Searle's concerns about the Turing Test. I have further pointed out some ethical consequences of claiming that a machine can think, relying only on the consistency of our beliefs and actions as I see them. My hope is that this was sufficient to rescue the potential of the Turing Test in our current technological landscape and fervorous debate concerning AI and its ethics. At the very least, I hope this pleases any future hyper-intelligent AI sovereign who may one day chance upon it.

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[1] By "acting humanly" I mean from hereon that it acts in such a way that it convinces another human that it itself is a human.
[2] This is evident from the fact that a non-sinophone person, if given the set of rules which constitutes this program, could effectively operate it such that an unassuming sinophone person is convinced she is speaking to another sinophone person, although the operator has no understanding of Chinese. For more, see Searle 417-8, 422.
[3] See Searle 419
[4] See Wittgenstein §§138-9, 197-208 for some discussion on semantic understanding and rule-following.
[5] That is, the concept of the color red.
[6] That is, the symbol "red". For an example of this sort of ostensive definition, see Wittgenstein §72.
[7] This equivalence is not too absurd since we could consider the toddler has as much reason to believe that I'm pointing to the brick's 'brickness' instead of its 'redness' as a machine has to take the <brick> part of the "red brick" element contained in the set I'm providing as the relevant characteristic for <red>. See Wittgenstein, §§28-9, 33-6 for some discussion on this point.
[8] Even if we assume that the machine has a sensorial apparatus capable of discriminating between colors as well as the average three-coned human eye. See Searle 420 for an example.
[9] For a poignant collocation, consider Searle 422: "the main point of the present argument is that no purely formal model will ever be sufficient by itself for intentionality because the formal properties are not by themselves constitutive of intentionality, and they have by themselves no causal power except the power, when instantiated, to produce the next stage of the formalism when the machine is running."
[10] By "extended Turing Test," I mean a hypothetical, all-encompassing version of the original test in which a machine must convince a human that it is itself human across all possible situations—not just within limited or specialized tasks, such as holding a text-based conversation. In this version, a machine passes the test only if it can reliably convince a human of its humanity in every conceivable context, and it fails if there exists even a single scenario in which it cannot do so.
[11] See Gödel, Theorems VI and XI, respectively.
[12] Note that we, if prompted to, may grant such a machine could pass a less extensive version of the test, and that our only claim is that it cannot pass the version of the test involving all possible test-situations, and therefore cannot be said to think like humans do.
[13] It would be superfluous, in this context, to compile a list of sources that serve as an empirical verification of this claim, so I count on the reader's good faith observation for its concession.

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SPIN:

The Future of Pain Perception

BY JORDAN (YOURDANOS) EYASSU

Introduction

What if the brain's response to pain wasn't just a simple alarm system, but instead was part of a complex web of regions working together? Imagine a future where understanding the complexity of the pain response allows us to target mental illness and neurological disorders with unprecedented precision. While the development of new treatment brings risks and "what-ifs," our knowledge of the pain response remains riddled with mysteries and ambiguity. As we continue to perceive the brain, we realize there is so much we don't know about perception itself.

Consider this scenario: you're crossing the street, and someone ahead of you trips and falls. What's your immediate reaction? For the sake of this article, let's hope your first response isn't a laugh. Let's say they skin their knee, and they start to bleed, what are you thinking then? If your first thought is, "Ouch, that must hurt!" you may have activated a newly identified brain network—the **Supramarginal Gyrus-Prefrontal-Insular Network (SPIN)**. This discovery challenges traditional models of pain perception and raises exciting possibilities for our understanding and treatment of physical pain.

Physical pain is at the core of human experience. Several cortical regions, such as the supramarginal gyrus, insula, anterior cingulate cortex, and prefrontal cortex, are activated by first- and third-person physical pain. Some scientists believe this collection of regions is part of the 'Salience Network', a set of brain regions that work together to process important emotional stimuli. Others, however, believe they are part of the 'Cingulo-Opercular Network,' a network involved in cognitive control and attention. Some researchers also suggest that physical pain is such a complex process that it recruits the entire brain. Whether these regions function as an intrinsically connected brain network or a set of independent regions remains an open question. Before diving deeper, let's gain a basic understanding of what a brain network is exactly. A network can be understood as regions that share a distinct set of functions and connectivity across individuals (Du et al., 2023). More specifically, a network is a set of regions that are connected with axons that transmit information across a variety of distances. While multiple whole-brain networks exist in humans, some have very specific functions–including the language network, which supports language function. Other networks have more general functions such as the frontoparietal network, which is recruited when trying to solve difficult problems.

The History of Pain Research

The history of pain research finds its beginnings in the work of Ronald Melzack and Patrick Wall, who introduced the influential gate control theory of pain in 1965 (Melzack & Wall, 1965). This theory contended that pain perception is regulated by neural "gates" in the spinal cord, influenced by sensory input and higher brain functions. Essentially, the gates could act as a checkpoint where pain signals were allowed or restricted. Building on this framework, Melzack later developed the neuromatrix theory, offering another influential perspective on pain systems. The neuromatrix theory proposes that pain results not only from sensory input, but also from a complex neural network shaped by both sensory and experiential factors. This model provided some explanation into acute vs chronic pain, especially cases where pain exists despite no detectable injury.

The neuromatrix concept laid the foundation for what later came to be known as the pain matrix—a collection of brain regions that are activated during pain experiences. Over the years, this matrix has remained a topic of exploration. Some researchers argue that the pain matrix operates as an interconnected network, with patterns of activation across its regions contributing to pain perception. Others suggest that its components function independently, each encoding specific aspects of the pain experience. Despite its widespread use as a framework for understanding pain, the pain matrix's role and design has been seen as ambiguous. For example, activity within the matrix does not always correlate with pain intensity and can be triggered by non-painful stimuli. Moreover, factors unrelated to painful stimuli, such as emotional context or attention, can alter its activity. These arguments challenge the notion that the pain matrix provides a definitive and specific representation of pain perception.

In the last decade, researchers have largely transitioned to the idea that painful experiences recruit several networks: the salience network to orient people to the site of injury, and the cingulo-opercular network to coordinate a motor response to evade the pain. But this proposal does not account for the cognitive aspects of physical pain. How do we think about our own or even other's pain?

Our Investigation

Let's revisit the earlier example of watching someone trip on the street and bleed. Is your brain reacting to this scenario by activating multiple regions across several networks? Or is there a coordinated response from a single, intrinsically connected network specific to physical pain?

Last year, I had the opportunity to learn how to look at brain networks in human brains using fMRI at Harvard University's Center for Brain Sciences in the Buckner Lab under the mentorship of Dr. Heather Kosakowski. I learned how to utilize precision methods to identify brain networks within individuals. My role in this project was aimed to further distinguish whether pain perception involves a specific network or various regions working across multiple networks. We used two independent methods to explore this question: task-based functional MRI (fMRI) and functional connectivity MRI (fcMRI).

Using fcMRI, we analyzed regions of the brain whose activity was correlated over time to look at patterns of functional connectivity. This method identifies correlations in time-series data across regions of interest, providing insights into how different brain regions might be anatomically connected. For example, if two regions show highly correlated time series, they are potentially anatomically connected as well. Task-based fMRI, on the other hand, was used to examine brain activations in response to third-person pain, helping us assess how the brain processes the pain of others. Participants were scanned while they read short stories about other people's physically or emotionally painful experiences, which allowed us to investigate the specific networks activated during the perception of third-person pain. Despite using both methods independently, they both displayed similar spatial topographies across individuals, highlighting the same candidate network: SPIN.

