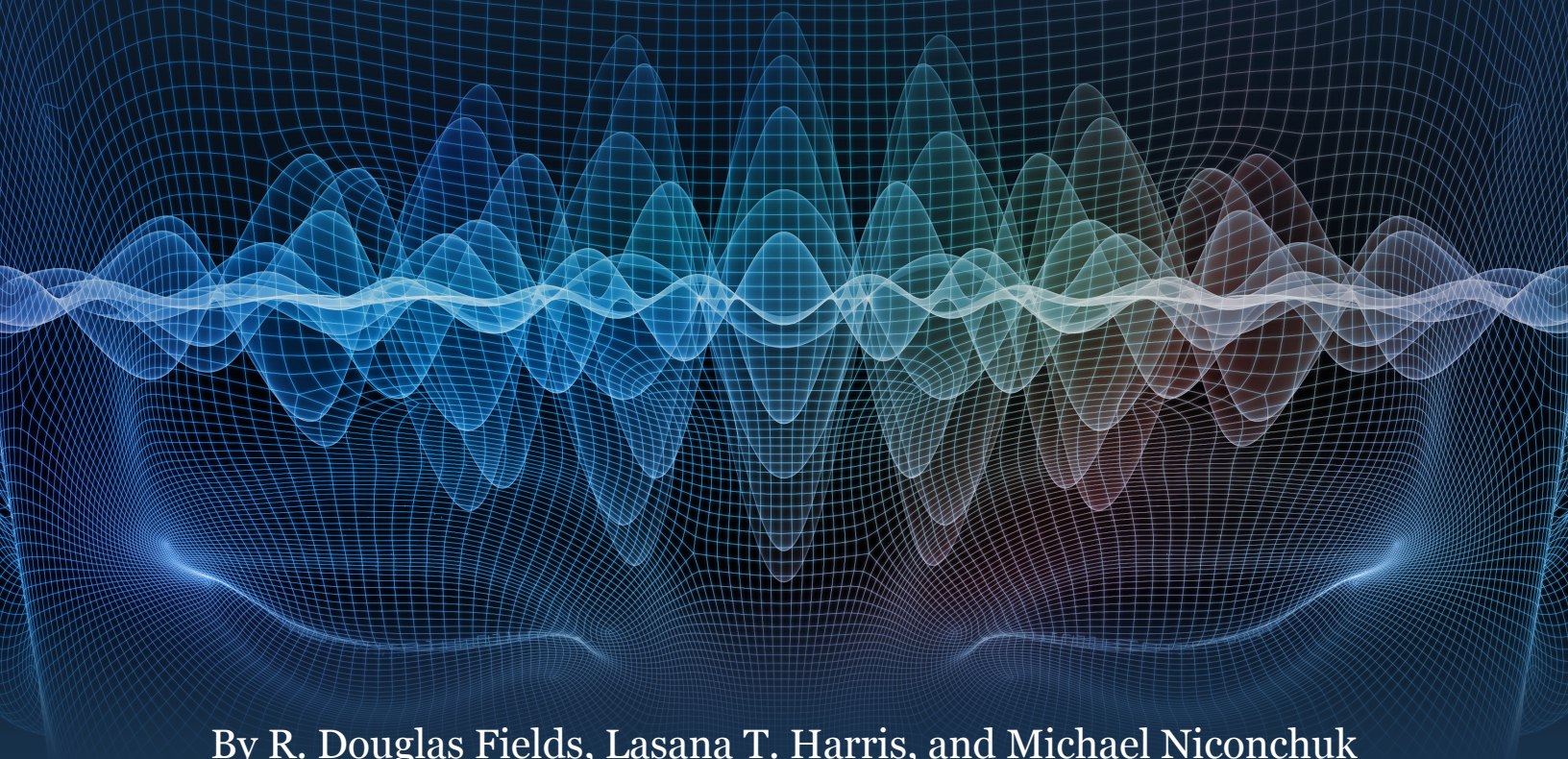
NeuroPeace 1 Where Peace Crosses the Mind MARCH 2021

NEUROSCIENCE *and* PEACEBUILDING

Exploring the Neurobiological Dimensions of Violent Conflict and the Peacebuilding Potential of Neuroscientific Discoveries

PART I: INDIVIDUAL AGGRESSION



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About *NeuroPeace*

NeuroPeace is an online, open source series focusing on research and practice at the nexus of peacebuilding and neuroscience. *NeuroPeace* includes articles and essays by scholars and practitioners exploring how neuroscientific insights can inform peacebuilding processes, including supporting dialogue, fostering reconciliation, and preventing violence, as well as addressing the fundamental causes of destructive conflict, injustice, and societal divisions.

This, the inaugural edition of *NeuroPeace,* is the first of three parts of an edited volume that brings together a group of eminent researchers on the frontlines of neuroscience to share—in a way that is accessible and engaging to nonscientists—their work and to spotlight how it might be relevant and useful to those who work to prevent wars, terrorism, and other forms of violent conflict and to help societies and individuals to heal in the aftermath of violence. The researchers cover a wide range of cutting-edge topics that are grouped under three broad headings and published in three separate editions: Individual Aggression (*NeuroPeace* no. 1), Group Dynamics (*NeuroPeace* no. 2), and Trauma (*NeuroPeace* no. 3).

NeuroPeace is sponsored by the Mary Hoch Center for Reconciliation, a center within the Jimmy and Rosalynn Carter School for Peace and Conflict Resolution at George Mason University.

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NeuroPeace No. 1. Published March 15, 2021.

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Introduction

Colette Rausch

Appropriately enough for a series with the name *NeuroPeace*, this inaugural issue presents a collection of articles entitled, no less aptly ""Neuroscience and Peacebuilding." This collection is divided thematically into three parts, and each part will form one of the first three issues of the new series, with *NeuroPeace* no. 1 focusing on the neurological roots of individual aggression, *NeuroPeace* no. 2 on group dynamics, and *NeuroPeace* no. 3 on trauma.

Collectively, the articles ask—and begin to answer—a deceptively simple question: What can neuroscience contribute to peacebuilding? To date, that contribution has been modest, but the potential is huge. Neuroscientists are making rapid and significant strides in understanding the structure of the nervous system and the brain, and the field of neuroscience is deservedly attracting increasing attention from researchers and practitioners—as well as the media and the public at large—eager to see if those discoveries might illuminate problems and solutions in a wide variety of other fields. For peacebuilders, who are increasingly conscious of the shortcomings of technical solutions to conflicts rooted in human perceptions and patterns of thought and behavior, neuroscience may offer insights and knowledge of incomparable value.

Neuroscience is not really one field, but many. Historically, neuroscience was narrowly viewed as a subdivision of biology (and it is sometimes still called "neurobiology").[1] Today, however, neuroscience is seen as a collaborative and interdisciplinary field that integrates several disciplines, including not only biology but also linguistics, psychology, computer science, mathematics, engineering, linguistics, philosophy, chemistry, physics, and medicine.[2] Neuroscience has many branches. Some of those cluster around biology, such as neurophysiology, which studies the nervous system and its functions, and molecular and cellular neuroscience, which explores genes and other molecules that guide how neurons function. Other branches focus on thought and feelings, including affective

neuroscience, which looks at the role of emotions, and behavioral neuroscience, which investigates how the brain affects the behavior of humans. Yet other branches combine disciplines in specific applications. One example is neuroengineering, which emphasizes an engineering and quantitative approach to research areas at the molecular, cellular, and systems levels to address neurological problem such as epilepsy or strokes.

Peacebuilding, too, is a broad umbrella under which experts and practitioners gather from diverse fields, including economics, security studies, law, human rights, humanitarian relief, and governance. Broadly speaking, the goal of this disparate cast is to help bring about—in societies that are threatened by, in the midst of, and trying to recover from violent conflict—"a transformation toward more manageable, peaceful relationships and governance structures—the long-term process of addressing root causes and effects, reconciling differences, normalizing relations, and building institutions that can manage conflict without resorting to violence."[3]

In pursuit of that goal, peacebuilders could benefit considerably from neuroscience's insights into subjects such as what drives violent behavior and how to address the roots of violence at both individual and societal levels. Policymakers and practitioners of peacebuilding develop "interventions" (a term of art for peacebuilding projects) based in part on their assessment of a conflict's root causes. They talk about the "roots" and "drivers" of conflict being such things as lack of inclusion, marginalization, corruption, and weak rule of law. But what if they were also to go even deeper, down into the wiring of the human mind?

Scientists are making notable advances in understanding how that wiring affects the outlooks, predispositions, and decision-making processes of individuals and societies. Neurobiologists and neuroscientists are discovering how the anatomy and physiology of the brain and nervous system influence how our brains work, while scientists in the field of neuroepigenetics are exploring how our life experiences can lead to changes in the brain and how those changes can in turn affect our thinking and behavior.

This expanding awareness could be invaluable in understanding not only what drives individuals and societies to use violence to resolve their disputes but also what encourages people to turn from war making to peacemaking—what leads them to embrace negotiation, mediation, reconciliation, and the other components of peace processes. Why and how are prejudice, hate, and fear superseded by or transformed into a conscious choice for peace? Peacebuilding strategies could be informed by a better understanding of how the neural structure varies across populations; by knowledge of the genetic varia-

tions in brain structures and how environmental and cultural conditions influence beliefs and disposition;[4] and by research findings about the sources of decision-making and prejudice, and the limits of rationality.[5] Neuroscientists are discovering how changes in neurochemistry, neural pathways, and neuro-anatomical transformations in the brain can affect human emotionality, morality, trauma, and the drive for political power.[6] Neuroscience is educating us on the role of empathy in predicting and addressing intergroup violence.[7] Recent studies have demonstrated the remarkable plasticity of the human brain, underlining the notion that primordial disposition does not imply predetermination.[8] The plasticity of the human brain might even hold the promise of sustainable peace by allowing not just for shifts in attitudes but for new neuropathways to be created and new associations to be formed between, on the one hand, internal states and, on the other, actions and changes in the environment.

Such knowledge could help peacebuilders not only understand human societies better but also tackle specific challenges. For instance, neuroscientific research could help in uncovering the processes and pathways that drive radicalization and make some individuals vulnerable to recruitment by terrorist groups.[9] It could also enhance understanding of the impact of trauma on youth in conflict-affected societies and on the prospects for turning those societies into stable and inclusive democracies.

Goals, Audience, and Authors

"Neuroscience and Peacebuilding" is designed to stimulate interest in such applications of neuroscientific knowledge in the cause of building peace in our conflict-plagued world. We do not claim that neuroscience is a peacebuilding panacea; it must be combined with other peacebuilding tools and approaches. Nor do we dismiss it was a fashionable irrelevance; the current tide of media interest in neuroscience's discoveries may soon subside, but the value of those discoveries will undoubtedly endure.

Taking what we trust is a balanced view, this collection seeks to stimulate awareness of the role that neuroscience can plausibly play in peacebuilding. It describes the work being done in a wide variety of areas of the neuroscience field. It assesses the extent to which neuroscience-based insights and techniques have already been used in peacebuilding and with what results. It explores how, when, and where they might be applied in the future and used in practice.

In addition to reaching out to peacebuilders of all stripes, "Neuroscience and Peacebuilding" aspires to help scientists understand how their work might be used in peacemaking and peacebuilding and to stimulate further research on the nexus of peacebuilding and neuroscience. Researchers, scientists, and scholars and their students from the multiple disciplines brought together in this collection will, we trust, find much to spark their interest in the work being done in fields other than their own.

All but one of these articles are written by neuroscience researchers. The "neuroscience" label may be misleading, however, insofar as they come from a wide array of branches of this broad field, from neurobiology to social psychology to clinical psychology to neuroepigenetics. The contributors have been selected not only because they are recognized experts and innovators in their fields but also because they have a gift for conveying complex information in an accessible way.

This is, we believe, one of the first publications that builds bridges between peacebuilding and neuroscience. There are more than a few volumes that offer general readers an introduction either to neuroscience as a whole or to specific aspects or avenues of research within the broad neuroscientific discipline. (The "Further Reading and Resources" sections at the end of each part of "Neuroscience and Peacebuilding" spotlight a number of publications and online resources that interested readers can explore.) And as one would expect in so dynamic an area, books and especially articles aimed at fellow neuroscientists are legion. Although some existing publications have explored the intersection of neuroscience and peacebuilding, none have covered it from as many variant angles as this collection does.

"Neuroscience and Peacebuilding" was birthed as part of a wider project housed at the United States Institute of Peace (USIP), a nonpartisan institution funded by the US Congress and dedicated to preventing, mitigating, and resolving violent conflicts abroad. That project, initiated by Colette Rausch, *NeuroPeace*'s editor, subsequently found a new home at the Mary Hoch Center for Reconciliation (MHCR) which is part of George Mason University's Carter School for Peace and Conflict Resolution. In tune with MHCR's vision and mission, "Neuroscience and Peacebuilding" (like the *NeuroPeace* series as a whole) seeks to raise awareness, educate, and spark innovative thought, research, and action. A variety of other initiatives at MCHR—such as the *Think Peace Podcast*, which debuted in early 2021, as well as webinars, videos, articles, and events—are designed to help peacebuilders become more familiar with and make use of the insights presented in the following articles.

How "Neuroscience and Peacebuilding" Is Organized

As noted above, "Neuroscience and Peacebuilding" is being published in three parts, each focused on a broad unifying theme and each part a separate issue of *NeuroPeace*. Part I is focused on sources of aggression in individuals and what can cause individuals to react with aggression, engage in dehumanizing behavior toward others that can lead to violence, and join violent extremist groups. Moving from the individual to the group, part II explores two aspects of the neuroscience of group dynamics, which often have a profound impact on violent conflict. Part III focuses on understanding the role of trauma and its impact on the individual and group dynamics that affect peacebuilding processes.

Part I: Individual Aggression

Part I consists of this introduction and three articles. The first of the trio is by R. Douglas Fields, an international authority on nervous system development and plasticity and the author of *Why We Snap: Understanding the Rage Circuit in Your Brain*. As the article's title—"The Neural Circuitry of Aggression and Practical Applications to Peacebuilding"—makes clear, Fields delves into the architecture of the brain and examines the triggers that cause individuals to react with aggression. This article begins by highlighting well-known but outdated or misleading notions of the neuroscience of aggression—such as the concept of a "lizard brain" controlling the fight-or-flight response. Fields' bases his argument on recent experimental research that has enabled neuroscientists to map specific neural circuits that relate to aggression. He identifies nine biological triggers of aggression, each of which can be activated by a certain kind of environmental experience that affects neural pathways associated with aggression. Different types of aggression, the article shows, are mediated by distinct neural circuits.

In "The Impact of Dehumanization on Decision-Making Processes and Violence," Lasana T. Harris, an assoicate professor at University College London, applies a flexible social cognition theory—an understanding of what happens between a network of brain regions that engage and make judgments when encountering or thinking about others—to unpack the process of dehumanization, which he describes as "people having the capacity to treat other people as if they were not in fact people, suspending moral rules and social norms that prohibit such violent behavior." By looking at how underlying brain mechanisms and psychological processes influence moral decision-making (i.e., decisions and beliefs regarding another's character or personhood), he explains how such

decision-making can facilitate violent conflict and outlines the implications for conflict resolution efforts.

In the third and final article in part I, "Terrorist Cells: Neurobiology and Violent Extremism," Michael Niconchuk, Program Director for Trauma & Violent Conflict at Beyond Conflict, draws from concepts in psychology and neurobiology to examine key processes that are important factors in typologies of violent behavior. He explores violent extremism as a byproduct of "normal" brains and bodies, based on the evidence that most terrorists are normal, without clear psychopathology. Niconchuk argues for a shift away from violence prevention strategies that use psychology and neuroscience to predict violent tendencies and toward a focus on neuroscientific tools that illuminate the brain's ability to adapt and change. This reorientation, he contends, can help dispel common myths about terrorism and lead to more effective strategies to address and respond to violent extremism.

Part II: Group Dynamics

Part II investigates two aspects of the neuroscience of group dynamics, which can frequently fuel violent conflict, but which, as these two articles explain, can be managed to support peacebuilding.

In their article "From Conflict to Reconciliation: Bridging Groups by Promoting Commonality," Aharon Levy from Columbia University, Professor John Dovidio from Yale University, and Professor Tamar Saguy from the Interdisciplinary Center in Herzliya, Israel, explore the foundations of intergroup conflict, social cognition, and the social and functional relations between groups. The authors note that psychological and neuroscience perspectives converge to illuminate the processes—social categorization, social identity, and functional interdependence—that underlie and shape relations between groups. When left unmanaged, these processes tend to create and sustain intergroup bias and social conflict in ways that represent major barriers to peacebuilding efforts. In addressing these issues, the authors consider common obstacles and potential unintended consequences to category-based social interventions for peacebuilding and suggest practical ways to overcome the barriers to effective peacebuilding. These interventions include creating opportunities for positive interactions between members of groups in conflict, indirect forms of contact, observing positive cross-group interactions, mentally simulating positive contact experiences, and computer-mediated interactions, all of which can reduce intergroup bias and conflict.

The second article in part II is "A Neurobiological Understanding of How Rituals Can Support Peacebuilding Processes." The authors—peacebuilding practitioner Beatrice Pouligny, Professor Dara Ghahremani from UCLA, and Professor Matt Rossano from Southeastern University Louisiana—explore how rituals engage individuals and communities with nuanced, diverse, and culturally embedded practices, which both transcend and complement standardized approaches to peacebuilding. The authors review existing neuroscience research that reveals the ability of rituals to support the regulation of emotions, sculpt cognitive control, and refine explicit attentional and memory processes—all functions that facilitate positive interactions among individuals. Pouligny, Ghahremani, and Rossano highlight the paradoxical role that spiritual and ritualistic practices can play in either alleviating or exacerbating intergroup bias and us-vs.-them thinking, and they suggest ways to bypass these difficulties by analyzing the research on the role of ritual in promoting trust building, interconnectedness, and social bonding

Part III: Trauma

Part III consists of two articles on different aspects of trauma, plus an article that, while it touches on trauma, offers a wide-ranging and forward-looking assessment of how and why peacebuilders can make use of the knowledge and insights that neuroscientists are creating.

The first article is "Epigenetic Transmission of the Effects of Trauma across Generations: Implications for Individuals and Society" by Dr. Ali Jawaid, Senior Group Leader at the Center for Neural Plasticity and Brain Disorders BRAINCITY of the Nencki Institute in Warsaw, Poland, and Professor Isabelle Mansuy from the University of Zürich and the Swiss Federal Institute of Technology. The authors explain that epigenetic inheritance does not depend on changes in the DNA sequence. Traumatic experiences can set in motion molecular mechanisms that alter the activity of the genetic code without changing its sequence. Their analysis reviews studies in animals and humans on the intergenerational and transgenerational transmission of the effects of traumatic stress by addressing the questions of how trauma exposure and associated emotional and cognitive perturbations can leave traces in the germline. The authors also discuss the question of "windows of opportunity" at different stages of life, from pre-conception to embryonic development, postnatal life and adulthood, during which the inheritance of the effects of trauma may be prevented.

The second article, "The Restoration of Resilience: A Neurophysiological Approach to Healing Individual and Collective Trauma," is by Abi Blakeslee and Glyndie Nickerson, two psychologists and leading practitioners of a trauma resolution approach known as Somatic Experiencing. The authors examine how interoception—the awareness of one's own bodily sensations—can give individuals access to their nonconscious memory and to signals between their brains and bodies that register whether they are in safety or in danger. They examine how, when, and where individuals may be susceptible to trauma, shifting the discussion on trauma from a traditional emotional and behavioral model of mental health to a psychobiological perspective. Their approach draws on the fields of ethology (wild animal behavior), interpersonal neurobiology, and psychology. Trauma, argue the authors, lies not in the trauma-inducing event itself, but is held in ongoing signals in the autonomic nervous system that is deeply rooted in our biological imperative for survival. This article also provides peacebuilders practical exercises to help individuals and communities regulate stress and restore resilience by building on group processes and existing cultural resources.

The final article, by Colette Rausch, brings the "Neuroscience and Peacebuilding" collection full circle by making the case for integrating neuroscientific discoveries in peacebuilding practices by explaining what peacebuilding is and why peacebuilders need the help of neuroscientists. The article begins by discussing how the term "peacebuilding" has evolved, describes the range of actors that conduct peacebuilding, and spotlights some of the major challenges facing peacebuilders in the twenty-first century. Rausch underscores the failures of peacebuilding interventions, citing the limitations of technocratic emphases and donor expectations, which hinder attempts to fully understand how and why people behave as they do during and in the aftermath of violent conflict. Drawing from her own and her colleagues' experiences working as peacebuilders in war zones across the globe, Rausch illustrates the kinds of neuroscientific knowledge and insights peacebuilders can learn from and use to sharpen their current tools and to develop new approaches. The article concludes by highlighting several examples of potential practical applications of neuroscientific research, such as helping facilitators manage dialogue between angry and antagonistic individuals and groups, turning traumatic experiences into a catalyst for personal empowerment and societal resilience, and tackling governance reforms with an awareness of the neural foundations of decision-making processes.

* * *

Several of the cross-cutting themes that emerge from "Neuroscience and Peacebuilding" underline the scale of the challenges that peacebuilders face and raise some disquieting questions. For instance, does the discovery that trauma can be passed down from one generation to the next mean that the neurological scars of war may never heal? Given the strength of our instinctive attachment to in-groups and our reflexive responses to out-groups, will humans always be vulnerable to manipulation by fearmongers with political ambitions and by violent extremists offering both a sense of belonging and an "evil" target on which violence can be unleashed?

But seen from a different angle, such neuroscientific revelations also offer the promise of more effective peacebuilding. Trauma may sometimes be inherited, but it may also be healed—and that inheritance interrupted—by new approaches rooted in a better understanding of how the brain and nervous system process traumatic experiences. Dehumanization—and the genocidal impulses and behaviors it unleashes—may be all too tempting under certain circumstances given how our brains are wired, but perhaps we can harness our knowledge of moral decision-making to steer individuals and groups to make more empathetic decisions. Knowledge is power, and self-knowledge—of how and why we think, act, react, and interact as we do—gives us the power to alter our behavior.

Taken together, the articles in parts I, II, and III make a compelling case for the need, one, to expand the toolbox which individuals, communities, and institutions can use to work with our brain and neural connections to help transform societies; and, two, to better understand neuroscience so that we can rewire our brains for peace or at least help short-circuit reactions that lead to violence.

Notes

1. The terms "neuroscience" and "neurobiology" are sometimes used interchangeably; however, for purposes of this book, "neurobiology" refers more narrowly to the biology of the nervous system itself whereas "neuroscience" refers to anything that has to do with the nervous system.

2. This description draws on "Neuroscience," *Nature*, accessed November 29, 2018, https://www.nature.com/subjects/neuroscience; and "About Neuroscience," a page on the website of Georgetown University's University Medical Center's Department of Neuroscience, accessed November 27, 2018, https://neuro.georgetown.edu/about-neuroscience. See also Christian Nordqvist, "What Is Neuroscience?" *Medical News Today,* June 26, 2018, https://www.medicalnewstoday.com/articles/248680.php See also the box below, "A Short Primer on Neuroscience."

3. Dan Snodderly, ed., *Peace Terms: Glossary of Terms for Conflict Management and Peacebuilding* (Washington DC: United States Institute of Peace Press, 2018), 67.

4. Heejung S. Kim and Joni Y. Sasaki, "Cultural Neuroscience: Biology of the Mind in Cultural Contexts," *Annual Review of Psychology* 65, no.1 (2014): 487–514.

5. Gayannée Kedia, Lasana Harris, Gert-Jan Lelieveld, and Lotte van Dillen, "From the Brain to the Field: The Applications of Social Neuroscience to Economics, Health and Law," *Brain Sciences* 7, no. 94 (July 2017): 1–16.

6. Nayef Al-Rodhan, "Us versus Them. How Neurophilosophy Explains Our Divided Politics," *OxPol: The Oxford University Politics Blog,* October 26, 2016, https://blog.politics.ox.ac.uk/us-versus-neurophilosophy-explains-divided-politics/.

7. E. Bruneau, N. Kteily, and L. Laustsen, L. "The Unique Effects of Blatant Dehumanization on Attitudes and Behavior towards Muslim Refugees during the European 'Refugee Crisis' across Four Countries," *European Journal of Social Psychology* 48, no. 5 (August 2018): 645–662, https://onlinelibrary.wiley.com/doi/full/10.1002/ejsp.2357

8. Emile Bruneau. "Understanding the Terrorist Mind," *Cerebrum*, November 2016.

9. Mike Niconchuk and Kyle Dietrich, "Two Sides of the Same Coin? An Examination of the Cognitive and Psychosocial Pathways Leading to empowerment and radicalization, and a Model for Reorienting Violent Radicalization," *YouthPower*, last modified May 17, 2018, https://www.youthpower.org/resources/two-sides-same-coin-examination-cognitive-and-psychosocial-pathways-leading-empowerment-and-radicalization-and-model-reorienting-violent

10. https://www.ushmm.org/genocide-prevention/countries/bosnia-herzegovina/case-study/background/1992-1995

1

The Neural Circuitry of Aggression and Practical Applications to Peacebuilding

R. Douglas Fields

Since war begins in the minds of men, it is in the minds of men that the defenses of peace must be constructed.

—UNESCO Constitution

To promote peacebuilding, it is necessary to understand the root causes of aggression and violence, because the first step in managing anything is understanding. Politics, sociology, and psychology all provide valuable perspectives to understand conflict, but advances in neuroscience are now producing fresh insight into the biology of aggression. These scientific findings can be applied practically in addressing conflicts between individuals, groups, and nations. From the biological perspective, aggression and violence are behaviors, and like all behaviors they are controlled by the brain. New research is identifying the neural circuits that control aggression, overturning out dated notions, and contributing an informed approach to help reduce human conflict.

It may seem that the origins of human conflict are infinite and bewilderingly complex, but from a biological perspective, this is not true. Only a small number of specific situations will provoke anger and aggression. The reason for this is that engaging in violence puts an individual's life and limb at risk. Therefore, aggressive behavior is highly controlled at the level of brain biology.

Just as eating is life-threatening, and therefore regulated by powerful brain circuitry that has evolved over eons to preserve the species, so too have intricate and powerful

* This article is written in the author's personal capacity.

circuits in the brain evolved to initiate and inhibit aggression. It is nearly impossible to eat anything that smells foul. Appetite is instantly quashed by sudden nausea if someone in your vicinity vomits. Indeed, you may be provoked to engage in the same emetic behavior upon witnessing it in someone else. There may be nothing wrong with the food on your plate, and if food smells rotten or someone else vomits, it does not necessarily mean that you have been poisoned. Regardless, the sight and smell of vomit, or the stench of rot, will override the highly motivated behavior of eating, because from the perspective of evolution of the species, your life is at risk in consuming tainted food.

Consider the very sophisticated neural circuits that have evolved in the human brain to instantly arrest the essential behavior of consuming food because it may be dangerous, drawing on olfaction, taste, vision, perception of body language and social dynamics, etc. Equally sophisticated and expansive neural circuits initiate and inhibit aggression triggered by situational factors playing against the backdrop of internal bodily states, such as stress and fear. Before considering the new research that is identifying the neural circuits of aggression, it is helpful to dispel two outdated notions and common misunderstandings about the neuroscience of aggression.

Outdated Notions of the Neuroscience of Aggression

The lizard brain concept, advanced by psychologist Paul MacLean in the 1960s, and widely popularized by the media, is that the anatomy of the human brain is like a snowman constructed of three stacked blobs.[1] The human "triune" brain stacked up over the course of evolution with the most primitive reptilian brain (basal ganglia) at the bottom, the paleomammalian brain (limbic system) in the middle, and the neomammalian brain (neocortex) stacked on top. Each of these brains, relics of our evolutionary past, carry out separate functions. The "reptilian" brain at the bottom of the stack, handles automatic bodily support functions, whereas our beastly impulses and emotions erupt from the middle brain that we share with "less evolved" vertebrates. These "more primitive" creatures do not have a well-developed crowning blob, the cerebral cortex, that reigns supreme in humans over the impulsively violent lizard and emotional brains beneath.[2]

How this nonscientific popularization took root and had such influence is baffling. The description fails to even square with the obvious anatomical facts. The so-called lizard brain is not the source of primitive beastly urges. It does not operate independently and in rivalry with the cerebral cortex as MacLean argued. The limbic system in the midbrain has connections spanning throughout the brain, and it operates in intricate cooper-

ation with the rest of the brain, not in conflict with the cortex. These brain regions are not primitive relics; they are highly evolved and complex parts of the human brain. The limbic system is an essential hub where internal and external states are assessed, but the limbic system participates in diverse functions from arousal to memory. The cerebral cortex is indeed the brain tissue of reasoning, and in humans at least, of consciousness. To carry out these higher-level cognitive functions, however, the cerebral cortex is highly interconnected among different cortical regions and with neural circuits sweeping throughout the entire brain. How else could higher level cognition proceed without having access to all available information? The lizard brain concept for understanding aggression is scientifically invalid, far too simplistic to account for the challenges and complexities of human aggression, and offers little of practical value that can be applied to peacebuilding.

The second popular misconception is the fight-or-flight response as being the instigator of aggression (or retreat). As everyone has experienced, the fight-or-flight response is an automated physiological response that racks the entire body, setting the heart pounding, the skin sweating, muscles twitching, and blood pressure skyrocketing in response to sudden danger. It is the sensation that accompanies anger, and the purpose of anger is to prepare one to fight. These physiological changes set the body and mind at peak levels of performance to cope with a sudden threat aggressively if necessary, but the fight-or-flight response is the *consequence* of a threat response not the *trigger* to fight or flee. That's because the fight-or-flight response is driven by hormones and neurotransmitters released into the bloodstream to activate diverse tissues throughout the body. Any response that is mediated by delivery through the bloodstream is too slow to address a sudden threat; say, for example, ducking a fist thrown toward your chin. That threat assessment has already taken place in a split second in specialized neural circuits that constantly monitor and evaluate our situation for external and internal threats. These circuits lie beneath the cerebral cortex and they operate without conscious awareness. In the face of a sudden threat, your brain has already detected the danger, calculated the odds, and set you on a definitive aggressive course to confront it, before you are even consciously aware of the threat. The surge of hormones into the blood stream happens much later.

Consider, for example, how we duck and deflect an errant basketball careening toward our head before we even perceive what it is that has triggered our response. "What was that!" we exclaim after having ducked and deflected the basketball with arms outstretched with precision to intercept it, and then the fight-or-flight response kicks in leaving us shaking. We tremble because the body is revved up from the adrenaline surge to

respond aggressively, but there is nothing to do. Your brain's threat detection system has already detected the threat and commanded control of your body to take effective action, leaving you to figure out later what happened. The way this works at a neural circuit level is fascinating, and will be explained below, but this threat-detection circuitry is highly relevant in understanding anger and aggression, because these responses can arise instantaneously and overwhelm reason. This is commonly experienced in road rage, which often ends in regrettable violence. To foster peace, it is necessary to understand this biology that equips us to fight.

Neural Circuits of Aggression

In the late 1920s, Walter Hess began exploring the connection between neural circuit activity and behavior by inserting fine wire electrodes into the brains of cats and delivering a weak electric current to make neurons at the tip of the electrode fire impulses.[3] Depending on where in the brain the electrode was placed, different responses could be elicited. Typically, stimulating the electrode evoked twitching and other simple reflexes, but when Hess stimulated neurons in one region of the brain, called the hypothalamus, the cat launched into a violent rage, hissing and attacking anything in sight. Another animal in the cage would be attacked and killed by the cat when Hess stimulated this spot, which he called the hypothalamic attack area. Remarkably, the extremely complex behavior of engaging in violent attack was unleashed by stimulating this small spot in the brain, and the explosive violent behavior was overwhelming. This brain region is not unique to cats. It is present in primates and humans, and brain stimulation experiments in humans and primates confirm these findings.

The essential question following this discovery was, what brain circuits feed into the hypothalamic attack region to trigger this overwhelming violent reaction? Until recently, research to identify these circuits was severely limited by the methods available. Electrodes made of wire are far too blunt a tool to trace out the intricate neural circuitry of aggressive behavior. Also, the electrical current can stimulate neuronal fibers passing near the electrode, and excite neurons in distant regions, not only neurons at the electrode's tip. This can make mapping out neural circuits this way, difficult and error prone.

New methods, using genetic engineering and laser stimulation, have enabled scientists to trace out these neural connections in fine detail and link their activity to specific behaviors. What this body of research is revealing is that the brain's threat detection circuitry is extremely complex, with connections that span in a vast network extending

across the entire brain.[4] This circuitry activates and inhibits the hypothalamic attack region and unleashes aggression with a high level of precision and specificity.[5]

Three brain centers, spanning nearly the entire brain, are engaged in threat detection and aggression.[6] The amygdala and limbic system, situated at the core of the brain beneath the cerebral cortex, constantly monitors the external and internal state for potential threats. Operating beneath the level of conscious awareness, all of our senses feed into the amygdala by high-speed connections before they are transmitted to the cerebral cortex for the intricate processing required to perceive the input. For example, to analyze light reflections and movement against a background scene to ultimately perceive it as a familiar person's face requires a complex sequence of neural processing steps that progress from the back of the cerebral cortex to the front, with increasingly more sophisticated analysis taking place at each step. This neural processing requires hundreds of milliseconds to complete.

The hypothalamus is the brain region that processes the automated biological functions necessary for life, such as respiration, feeding, sex, thermoregulation, etc. The hypothalamus is connected broadly to other regions of the brain, including the limbic system and cerebral cortex. Once activated, the hypothalamic attack region of the hypothalamus communicates with the pituitary gland to stimulate the release of hormones into the blood that will reach the adrenal glands on the kidneys, causing them to release stress hormones (adrenaline and cortisol) into the bloodstream to energize the entire body to prepare to fight or flee.

The prefrontal cortex can inhibit or excite the limbic system and even the hypothalamus. In performing its executive functions in rapid decision-making, the prefrontal cortex controls impulsive aggression and enables deliberation to guide behavior. However, in adolescents this connection is not fully developed, which is why juveniles are more impulsive and not held criminally responsible as adults. Drugs of abuse will also impair this "top-down" control, and a large portion of violence that the criminal justice system deals with is committed by individuals under the influence of alcohol or other drugs.[7] Genetics and adverse environmental experience also affect the development of the neural circuits controlling aggression. Impairments in this circuitry underlies serious antisocial criminal behavior and psychopathology. Likewise, deliberate acts of aggression instituted with conscious control that originates in the cerebral cortex will activate the same subcortical circuits of aggression to carry out the behavior.

The neural circuits of aggression also sweep to other parts of the brain, for example to suppress pain, which is necessary to enable an animal or person to engage in a violent

life-or-death battle and also to stimulate the brain's reward system, the striatum. A powerful drive of reward in defeating an opponent, generated by the neurotransmitter dopamine in the striatum, is what propels an animal against the obvious risks to engage in aggression, and by extension, what fuels many road rage incidents on the highway. This is the same brain region where cocaine and other drugs of abuse activate, resulting in addiction. Activation of the brain's reward center in aggression and violence drives the hedonistic pleasure of bullying or, in the extreme, sadism, but activation of this leg of the neurocircuitry of aggression is also what accounts for hunting and fishing as popular, rewarding pastimes.

In contrast to the lizard brain concept, this new research shows that different neural circuits activate the hypothalamic attack region in response to different types of threats. When one considers the complexity of information that must be assessed rapidly, and the complex mental and bodily functions that are engaged in aggression, the need for a highly complex neural circuitry to carry out threat detection is obvious. Indeed, a large portion of the brains of animals and humans is devoted to threat detection. The consequences of ineffective or inappropriate activation of this circuitry could not be more profound from a survival-of-the-fittest biological perspective, and the struggle for survival is what drove the evolution of the human brain.

New techniques are tracing out the neural circuits of aggression in fine detail. When neurons are genetically engineered to generate light when they fire impulses, scientists can thread a fine fiberoptic camera into the brain and watch neurons fire when an experimental animal is engaged in a behavior. In this way, the neural circuit responsible for the behavior can be traced out. For example, researchers can watch to see which neurons fire when a mother rat defends her pups from an intruder.[8] (This aggressive response is termed "maternal aggression," which is the well-known response of a mother to selflessly and instantaneously unleash extreme violence, if necessary, to protect her offspring in danger.)

Also, by genetically engineering these neurons so that they will fire impulses, or conversely to inhibit the firing of impulses, in response to shining the appropriate color of laser light beamed into the brain through a fiberoptic filament, neuroscientists can activate or inhibit specific neurons in neural circuits and manipulate the aggressive responses they mediate. This type of research shows that different neural circuits are connected to the hypothalamic attack region, and that different types of threats activate distinct circuits. For example, when the neural circuit that unleashes a violent attack in maternal aggression is inactivated experimentally, the mother will no longer protect her pups from

an intruder. However, the same animal will still respond aggressively to other types of threats—for example, to defend against a bodily attack (defensive aggression).

This body of research is illuminating the biological basis for individual differences in propensity for aggression being provoked by different situations. Genetic and environmental influences on the development and function of these different circuits help account for why some individuals are prone to anger and violence in certain circumstances, but others are indifferent or cower. Moreover, by analyzing these distinct neural circuits that unleash aggression in response to specific threats, it is possible to obtain a neuroscience perspective on the triggers for aggression, and thus obtain a better understanding of how to manage it.

Identifying the Neural Triggers of Aggression

Research on the neuroscience of aggression relies, as most biological research does, on the use of experimental animals. Vital information is obtained in this way, which provides fundamental understanding at a basic science level that can be applied to humans for practical benefit. Animal research is the foundation for most medical treatments for human conditions, and even psychiatric illness is studied in mouse models; even though schizophrenia may be unique to humans, some aspects are shared across species. While it can be problematic to draw parallels from animal behavior to human behavior, the human brain shares the same neural circuitry for aggression that is triggered by similar situations in animals. For example, all animals will react violently if attacked, which is called defensive aggression. So it is with other circumstances that trigger violent behavior in animals and people. Viewing violence from the perspective of neural circuitry, sudden aggression will be induced by nine situational triggers, two of which, maternal and defensive aggression, have already been mentioned.