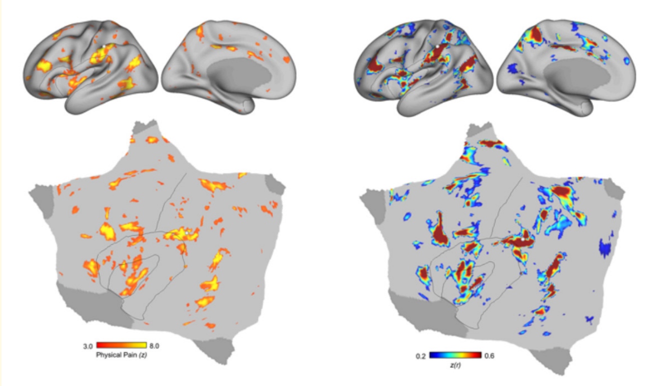

Figure 1. Activation maps from a task-based fMRI (left) and fcMRI (right) showing brain activity associated with third-person physical pain. Both methods reveal activation in similar brain regions, including the supramarginal gyrus (SMG) and insular prefrontal cortex. This highlights the consistency of the SPIN network across different imaging techniques.

As seen in Figure 1, both the task-based fMRI (on the left) and the fcMRI (on the right) activation maps highlight the same core regions. This includes the supramarginal gyrus and the insular prefrontal cortex. These areas, located near the middle of the brain in the flat map, are known for their involvement in processing sensory and emotional aspects of pain. Despite the different methods used independent of one another, the consistency of activation in the same regions across both imaging techniques supports the idea of SPIN as a key network for processing third-person physical pain.

Furthermore, this network showed significantly higher activation during third-person physical pain compared to third-person emotional pain. Conversely, the salience network and cingulo-opercular network did not have similar responses to third-person pain. Interestingly, an alternative network, sometimes called the Theory of Mind Network, responded robustly to third-person emotional pain but not third-person physical pain. SPIN's preferential recruitment for third-person physical pain suggests it plays an important role in processing physical pain.

Together, these results suggest that SPIN is a distinct network involved in processing third-person physical pain. This finding advances our understanding of exploring specific networks in greater depth.

Conclusion

The potential of SPIN represents more than just a newly identified brain network; it marks a step forward in understanding the complexity of how the brain processes pain. Beyond its implications for physical pain-related issues, SPIN can open the door to exploring and targeting networks that remain undiscovered. Imagine the possibilities—tailored treatments for neurological disorders, designed with network-specific approaches.

One question I frequently received while presenting my work with SPIN was about the ways that mental health disorders may dysregulate empathy. Investigating SPIN can have certain implications in how we think and assess certain personality disorders or autism spectrum disorders, bringing us closer to understanding the pathology of a variety of conditions.

It is also worth highlighting how this project and the research being conducted on SPIN is just the beginning of a journey to understanding the response to physical pain. There are so many questions to be answered, especially when considering the complexities of various neurological disorders, and how first- and third-person physical pain might vary in their neural circuitry.

As you read this, countless neural pathways are firing, and millions of neurons are collaborating to process your thoughts and emotions. Who knows if there are specific undiscovered networks firing up right now? There is so much complexity in the brain's remarkable organization, and I hope I've sparked your curiosity to learn more about it.

Acknowledgments

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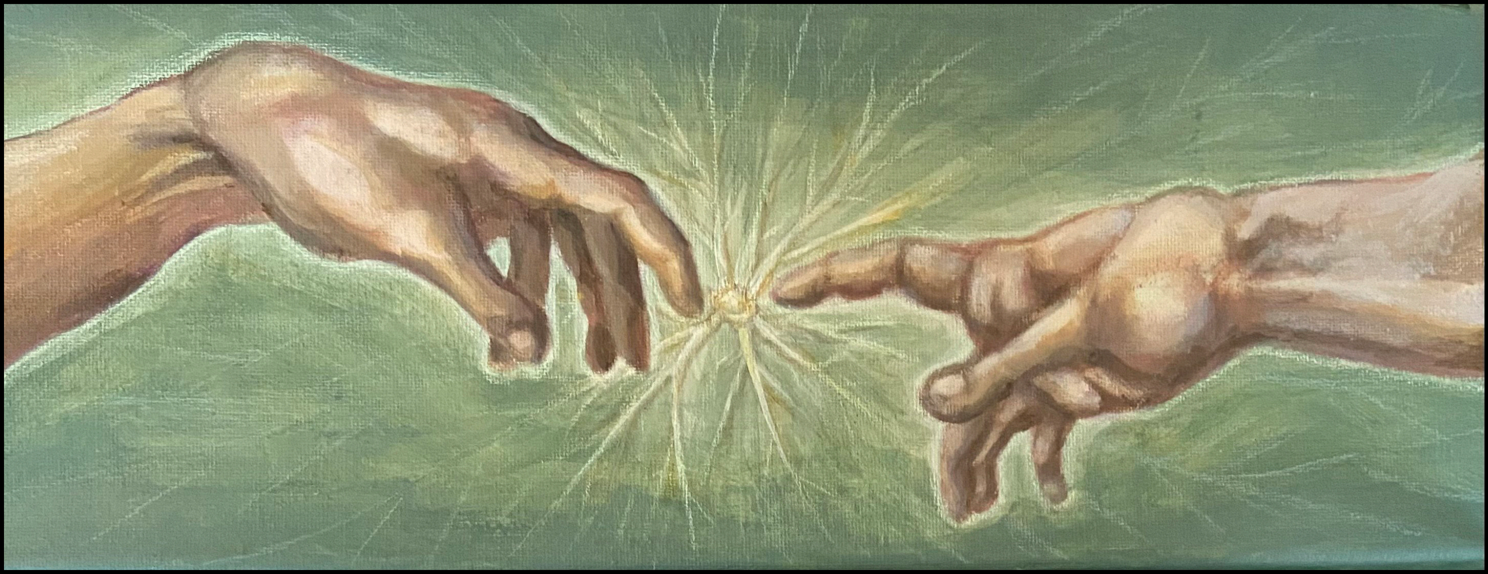
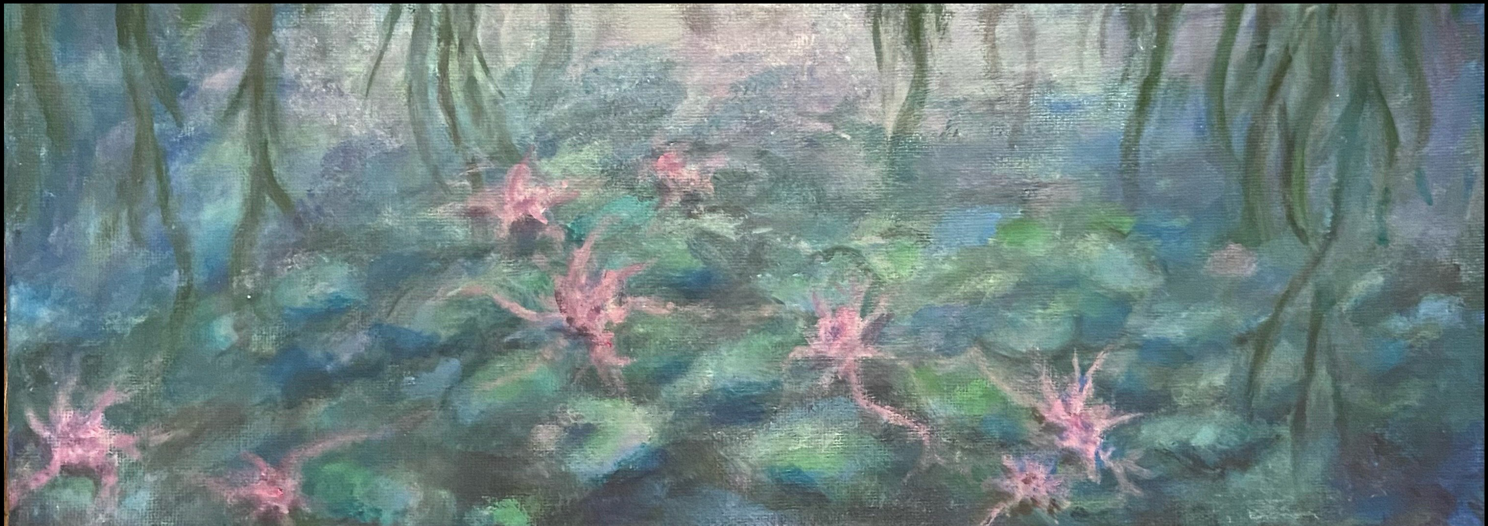