Aggression and violence are studied by many different disciplines. The ability to study aggression as a behavior from the perspective of neural circuits is a relatively new approach that can complement traditional approaches. It is important to note that aggression is categorized by different academic disciplines in different ways, and each uses a different vocabulary. In social psychology, “aggression” and “violence” have different meanings than these words do in biological science or when used in the vernacular. In this chapter these two words are used relatively synonymously, because the experimental data derives primarily from animal experimentation. It is not appropriate to anthropomorphize emotion or to presume motivation and intention for observed behaviors in

animals, which is central in psychological studies and which informs the terminological differences.[9] To avoid the scientific jargon in analyzing aggression from the neural circuit level, and for the practical purposes of rapidly identifying the trigger for aggression in any situation in order to manage it, the mnemonic LIFEMORTS can be helpful (see figure 1).[10]

Each of these triggers of aggression activates neural circuits that have evolved to address specific situations that present a serious biological threat to survival. This is why, when violence is viewed from the perspective of neural circuitry, there are so few triggers for aggressive behavior. The vast majority of everyday experience is not life risking, but over eons of evolution highly selective neural circuitry to detect and respond to these nine serious threats increased the survival of those individuals in the struggle for survival in nature. When viewed at an interpersonal level, violence, it seems, can be provoked by innumerable and sometimes baffling situations, such as in road rage. In fact, the vast array of interpersonal violence and violence between groups and nations is triggered by only one or more of these nine triggers. The challenge in mitigating the consequences of the neural circuit being triggered is in rapidly recognizing, in any situation, which of the nine triggers has been tripped.

Much of the neural circuitry of sudden aggression is subcortical (i.e., unconscious) because sudden threats require the most rapid response possible. Thus, the nine situational triggers are threats that are, in the biological sense, the kind of instances that put an animal's survival at sudden risk. However, the same trigger circuitry is engaged when aggression is the result of conscious deliberation or intention. Since aggression risks life and limb, evolution would have favored development of neural circuitry that would unleash this very risky behavior only in the circumstances where this risky behavioral response would be life-saving. This means that even when the behavior is executed deliberately, the aggressive response must be worth the risk, and thus initiated by one of the LIFEMORTS triggers.

It is important to realize that while this analysis derives from neuroanatomical and neurophysiological studies on individual experimental subjects, and is thus directly relevant to understanding and controlling aggression as an individual, the findings are equally instructive to group behavior, and thus to peacebuilding. This is because members of a group, be it a gang, tribe, or nation engaging in aggression and violence, are motivated and directed by leaders. It is these same neural circuits of aggression in the mind of a leader that initiates the aggressive response and drives the group to follow. Understanding the root causes of incitement to violence, at a biological level, can be helpful in

peacebuilding efforts to address the situation by seeking other means of resolution than resorting to aggression. Secondly, the individual members of a group who are called upon to engage in violence will not be inclined to do so unless one or more of the neural circuits that have evolved to produce and control aggressive behavior are activated. Finally, even without a specific leader, group behavior often compounds the risk of resorting to violence, because of the strong herding behavior of humans to do as they see others doing. (Why else would a man concern himself about the width of a silk tie knotted around his neck, or indeed, whether or not to wear a tie at all?) Mob violence is the ugliest form of this herding instinct, and there is little need to expand upon this with examples. Efforts to mediate or prevent group violence can be assisted by pinpointing the LIFEMORTS trigger or triggers that are instigating the anger.

Figure 1 . The LIFEMORTS mnemonic for the nine triggers of aggression

		Situation provoking aggression
L	Life or Limb	Physical attack
I	Insult	Social rank
F	Family	Threat to offspring
E	Environment	Invasion of territory
M	Mate	Obtaining and maintaining mates
O	Order	Social organization
R	Resources	Theft
T	Tribe	Threat to one's group
S	Stopped	Breaking restraint

L Trigger

L stands for "life or limb," referring to the neural circuitry of defensive aggression. Any creature will respond aggressively to being attacked; indeed, with unrestrained violence if their life is about to be taken. This neural circuitry will be tripped instantaneously, without any conscious thought. Anyone being attacked will hit, kick, bite, or grab any available object to use as a weapon. The Japanese bombing of Pearl Harbor in 1941 and the al-Qaeda orchestrated attacks on the World Trade Center and the Pentagon in 2001 tripped the L trigger for most Americans, producing an instantaneous impulse to strike back, as seen in reports in US media and pronouncements in Congress in the immediate

aftermath. Many other factors and interests came into play thereafter, as the political system decided to launch full-scale and protracted war, but at least part of the support from many Americans for war stemmed from the L trigger being pulled at Pearl Harbor and on 9/11. Criminal law and international law recognize this biological imperative to use violence if necessary in self-defense. So powerful is this trigger for aggression that it helps explain the otherwise seemingly inexplicable readiness of much of our species to contemplate the use of atomic weapons, even though they might result in what became known in the Cold War as "Mutually Assured Destruction" or might threaten the ecosystem of the entire planet.

I Trigger

The next trigger circuit in the LIFEMORTS mnemonic is **I**, for insult. Many animals, including primates, are highly social species, and aggression is how social order is established and maintained. Headbutting in rams is a vivid example. An individual's access to resources, mates, and success in a social group very much depends on hierarchy. Humans cannot live alone. The survival of every individual depends upon being a part of a large social group, in which different individuals carryout distinct roles, and those roles are structured in a hierarchy. Humans have language, which can substitute for physical violence to establish hierarchy, but when an individual in society feels their status threatened, the neural circuitry to engage in aggressive behavior to defend rank becomes activated.

Duels to the death in response to insult have been accepted at different times in many societies until very recently. Today, people or peoples feeling dominated by others will lash back, because of the I trigger. This is a common cause of barroom brawls and domestic disputes. Social inequality drives this neural circuitry of violence, and revenge is often the result of the same perceived threat to one's hierarchy in society. On a larger scale, perceived insults to a nation's or a particular ethnic or religious group's history, culture, or standing have helped provoke bloody protests and even full-scale war. "Conflict entrepreneurs" and other political leaders looking to bolster their support by positioning themselves as defenders of a group's or a country's reputation often seek to exploit this impulse.

F Trigger

The **F**, or "family" trigger, is the neural circuit for aggression that is tripped whenever a family member is threatened. Typically called "maternal aggression," in many species,

including humans, both sexes will act aggressively to defend their young. Indeed, any member of a family unit may engage in aggression if necessary, because family is the fundamental unit for survival. In the evolutionary sense of natural selection being a competition to pass on one's genes to the next generation, young offspring are the weak link in the genetic line of inheritance. Therefore an innate aspect of parenthood is to fight to the death, if necessary, without reservation to protect offspring.

E Trigger

Aggression provoked to protect one's home environment is the "**E**" trigger in the mnemonic. Not all animals are territorial, but many are, and violent aggression is how their territories are defended. Humans are fiercely territorial creatures. "Trespassers will be shot," "Private Property," and the right to defend one's home from intrusion by strangers using physical or deadly force if necessary is a core biological feature of humans. From a biological perspective, the reason for this is clear. One's life depends on securing shelter from the physical elements and other threats to carry out activities that are essential for life and to store and utilize resources upon which life depends.

The prospect of territorial loss provoked by an armed invasion almost always generates an immediate and violent response from the victim of the attack. Equally, the prospect of territorial gain, although seldom the sole reason for a civil or interstate war today, is often a major component of the rationale for such large-scale violence. From the Six Day War of 1967 in which Israeli troops took territory from neighboring Jordan, to the long-running and sometimes bloody dispute between India and Pakistan over control of Kashmir, countries have battled to secure territory that they believe is rightfully theirs and which will enhance their sense of security. An armed invasion of a country is one of the few events that, as history testifies, typically instantly galvanizes a united and aggressive response from the inhabitants of the territory being invaded.

M Trigger

M is for "mate," which refers to the use of aggression throughout much of the animal kingdom, including primates, to use aggression to secure and maintain mates, just as infidelity, competition for mates, and domestic disputes are frequent provocations of violence in humans. Some of the same neurons in the hypothalamic attack area of mice have been shown to also control sexual behavior. By stimulating these neurons in the right

way, by flashing laser light beamed through a fiberoptic filament inserted into the brain, the animal can be switched back and forth between fighting and copulating. Sex and violence share several common features, such as extreme arousal, common influences by hormones, and a strong sense of reward, so in retrospect, it is reasonable to expect some commonalities in brain circuitry between these two behaviors.

The single most important factor in violent behavior is gender. Men are far more likely than women to perpetrate violence, not least sexual violence. One in three women experience intimate partner violence in their lifetime, according to World Health Organization statistics.[11] In war, rape has long been used as a tactic and regarded as a spoil of war. The Bible, for instance, includes the verse, "I will gather all the nations to Jerusalem to fight against it; the city will be captured, the houses ransacked, and the women raped" (Zechariah 14:2). Many years later, to cite a more modern example, Japan forced large numbers of women—most from Korea but many also from China, the Philippines, and other countries—into prostitution to service Japanese troops in World War II;[12] estimates range from 20,000 to 200,000 women. Peacebuilding programs directed specifically to males, which includesthe biological as well as cultural factors that combine sex and violence, would seem imperative.

The power of the M trigger makes it attractive for violent extremists and others looking to fuel conflict by manipulating people's neural circuitry. One of the ways in which the M trigger can be exploited by violent extremists is illustrated by the following example:

> Terrorist organizations such as Boko Haram and ISIS have exploited marriage inequality among young males by paying the brideprice (money or gifts given to a potential wife's family), or providing wives, for recruits in the Middle East and West Africa. When some males monopolize access to wealth or mates, young males who are left out may behave violently to try and distinguish themselves, competing for control of such resources. As we might expect, there is evidence that higher rates of resource inequality within societies are associated with increased rates of violent conflict among men.[13]

O Trigger

Aggression is used to control behavior of individuals within groups of social species. In modern human society, capital punishment, imprisonment, and forceful removal of resources (fines and revoking privileges) are how social order is maintained, but these are all codified forms of aggression that our species accepts to establish and maintain

social order. This aggression is not like the I (insult) trigger, which is motivated to protect an individual's rank in society, but rather driven to enforce the rules of behavior to maintain social order. Anger rises when individuals violate social rules; for example, if someone cuts in line or runs a stop sign, and this situation can quickly escalate into a violent encounter. Violation of international law or accepted norms will provoke an aggressive response from other nations to maintain order. This behavior is so engrained in us, we are oblivious to it. The use of aggression to maintain order within society is deeply engrained, to the extent that without aggression, regulated and executed by members of society who are granted that role, chaos would break out. Crime and punishment and the human criminal justice system are driven by the innate wiring in the human brain to engage in violence to establish and maintain order in society.

R Trigger

Aggression to obtain and retain resources is ubiquitous in nature. As a species, humans are carnivores, and deadly aggression is how we obtain food. The neural circuitry for predation has been traced out and well-studied in experimental animals, and these same neural pathways are active in the human brain. Seagulls will battle for food, and even a friendly household pet will snap if another animal, or even the owner's hand in some cases, threatens its food dish. In modern society, the basic resources essential for survival are expanded into abstractions, such as money or valuables of other types, but the same R (resources) trigger of aggression will activate this neural pathway that forged the human brain in prehistoric times. On an international level, and among groups of people, competition for natural resources such as water, oil, and minerals, will evoke the same neural systems to unleash aggression to obtain and protect resources.

T Trigger

Being a social species in which survival of each individual is dependent on being part of a group, humans will engage in fierce violence in defense of their own "tribe," whether that be a nation, a gang, or a religious or ethnic group. This is the "T" trigger of aggression, which humans share with many other social animals. This powerful biological drive to protect one's social group can help to fuel strong group identity—such as may be embodied in a nation's military—but it can also drive violent behaviors in order to achieve this goal. There is no shortage of examples of the latter phenomenon, which at one end of

the scale might involve immigrants of a different ethnicity or religion to the majority in society being beaten up by local people fearful of their group losing some of its power and identity. At the far end of the scale are genocides such as the mass slaughter in Rwanda in 1994, which was fueled by Hutu extremists persuading more moderate Hutus that their Tutsi neighbors posed a deadly threat. Some terrorist movements (including some contemporary Islamist extremist groups) are similarly driven, fundamentally, by a fear that the terrorists' "tribe" is under assault by an outside force determined to steal the tribe's resources, undermine its culture, and subjugate its members. This biological need to be a part of a tribe draws individuals who feel alienated or unable to assimilate into society to join gangs and violent terrorist organizations.

S Trigger

An animal in the wild will react violently if restrained. This is the "S" or "stopped" trigger of aggression, and because restraint is easily applied in experiments, a great deal is known about the brain circuitry that restraint activates. Being held up in traffic is not much different from being restrained in any other way. Even being stopped by an unresponsive computer provokes anger because of this deep-seated biological reaction to fight aggressively if trapped. On a national scale, impeding another nation from fulfilling its endeavors can help spark war, as can blockades and embargoes. The oil embargo against Japan has been blamed for provoking the sneak attack on Pearl Harbor, for example.[14] On an individual scale, being thwarted from personal achievement trips anger and often violence in the workplace.

The Double-Edged Sword of Aggression

These triggers of aggression must not be dismissed as failures. We owe the success of our species to these triggers, because aggression, from a biological perspective, is sometimes necessary. The T (tribe) trigger sparks gang warfare and war between nations, but it is also what makes nations possible. All nations are defended by individuals who will fight to the death to protect their country. It is the T trigger that energizes competitive sports, and it is the T trigger that binds individuals together in common purpose to achieve a goal, from a sales team working to meet a quota, to a nation's quest to be the first country to put a man on the moon.

The LIFEMORTS are the neural circuits driving aggression, but they are also the same circuits that can bring peace. The T (tribe) trigger has helped fuel total war between, for instance, France and Germany, and between the United States and Japan—but today, these same countries are close allies, committed to support and even to defend the other against attack. Whether it is making peace between people, political parties, or nations brought into conflict to defend their "tribe," peace and unity can be achieved by recognition that although different, everyone in both groups is a member of the same tribe in larger aspects, because of shared values, goals, and ideals. Put differently, people belong to different kinds of tribes, some of which can divide people and others of which can unite them. In many democracies, for example, election campaigns witness fierce competition between parties vying for votes, with their differences magnified to the point that they are sometimes described understandably as competing "tribes." But when a national emergency occurs, these tribes may put aside their differences and focus on their common interests and values. (When this does not happen, and lower-level tribalism impedes tribal unity on a national level, violent conflict may not be far away—as witnessed during the American Civil War. A similar tribally inspired splintering occurred during the 1990s when the constituent republics of Yugoslavia fought to assert their own identities.)

How LIFEMORTS Can Inform Peacebuilding

Taking the biological perspective, we see tooth and nail throughout the animal kingdom. But we choose today to live in a more civilized world of law and order, where conduct is managed by our shared human values, not by the rules of the jungle. Peacebuilders devote considerable attention to distilling complex situations of violence to their root causes, and in pursuit of this goal the LIFEMORTS perspective can be helpful in three ways: recognizing aggression's roots, signaling the need for proactive steps to avoid danger, and avoiding manipulation.

Recognizing Aggression's Roots

Recognizing what is driving the aggression from a biological perspective can help in bringing peace by enlightening you to the underlying cause. This equips you to distinguish whether the incident of impending conflict is a misfire in the sense that the situation has inappropriately activated one or more of the neural circuits that unleash aggressive behavior for survival, often by a circumstance that these triggers were never designed to

experience. For example, realizing *why* you may suddenly feel anger welling up on the road when a person cuts into your lane can prevent an altercation. "*Your* lane!" The car cutting in front of you has tripped the E trigger (environment) in your brain, to defend your territory. But this situation on the road is an illusion created by a circumstance the brain was never equipped to experience—traveling through space a mile a minute inside a machine. The E trigger is not tripped in a foot race if someone outpaces you. That might even provoke laughter, but in a foot race you are running *over* territory not *within* your territory, which is the illusion created on the road. This is a misfire, and for the purpose of the behavior you are engaged in, transportation to your destination, it makes little difference if the person in the other car is on your front bumper or back bumper. Rather than trying to suppress the anger, the anger will recede because that fiery emotion is how the brain's threat detection system alerts the conscious mind to a sudden danger. Once alerted, it is the cerebral cortex's job to decide what to do, if there is time for it to become engaged. The conscious mind can quickly evaluate the alarm and shut it off by sending inhibitory signals from the prefrontal cortex to the amygdala. For example, if you are bumped in a crowd, you will instantly tense up and turn to confront the possible threat—the L trigger of aggression. But if the person says "excuse me," the urgent emotions of alarm are instantly shut down, because your cerebral cortex recognizes it as a false alarm.

This scenario of road rage assumes, of course, that the abrupt lane change has not put you in a dangerous situation. In that case, the L trigger (life-or-limb) will be tripped, provoking anger to aggressively defend yourself or your loved ones. Even in that case, realizing that you have a biological need to prepare for battle to defend yourself against a bodily threat, and all the biological systems in the fight-or-flight response will have been activated in your body automatically, your conscious awareness can override the powerful impulse to fight by recognizing that in this situation, a physical fight is not going to help. Recognizing *why* you suddenly feel the urge to fight—to joust with the other vehicle or make an obscene gesture, or worse—can be more effective in managing the situation than trying to suppress the sudden explosive anger. We have that emotion for a biological purpose, and telling someone (or yourself) to calm down when angry rarely works. (Often this trips the S [stopped] trigger, compounding the anger and aggressive impulses.)

Likewise, we get angry when traffic lanes merge and someone whips around and cuts into the line of cars that are dutifully blending into a single lane. That trips the O trigger (order in society), igniting sudden anger, because the person is violating social order. In past generations, the necessity of maintaining social order was an individual or

collective responsibility of members of human society, but in modern civilization, we have delegated that responsibility to the police and legal system. We have done that for very good reasons, and for you to engage in an aggressive counter response is to revert to the laws of the jungle and assume the risk of bodily harm unnecessarily.

An important aspect of being able to identify the neural triggers in any situation that promotes aggression is that it enables you to recognize when these triggers have been activated inappropriately; that is, as misfires. From road rage to a school shooting, tragic, seemingly incomprehensible violence is often the result of misfires of these triggers, because while these neural circuits evolved for the benefit of our species, they can malfunction due to disease or circumstance. It is necessary to appreciate that these triggers, and the brain circuits that they activate, evolved over the course of human experience in a very different environment. The human brain today is the same as it was in our ancestors 100,000 years ago living on the open plains of Africa, but today the human brain is coping with an environment in which it was never designed to operate. In prehistoric times, individuals likely knew every member of their tribe, and an encounter with a foreign tribe was a threat to resources. Today, technology, crowding, and stress in modern life increases the opportunity for these triggers to be tripped. Today, with high-speed transportation and instantaneous communication, people and tribes can be brought into conflict readily.

There is not space to go through each of the LIFEMORTS triggers and how they apply to peacebuilding. In many cases of international conflict, these triggers of aggression obviously play a driving role—the T "tribe" trigger and E "environment" triggers are, by themselves or in combination with other triggers, frequent instigators of war. But understanding the biology behind commitment to war in these and other instances that trip the LIFEMORTS triggers of aggression is vital.

One can use knowledge about the LIFEMORTS triggers in negotiation to motivate cooperation instead of conflict, because we all share these triggers. Driving into a peaceful park in the countryside, once, I stopped at the entrance kiosk to read the information and pay the fee. A person in a car behind me suddenly started angrily honking his horn. (At that particular time of day, there was no entrance fee and I then realized that no one was inside the kiosk.) Like anyone, the loud angry honking sparked the emotion of anger to equip my body to respond to aggression as a threat to be countered by fighting back if necessary. But I realized that the person in the vehicle was angry because I had tripped the S (stopped) trigger of aggression in his brain, by restraining him from entering the park. I immediately understood his aggression. I got out of my car, calmly walked up

to the driver's window and politely said, "You know you are in a park. You shouldn't be honking your horn like that." Looking chagrined, he immediately apologized and further confrontation was avoided. The O trigger that compels humans to follow society's rules had nullified his S trigger.

Being able to recognize the type of threat causing anger in another individual or group can help manage it, and prevent regrettable violence. Being able to identify the trigger that is evoking a sudden rise in anger in yourself can enable you to rapidly understand and distinguish whether it is a legitimate trigger requiring life-saving aggression or a misfire.

Signaling the Need for Proactive Action to Avert Danger

When friction develops between people, recognizing situations that are pressing on one of these nine triggers will alert you to the fact that this is a potentially highly aggressive or even potentially deadly confrontation, no matter how contained things may appear at the moment. A neighbor's tree encroaching onto your property or a difference of opinion about a fence line is the E (environment) trigger for aggression to use violence if necessary to protect your territory. This is a situation that must be addressed proactively or it could escalate. The papers are filled with assaults arising from disputes between neighbors over property. Border disputes—from Kashmir to the South China Sea—are situations now in the news that are pressing on the E (environment) trigger to use aggression to obtain and defend territory. Peacebuilding efforts must be engaged as early as possible in any situation pressing on one of these nine triggers, because their purpose is to unleash violence.

Avoiding Manipulation

Recognizing when these neural triggers of aggression are being pressed to incite violence for political reasons is vital. False flag provocations to war, in which one side stages a clandestine attack to give the appearance of being attacked by the opposing side, illustrates how effectively mass violence can be incited by exploiting the L trigger of aggression. The war in Iraq and the war in Vietnam were both launched by political officials marshalling Americans to war to defend their country (the L, life-or-limb, and T, tribe, triggers), but the justifications given for going to war were not as clear-cut as they were presented to be at the time. Secretary of State Colin Powell famously assured the United Nations and the American people that the threat of weapons of mass destruction in Iraq was real, but he

would later regret that the evidence for his claims was not entirely sound.[15] The attacks on the US Navy ships *Turner Joy* and *Maddox* in Vietnam, which helped persuade Congress to authorize the war in Vietnam in the Tonkin Resolution, were revealed years later to have been a false pretext, pressing Americans to engage in aggression to defend their country against attack—the L trigger.[16]

If these neural triggers of aggression are activated by circumstances for which they were evolved, individuals will be driven to engage in violence and destruction with extreme selflessness and commitment, as in, for example, Americans entering World War II. But if the instigation is a false pretext that exploits the neural circuits in the human brain that have evolved for aggression, the men and women compelled to fight, and society in general, may revolt. Peacebuilding may be promoted by efforts to recognize when a potentially violent conflict would be "justified" in terms of the biological perspective and neural substrates required to carry out violent behavior, or when the provocation is a misfire or can be resolved with peaceful means. An analysis from this perspective could also help to spotlight when leaders of groups are exploiting this biology for incitement to violence for ulterior motives.

The Vietnam war tore apart the social and political fabric of the United States in the 1960s and 1970s, because so many of the individuals who were required to engage in the violence, and their loved ones, did not feel any of the LIFEMORTS triggers of aggression in their mind were pressed. The Vietnam war ignited mass demonstrations in the streets. One hundred-twenty-five thousand Americans emigrated to Canada to avoid the military draft into compulsory service. Fifty thousand American service men deserted. Of those Americans who served in Vietnam, 58,200 were killed and 125,000 were injured.

Propaganda and fearmongering are often used to advance a political agenda, and these tactics are effective because they excite one or more of the LIFEMORTS neural triggers of aggression. Vilifying refugees, political opponents, or religious groups as hostile threats can incite violence. Shutting down orderly exchange of people and trade across territorial borders, instituting blockades, embargoes, and imposing onerous tariffs are all aggressive actions that will appeal to these neural circuits to marshal support for aggressive political agendas and approval for the use of force.

Political leaders and citizens who ignore or exploit situations in which one or more of the LIFEMORTS triggers arise within society do so at their own peril. For in these situations, the neurobiological circuitry evolved in the human brain to unleash violent rage will provoke that behavior on a mass scale. The violent mob that was incited to storm

the US Capitol on January 6, 2021, to stop Congress from certifying the outcome of the presidential election is a vivid recent example. The triggers evident in the post-election turmoil were clear warning of the impending danger of violence: "Stop the steal!" (the R trigger.) "The election was rigged!" (the O trigger.) The T trigger of violence was obvious from the deep divisions and extremism that pitted different factions of Americans against each other. Some rioters behaved as invaders in war, intent upon taking captives and threatening death to some political leaders. Other LIFEMORTS triggers also contributed, making the situation extremely toxic.

The police who were forced to counter mob violence with violence engaged in that behavior because several of the LIFEMORTS triggers arose with their responsibility and commitment to defend the US Capitol and protect those inside. In doing so they demonstrated why we have this capability for violence engraved in the human brain. While it is always dangerous, destructive, regrettable, and must be avoided at all costs, violence is sometimes necessary for self-preservation and for the larger good of society upon which all individuals within it depend. The triggers L, E, O, R, T, and S were all at play in the actions of the police and the National Guard.

But the violence that became necessary for the police to engage in as a last resort need never have happened had appropriate peacebuilding measures been implemented earlier. Those measures would have focused on systematically defusing the pressures being applied to the triggers of violence by working to address the reasons that some Americans felt that they were robbed, that the election was rigged, and that the rules governing our society and politics were being violated.

Even as we are separate as individuals and nations, we are all united by our biology. The stunning history of success that our species has achieved on this planet is testament to the power of the human brain to enable us to survive, to inhabit every corner of the globe, to innovate, and to form cooperative groups and societies, all driven by both a fight for survival and a deep desire to coexist in peace.

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2

The Impact of Dehumanized Perception on Moral Decision-Making during Violent Conflict and Peacebuilding

Lasana T. Harris

Human beings have long engaged in violent conflict. Around 2 percent of all human deaths are due to interpersonal violence, a similar proportion to when we existed in prehistoric bands or tribes. This proportion is similar to that of the evolutionary ancestors of our closest cousins: primates and apes.[1] Human beings therefore belong to a particularly violent branch of the mammalian tree. However, such murderous behavior is relatively unique across the remainder of mammals, with only wolves, chimpanzees, and mice observed practicing intraspecies killing due to social conflict. Yet only humans engage in intergroup violence on such large scales, committing genocide, engaging in wars, perpetrating acts of terror, and other such human atrocities. A plausible mechanism to explain such phenomena is dehumanization: people have the capacity to treat other people as if they were not in fact people, suspending moral rules and social norms that prohibit such violent behavior. Presumably, such dehumanization facilitates violent behavior because it short-circuits moral reasoning, promoting immoral decision-making. Over the last two decades, psychologists have unearthed the brain mechanisms of both moral decision-making and dehumanized perception. This article describes these brain and psychological mechanisms and discusses the implications of this science for conflict resolution and peacebuilding.

The brain evolved to ensure survival and reproduction. Reproduction ensures that we can pass on our genetic material, and we must survive long enough to guarantee such successful propagation. As a result, the brain is primarily concerned about movement

toward appetitive (rewarding) and away from aversive (punishing) stimuli. Guiding such movement are learning mechanisms that ensure optimal decision-making. Thus, learning and decision-making are inextricably linked. Decision-making is governed by rewards and punishment, the proverbial carrot and stick. During decision-making, the brain makes a prediction based on a model; it relies on an expectation about reward or punishment based on past experiences. It then motivates a behavior, and integrates the outcome of the behavior to update the model, which better informs future predictions and behavior. This iterative learning process occurs largely beyond consciousness and governs all behavior.

Morality, like other psychological processes, is dynamic, suggesting a temporal component to moral decision-making. To better understand this, let us consider the anatomy of a moral decision[2] to engage in genocidal killing. Specifically, let us consider a person who picks up a weapon with the intention of joining in mass killing behavior against a hated out-group. Such a decision is by definition a moral decision since the behavior will result in harm and cause suffering. Certainly, such a hefty moral decision does not occur in a vacuum; any person engaged in such behaviors was raised in a society that has a particular architecture that clearly defines different social groups. That individual thus has an identity tied to one such group in their society. That group, by its very existence, is in opposition to other groups.[3] The degree of camaraderie or animosity between those groups is based on historical circumstances that shape the current societal hierarchies and each group's place in it. Moreover, there are cultural narratives local to each group that explains why the current societal hierarchy exists and the agency of each group in affording their place in that hierarchy. This allows current behavior by group members to be interpreted within that context. The summation of all of this historical and contemporary context creates the motives that justify and encourage genocidal killing; the priors that inform their model. "The outgroup has always wronged us, continue to do so, and will for future generations unless we do something about it." Nonetheless, such motives may be sufficient to explain the genocidal killing as a whole, but do not adequately explain why a particular individual may participate in such moral wrongdoing; other idiosyncratic individual differences and contextual factors play a role in determining whether any individual member of the in-group will participate, including but not limited to social roles, group identity, opportunity costs, personal history, and cognitive composition or personality.

Moreover, if we were to consider the time-course from a decision to participate in genocidal killing to the execution of the genocidal act, then an understanding of the com-

plex factors just described would still be insufficient to explain why a particular person engaged in such behaviors. Instead, a more mechanistic account is warranted, focusing on the psychological factors responsible for the behavior. Assuming an individual matched all of the criteria described above, that is, is imbued with sufficient motivation to engage in genocidal killing, an account based on rage and emotion does not adequately explain such behavior. Instead, a cold, calculating cognitive account is necessary because the genocidal individual has to decide when to strike, what weapon to use, and how to go about the act while keeping feelings of moral wrongdoing and guilt at bay. Here is where dehumanization—a failure to consider another person's mind—may be useful. Stated differently, dehumanization may not explain why someone is motivated to commit genocidal killing, but it may kick in when the person is at their neighbor's door wielding a machete.

This article attempts to explain the anatomy of moral decision-making in the context of intergroup conflict and human atrocities. It begins by examining the brain mechanisms of moral decision-making, before comparing moral decision-making with economic decision-making. It then explores dehumanization, flexible social cognition, and disgust—psychological mechanisms that guide moral decision making. Finally, it links the psychological mechanisms involved in intergroup violence to dehumanization. In the process, this article argues that the decision to engage in violent conflict is influenced by contextual and political factors that rely upon historical circumstances, creating a view of the world where such violence seems inevitable and necessary. As such, preventing or short-circuiting such violence requires altering the prevailing world view that political actors seize upon to encourage violence. Thus, peacebuilders must be informed about these historical circumstances and the current world view on both sides of the conflict, and use this knowledge to find ways of destroying the myth of inevitable violence.

Brain Mechanisms of Moral Decision-Making

Morality is not a unitary construct, and moral decision-making does not rely on a singular brain mechanism. Moreover, it is important to distinguish between moral evaluations, or judgments, and moral decisions. The former involve evaluating the actions of others, including abstract representations of the self that occur during hypothetical moral scenarios, while the latter focus on decisions made involving the self that guide subsequent behavior. A meta-analysis[4] suggests that while there is overlap in the brain between these two types of moral decisions in the *middle temporal gyrus (MTG)*, *cingulate gyrus (CG)*, and *medial prefrontal cortex (MPFC)*, there are important differences. For instance, in

addition to the regions listed above, moral evaluations recruit the *superior temporal sulcus (STS)*, while moral decisions recruit the *precuneus, inferior frontal gyrus (IFG),* and the *caudate*. These brain regions are involved in other psychological processes such as social cognition—thinking about another person's mind—and economic or reward-based decision-making. Such a dissociation between hypothetical moral judgments and actual moral decision-making is key because policymakers, peacebuilders, and other political actors usually consider moral judgments when determining policy and actions to prevent or curtail violence, but the actual perpetrators of the violence are not engaging moral decision-making mechanisms. Thus, there is a mismatch between policy and violent behavior, making the policies less effective.

Moreover, the brain regions implicated in moral decision-making are associated with other psychological processes related to different facets of morality. Punishment relies on the *amygdala*, a sub-cortical structure that is the most interconnected region of the brain and serves as a salience detector or burglar alarm, directing attention to salient events. As such, the amygdala underlies emotion processing, learning, and influences a number of other cognitive processes, including decision-making, attention, social cognition, memory, and basic perceptual processes such as audition and vision. Magnitude-of-punishment decisions correlate with activity in the amygdala, consistent with theories of punishment that posit it as an emotional response. This allows punishment to fulfill its motives, including to communicate to the perpetrator, the victim, and the wider social community that moral violations will not be tolerated, to deliver just desserts, and, most importantly, as retribution for wrongdoing.

Moral decisions are guided by both the behavior of the perpetrator and the perpetrator's inferred mental state or mind. As such, moral decisions inherently require social cognition. For instance, murder and manslaughter trigger different moral appraisals and receive differing punishments because murder involves an intention to harm, whereas in manslaughter, the harm is deemed accidental; the perpetrator did not have the intention to cause harm. Therefore, moral decision-making also relies on the *social cognition brain network (SCBN)*, a suite of regions that reliably engage when people are thinking about their own minds and the minds of others. One region in this network is the *temporal-parietal junction (TPJ)*, a brain region that has been extensively investigated in moral judgments. This brain region seems to integrate statistical information, a necessary feature for any brain region responsible for inferring other minds since such inferences require a Bayesian[5] integration of statistical information. For instance, this brain region is able to dissociate whether someone poisoned another person intentionally or accidentally.

Furthermore, moral judgments can be categorized as either deontological or utilitarian. Deontological[6] decisions are based on largely emotional reactions that promote harm avoidance. In the trolley dilemma, a vehicle heavily used to investigate such moral judgments, people are given a choice between sacrificing one person to save five lives, or allowing the five people to die by refusing to sacrifice one person. Deontology suggests that any harm is wrong, regardless of the implication (in this case, the benefit of the harm results in five lives saved), so judgments consistent with this philosophy refuse to sacrifice the one person. When participants make such judgments, there is activity in a suite of brain regions associated with emotion: limbic brain regions that include the MPFC and CG. However, a more utilitarian decision promotes sacrificing one person to save five people. Utilitarianism prioritizes benefiting the many, rather than the few. Such cost-benefit analyses are defunct of emotion, and cold and calculating brain regions become involved, such as the MFG and *parietal lobule (PL)*. Therefore, different networks of brain regions underlie different moral judgments.

Moral judgments, evaluations, or intuitions are not decisions,[7] but people make moral decisions every day. There is a well-understood brain architecture that supports (economic) decision-making. Studied primarily in the context of economic (reward) decision-making, the *striatum*, a sub-cortical structure that includes the caudate, *putamen, substantia nigra, and globus pallidum*, tracks reward probability and prediction error—failures to obtain a reward when one is expected—among other psychological functions, and is central in the decision-making brain network. The striatum works in concert with medial frontal brain regions including the MPFC, *medial orbital frontal cortex (MOFC)*, and CG, which is responsible for assigning subjective value to options during decision-making. Presumably, value and error are aspects of moral decision-making, suggesting the generic decision-making brain network plays a role during moral decision-making.

Comparing Moral and Economic Decision-Making

Having considered the brain correlates of both moral and economic decision-making, it is interesting to compare the role of dehumanized perception during both types of decision-making. I define dehumanized perception as reduced engagement of the SCBN, a brain network that includes the MPFC, TPJ, precuneus, *posterior cingulate cortex (PCC)*, and areas of the temporal lobe, including the STS and *anterior temporal pole (ATP)*. This vast brain network facilitates moral decision-making, but may inhibit optimal economic decision-making. For instance, if you needed to sell your house, but your best friend was

a terrible realtor, would you choose to go to your friend to sell your house? The optimal economic decision in this scenario is to hire another realtor to sell your house because another realtor would be able to maximize the profit inherent in your property. Your friend's mind (negative subjective experiences and potential distress when finding out that they had been overlooked) is irrelevant regarding this economic decision. However, if you value your friendship, you may consider your friend's mind, weigh their potential disappointment, and choose to appoint your friend as realtor. This may certainly be a suboptimal economic decision, but a better social one. Because morality resides in the social domain, there are similar benefits for engaging social cognition during moral decision-making.

A suite of studies conducted in my lab further illustrate this distinction between people and profit. We first conducted a review of the neuroeconomics literature that revealed the SCBN is more engaged when people play strategic interaction economic games with other people versus computers, while behavioral outcomes also differ in these paradigms. Stated differently, people bring additional cognitive processing—specifically, social cognition—to bear in economic contexts involving other people. This additional processing is often not necessary in economic contexts because it makes salient social forces or rules of behavior that allow people to think about the minds of others, which may change their behavior. For instance, Dan Ariely and colleagues[8] documented a phenomenon where people took more cheap candy (costing just one or two cents) than free candy when offered by the experimenter. This behavior is economically irrational given that free candy costs nothing, but purchased candy, even for such small sums, results in a financial cost to the participant. However, in this experiment, a participant in the free candy condition may consider how the experimenter may view them if they took large amounts of candy, in addition to considering the minds of other participants coming to the experimenter later who may not have access to candy if the participant exploited the resource. The participant may also reflect on their own self-view as considerate; taking a lot of candy would conflict with such an identity. However, in the economic context, those thoughts are irrelevant because behavior is driven by market instead of social forces. In another experiment, James Heyman and Dan Ariely[9] documented a similar phenomenon where participants worked harder when paid in candy versus when paid in small sums of money (equivalent to the value of the candy). In this experiment, a participant may consider the mind of the experimenter who has requested a favor, instead of market forces that place a value on their labor. Finally, Uri Gneezy and Aldo Rustichini[10] documented that people were more likely to arrive late to collect their child from daycare if the daycare

instituted a late-arrival fee. In this experiment, a parent may consider the minds of the daycare staff that are being inconvenienced by their late arrival when there was no fee, but may hold no such consideration after the fee had been introduced because they are now trading that inconvenience for a profit. Taken together, these studies are all consistent in suggesting that additional social cognitive processing may differentiate social and economic contexts, driving behavioral differences.