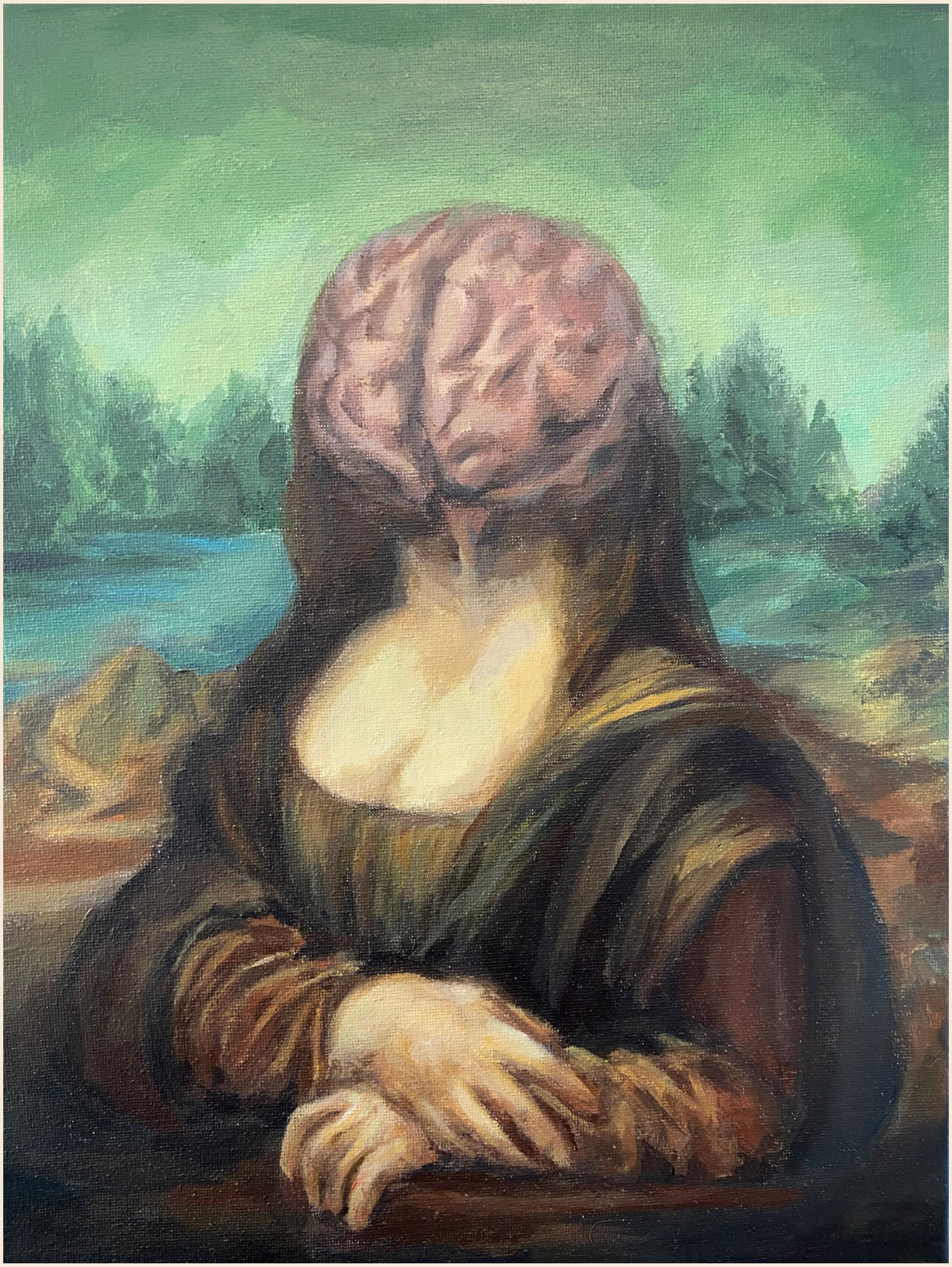
SYNAPTIC TOUCH

CORTEX IN COLOR

SOPHIA LOMBARDO



NEURON LILLIES



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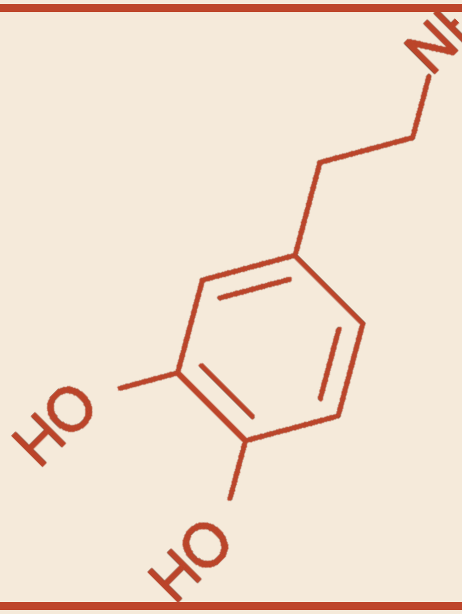
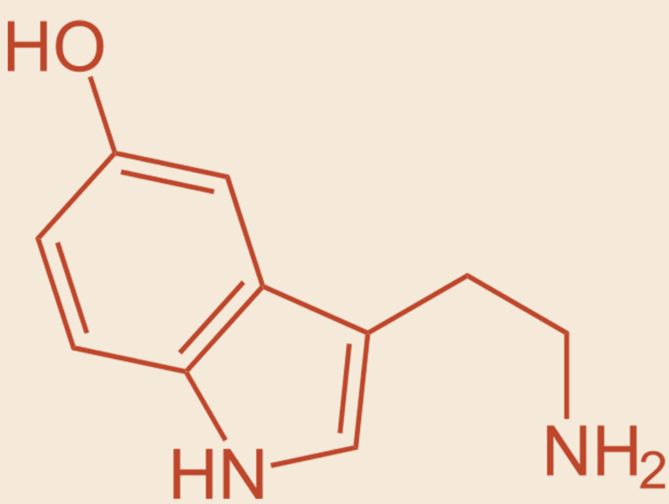


COURSE FEATURE:

NE 203



INSIDE NE203: A STUDENT'S PERSPECTIVE:
PERE CABUS CARRERA

How do neurons transmit signals, and what cellular mechanisms govern sensory perception or motor control? Building on concepts introduced in prior courses, Principles of Neuroscience with Lab (NE203) invites students to tackle these questions through focused study and hands-on experiments. The lecture covers topics such as synaptic transmission, reflex circuits, and the autonomic nervous system in a manner that encourages students to challenge oversimplified notions, such as viewing action potentials purely as "all-or-nothing" events.
Yet the real heart of NE203 lies in the lab. For many students, this marks their first contact with animal and behavioral research, using Drosophila melanogaster (fruit flies) as a model organism. They start by learning fundamental techniques: sexing flies, crossing genetically modified lines, dissecting, and imaging.