We further tested this distinction in brain imaging experiments. In the first brain imaging study,[11] we created an investment task where participants had to choose a human and computer investor with whom to invest a sum of money over a number of rounds. We provided a learning opportunity for the participants such that they could determine which investors were more likely to return a profit. Importantly, we framed the reason for the outcome as due to investor competence or generosity. We kept a similar cover story for the computer-program investors, attributing differences to the underlying algorithms that determined commission fee (generosity) or investment competence. Across multiple measures of learning, we found that participants were less likely to learn about the investors in the human generosity condition. Moreover, participants displayed enhanced activity in the SCBN, mirroring the pattern observed in their behavior. This suggests that participants engaged social cognition to investors whose behavior was framed by a personality trait (generosity), not to investors whose behavior was framed by ability, or to nonhuman investors. This additional cognitive processing hindered learning within this economic context.

The above study suggests that engaging social cognition in economic contexts can lead to sub-optimal decisions. In a second brain imaging paradigm,[12] we first created a time-estimation labor market—we recruited an initial pool of participants who estimated intervals of time. From this pool, we created profiles for each "player," including their photographs and their time estimation ability over multiple rounds. We also assigned each player a value based on their time estimation accuracy. We then recruited a separate sample of participants who were endowed with $20 to purchase five players who would comprise a time-estimation team that competed on their behalf. We then took these "owners" to the brain scanner, where they witnessed the photographs of purchased and non-purchased players, as well as a sample of their time-estimation outcomes. Owners were rewarded for accurate time-estimation performance of their purchased players. Owners were also given the opportunity to revalue each player after each outcome. We found a behavioral difference in the revaluation of players such that owners revalued their

own player more often after a correct than incorrect estimation, but displayed the opposite pattern to non-purchased players. Revaluation is irrational in this paradigm because owners were aware that player value was tied to overall time-estimation ability, which was determined over a large number of trials; witnessing one outcome from this large set of trials should not change a player's overall value. However, the behavioral difference by the owners toward the purchased and non-purchased players suggested differential processing of these two types of people. The brain data supported this inference; owners reduced engagement of the SCBN when viewing the photographs of the purchased compared to non-purchased players, suggesting that they reduced social cognition to the purchased players because the players' ability was all that was task relevant, not their minds. Moreover, this reduced activation predicted revaluation behaviors for purchased players, whereas brain regions associated with economic decision-making predicted revaluation for non-purchased players. This suggests that the social cognition activity served as a heuristic that could guide behaviors toward the non-purchased players, triggering brain regions responsible for economic decision-making.

In contrast, in the courtroom where legal decisions often based on moral judgments are made, social cognition influences decisions about who lives and dies, who is responsible for crimes, and how much people should be punished. It also affects deductive logic processes necessary for culpability judgments and sentencing. Given that legal contexts are concerned primarily about minds, then social cognitions that produce inferences about minds are vital. Research in the legal context demonstrates that making the defendant's mind (their intentions, personality, etc.) less salient can be detrimental for the prosecution, but beneficial for the defense. For instance, describing a defendant in biological terms can mitigate responsibility and punishment judgments,[13] even when United States federal court judges make such decisions,[14] and making a defendant's mind less salient mitigates such decisions. Additionally, social cognition is often regulated when American police officers are engaging in violent behaviors toward African-American civilians.[15] Therefore, biological descriptions of people promote flexible social cognition in legal contexts; because the law is concerned with punishing human beings that have minds, any indication that a person is not fully human—such as biological cues that reduce people to the level of animals or other nonhuman organisms—make social cognition superfluous. In one brain imaging study, we demonstrated that making the defendant's biology salient (for instance, John has an over-active amygdala) versus making their personality salient (John is an aggressive person) reduced the extent to which *dorsolateral prefrontal cortex (DLPFC)*—a brain region associated with logical processing—was engaged when partici-

pants made decisions about responsibility and punishment for crimes John committed. Stated differently, possessing a mind separates human beings from nonhuman agents. Because possessing a mind is a uniquely human quality, cues that suggest no mind is present, even cues that trigger physical disgust, or that make the mind less salient, dehumanize the perpetrator, mitigating legal judgments, but promoting violent policing.

Dehumanization

The discussion to this point has outlined brain architecture that presumably is implicated in various aspects of moral decision-making; next we describe dehumanization in more detail. The classic view of dehumanization is somewhat consistent with the notion that it can facilitate immoral behavior by gating whether morality is relevant or not. Famed social psychologist Gordon Allport[16] described dehumanization as the "worst type of prejudice," and that label has stuck, influencing the view of the phenomenon for decades. However, brain imaging research has revealed a dissociation between regions underlying dehumanization and prejudice. Dehumanized perception manifests as a reduction in engagement of the SCBN.[17] These are all neocortical brain regions associated with cold, calculating cognition. Additionally, dehumanized perception engages the *anterior insula*, a brain region associated with disgust and interoception (the sense of detecting one's internal bodily states). Conversely, prejudice responses rely on the amygdala[18] because prejudice is an emotional response based on implicit learning. Therefore, in opposition to Allport's famous declaration, dehumanization may not be a kind of prejudice at all.

More likely, dehumanization is a cognitive strategy that facilitates moral disengagement. Social psychologists Albert Bandura, Ervin Staub, and Susan Opotow each independently posited this idea decades ago;[19] dehumanization is reserved for people considered beyond the bounds of moral protection, facilitating social exclusion and short-circuiting moral decision-making processes. As such, dehumanization reduces people to the level of animals or objects, consistent with folk psychological understanding of the phenomenon. This dualist view of dehumanization was expressed more concretely by social psychologist Nick Haslam,[20] who likened denial of typically human characteristics to dehumanization to objects or automata, and denial of uniquely human characteristics to animals. Social psychologist Jacque-Phillippe Leyens and colleagues[21] were the first to empirically study dehumanization, and they focused on the denial of complex emotions to others as an index of a dehumanized perception. Their infrahumanization theory posited that basic emotions (e.g. happy, angry, sad) could be attributed to both humans and

animals, but complex or secondary emotions required an inference of another's mind, and therefore were attributed only to people (e.g. regret, remorse, exuberance).

Perhaps most interestingly, clinical neurologist Itzhak Fried[22] proposed a controversial view of dehumanization. After observing people who had participated in mass human atrocities, Fried suggested in the medical journal *The Lancet* that they suffered from a psychological disorder he termed Syndrome E (for "evil"). Such people were not driven to their crimes by fits of rage or other emotional responses as most lay people suspected; instead, participants in genocidal killings were extremely logical in their behavior. Syndrome E was characterized by diminished affective reactivity, hyperarousal, intact memory, language and problem-solving skills, rapid habituation or desensitization, compartmentalization, susceptibility to the impact of the social context or environment, and group contagion. These symptoms resulted in a cognitive fracture, such that perpetrators were able to separate their behaviors from moral and empathic processes typically engaged when interacting with other people. While some scientists[23] criticized such characterization for medicalizing motives for murder, reducing the agency and blame attributed to people who participate in such acts, the battery of symptoms outlined by Fried are consistent with a view of dehumanization as a cold, calculating cognitive processes, rather than one driven by more base, animalistic, affective motives.

Flexible Social Cognition

Another view of dehumanization that focuses more directly on its role in moral decision-making begins with the concept of flexible social cognition. As mentioned above, there is a reliable network of brain regions engaged when people think about the minds of others, the SCBN. This network is spontaneously engaged when people encounter other people, and is even engaged when people are lying in an fMRI machine mind-wandering without any specific task. Mind-wandering involves thinking about the self (a social agent), as well as one's place within social hierarchies, the status of social relationships, and other people's minds. Therefore, the SCBN tends to be constantly active. Indeed, the mind never sleeps. Flexible social cognition characterizes the cases when the SCBN is not engaged in the presence of other people, or when thinking about other people.

A lack of SCBN engagement is a rare occurrence and unusual given the tonic activation of the SCBN. Recently, we have begun to understand why such a unique occurrence may be functional or useful: it gates whether moral rules and social norms are relevant or not. We now argue that such dehumanized perception is a moral heuristic; if an agent

does not trigger spontaneous social cognition, then they are an agent not deserving of moral protection, making permissible behaviors that would otherwise be deemed morally reprehensible. Moreover, the time-course of SCBN engagement and disengagement may be narrower than we first imagined, suggesting that the same agent can be both humanized and dehumanized within the same social interaction; electrical signals from the brain index differential processing between humanized and dehumanized individuals 120 milliseconds after exposure. Therefore, the social cognitive mechanism is inherently flexible, allowing us the ability to determine when we apply morality and the resulting behavioral prohibitions, and when we do not.

Such a flexible mechanism was evolutionarily preserved presumably because it was functional. One benefit of flexible social cognition may be to reduce cognitive load, saving capacity for other tasks at hand. The SCBN is a network of neocortical brain regions, the part of the brain that is more recently evolved and dissimilar in humans compared to other species. The neocortex may also be the seat of consciousness; therefore, anything that engages our conscious, effortful processing depends on these regions. But consciousness is limited; that is, we have a limited cognitive capacity that affects our ability to engage in multiple simultaneous cognitive tasks. Flexible social cognition may therefore be useful because switching off the SCBN may liberate cognitive capacity, allowing better focus on a task at hand. A second benefit for flexible social cognition is that it gates other downstream psychological processes such as empathy and moral reasoning. In order to feel empathic to another person, one first has to consider that person's mind in order to achieve the emotional resonance necessary to spur empathic concern. Similarly, morality is concerned with harm and the suffering of others. One can tell that another is suffering only by considering their mind. Flexible social cognition may allow a short-circuiting of such processes because the perceiver never registers the mind of the other person.

These evolutionary arguments for flexible social cognition match the motives traditionally attributed to dehumanization. The first such motive surrounds proactive emotion regulation. Experiencing another's suffering can trigger empathic concern, but empathy is subjectively unpleasant despite its prosocial benefit. People anticipate that experiencing empathy can be unpleasant, and can flexibly engage social cognition to avoid this negative experience. Evidence for this comes from studies where participants are told that they are about to interact with a homeless person who either is uplifting and inspiring or sad and depressing.[24] Participants only dehumanize in the latter case, suggesting that the expectation of an unpleasant social interaction reduces the engagement of social cognition.

Another motive for dehumanization surrounds post-hoc justification for immoral behavior. If the victims of one's or one's group's moral violation do not possess minds that can experience suffering, then the behavior is by definition less moral. Evidence for this motive comes from studies that explore historical harms. In one such study,[25] Emmanuele Castana and Roger Giner-Sorolla reminded American participants of predominantly European descent that the continent was inhabited by Native Americans before the arrivals of Europeans, and these Europeans brought either disease or violence that led to the genocide of the Native Americans. Only in the case of violent genocide did participants dehumanize Native Americans, providing evidence for the post-hoc benefit of dehumanization. Further suggestive evidence comes from studies of political speeches during genocides. The International Criminal Court and human rights law consider dehumanization as a motivating factor in genocide, the fuel for the fire. However, finding causal evidence for such a role of dehumanization is difficult because most perpetrators of genocide do not cite political hate speech as the motivating factor for their behaviors; situational factors play a more prominent role. In one study,[26] we adopted political speeches by former politicians on trial for inciting genocide at the International Court Tribunal for Yugoslavia (ICTY), removing the references to Serbs and Croats, and replacing them with fictitious groups. We then asked participants who read the speeches to what extent was violence against the out-group justified. Speeches distilled for dehumanization did not promote violence; instead, speeches that cited past or historical atrocities and the need for revenge better motivated endorsement of violence. Thus, dehumanization may play a role in sustaining, rather than motivating genocidal violence.

As posited at the begin of this chapter, dehumanization may not cause you to get to your neighbor's door with a machete in hand, but may kick in once you kick down the door. This highlights the final motive for dehumanization; it facilitates behavior that violates social convention. In cases where people are treated as a means to an end, dehumanization may be vital, shutting out that person's mind and enabling behavior not typical in everyday social interactions. Suggestive evidence for this motive comes from studies of objectification:[27] the phenomenon where men and women are processed primarily as sexually desirable objects or body parts, not full human beings. In these studies,[28] eye-tracking evidence reveals that highly sexist men, for instance, will focus on a woman's body instead of her face. The face is the primary sources of information about a person's mind, not the waist, hips, and chest. Brain imaging studies[29] also show that these men engage the SCBN less when looking at images of scantily clad women (and of course look

less at their faces). Therefore, these motives paint a picture of the function of flexible social cognition during moral decision-making.

Disgust

In addition to a reduction of social cognition, dehumanization is often characterized by a disgust emotional response; brain responses during dehumanization involve engagement of the anterior insula in addition to a reduction in the SCBN. People also report that traditionally dehumanized groups such as homeless people elicit disgust more than more complex social emotions such as envy, pity, or pride.[30] Disgust is an avoidance emotion; a type of fear response that suggests contamination, which moves the person away from noxious or poisonous stimuli. Evolved as a response to keep chemical contaminants out of the body, disgust has been co-opted into the social realm and serves as an index of social contamination and subsequent immorality. For instance, immigrants can elicit the disgust response, in part because they are viewed as possible physical contaminants carrying diseases foreign to a particular habitat, but also because they may contaminate a society's cultural systems.[31] Therefore, disgust may promote eradication.

Threat can motivate either approach or avoidance behaviors—fight or flight.[32] Disgust as a threat response stands in contrast to other threat responses present in intergroup conflict such as revenge. Revenge motivated threat suggests that a person or group of people have previously posed a threat and continue to do so, promoting their eradication. This response is associated with anger, an approach emotion that motives violence. Nicole Tausch and colleagues demonstrate that people are more likely to engage in physical violence when they experience anger rather than disgust in intergroup conflict scenarios.[33] Disgust motivates passive harm rather than more active conflict. This is consistent with the work on hate speech discussed above, and further suggests that dehumanization may not motivate violence, but can facilitate it, particularly once it is ongoing via passively ignoring the violence and the minds of the victims.

Linking Psychological Mechanisms of Violent Conflict to Dehumanization

If we link the discussion of dehumanization with other mechanisms that might be engaged during violent conflict, we can get a broader picture of the psychological mechanisms that inform moral decision-making in such contexts. As discussed above, intergroup violence

and human atrocities are not attributed to a single psychological mechanism. Theorists of political violence hypothesize a number of social, political, and cultural factors that have historically impacted the likelihood of genocide and violent intergroup conflict.[34] Interestingly, these factors align quite nicely with our discussion of moral decision-making and dehumanization thus far, and highlight the role of these psychological mechanisms in decisions to participate in violent intergroup conflict and genocidal behavior.

One set of psychological processes continuously highlighted by political theorists in human atrocities are intergroup processes, including nationalism, religiosity, ethnicity, and racism. These processes operate on an us-versus-them view of the world.[35] They rely on stereotyping processes, which provide a mental shortcut or heuristic for information about a person or group of people. Such cognitions or thoughts homogenize individual members of a group, treating them as if they were all the same, and marginalize their individual idiosyncrasies. Stereotypes also give rise to bias or prejudice emotional responses to such individuals. Emotions can be motivating factors that drive behavior (as discussed above). In the brain, stereotypes activate the SCBN because they contain information about the possible contents of another person's mind. Prejudice responses depend on the amygdala and can drive intergroup violence.

Along with stereotyping, prejudice, and intergroup processes, deindividuation has also been noted by political scientists and historians as relevant during violent intergroup conflict. Deindividuation involves losing one's sense of self while being a part of a larger group and has been argued to be prominent in mob behavior and other forms of crowd violence. The concept gained academic life with Gustave Le Bon's popular book *The Crowd: A Study of the Popular Mind* in the late eighteenth century. Le Bon argued that anonymity, suggestibility, and group contagion resulted in a collective mind that reduced people to mindless puppets. Leon Festinger and colleagues[36] theorized that deindividuation released restraints, allowing people to engage in behaviors they would not otherwise perform. This occurred because other members of the group do not observe individuals and their behavior, leading to a feeling of being less scrutinized. Festinger, along with Henry Reicken and Stanley Schacter, perhaps observed these effects when they infiltrated "The Seekers" apocalyptic cult in the 1950s, providing further anecdotal evidence for the theory.[37] However, the scientific study of deindividuation does not support its causal role in collective violence and other antisocial behavior. Instead, deindividuation results in better adherence to social or situation-specific norms.[38] Similar to dehumanization, deindividuation suffers from strong lay theories about its relevant to collective violence, with scientific evidence suggesting otherwise.

Past victimization, which drives feelings of revenge, has also been theorized by political theorists to be relevant to violent intergroup conflict. As discussed above, these trigger the emotion of anger, which has clearly been linked to violence.[39] In the brain, a region of the hypothalamus is responsible for aggressive responses.[40] However, this stands in contrast to the cold, calculating dehumanization response. Considering the time-course of violent behavior may allow both processes to play a role in driving the violence, highlighting the importance thinking about violent behavior as a multifaceted, complex set of behavior driven by a myriad of psychological processes, each prominent at different instances.

Another factor identified by political theorists is profit or reward. Our discussion of the economic decision-making brain system clearly supports the involvement of profit in violence; indeed, our research demonstrates that thinking of people as commodities requires a dehumanized brain response. It is not difficult to image how this would operate when scaled to large groups of people; financial profit has been and continues to be a driver of many human atrocities, from New World Slavery[41] to modern day exploitation of people in sweatshops and the human sex trafficking epidemic.[42] Related to profit motives are feelings of entitlement or ownership, which may also drive reward processing, inhibit moral reasoning, and have been identified by political theorists as causal factors for violent intergroup conflict. Perhaps the most relevant of such conflicts is the Israeli-Palestinian conflict, a conflict some theorists argue has historical roots dating back to the turn of the eleventh century. Both sides involved in the conflict feel ownership over a narrow stretch of land that holds significance for each. These feelings of ownership continue to be at the heart of the modern conflict as they were when European crusaders went to the Middle East to reclaim these Holy Lands.

Implications for Reducing Violent Intergroup Conflict and Peacebuilding

To conclude, the research and scholarship discussed thus far provide some useful information regarding reducing violent intergroup conflict. To begin, violent intergroup conflict is a fluid, situationally determined phenomenon. Peacebuilders must therefore be aware of these situational determinants and create strategies that construe the situation as one where violence is not the only option. Because people's brains are geared toward learning, there is an inherent opportunity to create a different worldview by leveraging the mechanisms that promote learning: primarily, frequency of associations and predic-

tions based on prior beliefs. While engaged in this change processes, it is important to remember the difference between moral judgments and decisions, the former being relevant during debates and rhetoric, while the latter operate during the actual violence. Given that economic decisions can affect moral decisions, it is also important to satisfy concerns surrounding financial stability in order to make real progress toward conflict resolution and avoid dehumanization. Disgust and threat also promote both dehumanization and moral decision-making, so eliminating both emotions will also aid in peacebuilding efforts.

Addressing any of the sociopolitical factors described above should deescalate ongoing conflicts, but I argue that particular attention should be paid to dehumanization. Taking dehumanized perception into account can also explain the moral decisions that perpetrators of such atrocities make. If their victims' minds are made salient and their experiences highlighted, then dehumanization can lose its justificatory purpose and conflict resolution is more likely. Similarly, if observers of such atrocities are aware of the impact of dehumanized perception as an emotion regulation strategy, they could ensure that empathy has an opportunity to be engaged to the victims, driving pro-social and helping behavior.