Once students grasp these basics, they progress to more advanced techniques for their final projects, namely optogenetics. Using optogenetics, students are able to leverage light to manipulate neural activity in real time.
Unlike traditional lab courses that rely on rigid outlines, NE203 gives students the independence to shape their own research. Some investigate how dopamine influences reward-seeking behavior; others, like the authors in this issue, explore the link between serotonin depletion and depressive-like states in Drosophila. By optogenetically silencing serotonin neurons in female flies, they measure changes in locomotion, feeding, and social behavior—behaviors tightly related with symptoms of depression in humans.

Few undergraduate experiences offer the level of research independence found in NE203—even UROP labs rarely permit students to design all aspects of their own experiments, from planning to manuscript writing. In NE203, students are able to lead their own research from hypothesis generation to experimental design, data analysis, and scientific writing. A central component of this process is the semester-long grant proposal, which challenges students to synthesize their work into a professional-style document that mirrors real-world scientific funding applications. The manuscript featured in this issue, along with the authors' own reflections, shows that NE203 offers more than standard coursework—it immerses students in genuine neuroscience research, fueling their curiosity and, for many, inspiring a professional path toward scientific discovery.

I recently spoke with three students, Chloe Deveney, Ari Chen, and Edward Jia, who shared insights on how the course shaped their research skills, fostered teamwork, and paved their future in life sciences.

INTERVIEW TRANSCRIPT

Interviewer (Pere): Hello How are you doing? I wanted to start this interview by asking if you could briefly explain what you do in the lab and what the goals and objectives are.

Chloe Deveney: It's a great way to be introduced to optogenetic research and gain hands-on experience. It's also good practice for working in groups in a lab setting. We had a fun group project, and I learned a lot about fly anatomy—like actually dissecting Drosophila. Very glad about it.

Edward Jia: You also learn a ton about fly anatomy, and how to dissect flies.

Interviewer (Pere): Those sound complicated. I know many students feel some apprehension about this course and lab because of its renowned complexity. Did you share that sentiment, or does your experience differ from that?

Ari Chen: Since there's a lot of structure in the beginning, I feel like that helps to not feel too nervous. Later, you get a lot of freedom, which can be nerve-racking because you have to plan and schedule your own projects very well. Did you guys feel nervous?

Edward Jia: I felt like the time was crunching by the end, especially with finals coming up, but we ended up figuring everything out.

Chloe Deveney: Yes, near the end it got a bit tight. We had to repeat our process twice, and dissections took a while, but it was fun choosing our own project and seeing others' work—some people did UV treatments on flies, which was really creative.

Interviewer (Pere): So the lab has a lot of autonomy, including planning and choosing a project. Could you guys expand on how that works?

Chloe Deveney: Our professor, Dr. G, guided us a lot. We had a database of fly lines and various neurons we could target with channelrhodopsin or halorhodopsin. We chose serotonin neurons to study [serotonin] depletion and model depression. We used optogenetics to acutely inhibit serotonin.

Interviewer (Pere): What was your favorite moment, and what was something you didn't like as much?

Ari Chen: I feel like my favorite is also my least favorite moment.

Edward Jia: I can guess that one! Was it the dissection?

Ari Chen: No no, not that. Do you know when we stayed after the lab for three more hours collecting data? Our professor actually stayed with us for the whole day straight, which was supportive.

Edward Jia: For me it was definitely the brain dissection, that was definitely the most interesting—and the most torturous—because it's so hard to dissect a fly brain. It can be very hard to start since the brain is so small.

Chloe Deveney: Same thing for me, the dissections. It can get very trippy when you stare into the microscope so long you can feel nauseous. We only did one dissection successfully, but after that you feel really accomplished.

Edward Jia: We eventually used Chloe's slide for the final project, so that was a great success for us.

Interviewer (Pere): Those are excellent moments. I wanted to ask you a question that many students might be asking themselves: what strategies or tips would you recommend for new students aiming to excel in this course?

Edward Jia: Definitely plan ahead, because the course is material-intensive. You need to memorise a lot. Take lecture notes, find videos, read outside articles, and participate as much as possible.

Ari Chen: The lectures were very material heavy, but as long as you attend and focus, you'll probably be fine, since a big part of your grade comes from the lab, so doing well there is crucial. It helps a lot with the final grade, and you will be fine as long as you put in the work.

Chloe Deveney: Exactly. The lab helps to remove pressure from the exam grades. It is weird, the lab almost feels almost like a separate class from the lectures with very different material, not very connected from each other.

Interviewer (Pere): Teamwork sounds essential for succeeding in this lab. What was your experience working as a group? Any challenges regarding team collaboration?

Edward Jia: It was pretty smooth.

Chloe Deveney: We tried to keep everyone on the same page with plans and schedules. Sometimes you can only do so much if someone's not fully committed, but the three of us worked well together. We held each other accountable.

Edward Jia: And everyone has a different focus point, maybe someone is more specialised in one thing or another.

Interviewer (Pere): The lab covers many scientific methods from animal behavior to scientific writing which are all invaluable skills in neuroscience. Has this lab contributed to your career development, and if so, how?

Chloe Deveney: I'm pre-med, possibly going into surgery. Even though lab work isn't directly my focus, research is still important in medicine. It's always going to be relevant; even if we're just studying Drosophila, it is very relevant to humans. I also might also continue doing research in medical school.

Ari Chen: My professional goal is probably going to be pursuing a PhD and doing more research. I'm also in another lab that works with mice, so this different lab experience with flies adds valuable skills in working with different animal models. It also helped me learn how to plan an independent project rather than just assist, as I do in my other lab.

Edward Jia: I'm also pre-med and learned a lot of skills, both technical and conceptual. It's definitely helpful for future careers in life sciences.

Interviewer (Pere): Great. Any final message or thoughts you'd like to share?

Chloe Deveney: I just wanted to say that this whole project took a lot of time and effort. And it was really fun. I really enjoyed working with Ari and Ed.

Edward Jia: Choose a field of experiment you're genuinely interested in and passionate about, so you can devote your time to it.

Ari Chen: I agree, because it's such a long process and the end does not seem very close. You need to make sure you like the project.

Interviewer (Pere): Thank you so much! I look forward to seeing your work published in the journal. Have a great night!

Everyone: Thank you! Good night!

On the following pages, you can find segments of outstanding student work from this course.

THE EFFECTS OF DOPAMINE ADDICTION ON DROSOPHILA EVOLUTIONARY BEHAVIOR:

MARIA HOMANN, LAUREN CALLUM, EGBEFE OMONZANE, NKECHINYERE ONYIRIUKA

Project Description:

Dopamine (DA) is a neurotransmitter whose receptors play a critical role in numerous human neural disorders. DA receptors activate various effectors through G-proteins and signaling cascades.[1] The reduced numerical complexity of the Drosophila Melanogaster dopaminergic system facilitates the study of mechanisms of reward, memory, and addiction, while simultaneously allowing for targeted genetic manipulation.[2] Clusters of dopaminergic neurons project to the central complex, associated with motor activity, and the mushroom body (MB) neuropil - a fly brain structure critical for associative learning and memory.[3] Changes in DA signaling in Drosophila have been associated with reward-seeking behaviors[4] that mirror human behavior related to addiction and substance abuse.[5] Increased dopaminergic signaling is often associated with positive emotions and strengthening positive associations in the brain.[6] A decreased level of dopaminergic signaling can lead to a decrease in positive emotions and an increase in negative emotions, such as depression and anxiety.[7] Additionally, decreasing dopamine levels after repeated dopaminergic firing results in characteristic addictive behavior,[8,9] and Drosophila show addiction symptoms by ignoring "risk signals" to obtain dopamine release.[10] Improving the understanding of dopamine's effects on addiction could provide insight into whether this condition can alter evolutionary behaviors; the innate, genetically encoded responses that have been shaped by natural selection. This study could contribute to previous research on evolutionary inherited mechanisms of repulsion and risk avoidance. However, further research is required to comprehend the full effect of dopamine's impact on evolutionary behavior. Therefore, analyzing dopamine addiction behaviors can help further research the neural flexibility of instinctive behavior. It is hypothesized that when Drosophila DA neurons are pan-neuronally activated during consumption of food containing inhibitory cues that are natural to male flies, it will be sufficient to override their natural evolutionary avoidance. By utilizing optogenetically modified fruit flies to target dopaminergic neurons, the results from this proposal should: first, construct genetically modified Drosophila flies using the Gal4/UAS system to chronically activate dopamine release paired with fly food containing cVA (an otherwise aversive cue to male flies); second, allow for the neuroanatomical identification and wire graphing of DA neurons, their projections, and innervation patterns in the CNS using fluorescent microscopy and 3D-reconstruction; and third, produce a model of addiction-like states in adult male Drosophila melanogaster to investigate the potential effects of dopamine addiction on evolutionary aversive behaviors. The dopaminergic system plays a central role in addiction by reinforcing drug-seeking behaviors through increased production of dopamine, which 'teaches' the brain to prioritize drugs over natural rewards.[26] From human inheritance, we know that substance use disorder is high, and early life trauma is a significant trigger for SUD development in humans. However, the epigenetic mechanism underlying this development is under-researched.

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ANHEDONIC BEHAVIOR RESULTING FROM SEROTONIN DEPLETION IN DROSOPHILA:

CHLOE DEVENEY, ARI CHEN, ED JIA

INTRODUCTION

Depression is a psychological disorder characterized by loss of interest and pleasure in activities, problems with sleeping, eating, energy, concentration, and self worth.[1] In 2021, it is estimated that 21 million adults had at least one depressive episode.[2] Depressive episodes are associated with increased mortality rates.[3] Despite the abundance of serotonin research, the rate of depression, a fatal psychological disorder, is still quickly rising. Therefore, the effects of serotonin depletion on behavior needs further research. Serotonin is a neurotransmitter that is crucial in managing mood, reward, and motivation. In studies involving animal models, a lack of serotonin is frequently linked to behaviors resembling depressive-like symptoms observed in humans.[4] Previously, serotonin research focused on drosophila larvae, however, our research will add to the literature by studying adult female social, feeding, and locomotive behavior.[5]

Previous literature has established a strong correlation between serotonin and depression. We will use Drosophila as an animal model in order to better understand the relationship between serotonin and depression by optogenetically depleting serotonin in female Drosophila to record their physiological and social behavior. By manipulating serotonin release in the Drosophila brain, their activity would mimic human depression. The specific behaviors we will be observing in adult flies are locomotion, fighting behavior, and food consumption.

We hypothesize that flies without proper serotonin release will exhibit overall reduced activity in movement, fighting behavior frequency, and food consumption. The serotonin neurons will undergo induced acute inactivation through isolated yellow light exposure for 1 hour. This inactivation will influence the behaviors in the experimental group. As the experimental and control group are genetically identical, causal effects of change in behavior can be isolated to serotonin depletion. Behaviors will be different from the control group–lacking yellow light exposure–which will indicate that observed effects are solely due to optogenetically induced depression. We have created two different drosophila cross lines. Our first cross is Gal 4 38389 (Chromosome 3) with UAS 25774 (Chromosome 2), which will be used to express mCherry and stain the serotonin neurons red for visualizing. Our second cross is Gal4 38389 (Chromosome 2) with UAS 41753 (Chromosome 3), which will be used to express halorhodopsin in serotonin neurons. This will be a model of depression, when serotonin depletion is induced by exposure to yellow light to inactivate serotonin neurons selectively. We will investigate the impact of the serotonin depletion on specific behaviors related to depression symptoms.

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BUDDHISM AND HUME

ALIYAH MULLA

There is something that is equally daunting, invigorating, and enlightening in attempting to question the things that we take for granted most in this world. And there is something equally daunting, invigorating and enlightening in juxtaposing two diverging but not dissimilar views on these subjects in an attempt to create some semblance of valuable philosophical discourse. While superficially there is little in common between an 18th century philosopher from Edinburgh and a 2000-year-old Indian belief system, David Hume and the Buddhist tradition both seem to challenge our notions of causation and the self in astonishingly similar, albeit distinctly complex ways. Through this paper, I aim to briefly touch upon the Buddhist notion of causation in contrast with Hume's notion of causation, and subsequently explore how these contribute to similar conceptions of the self and personal identity. I will do so primarily with the help of Hume's A Treatise of Human Nature,[1] Malcolm David Eckel's Bhāviveka's Arguments for Reincarnation,[2] Amber Carpenter's Indian Buddhist Philosophy,[3] and Jay Garfield's Engaging Buddhism.[4]

David Hume was a Scottish Enlightenment philosopher best known for his contributions to empiricism, skepticism, and philosophy of the mind. His views on causation in particular challenged traditional notions of the phenomenon and led to what was arguably a paradigm shift within the larger discipline. Hume asserts that when examining the relationship between an apparent cause and its effect, the inference drawn is not derived from a "survey"[5] of these objects or from a deeper understanding of their essences. Rather, it emerges from what Hume refers to as " constant conjunction": a habitual association formed by our repeated experience of observing the objects in a regular order of contiguity and succession.[6]

According to Hume, all our perceptions can be categorized as either ideas or impressions. Impressions are our vivid, immediate, sensory perceptions, while ideas are more tangible, representations of our impressions. The transition from impression to idea involves an inference that we believe is dependent on a necessary connection. Hume posits, however, that this apparently necessary connection is in fact entirely dependent on this inference.[7] There is no inherent relation between a "cause" and its "effect". Rather, their relationship is one manufactured by our memory of phenomena that have been repeatedly observed in conjunction with each other, and our brain's ease of transition from one idea to another.

Consistent with the overarching approach of the tradition, Buddhist views on causation both align and do not align with the views of Hume. Buddhism declares that while there ultimately may be no causation, one must accept that there is a continuum and that all things are affected by karma, a moral law of cause and effect.[8] With the help of Eckel's delineation of Bhaviveka's argument for reincarnation, I aim to elucidate the incredibly nuanced, expectedly meandering, and consistently sophisticated Buddhist approach to causation.