The above suggestions are all reactionary, useful once conflict has already begun. However, there are also proactive strategies that could be employed to prevent such violent intergroup conflicts from beginning. Peacebuilders should remember that they are human beings making decisions about other human beings. As such, they are susceptible to stereotyping and bias processes just like any other human being. They are also motivated by a host of motives that may commoditize the people they are there to help. Therefore, greater awareness can go a long way in changing the approach and strategies of peacebuilders. Moreover, it is important to consider how dehumanization gates economic and moral decision-making during violent conflicts. Putting measures in place that further humanize the people more vulnerable in such crises can make morality more salient. Similarly, reducing the impact of financial considerations can also humanize such vulnerable populations, making them more human.

Notes

1. Researchers estimate such proportions from the collective behavior of great apes, which are descended from the same distant species as humans. Jose María Gómez, Miguel Verdú, Adela González-Megías, & Marcos Méndez, The phylogenetic roots of human lethal violence. *Nature, Vol. 538,* October 2016, pp.233–237. https://doi:10.1038/nature19758. However, this level of violence has changed throughout human history due to sociopolitical changes on the organization of human populations.

2. Considering engaging in genocidal killing as a moral decision assumes that such people consciously decide to engage in such behavior, as opposed to a less conscious non-moral decision based on rituals or group norms.

3. For an early demonstration of the minimal conditions necessary for in-group favoritism and subsequent intergroup hostility, see Henri Tajfel, M. G. Billig, R. P. Bundy, & Claude Flament. Social categorisation and intergroup behavior. *European Journal of Social Psychology, Vol. 1 (2)*, 1971, pp. 149–178. https://doi.org/10.1002/ejsp.2420010202.tify

4. See Beverley Garrigan, Anna Adlam, & Peter Langdon. The neural correlates of moral decision-making: A systematic review and meta-analysis of moral evaluations and response decision judgements. *Brain and Cognition, Vol. 108*, October 2016, pp.88–97. https://doi.org/10.1016/j.bandc.2016.07.007.

5. Bayesian inferences, derived from Bayes Theorem, are a statistical method for prediction. Briefly, they rely on integrating a prior belief with the likelihood the belief is true to determine a possible outcome.

6. Deontological decisions are based on proscriptive moral rules such as “killing is wrong” and are usually inflexible to contextual or circumstantial occurrences. They manifest as a gut reaction or feeling that a particular behavior is inherently wrong, regardless of whether there is justification for why the behavior is wrong.

7. For a comparison of real and hypothetical decisions in the brain, see Colin Camerer & Dean Mobbs. Differences in behavior and brain activity during hypothetical and real choices. *Trends in Cognitive Sciences, Vol. 21 (1),* January 2017, pp. 46–56. https://doi.org/10.1016/j.tics.2016.11.001.

8. Kristina Shampanier, Nina Mazar, & Dan Ariely. Zero as a special price: The true value of free products. *Marketing Science, Vol. 26 (6)*, November-December 2007, pp. 742–757. https://doi.org/10.1287/mksc.1060.0254.

9. James Heyman & Dan Ariely. Effort for payment: A tale of two markets. *Psychological Science, Vol. 15 (11)*, November 2004, pp. 787–793. https://doi.org/10.1111/j.0956-7976.2004.00757.x.

10. Uri Gneezy & Aldo Rustichini. A fine is a price. J*ournal of Legal Studies, Vol. 29 (1)*, January 2000, pp. 1–17. https://doi.org/10.1086/468061.

11. Victoria Lee & Lasana Harris. Sticking with the nice guy: Trait warmth information impairs learning and modulates person perception brain network activity. *Cognitive and Affective Behavioural Neuroscience, Vol. 14 (4)*, December 2014, pp. 1420–1437. https://doi.org/10.3758/s13415-014-0284-9.

12. Lasana Harris, Victoria Lee, Beatrice Capestany, & Alexandra Cohen. Assigning economic value to people results in dehumanization brain response. *Journal of Neuroscience, Psychology, and Economics, Vol 7 (3),* 2014, pp. 151–163. https://doi.org/10.1037/npe0000020.

13. Beatrice Capestany & Lasana Harris. Disgust and biological descriptions bias logical reasoning during legal decision-making. *Social Neuroscience, Vol. 9 (3),* 2014, pp. 265–277. https://doi.org/10.1080/17470919.2014.892531.

14. Lisa Aspinwall, Teneille Brown, & James Tabery. The double-edged sword: Does biomechanism increase or decrease judges' sentencing of psychopaths? *Science, Vol. 337 (6096)*, August 2012, pp. 846–849. https://doi.org/10.1126/science.1219569.

15. Alison Hall, Erika Hall, & Jamie Perry. Black and blue: Exploring racial bias and law enforcement in the killings of unarmed black male civilians. *American Psychologist, Vol. 71 (3)*, 2016, pp. 175–186. https://doi.org/10.1037/a0040109.

16. Gordon Allport. *The nature of prejudice*. 25th Anniversary Edition, Cambridge: Massachusetts, USA, Perseus Books, 1954/1979.

17. See Lasana Harris & Susan Fiske. Social neuroscience evidence for dehumanised perception. *European review of Social Psychology, Vol. 20,* June 2009, pp. 192–231. dx.https://doi.org/10.1080/10463280902954988. for a review

18. See Jennifer Kubota, Mahzarin Banaji, & Elizabeth Phelps. The neuroscience of race. *Nature Neuroscience, Vol.* 15 *(7),* June 2012, pp. 940–948. https://doi.org/10.1038/nn.3136. for a review

19. For a comprehensive theoretical overview of dehumanization and other psychological roots of evil, please read Ervin Staub. T*he psychology of good and evil: Why children, adults, and groups harm others*. Cambridge: Massachusetts, USA, Cambridge University Press, 2003.

20. Nick Haslam. Dehumanization: An integrative review. *Personality and Social Psychology Review, Vol. 10 (3)*, August 2006, pp. 252–264. https://doi.org/10.1207/s15327957pspr1003_4.

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22. Itzhak Fried. Syndrome E. *Lancet, Vol. 350 (9094),* December 1997, pp. 1845–1847. https://doi.org/10.1016/S0140-6736(97)09385-9.

23. For instance, psychiatric anthropologists such as Boris Cyrulnik have criticized this idea, stating that interviews with perpetrators of genocide often reveal emotion as a motivating factor and dehumanization as relevant. However, this remains an open and long debate.

24. See Laura Shaw, Daniel Batson, & Matthew Todd. Empathy avoidance: Forestalling feeling for another in order to escape the motivational consequences. *Journal of Personality and Social Psychology, Vol. 67 (5),* 1994, pp. 879–887. https://doi.org/10.1037/0022-3514.67.5.879. and C. Daryl Cameron, Lasana Harris, & B. Keith Payne. The emotional cost of humanity: Anticipated exhaustion motivates dehumanisation of stigmatised targets. *Social Psychological and Personality Science, Vol. 7 (2).* 2016, pp. 105–112. https://doi.org/10.1177/1948550615604453.

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26. Jordon Kiper, Richard Wilson, Christine Lillie, & Lasana Harris. Propaganda, empathy, and support for intergroup violence: The moral psychology of international speech crimes. Manuscript under review.

27. It is important to remember that a psychological process itself is not good or bad, but could lead to good or bad behavior. The same psychological processes underlying human atrocities may promote nurturing and loving behaviors in a different context.

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32. See the article by Ali Jawaid and Isabelle Mansuy in *NeuroPeace* no. 3 for a discussion of the impact of threat on psychological processes.

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34. While there is a wealth of information on this topic, I recommend Jonathan Leader Maynard. *Ideology and Mass Killing: How Groups Justify Genocides and Other Atrocities Against Civilians.* Oxford: Oxford University Press, 2019.

35. See the articerl by Aharon Levy, John Dovidio, and Tamar Saguy in *NeuroPeace* no. 2 for a comprehensive discussion of intergroup processes and their contribution to intergroup violence.

36. Leon Festinger, Albert Pepitone, & Theodore Newcomb. Some consequences of de-individuation in a group. *Journal of Abnormal and Social Psychology, Vol. 47 (*2S), 1952, pp. 382–389. https://psycnet.apa.org/doi.10.1037/h0057906

37. For further reading on this most interesting field experiment, read ‘When Prophecy Fails: A Social and Psychological Study of a Modern Group that Predicted the Destruction of the World’, 1956, Harper-Torchbooks, written by these researchers.

38. For a review of this literature, see Tom Postmes & Russell Spears. Deindividuation and antinormative behavior: A meta-Analysis. *Psychological Bulletin, Vol. 123 (3),* 1998, pp. 238–259.

39. There is a rich literature linking anger to aggression and violence, but in psychology, the most prominent such theory is the frustration-aggression hypothesis by Dollard and colleagues, summarized in the book ‘Frustration and Aggression’, 1939, Yale University Press.

40. See Fields, 2019 review article in *Scientific American* for a detailed discussion of the neuroscience of aggression.

41. See Eric Williams’ ‘Capitalism and Slavery’, 1944, The University of North Carolina Press, for a discussion of the relationship between profit and slavery in the British West Indies, and Edward Baptist ‘The Half has Never been Told: Slavery and the Making of American Capitalism’, 2014, Basic Books, for a similar discussion in the context of American slavery.

42. See Ella Cockbain’s ‘Offender and Victim Networks in Human Trafficking’, 2018, Routledge Press, for a discussion of sex trafficking.

3

Terrorist Cells

Neurobiology and Violent Extremism

Michael Niconchuk

"You can compare it with a US soldier who wants to join the army . . . why is he ready to join the US Army, and go to Afghanistan or Iraq or Syria to sacrifice his life for the sake of democracy? We heard that they announced an Islamic State, this is what we came for."

—Lukas Glass, foreign fighter, ISIS

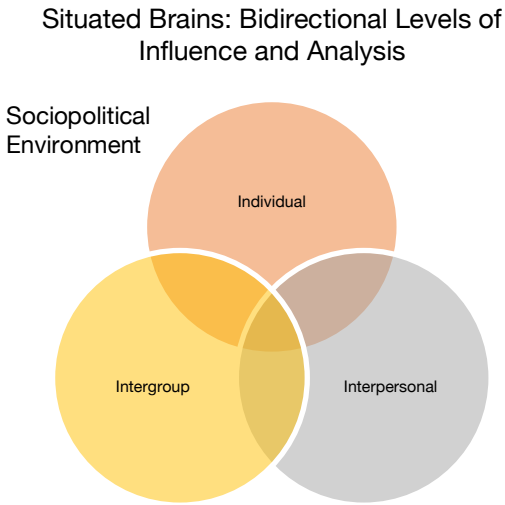
Lukas Glass, quoted above,[1] left Germany with his wife to join in the Islamic State soon before Abu Bakar Al-Baghdadi declared the "Caliphate." If we take Lukas at his word, he left to be part of a group. He left for sacrifice. He left in response to a deeply felt threat. For whatever reasons, he left for the world's most vilified and notorious terrorist group. For those of us on the outside, we instinctively respond "okay, *but* . . ." He must have been crazy. He must have been delusional. He must have been something *abnormal*. What Lukas frames as a decision comparable to joining the army, most view as absolutely unfathomable.

Over the past decades, scholars from psychology and neuroscience have explored the neurobiological and psychological underpinnings of various political behaviors and decisions, including radicalization into terrorism. And like researchers from social sciences, they have failed to find *the* answer, *the* causal or explanatory model. Instead, they have found diverse and interesting pieces of a puzzle, uncovering insights about how seemingly typical brains can, under certain conditions and contexts, radicalize into violence.

Both individual radicalization into terrorism and group-targeted harm in general are phenomena that must be explored from a interdisciplinary perspective, and a meaningful understanding of these phenomena will naturally take us from the "genetic through

to the social levels."[2] Like any political or social behavior, radicalization and the commission of violence are products of situated brains and beings—persons with their own unique biology and neural functioning embedded in families, communities, and systems of power that exist in bidirectional relationships to produce social behaviors. Thus, to either explain or predict social behaviors, no single level of analysis can be explored in isolation.

Ostensibly, to study radicalization and violent extremism from a social neuroscientific perspective requires exploring interdependent and bidirectional interactions between individual-level factors that relate to impulsivity, violence, moral judgments and perceptions (e.g., individual genetic, neural, perceptual, and behavioral differences), interpersonal factors (e.g., group membership, social networks), and intergroup factors (e.g., agency, status, threat perception, intergroup empathy).



It is outside the scope of this article to cover the entirety of the literature from psychology and neuroscience relevant to violent extremism. Instead, we here offer a brief look for practitioners in the peacebuilding field interested in what social neurobiology has to say on the issue of radicalization and violent extremism.

Back to Basics: How the Brain Works

Other authors in "Neuroscience and Peacebuilding" share insights about how the brain works, about how interactions between biological systems and our environment produce social behaviors, emotions, and interpersonal and intergroup conflict. It is outside the

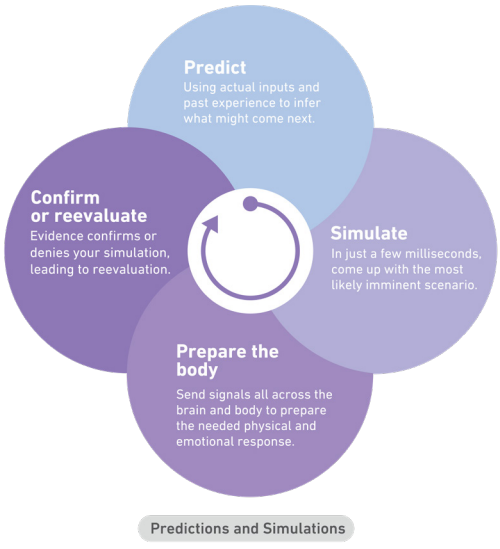
scope of this article to provide a full overview of brain functions relevant to conflict behaviors. However, it is important to start our exploration of violent extremism with a quick, highly simplified review of how the brain works and interacts with the social environment.

The human brain can be likened to an airport control tower.[3] Like an airport control tower, it is constantly scanning for risks and constantly trying to keep you safe and successfully navigating the world around you. It does so against quite subjective metrics and interpretations. The world you see is not necessarily the same world others see, and your brain responds to *your* perceptions of the world, as opposed to an *accurate* interpretation. Bluntly, your brain is more concerned with your successful navigation of the world around you than with accuracy.

Your brain coordinates every response—from breath to emotions to thoughts—to help you accrue all the resources you need to survive. These resources include food and water, love and friendships, status, and agency, among many others. To protect these resources, your brain needs to classify, recall, and mobilize information. It does so through various processes, including *associations* and *heuristics*.

First, your brain is constantly making associations, or links between feeling states and possible causes in the world around you. In other words, your brain is constantly trying to infer or *make meaning* of what is happening to you and in you. By making meaning and learning cause and effect, we learn to stay alive. We learn what to approach and what to avoid.

Given the complexity of our world, it would be difficult to survive if we had to stop and think every single time we had a feeling, or had a new experience, and had to make brand new categories for those feelings and experiences. Thus, over time, we build mental models and heuristics (i.e., shortcuts, biases) of the world around us, putting various experiences into broad categories that we can then use to successfully navigate similar situations—or situations we perceive to be similar.



All the accumulated information, inferences, and models we build thus become quite automatic for rapid access and deployment to confront situations in real time. The brain uses heuristics to rapidly predict and simulate what

might happen next in the environment, and then coordinates a host of adaptive response in the body to most appropriately confront the situation. Importantly, our brains have highly developed reward and punishment circuitry to reinforce these lessons and consolidate patterns that lead to pleasurable or desired outcomes.[4]

Critically, the same necessary associations and predictions we make for interactions with objects, *we also make for people and groups of people*. We attribute cause and effect, positive and negative attributes, and broad generalizations to individuals and entire groups who share subjectively viewed common factors (as discussed in the article by Aharon Levy, John Dovidio, and Tamar Saguy in *NeuroPeace* no. 2).

In short, we develop biases about people, and various biological systems, including brain functioning and neurochemical production, support our goals of preserving ourselves and our in-groups. In other words, various systems in the brain and body support "us" versus "them" thinking and behaviors, thus increasing our chances of survival, but also contributing to biases and intergroup antipathy.

Functionally, associations, heuristics, and the ability to make rapid predictions are crucial for survival. They are also highly subjective and deeply influenced by social norms, social groups, and social needs. These various processes in the brain simultaneously help us stay alive, yet can also encourage intergroup conflict and violence under certain conditions, when associations, perceptions, and predictions interact with perceived threats, negative emotions, and inaccurate perceptions of others' motives.

Bluntly, when survival is at stake, the brain is usually not so concerned with perception errors. And in general, the brain is highly sensitive to perceived threats—including abstract threats. So, as we think of violent extremism and young recruits like Lukas Glass, it is important to keep in mind a few speculative questions:

- Is there something fundamentally different about the way terrorists' brains work?
- What is the subjective reality of individuals at risk of radicalization? How do they perceive others? How do they think others' perceive them (i.e., false attributions; intergroup perception errors)?
- For those who join out of desperation, pain, or a desire for retribution, what (or who) do they consciously or unconsciously see as the cause of their pain? Who has helped generate that believed narrative?
- What is the landscape of perceived risks in the person's life? Whether or not it is real, what threatens them? Why did Lukas feel threatened?

With these in mind, we can then explore how often unconscious processing is affected not just by how *you* perceive the world, but *alongside who* you perceive, and under what conditions you perceive.

We enter our exploration of neuroscience and extremism at the individual level by asking—*Are terrorists insane? Abnormal? Are their brains or genes fundamentally different than the majority of the population? Do they process information differently than most people*? In other words, we must start by exploring the role and explanatory limits of individual genetic, psychological, and neural factors that may influence radicalization and participation in violent extremism.

Diverse Behaviors: When the Law Spans Various Natural Categories

Those who study the neurobiology of violent extremism face a challenge from the start, insofar as the behaviors classified as "terrorism" under international and national laws encompass a diversity of behaviors that are often only loosely related. Legal definitions of terrorism[5] differ across countries and cover a wide range of behaviors and intents,[6] and the way the law categorizes behavior is not necessarily the way that a neurobiologist or psychologist would categorize—or study—behavior. Simply, terrorism-related offenses span behaviors of various "natural kinds,"[7] thus making it difficult for cognitive scientists to provide actionable insights for policymakers interested in terrorism prevention.

The sheer diversity of terrorist behavior has rendered it all but impossible for scientists to identify neat causal pathways into radicalization and terrorist violence.[8] Cases and causes are diverse and require various levels of analysis, including genetic and epigenetic considerations, evaluation of childhood experiences or adulthood traumas, idiosyncrasies in social cognitive processing, and issues of identity and group belonging. For example, lone mass murderers like Anders Breivik, who murdered more than ninety youth at a summer camp in Norway in 2011, bear extremely limited psychological or behavioral resemblance to noncombat members of the Islamic State like Lukas Glass who served in administrative roles. That said, both Breivik and Glass are considered "terrorists" under European law, respectively, even though their motivations, personality, psychopathology, and behaviors are quite different. From a neuroscientific or social psychological perspective, it is difficult to study these two very different cases as the products of the same psychological phenomena, despite their prosecutorial similarities. Whereas Anders Brevik murdered nearly one hundred people in the name of extremist convictions, Lukas Glass—

reportedly—did not serve in a combat role and claimed to join ISIS in defense of his faith. Their similarities start and end with their extreme ideological conviction and willingness to engage in murderous, illegal, and counternormative behavior in the name of those convictions.