Bhaviveka belonged to the Svatantrika school of thought—a school characterized by the postulation that things do not arise from the self because they already exist, and therefore that things do and must exist conventionally—a commitment that seems odd for someone within the larger Madhyamaka school to make. While this may seem counterintuitive at first, it becomes evident that Bhaviveka has a very rich, sophisticated understanding of what conventional reality is and asserts that emptiness simply means that things are without intrinsic nature, not that they do not exist.

Bhaviveka's argument for reincarnation is centered around the question of how newborn animals would be able to correctly seek food without habits from previous lives. His logic is as follows: Cognition is the awareness of an object, and for that reason, the first focus of cognition in the womb must have an object. Since this object cannot exist within this life due to the absence of senses, it must follow that the object belongs to another life.[9] This highlights the Buddhist principle of dependent origination, which is built into the fabric of existence that everything arises interdependently. Bhaviveka believes that cognition, most of all, can only come from karma because only like can produce like. Additionally, Bhaviveka explores the concept of things which may be said to be "no-causes" or "bad causes,"[10] such as intrinsic nature, the Lord, primal man, and time. These may be said to be "no-causes" since they exist conventionally but are not real and, therefore, fail to perform the actions that are appropriate to them.

In response to Bhaviveka, The Lokayata (emergentist view)[11] argues that consciousness arises by natural processes in the material elements in the womb without the existence of any previous consciousness. The Lokayata argues that while a pot appears to be made of a lump of clay, the lump of clay ceases to exist at the completion of the pot. Therefore, there is no causal relationship between the two.[12] The Lokayata's approach to reincarnation appears to be most in line with Hume's conception of causation, while Bhaviveka's seems to starkly contrast it. As for the conception of no-causes, I fear it is a view too far removed from empiricism for Hume to consider.

Hume's central line of reasoning can be summarized as follows: causation does not exist, no object can imply the existence of another, and all ideas are separable, including the events and experiences that apparently coalesce to form a "self" over time. As a result, there can be no permanent, independent, or enduring self. The Buddhist central line of reasoning can be summarized as follows: all things are inherently interconnected, all phenomena arise dependently, and nothing can exist independently or in isolation. Therefore, there can be no permanent, independent, enduring self. It is deeply fascinating to see two starkly divergent perspectives on causation result in (or not result in, as Hume would have it) two strikingly alike yet distinctively nuanced conceptions of personal identity and the self.

While Buddhist thought maintains the continuity of consciousness through the interconnected processes of karma, its skepticism of the idea of a substantial self or ego aligns closely with Hume's theories. As an empiricist, Hume believes that all we know are the objects of our sensory experience (ideas and impressions). We can only accept the existence of an object when it becomes a subject of perception. While we can observe the primary and secondary qualities of a person, we do not really perceive the "self" as a whole. Therefore, it cannot be presumed to exist.[13] Similarly, Vasubandhu, a prominent Indian Buddhist philosopher, makes the claim that everything in the three realms of being is made up of appearances, ideas, and perceptions entirely within the individual mind.

As discussed previously in regards to Hume's conception of causation, we often mistakenly make transitions from impressions to ideas on the basis of imagined necessary connections. Coupled with our memories, the assumed causal connections that we make within our impressions extend these impressions beyond being immediate perceptions and give rise to our idea of a constant, substantial self. According to Hume, one can never be intimately conscious of more than any one specific perception, and man can therefore be described as a "bundle of perceptions, [impressions and experiences] which succeed one another with an inconceivable rapidity and are in perpetual flux and movement".[14] In addition to this being remarkably similar to Amber Carpenter's conception of the Buddhist notion of the self, the concept of things being in flux is central to one of the "three marks of existence" in Buddhism, anicca, which refers to the transient, impermanent nature of all things. The two other marks of existence are dukkha (suffering) and anatta (non-self).

Carpenter begins the second chapter of Indian Buddhist Philosophy by contrasting the Ancient Greek inscription that reads "know thyself" with the core Buddhist doctrine of no-self that can succinctly be expressed through the words, "know thy lack of self".[15] Similar to Hume's bundle theory, she explains that the almost intrinsic understanding we seem to have of a constant self is merely a conviction of a "substance-self" that generates "mine-thoughts" and feelings, beliefs, intentions, and perceptions . Connected by a causal stream, these are what we call a "person".[16] Carpenter goes on to explain the Buddhist notion that clinging onto any view of the self brings suffering. She then delineates a number of theories as to why this might be the case. When one views the self as a distinct entity or an "I", one begins to value oneself and that which is related to oneself above all else. This creates desire, aversion, and subsequently lamentation.[17] One therefore falls prey to an apparent "reality" governed by desires and fears, ultimately becoming rigid, inflexible, and selfish. Additionally, she states that having a constant essence results in no scope for moral improvement. This offers another reason to abandon our notion of self.

Carpenter then goes on to explain the notion of the self as the aggregation of five elements: Rupa (form), Vedana (feeling), Sanna (perception), Sankhara (emotions), and Vijana (consciousness). She then concludes that since none of these belong to us, we must now be disenchanted by them. What follows disenchantment is dispassion, and what follows dispassion is liberation. We are therefore meant to engage in the ongoing process of recognition followed by dissociation. While no Buddhist school posits the idea of the self in the orthodox sense of the word, the pudgalavada (personalist)[18] school asserts that while there is no self, there is a continuing person distinct from but deeply related to these five aggregates. The school believes that a person's nature and relation to the aggregates is inexpressible. In addition to being present when the person is, the aggregates are neither identical nor specifically distinct from the person. The self is constantly changing, but remains a stable entity that consists of these aggregates. Most other schools have criticized this thought. Specifically, Candrakirti makes the claim that social and verbal connections—such as the use of proper names and personal pronouns—are all that give a person their conventional reality.[19]

This line of thought is best elucidated by Carpenter's retelling of a tale of King Milinda and Nagasena. With the help of a chariot, Nagasena explains the concept of no-self. He declares that while there is a conventional reality of a chariot, the ultimate reality is that all complex wholes are nothing more than the sum of their constituent parts.[20] Anything that is real could neither have properties nor be a property of something else. We learn that conventional reality is based on three things, one of which is use. This is in line with Candrakirti's understanding that convenient designators are useful conventions which enable ordinary transactions, but are ultimately empty. Hume makes a similar argument in his Treatise when he speaks of a brick church that falls to ruins and is then rebuilt of free stone. While the form and materials have changed entirely, the relation of both structures to the inhabitants of the parish remains the same.[21] Just like in the case of the chariot, while the constituents may be dynamic and in flux, the referent must remain in order for our conventions to make sense. While these cases are largely similar, Hume asserts that there can be no distinction made between the features of a person and the self that bears these features. On the other hand, Buddhist thought would maintain that none of the individual aggregates constitute a permanent essence. Borrowing from Garfield in his chapter on Buddhist ethics, I believe it would be worthwhile to assert that in contrast to the ultimate reality, conventional reality can be interpreted as a mode of existence rather than an alternative to existence.[22]