Participation in violent extremism is a gradual and multifaceted process that encompasses many normal, noncriminal motivations as well as a diverse set of criminal behaviors. To study the full spectrum of extremist violence is partially to study the notion of overvalued beliefs and deeply held convictions in general. It is partially to study the intensification of group membership. It is partially the study of a unique counternormative willingness to murder innocent people. And it is partially to study aggression and violence in individual and group settings. And as said, natural neural "logic" will not necessarily map on to legal logic.[9]

Individual Factors Associated with Violent Extremism

The degree to which terrorists as individuals are different or unique from the rest of the population can be explored from multiple angles and from different disciplines, and the success of studying the uniqueness of terrorists partly depends on how narrowly or broadly states define terrorism, as highlighted above. The search for tangible idiosyncrasies in the biology or psychology of terrorists naturally includes questions like: *Are they more prone to violence? Are they less empathic? Do they have any shared psychopathology (mental illness)*?

There are countless questions researchers may ask, each of which merit individual papers. And importantly, we must separate the neurobiological correlates of violence and aggression writ large from any neurobiological correlates of violent extremism, per se. Not all violence is violent extremism, and not all affiliation with violent extremist organizations involves the direct commission of violence. The issue becomes quite murky quickly.

While lawmakers, security services, and practitioners recognize the polycausal nature of radicalization and violent extremism, agencies around the world continue to develop predictive risk assessment tools, some of which seek to isolate individual-level factors to identify who is at higher risk of becoming involved with violent extremist organizations. Some groups have developed complex and bespoke risk assessment tools for profiling potential violent extremists, while others have borrowed and adapted assessment tools from gang violence, substance abuse, and interpersonal violence prevention

Shared Characteristics of Violent Extremists

- Relationships with known extremists
- Mental health issues
- Social bonding issues
- Commitment to violent ideology

research[10] in an attempt to situate violent extremist behavior and risk within broader public health approaches to violence. In other words, some of the current risk assessment tools thus *de-exceptionalize* violent extremism, placing it alongside other possible violent, antisocial outcomes for vulnerable individuals.

Across different vulnerability frameworks (e.g., Y-SET, ERG 22+, VERA 2), certain factors appear frequently. Specifically, 1) *relationships with known extremists,* 2) *mental health issues,* 3) *bonding issues*, and 4) *commitment to violent ideology individually or as a group member* appear frequently as risk factors. Those identified categories are broad, and importantly, none of the reviewed risk assessment frameworks incorporated neurobiological data, which is understandable given the myriad challenges in collecting such data from convicted violent extremists.

Overall, existing risk assessment frameworks are unsatisfying for those in preventing and countering violent extremism (P/CVE) programming as well as social neuroscience researchers, given that hundreds of millions of normal people may possess one or more of these "risk factors," yet so few become terrorists.[11] While efforts to date have failed to yield a precise risk profile for violent extremists, as opposed to other forms of collective violence, neuroscience and psychology research does suggest some unique features of individuals who tend toward violence more generally. While this may be unsatisfying for those seeking to isolate risks of potential violent extremists as a unique category of criminal, these findings may suggest the need to rethink the extent to which participation in violent extremism is indeed exceptional, as compared with other forms of collective violence.

Decety and Clifford provide a comprehensive review of many important studies that explore biological factors that influence the tendency toward violence,[12] though not necessarily extremist violence. Specifically, their review suggests that antisocial behavior and violence are "stable dispositions" from childhood, and that genetic and biological markers such as serotonergic hypofunction (low serotonin levels) and low monoamine oxidase A (MAOA) levels[13] are associated with increased aggression in adulthood. Similarly, Yang and Raine[14] conducted a comprehensive meta-analysis that suggests a link

between antisocial behaviors (including conduct problems and aggression) and reduced structure and function in pre-frontal cortical areas of the brain.[15]

Biological factors may exist alongside or independently of *processing* differences among violent individuals. In other words, beyond possible neurochemical and functional differences in the brain, there may be differences in the way violence-prone individuals process social "others" and social situations in a way that may affect behavior. For example, Seidel and colleagues' small-sample study showed decreased *emotion recognition* abilities among convicted violent offenders, as compared to a matched sample of non-offenders.[16] In other words, violent offenders were slower than non-offenders to correctly identify emotions based on facial patterns in a series of images. Other studies have found similar findings among convicted offenders both with and without psychopathology (mental illness).[17]

In a more relevant example, Baez and colleagues[18] found that, in a sample of more than fifty convicted offenders of paramilitary groups from war-era Colombia, convicted terrorists (under Colombian law) displayed reduced abilities in recognizing anger, sadness, and disgust. Furthermore, their sample displayed deviated patterns of moral judgment as compared to nonterrorists. Specifically, paramilitaries exhibited moral judgment that focused on behavioral *outcomes*, far more than *intention*. Baez aptly notes that this finding may seem contradictory, given how often terrorist groups justify violence as a "moral imperative." In response, he suggests that those who justify violence as moral imperative do not necessary believe their own argument.

Here we must note that most existing studies on the neurobiological and cognitive differences of violent offenders have not sought to identify the *cause* of any observed differences. In other words, there is a certain "chicken and egg" question that remains—whether or not observed biological or processing differences in violent offenders exist from birth, or are caused by life experiences, particularly in early childhood.

Research from clinical psychology and psychiatry has clearly demonstrated that certain life experiences can lead to changes in neurobiology and social processing. Specifically, childhood adversity can lead to detrimental *functional* (i.e., how different brain regions function, specifically in connection and communication with other brain regions) and *structural* (i.e., the size, shape, and neuronal density of brain regions) changes in various regions of the brain, including the hippocampus (responsible for memory formation and retrieval), the amygdala (responsible for threat detection and vigilance), and prefrontal cortical regions (involved in emotion regulation, processing, and inhibition).[19] Impor-

tantly, criminologists have long observed a high rate of adverse childhood experiences among violent far-right extremists,[20] and similarly, clinicians working in refugee trauma have also noted that post-traumatic stress may play a role in young refugees' openness toward violent activism.[21]

Neurobiological changes stemming from adversity and trauma *may*, through complex interactions in social environments, increase individual tendency to be drawn to violent extremist groups or to participate in violence. More collaborative studies between clinical psychology and neuroscience are needed to further explore potential pathways that link interpersonal violence, early childhood adversity, or adulthood trauma.

The Specific Question of Psychopathology

The links between mental health, radicalization, and participation in terrorism remain unclear, and data on the psychopathology of terrorism are currently spread among widely diverging literatures including criminology, clinical psychology, psychiatry, and neuroscience. Furthermore, much of the evidence we have is based on recall of demobilized or convicted fighters. Such "hindsight evidence" is inherently dubious and mostly comes from interviews with people like Lukas Glass, who on the surface seem well-adjusted.

It is not entirely incorrect to say that mental illness, childhood adversity, and post-traumatic stress may contribute to the psychological milieu that generates a violent extremist. To say so does not imply causality; it simply recognizes correlations in existing field research. Put differently, existing data encourages us to accept that there may be genetic and other biological factors that, in interaction with environmental influences, can predispose an individual toward either extremism, toward violence, or toward violent extremism.

In terms of mental health, we cannot say that all terrorists are psychologically disturbed. We also cannot say that all terrorists are psychologically stable or unremarkable, for many of the reasons listed above. Indeed, some terrorists may have existing mental health symptoms or altered brain functions (e.g., Anders Breivik's initial diagnosis of psychosis[22]) that may play a role in their behavior.[23]

Importantly, many convicted extremists demonstrate what psychiatrists call "extreme overvalued beliefs" (EOBs) that sit murky within current psychiatric diagnostic frameworks[24]. EOBs are defined as: "[a belief] that is shared by others in a person's cultural, religious, or subcultural group. The belief is often relished, amplified, and defended

by the possessor of the belief and should be differentiated from an obsession or a delusion. The belief grows more dominant over time, more refined and more resistant to challenge. The individual has an intense emotional commitment to the belief and may carry out violent behavior in its service."[25] Rahman's categorization of EOBs is important insofar as it attempts to define a line between counternormative, violent beliefs and *delusions*, which, in some contexts, could be used to remove legal accountability from perpetrators, as was attempted in the Anders Breivik case. From a psychiatric perspective, delusions are often not consistently defended, nor are they (usually) shared by others, whereas EOBs are often shared within microcultures or groups, and are usually amplified and defended by believers.

The study of EOBs is relevant for our understanding of conspiracy theories and extremist beliefs more broadly, not just violent extremism,[26] and scholars have developed frameworks for distinguishing how and based on what factors deeply held convictions differ from both criminally risky beliefs and mental illness (e.g., delusional disorder).[27] Anecdotal evidence and limited survey data suggest that mental illness can play a role in the genesis of an of individual's extremist violence—especially for those inspired by, but not necessarily part of, a movement.[28] That said, under current psychiatric parameters, we cannot say that terrorists as a group have any shared, demonstrable psychopathology (i.e., mental illness fulfilling existing diagnostic criteria as defined by the American Psychiatric Association).[29] Mental illness and mental health must therefore be explored carefully as one of many factors in a highly complex interaction that leads to radicalization and violent extremism.

Individual Difference Factors

Biological
- Serotonergic hypofunction
- MAOA levels
- Functional and structural differences in prefrontal cortex

Social Processing
- Empathic processing
- Moral judgements of groups
- Extreme overvalued beliefs

Life Experiences & Psychopathology
- Adverse childhood experiences
- Trauma-related psychopathology
- Other mental health challenges

To summarize, terrorists are not mentally ill. Rather, certain individual-level factors and life experiences can affect social processing and moral decision-making in a way that can increase the likelihood of perpetrating violence and of radicalization into violence. Overall then, researchers need more data to specifically explore how social and

environmental factors interact with individual-level factors and mental illness in the process of radicalization into violence and in the adoption of extremist beliefs generally. Specifically, researchers and practitioners would benefit from experimental data, whereby individuals who share one or more of the neurobiological features described above could be placed in *different* interpersonal, intergroup, and sociopolitical environments or engage with different hypothetical, manipulated scenarios for the sake of comparison over time. This type of experimental data would help researchers understand explanatory limits of individual factors and better assess the role of higher-level factors.

Interpersonal and Intergroup Factors

Social neuroscience seeks to understand human behavior as the product of bidirectional relationships between neurobiology and the lived environment, including relationships and sociopolitical systems. In other words, just as our neurobiology influences our thoughts, behaviors, and relationships, the opposite is also true—that lived experiences, relationships, and political and cultural environment influence our neurobiology. Thus, the individual-level factors that influence the commission of violence cannot be separated from the context of interpersonal and intergroup factors that also influence individual and group decisions toward violence.

As we suggested before, Lukas Glass left for ISIS to be *part of a group*. He left to *sacrifice* for a cause. And he left in response to a *threat* he deeply felt. While he likely ruminated over his choice in isolation, his thoughts and emotions were shaped by his identity as a Muslim, as a member of a group. Without the context of a collective Sunni Islam, Lukas would not have a centerpiece for his radicalization.

We do not know if Lukas Glass possessed any of the individual characteristics explored in the previous section. But in any case, any individual difference factors he possessed only became relevant because of the interpersonal and intergroup context of Islam, which Lukas' claimed to be defending in his *jihad*. His individual characteristics—if in any way unique or noteworthy—found fertile ground within his group identity.

Beyond individual factors, social neuroscience provides a useful lens for exploring *bonds* and *beliefs*, two universal features of human neurobiology that play a pivotal role in radicalization and violent extremism. How can a scientific understanding of these features change our view of terrorism? And how might placing violent extremism within

broader conceptions of intergroup psychology suggest a different approach to radicalization and deradicalization?

Staying Safe, Together

Humans are a social species, and as such have an intense need to belong.[30] Human social and political behavior is therefore best understood in the context of *how* and *why* we bond with others. Bluntly, it would be ill-advised to study group phenomena like violent extremist organizations (VEOs) without exploring how and why humans developed non-kin social bonds.

The need to belong is one of humans' fundamental motivations that transcends culture. Of course, culture plays an important role in structuring norms and practices around social bonding, and those differences can manifest at a neural level. Put differently, divergent cultural paradigms around independence and interdependence are manifested in how our brains process social others in our environment,[31] but, that does not change the fact that across time and culture, humans need to belong to groups.

From an evolutionary perspective, it makes sense that we have a strong need to belong. Survival was and is easier in numbers, especially in a world full of threats. And, as with all other biases and heuristics, the human brain has developed many ways to quickly recognize, categorize, and engage with social others in service of our protection and successful navigation of the world around us. Framed differently, we have developed ways to consolidate our sense of safety with those we trust and to interrogate and vilify those who pose a possible threat.

One of these biases is the brain's quick ability to distinguish between friendly others and risky or threatening "others." In other words, our brains developed quick ways to distinguish between "us" and "them." This ability was, evolutionarily, critical to survival, and thus our social bonds evolved to have serious influence on how we think. Call it "peer pressure," or conformity—the need to belong influences behavior, even pushing us to say or do things that we do not otherwise believe.[32] We will return to this concept shortly.

In short, belonging matters greatly, and it is malleable. Through decades of experiments, we have learned that it is quite easy to create new group identities that then influence cognition and behavior. For example, the simple provision of team colors in an experiment is enough to create in-group bias competition between otherwise randomly

assigned groups.[33] And classic psychology studies such as the Asch Experiment[34] and the Stanford Prison experiment,[35] for all their duly-earned criticism, suggest that group identities, arbitrarily assigned, can play a role in behavior and intergroup relations. In short, humans are heavily influenced by groups, and even simple experiments provide enough fuel to divide otherwise similar individuals into groups.

In hunter-gatherer times, the clustering of humans was based primarily on extended kinship bonds. But today, humans are unique in our ability to form diverse and deep bonds with those who are not our kin (i.e., blood relation). From an evolutionary perspective, humans, like many other social species, first evolved to fight with and die with those with whom we share blood relations; however, our social systems evolved beyond this, catalyzing "imagined communities"[36] or "fictive kin."[37]

Imagined or fictive kin are built on our ability to formulate, and believe in, common stories about ourselves.[38] While in some parts of the world, the dynamics of conflict can still be largely understood through the lens of tribe and kinship, many modern intergroup conflicts are not at all influenced by kinship identity. Violent extremist organizations sit square in this class of non-kin groups and conflict, and furthermore, the process of radicalization nearly always entails a consolidation of fusion of individual identity with non-kin group with shared ideology, values, and threats.

Class, ideology, religion, and even geography transcend kinship and provide new boundaries by which we define our identities, our groups, and our battles. The internet and social media have made fictive kin communities more salient, as digital communications technologies facilitate bonding, planning, and acting beyond our "near" communities, facilitating the spread of propaganda and ideologies and the construction of alternate realities among global peers who claim a shared identity.

Here we can pause again and ask some relevant questions for practitioners in the P/CVE space or peacebuilders working in communities at-risk of recruitment into violence:

- Who feels excluded in the community? Why?
- What are the main fault lines of identity among community members? How strong is their affiliation to identity groups?
- Do individuals in the community have multiple identities? Or just a small number?
- How flexible are the boundaries of identity groups in the community?

Chemically Bonded

Generally, our social cognition and biology have evolved in such a way that facilitates our intense belonging and loyalty to non-kin groups.[39] Certain *cognitive processes* (including empathy, emotion recognition, and dehumanization, among others) and *biological processes* (including the stress response along the hypothalamic-pituitary-adrenal axis, threat reactivity in the amygdala, the production of dopamine in response to sensed rewards, and the release of norepinephrine and cortisol in response to threatening stimuli, among others) are highly influenced by our loyalty, love, and affinity to loved ones and in-group members, and these processes may influence why, and under what circumstances, an individual will be willing to engage in violence on behalf of a group, an identity, or a group belief.

We can first explore in brief some of the relevant literature on the *biology* of belonging. For example, over the past few years, neuroscientists and psychologists have highlighted one particular neurochemical—oxytocin—for its potentially relevant role in human social behavior. While there is a dearth of data from *human* studies in oxytocin, and oxytocin studies remain methodologically controversial,[40] researchers in the field of social neurobiology have developed various theories, suggesting a role for oxytocin in the context of intergroup conflict.

Oxytocin, initially studied in the context of lactating mothers and babies,[41] has a demonstrated but still unclear role in trust and bonding with non-kin group members.[42] When administered to randomly constructed groups, oxytocin has been shown to improve information sharing within cooperation groups, increase the speed of face recognition among in-group members, and increase group members' attention to threatening out-group faces.[43] Similarly, recent data also suggests that oxytocin may contribute to improvements in coordinated attacks by in-group members against out-group members, particularly by affecting information sharing and cooperation behaviors among in-group members.[44]

While existing findings are controversial, it is safe to say that oxytocin may play a role in promoting parochial social cognition and behavior (i.e., increasing attention and protection of our in-group), at the expense of heightened aggression toward out-group members.[45] As researchers learn more about the *effects* of oxytocin, we must also explore what specific aspects of human relationships promote the *release* of oxytocin, as it is relevant for understanding collective violence in general.

Coordinating Chemicals: Neurobiology and Coalitionist Behavior

As said, oxytocin was originally studied in the context of lactating mothers and their babies, but we now know that oxytocin is associated with a host of tactile bonding activities from breastfeeding to sexual intercourse.[46] And critically, many non-intimate, non-touch bonding behaviors also stimulate the production of oxytocin.

Trumble and colleagues suggest that oxytocin plays a role in general "coalitionist behaviors,"[47] citing specific evidence that group hunting (a collective high-stakes behavior) promotes the release of oxytocin.[48] Similarly, researchers have explored the role of various religious and nonreligious rituals in promoting oxytocin[49] and suggest that certain collective rituals, especially those involving coordinated physicality and singing, may promote oxytocin and regulate stress responses.[50]

In addition to what we know about ritual bonding behaviors, research in chimpanzees shows that the collective *commission of violence* against threatening out-group chimps increases oxytocin.[51] And violence, when performed collectively, is a coalitionist activity. Of course, we do not yet know if the performance of violence increases oxytocin levels in humans, but it is important to consider to what extent, if at all, collective or ritualized violence—which is a common feature in violent extremist activity—may either indicate or facilitate intragroup bonding and coalitionist feeling.

Importantly, training practices of armed groups rely heavily on rituals that have elements of coordinated physical movement, social vocalizations, and performative violence. As such, it is not unreasonable to speculate that involvement in violent extremist organizations implies frequent participation in what are likely oxytocin-inducing rituals, from marching to chanting to tactical training.

Beyond oxytocin, research on *empathy* has shown that between loved ones, empathic processes are not purely cognitive, but also physiological. In other words, empathy is not purely an emotional process or mirroring, but also a physiological process of mirroring. Essentially, when we observe loved ones undergo stress, we mirror aspects of their physiological response to stress—including heart rate and hormone release.[52] When an intimate group member experiences stress, the body of an observer may produce many of the same reactions as if the observer were experiencing the stress directly.