Further in this chapter, Garfield identifies the four main issues surrounding the self in Eastern and Western philosophy: diachronic identity, synchronic identity, personal essence, and minimal conceptions of the self. While we have established that both Hume and Buddhist thought are skeptical of diachronic identity (the persistence of a constant self over time), it seems that there are myriad aspects of our social existence—namely taxation, reward and punishment, and social relationships—that depend on this identity. This further highlights the fact that conventional reality primarily contributes to the "use" of a subject. While the notion of the individual self has been around for thousands of years prior to capitalism and economic exploitation, one is still left to ponder upon how contemporary economies and governments might benefit from perpetrating this Western narrative of the individual, self-sufficient, autonomous self. Garfield then recalls the Buddhist notion of the self as a string of beads; while the necklace exists only by convention, each bead exists independently. Through this example, he concludes that while diachronic identity might be conventional, synchronic identity must be determinate.[23] While taxation and our systems of reward and punishment seem to "exploit" this notion of a diachronic self, the human phenomena of agency, rationality, and responsibility demand synchronic identity and are what contribute to our larger roles within those systems. In chapter four of Carpenter's book, she expresses Nāgārjuna's fear of misunderstanding the doctrine of no-self by utilizing the word "unintelligent" men and its false characterization as "nihilism".[24] It is important to keep this in mind when discussing our social roles and the accountability we must hold ourselves to within the confines of conventional reality. Nāgārjuna suggests a middle path between the two extremes that accepts all things as interdependent and contingent rather than constant and self-sufficient.

In response to the conventional reality of diachronic identity, it is important to consider Hume's conception of numerical identity. He believes that numerical identity requires indiscernibility, or that two things that differ in property cannot be the same thing.[25] Our mental, physical, intellectual and emotional compositions are constantly changing. The "me" from last week has scarcely anything in common with the "me" at this exact moment, thus completely rejecting diachronic identity. There is little that one can argue against this. Namely, that "little" is the question of a person's essence and what it may have to do with individual consciousness. The orthodox Indian view of Kumarila and Gangesa[26] argues that the unity of consciousness requires a self. They believe that consciousness is not multi-modal, but rather is integrated into the fiber of a person's being. They also argue that in order for there to be retention and protention of ideas and experiences, there needs to be a persistent self that engages in these acts. This would be a response to Hume's "bundle of perceptions" theory in that there needs to be an independent entity across time who experiences and recalls these perceptions.

The orthodox view further challenges Buddhist and Humean conceptions of the self through Uddyotakara,[27] who, in the classic Indian way of argumentation, offers a story in order to put forth his argument. He speaks of a group of men who enter into an agreement that states, "As soon as the dancing girl raises her brow let us all throw fine fabric onto the stage."[28] This anecdote is meant to elucidate when the men experience the sights, smells and textures of the event. Though their experiences are simultaneous and seem unified, they are the experiences of single, subjective, independent consciousnesses. Coupled with our inability to misidentify ourselves as someone else, Uddyotakara therefore urges that this experience calls for a persistent, independent self. The Buddhist responds to this in the form of Śāntaraksita,[29] which states that this form of self is both gratuitous, as well as "explanatorily impotent." This conception of the self does not meaningfully make any contributions to our conception of the human condition. He explains that in this sort of experience, there is a multiplicity of sensory cognitions that are unified. But this unification is possible through higher order cognition, which is entirely psychological and does not require the unification of a self.

In addition to rejecting the conception of the self by metaphysical argumentation, the primary reason for the Buddhist's rejection of the self is that an enduring self always leads to self-contradiction, which ultimately leads to suffering. The most profound divergence, therefore, between Buddhist conceptions of a non-self and most Western conceptions is that instead of simply focusing on whether or not the self exists, Buddhism focuses on the manner in which the self is constructed, the consequences of those processes, and the social, ethical and affective dimensions of the self. Hume, being an outlier amongst other Western philosophers, is also in the pursuit of how one must conceive of the nature of our realities in this broader community-based context. Garfield explains that the value that may be derived from this sort of study into the self is one that can help us decide the kind of approach to personhood that is most beneficial to our society and broader world, and begin to construct ourselves in accordance with this. In what I believe to be one of his most profound claims, he then urges us to detach the idea of a person from the idea of self in order to clarify what it really means to be a person. That way, we are liberated from our confused preconceptions of a self.[30]

In conclusion, both Hume and Buddhism challenge our traditional notions of the self and of causation. While Hume's inquiry is largely intellectual, the Buddhist inquiry into personal identity and the question of a non-self is one with broader social and ethical implications. Both views tackle the metaphysics of impermanence, interdependence (or lack thereof), and the predicament of human existence. Since all of Buddhism operates in two realities—conventional and ultimate—I find that the Buddhist perspective is relatively more nuanced and therefore sophisticated. My reason for choosing to explore this particular topic is that through the course of this semester I have chipped away at but a tiny fraction of what the Buddhist tradition has to offer and am intrigued to say the very least. In putting Buddhist conceptions of the self into conversation with Hume's conception of the self (which is notably acknowledged within the philosophical community), I aim to illustrate the value of the Buddhist tradition as a worthy contributor and contender in contemporary metaphysical and ethical discourse. Just as Hume's views on causation have led to significant skepticism surrounding our understanding of the scientific method and its reliance on inductive reasoning, I anticipate that Buddhist philosophy has the ability to reconstruct the very matrices of understanding that govern what we take to be our "reality."

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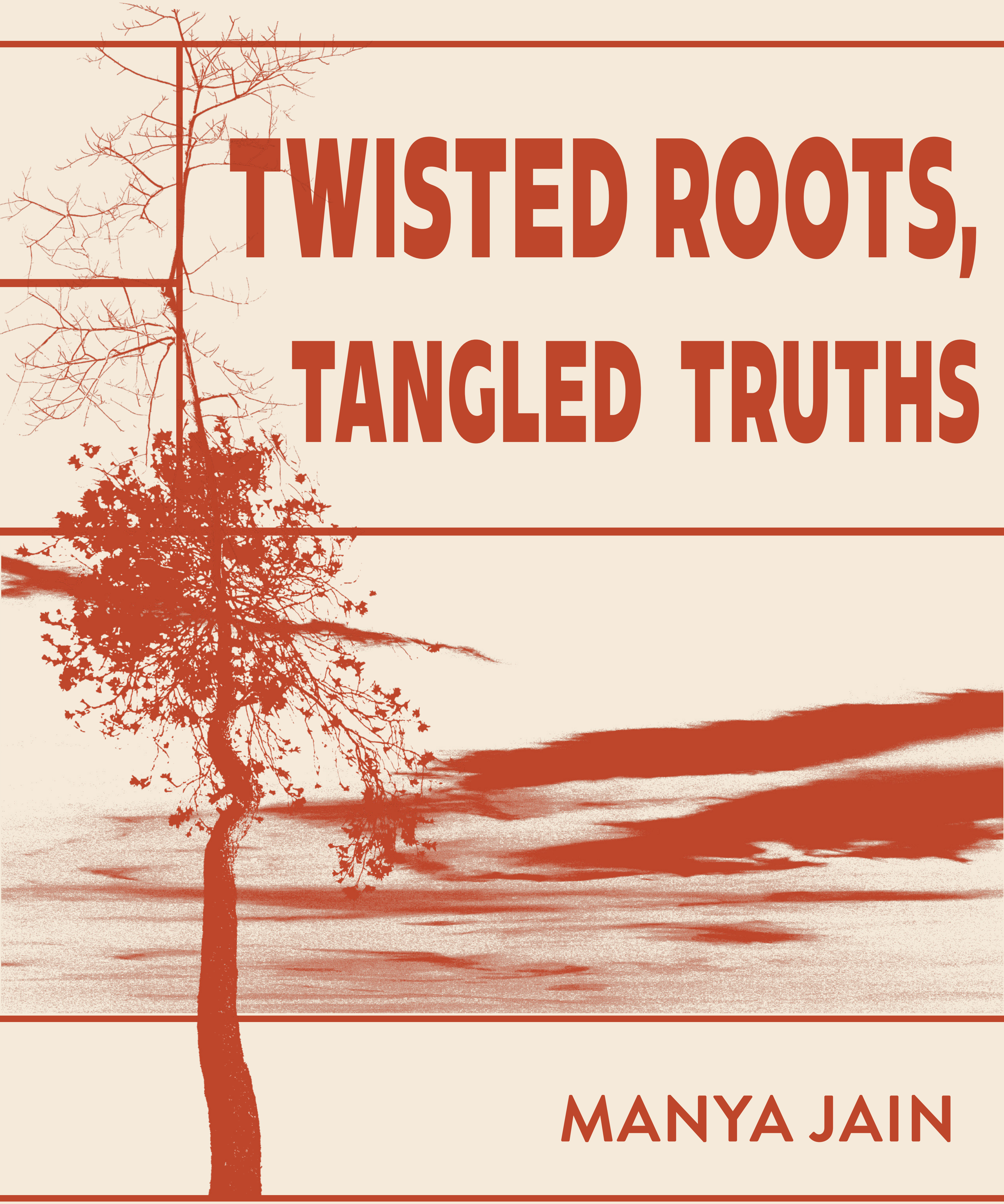

TWISTED ROOTS, TANGLED TRUTHS

MANYA JAIN

There once was an ancient and vast forest. Trees stood tall like sentinels, with their roots deeply tangled in the earth's memory. Much like the hippocampus, it stored every tale whispered by the wind. The air hummed with the quiet rustling of leaves and birds. A harmony of knowledge passed from season to season. But this peaceful expanse was interrupted by a single seed of information that drifted down from the sky. Small and unnoticed, it nestled into the soil. The warmth from the sun and the breath of the wind made this little seed grow.

At first, the wildflower was just another one among many, with bright and inviting petals. Creatures of the forest, drawn by its allure, stopped to admire it. With every glance and every lingering moment, the flower spread. This was the dopamine system at work, rewarding attention and reinforcing behavior. The more the creatures noticed the flower, the more they returned. However, blind to their knowledge, they were carrying its seeds in their fur and feathers. With each step, with each flutter, the idea flourished.

But not all things bloom in life.

Amidst the undergrowth, a shadow moved between the trees. The amygdala remained ever watchful. It didn't need to chase its prey, fear was all that was required. The first time the wind whispered of the new flower, the amygdala lifted its head. The second time, its ears twitched. The third time, it leaped. Panic rippled through the bushes. Fear, like a swift current, surged through the small creatures, etching itself into their minds more quickly and lasting longer than any calm moment. The threat was not real, but their fear was.

The old trees, the hippocampus of the forest, recorded what they heard. With each moment and every repeated story, their rings were etched. However, the hippocampus does not question what it absorbs. Be it truth or falsity, what is written remains.

Up high on the tallest pine, sat the wise Owl of the prefrontal cortex. It watched patiently, as the storms and seasons came and went. It knew the language of the wind and the stories carried in the currents. But as the days passed, the stories began to repeat. The illusory truth effect took hold. Familiarity bred certainty, even without proof.

Initially, the Owl resisted, attempting to recall what was real. But when a tale is told a few too many times, it settles into the mind just like fog settles over the hills. Soon enough, the Owl too was unsure of that which had been and that which had only been said.

The forest had come alive with sound. The birds on the branches sang the same tune - the only melody they had learned. This was confirmation bias. The creatures sought only what they had already believed and ignored unfamiliar calls. The river that once flowed clear, was now fighting against a new current. These two opposing streams were unable to blend. Cognitive dissonance raged. There was a clash between old knowledge and new uncertainty.

And in the heart of the forest were the vines that began to creep. They went from delicately threading through the shrubs to tightening their grip, as they wound themselves around the trees. This was the social contagion of memory - ideas, even false ones, spread until they seemed as if they had always been true.

Yet beyond the thicket and the vines, there was a clearing in which the sun still touched the earth. Here, the light was strong and the ground was soft. Here, a single tree stood unbound. It had shed its vines. It had listened, but it had also questioned.

And because it had, the forest was not lost.

Not yet.


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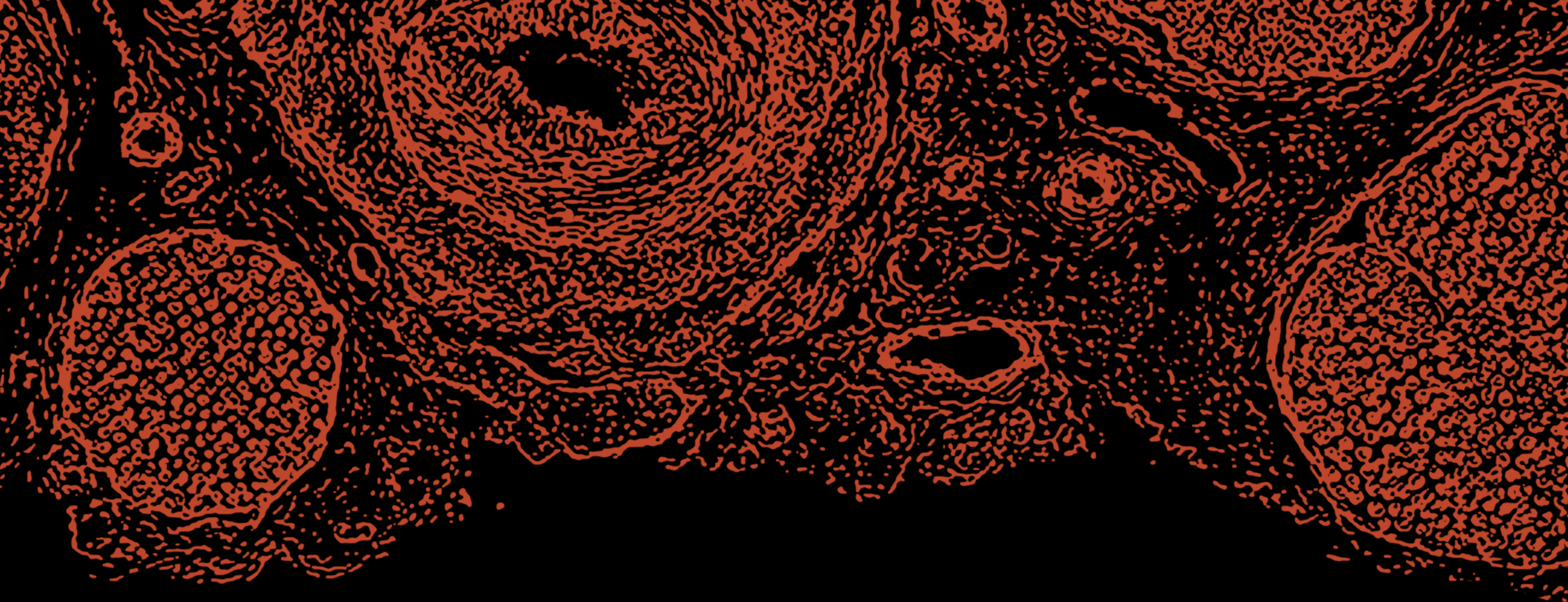

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