Simply, bonded individuals not only feel and experience together, but their physiological processes are, to a certain degree, intertwined. In an additional example, social

bonds can buffer the development and effects of post-traumatic stress disorder (PTSD) in individuals and communities that have experienced trauma.[53] Similarly, data suggests that a wanted touch from a loved one can moderate individual responses to stress and pain.[54] Additionally, social bonding may have a role in downregulating inflammation in the body,[55] which affects a variety of processes, including general immune functioning and even mental health.[56] Lastly, research suggests that quality of social relationships and supports are strongly correlated with physical health outcomes in the long term.[57]

Together, this data suggests that social bonds have tremendous sway over the individual, from the cellular to the behavioral level. Researchers are still exploring the links between social bonding and neurobiology, but that data we do have affirms the pivotal role of social bonding in regulating neurobiological and social cognitive responses. In other words, our bonds affect our biology, physiology, our thoughts, our health, and our behaviors, and it is impossible to separate individual psychology from the embodied context of relationships and group bonding.

For practitioners in the peacebuilding and P/CVE space, the emerging research on the neurobiology of group belonging suggests that the commission of violence cannot be studied as only an individual decision or action. Collective violence or collective in-group defense largely makes sense given the powerful impact of group identity on human neurobiology and physiology. While there are individual-level neurobiological factors that can influence individual commission of violence, group-oriented violence largely makes sense from an evolutionary perspective, and various neurobiological systems evolved to coordinate coalitionist behaviors, which can include violence. In other words, violence cannot be entirely explained as a result of differences in individuals' neurobiology.

Practitioners and policymakers should:

- Recognize the need to belong and plan for it within prevention of deradicalization programs.
- Consider the risk of social isolation, rejection, or ostracism for members of society; recall that social isolation is among the common risk factors in violent extremist risk assessment profiles.
- Recognize and leverage the types of behaviors that strengthen intragroup bonds, including collective rituals.
- Understand the potential negative consequences of tight group bonds in terms of intergroup conflict.

Perceiving Threats

Our bonds affect our bodies, and our bodies affect our bonds. Our social bonds, in the form of group identification, also affect our mind—*how* we think about ourselves and others. In other words, our identity-based bonds have a dramatic effect not just in neurochemicals and physiological processes, but on our individual and intergroup psychology.

The interaction and overlap between self and other(s) is crucial in understanding violent extremist movements and all collective action movements more broadly. Bluntly, where we invest our belonging and identity, we invest much of our social cognition, including cognitive processes such as empathy, dehumanization, and threat construction.[58] And critically, the chance of conflict escalates when we perceive our group or identity as under *threat*.[59]

Humans face diverse threats, and our brains and bodies have developed complex rapid response systems to enable us to confront threats.[60] In order to keep you alive and safe, your brain is constantly making predictions about possible risks, possible threats to your safety and survival, about what you are seeing and might see, about what you are feeling and might feel.[61] It predicts and confronts risks by relying on all sorts of associations it has made between what is safe versus what is unsafe, and then by coordinating the best response to confront that risk and stay alive.

In many ways, an imagined threat activates the same response in the body as a literal physical stress or threat to our safety. Again, from a neurobiological perspective, the stress caused by a threat to your identity is interpreted almost the same as a threat caused by an animal attacking you. The communication of stress-related signals from the outside world, to the brain, to the body happens incredibly fast and without our conscious awareness. When sensory inputs first interact with the brain, they often interact with the amygdala. The amygdala, a tightly bound cluster of neurons shaped like an almond, is located deep inside the brain, just above the brainstem. It is a core part of the limbic system and plays a large role in body state awareness (interoception), threat recognition, and memory.

The amygdala plays a large role in interpreting information against your first and foremost priority—survival—as mentioned earlier. It is often what lets us know to pay attention to a particular input in the sensory world. The amygdala begins part of the elaborate coordination process that leads to our general responses to the sensed world. It is intricately connected to many different regions of the brain, all of which play a role in our coordinated responses to deal with the world around us, including dealing with stressors.

After receiving initial inputs, the amygdala sends signals to multiple parts of the brain, including the hippocampus, the frontal cortex, and the hypothalamus. The hypothalamus plays a large role in the regulation of bodily and emotional activity. If the signal received by the hypothalamus indicates stress or threat, specific neurons in the hypothalamus begin to secrete hormones that stimulate the nervous system. Specifically, they stimulate the sympathetic nervous system.

The hormones released in the hypothalamus also stimulate the pituitary gland, which then secretes a hormone that activates the adrenal cortex, on top of your kidneys. This rapid and unconscious cascade of information along the hypothalamic-pituitary-adrenal (HPA) axis enables your body to physically respond to stressors or threats. After this rapid and unconscious communication takes place, the adrenal cortex produces a variety of hormones, including adrenaline, norepinephrine, and cortisol, which serve multiple functions in the body.

A prolonged stress response can, in certain contexts and for certain individuals, have negative effects on cognition, memory, and attention. Seeing as the brain's primary task is to keep its host alive, a continuous perception of threat may elicit heightened attention. Regardless of the source of perceived threat, a continued or chronic stress response along the HPA axis can lead to a state of hypervigilance, or focused attention on threat-related stimuli. Furthermore, chronic stress can lead to memory difficulties, challenges with information retention and comprehension, and impulse-control issues.[62] Generally, stress has been shown to reduce the ability to regulate automatic, impulsive responses.[63]

None of this is to suggest that all violent extremists have experienced chronic stress, nor are we justifying decisions toward violence among people who have experienced chronic stress. Rather, we reaffirm that there are many possible pathways in human neurobiology between threat, stress, and social processing that may or may not contribute to tendencies toward violence; and furthermore, perceptions of *identity threat* can strongly influence behavior.

The notion of perceived threat is a critical feature in pre- and mid-conflict rhetoric, both in VEOs and in non-extremist conflict. Essentially then, the construction of threat is highly relevant in understanding intergroup conflict, including VEOs, which often capitalize on threat construction to incite a host of responses in current and potential members of the cause. The "threats" manipulated by VEOs are diverse, and often irrational from outside perspectives, but nonetheless consistently play a key role in members' conception of "the cause."

Perceiving Threats, Together: Consolidation of Group Identity

The interaction of in-group identity and perceived threat is at the heart of group-based violent extremism. Fear and threat, not unlike ritual, can accelerate bonding and fortify group identity.[64] And the perpetration of violence by individual group members, similar to ritual, also consolidates identification with the group.[65] In short, the construction of threat and the perception of threat reinforce commitment to the group, and in turn, that commitment can promote hyper-salience of group identity and attentional bias toward in-group threat.[66] Over time, this *could* increase both the tendency and likelihood of violent defense of the group.

In the social psychology literature, research on *collective relative deprivation* (i.e., "the subjective experience of unjust disadvantage") has been linked to increased desire for retribution, as well as increased tendency for collective action. Specifically, van Zomeren and colleagues found that perceived collective injustice was a strong predictor of *antisocial* (violent/disruptive) collective action among Muslim youth in the Netherlands. Furthermore, van Bergen later showed that attitudes toward in-group defense, among Muslim youth, stemmed from Muslim participants' perceived relative deprivation of their in-group. And importantly, in that study, perceptions of in-group *superiority* played a key role in modulating attitudes toward group defense and out-group aggression.[67]

As said, the *collective experience of threat*, and even war itself,[68] can consolidate group identity[69] and can increase conservatism,[70] hardness of group boundaries, and rigidity of intragroup norms.[71] In this way, threat and belonging exist in a cycle of mutual reinforcement, where threats consolidate identity and group norms, and increased identification with the group further attunes social cognition to in-group defense. The literature further suggests that this cycle may be intensified by perceptions of group narcissism or superiority,[72] which are not uncommon in certain ethnic or religious groups. Specifically, notions of in-group superiority are easy to find in the propaganda of various VEOs, including ISIS, Boko Haram, and violent white supremacist movements.

There is no doubt that violent extremist groups, like other groups where membership entails high risk to self and safety, capitalize on devotion (i.e., love, loyalty, and enthusiasm) and engage in activities, both intentionally and unintentionally, that fortify bonding and devotion. Scott Atran and colleagues who study members of violent extremist movements have shown the importance of studying not just group membership, but

also the tightness or *fusion* of the group identity with one's sense of self. Across studies, Atran and his team have shown that the degree of *fusion*[73] (e.g., bondedness, integration of group identity within self-concept) between an individual and the group plays an important role in certain precursors of extremist violence, notably (1) willingness to sacrifice, and (2) willingness to violently defend the in-group—two factors critical to building what Atran calls *devoted actors*[74] Indeed, notions of sacrifice and violent defense are central to participation in violent extremist groups and align with Lukas Glass's self-reported motivations for joining.

Identity fusion and devotion are often further fueled by the existence of *sacred values*, or those values which are immutable even in the context of financial or other incentives.[75] Essentially, individual fusion with the group, in combination with deeply held sacred values (sacredness as measured by relative importance vis-a-vis other values)[76] increases individual likelihood for violent defense of the group, as well as self-sacrifice. Furthermore, recent neuroimaging data from self-identified extremists in Barcelona suggests that the experience of *exclusion*, which is a natural kind of threat, by out-group members may reinforce individual willingness to sacrifice for the in-group,[77] insofar as exclusion may increase the sacredness of previously nonsacred values worthy of defense.

Pretus and colleagues' recent neuroimaging work on the role of exclusion in promoting in-group defense among extremists maps neatly onto others' work in social exclusion. Social rejection is painful, and in the aftermath of rejection, individuals tend to seek support and pain-mitigation, which can take place via a group, even groups that knowingly engage in acts that contradict the norms of potential recruits.[78] In other words, social rejection may spur increased individual reliance on a group, in an attempt to assuage social pain or increase perceived agency. Here, practitioners and policymakers are confronted with some imporant questions:

- What groups in the community elicit devotion from their members?
- What is the landscape of perceived threats in a community vulnerable to recruitment into violence? Who is responsible for assuaging those threats? And how?
- What is the landscape of exclusion or perceived exclusion by minority group members? How might perceived discrimination affect radicalization?
- Do individuals feel that sacred values are under threat? By who?

Harnessing "Normal" Tendencies

Humans evolved to form groups as a form of resource acquisition and protection. It is thus logical that the human brain and body have developed to promote and protect our need to belong. As a species, we have a variety of ways that we preserve, protect, and consolidate our groups.

Essentially, across the literature we begin to see a potent picture—that *the consolidation of identity in response to threat can also be further reinforced by participation in behaviors and activities—rituals and violence included—that seek to address or ameliorate that same threat*. And in this context, identification with a group in a high-threat, violent context presents a potent psycho-biological cocktail which does not justify violence, but provides a partial explanation for it.

Over decades, scholars have exhaustively studied the social psychology of intergroup conflict, including the relevant neural and biological mechanisms associated with aspects of group conflict like dislike, dehumanization, hate, and prejudice.[79] While researchers' understanding of the social neuroscience of intergroup conflict is always evolving, there is general consensus on the idea that intergroup conflict is often related to parochial in-group affections and defense, as opposed to explicit dislike toward outgroups.[80] In other words, defense of the group is paramount, and willingness to defend the in-group is exacerbated in the presence of sacred values, threats, and deliberate bonding practices that take a number of forms, including violence itself.

These group-level factors interact with a host of individual factors that are partially captured in existing risk assessment frameworks. Mental health, adverse childhood experiences, social rejection, bondedness with existing extremists, and extreme beliefs have all been identified within existing violent extremism risk frameworks. But as said, the combination of individual and group level factors ostensibly confirms that violent extremism is one of many possible antisocial outcomes for millions of individuals living lives of perceived disadvantage.

As we said, the brain's main priority is to keep its host alive and successfully navigate the social world, as perceived. We have developed complex biases, heuristics, identities, and threat detection mechanisms in pursuit of that priority. As we navigate the world, our biases and perceptions are further shaped by our social relationships (or lack thereof), which then attune the brain and body to potential risks, rewards, and opportunities.

Much of what we know about the psychology of belonging, values, and norms makes sense in the framework of a predictive and protective brain. And much of the literature discussed here is not exclusive to violent extremism but encompasses identity-based violence as a whole. Of course, there are plenty of examples of lone attackers or terrorists with clear psychopathology that explains their behavior; however, the majority of P/CVE work has been directed at what are essentially intergroup conflicts, even if the groups in question are transnational, virtual, and brutal.

Here we suggest that, to a certain degree, the neurobiology of violent extremism is not very different from the neurobiology of intergroup conflict generally. Again, research from neurobiology, psychiatry, forensic psychology, and clinical psychology has uncovered only a small number of individual-level factors that may correlate with increased risk of perpetrating violence, whereas it is clear how group-level factors such as identity, group bonding, and threat construction and reactivity—which are not unique to violent extremism—can play a crucial role in the development of extremist violence. In this review, we have not thoroughly covered all the research on psychology and radicalization. We can say with confidence, however, that the study of violent extremist organizations, as a subset of intergroup conflict, demands particular focus on sacred values, willingness to sacrifice, norms surrounding violence, and—occasionally and delicately—mental health, including experiences of chronic stress, exclusion, and trauma. How that conversation continues, and how research is conducted, is critically important as it affects the lives and perceptions of marginalized communities around the world.

Conclusion

The challenge for researchers and practitioners remains, and important questions are still unanswered:

- Under what circumstances do otherwise normal individuals with "normal" motivations like belonging, safety, and group defense choose violence over other tactics?
- Are certain individuals drawn to *violent* ideologies over more normatively acceptable ideologies?
- If so, which individuals and why?
- What role does ideology play at all, above social and psychological needs?

For policymakers and practitioners, these questions remain of utmost urgency and importance. More field and experimental research is required to provide better answers.

Heuristics, attention to threats, social bonding, and group categorization are critical aspects of human evolution, and as such, we should not seek to fully undo or remove any of these features of the human experience as we look to address violent extremism. In other words, programs and activities which try to "de-program" these basic ways of thinking will not only likely fail, but usually operate with limited understanding of basic human motivations and psychology.

Importantly, while our brains and biology facilitate our intense devotion to non-kin groups, sometimes promoting violence, we also know that membership in non-kin groups provides concrete psychological, social, and biological benefits to members, irrespective of the behavior or actions of the group in question. These benefits potentiate the "sticking power" or "potency" that sustains members' attraction, irrespective of the perpetration of violence that, perversely, can sometimes consolidate bonds. So, moving forward, we must find a way to study the idiosyncrasies of terrorists at the individual level in a way that de-exceptionalizes violent extremism alongside other violent, antisocial outcomes, while also harnessing what we know about human biology and psychology to create bonded groups of devoted actors, willing to sacrifice for peace, inclusion, and shared prosperity.

Notes

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Suggestions for Further Reading and Resources

Works on Neuroscience in General

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Works on Topics Covered in This Issue of *NeuroPeace*

How the brain and nervous system influence decision-making processes and violent behavior

- R. Douglas Fields, *Why We Snap: Understanding the Rage Circuit in Your Brain* (New York, NY: Dutton/Penguin, 2015).
- R. Douglas Fields, "The Roots of Human Aggression," *Scientific American*, 320, no. 5 (2019): 65–71.

- Christopher D. Frith and Daniel Wolpert, *The Neuroscience of Social Interaction: Decoding, Influencing, and Imitating the Actions of Others* (Oxford University Press, 2007).
- Jonathan Haidt, "Morality," *Perspectives on Psychological Science* 3, no. 1 (2008): 65–72.
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Neuroplasticity and radicalization and violent extremism

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LASANA T. HARRIS

Lasana T. Harris, PhD, is an Associate Professor in Experimental Psychology at University College London. His research uses a social neuroscience approach to explore the neural correlates of person perception, prejudice, dehumanization, anthropomorphism, social learning, social emotions, empathy, and punishment. This research addresses questions such as: How do we see people as less than human, and nonhuman objects as human beings? How do we modulate affective responses to people? How do we decide right from wrong? By combining social psychology and affective and cognitive neuroscience with philosophy of mind, developmental psychology, evolutionary anthropology, economics, law, and policy, this research focus is a comprehensive strategy to explore human behavior. Harris completed his undergraduate education at Howard University before finishing graduate school at Princeton University, where he earned his PhD. He completed his postdoctorate research at New York University, and was appointed as an assistant professor in psychology and neuroscience at Duke University. He was then an assistant professor in social and organizational psychology at Leiden University.

MICHAEL NICONCHUK

Michael Niconchuk is an applied neuroscience researcher and practitioner focusing on mental health of conflict-affected populations and the relationship between trauma and intergroup violence. Niconchuk is the Program Director for Trauma & Violent Conflict at Beyond Conflict as well as the Senior Technical Expert for Mental Health and Psychosocial Support at *Questscope* in Amman, Jordan. Based in Jordan, he oversees the design and implementation of research and applied projects that address the role of chronic stress and trauma in the genesis and escalation of violent conflict, and the role of trauma healing in conflict resolution efforts. He is the author of several innovative scientific pub-

lications on issues of neuroscience, violent extremism, and intergroup conflict. He is also the author of the *Field Guide for Barefoot Psychology,* a psychoeducational and trauma recovery program for communities affected by trauma and forced displacement. Niconchuk is a former Fulbright Scholar and holds degrees from Tufts University and University College London.

Acknowledgments

I am deeply thankful to the contributors to "Neuroscience and Peacebuilding," whose chapters form the first three issues of the *NeuroPeace* series. It has been an honor and pleasure to work with each of them. They readily agreed to contribute to the "Neuroscience and Peacebuilding" initiative and to share their time, expertise, and commitment to exploring ways we can prevent violence and resolve destructive conflicts.

The *NeuroPeace* series would not have been possible without the support and encouragement of Antti Pentikainen, Director of the Mary Hoch Center for Reconciliation (MHCR) at George Mason University's Carter School for Peace and Conflict Resolution, who saw its potential and welcomed its creation. I am grateful for his unwavering trust in me. I also want to thank Charles Hauss, Senior Fellow for Innovation at the Alliance for Peacebuilding, who reviewed "Neuroscience and Peacebuilding" and supported its publishing. I am also thankful for Annalisa Jackson, Associate Director at MHCR, who appreciated the importance of engaging in discussions around the nexus of neuroscience and peacebuilding. And many thanks go to Marianne Michalakis for her creativity in designing the cover of *NeuroPeace* and to Karen Weldon for laying out the interior so expertly.

NeuroPeace would also not have been possible without Nigel Quinney, who not only served as the best developmental editor anyone could have, but also was a partner with me from start to finish in making decisions big and small. He provided moral and editorial support from the time the manuscript was conceptualized and then birthed as part of the "Neuroscience and Peacebuilding" initiative that I launched while at the United States Institute of Peace (USIP), to when it moved to its new home at MHCR and was published through *NeuroPeace*.

I am grateful to Tina Lui and Angelina Mendes, whose moral support, professionalism, and contributions—from reviewing drafts to helping map relevant literature—to the development of the manuscript were pivotal. They were with me each step of the way. I am also grateful to Beatrice Pouligny for her insightful critiques of concept notes and chapter drafts.

Thanks go to USIP as a whole for its support for the development of the manuscript. In particular, I would like to express my appreciation to members of the USIP senior leadership team—Ambassador Bill Taylor, Paul Hughes, Kathy Ross, and David Yang—who saw the value of the project and its contribution to peacebuilding and who supported its early development.

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Where Peace Crosses the Mind

MARCH 2021

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