



The Socializing Brain: Understanding the Relationship Between Social Interactions and the Central Nervous System

A Review of

New Frontiers in Social Neuroscience

by Jean Decety and Yves Christen

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The discipline of neuroscience may be defined broadly as the scientific study of the nervous system. Traditionally viewed as a branch of biology, neuroscience is a primary field of investigation that is generally regarded as relatively new even though exploration of the workings of the brain and nerves dates back thousands of years. Indeed, it is known that during the 7th century B.C. the Greek physician Pythagoras made reference to cognitive deficiencies associated with aging (Berchtold & Cotman, 1998; Gontkovsky, 2014) and that more than 2000 years ago Hippocrates described various details of traumatic brain injury and seizures (Chang, Lad, & Lad, 2007).

The advent of sophisticated and novel methods for studying the nervous system, in particular the brain, during the latter half of the 20th century propelled the field of neuroscience to a level nearly inconceivable even just 25 years ago. Complex and minimally invasive brain stimulation, recording, and mapping procedures, such as diffusion tensor imaging, functional magnetic resonance imaging, positron emission tomography, magnetoencephalography, and transcranial magnetic stimulation for example, alone or in combination with other investigative approaches (e.g., molecular, chemical, etc.), have opened the door to entirely new ways of understanding the neural bases of behavior.

This rapid expansion of neuroscience research has led not only to the field becoming increasingly interdisciplinary in nature but also to the emergence of various subspecialties within the discipline, the most common probably being cognitive neuroscience, which emphasizes the relationships among brain structures, neurological activity, and cognition (Revlin, 2013). The abundant new findings of cognitive neuroscientists have been published in numerous scientific journals. As an example, Yeo et al. (2011) recently reported data parceling the human cerebrum into 17 networks, ranging from very localized to widely

distributed, based on resting-state functional connectivity magnetic resonance imaging from 1000 study participants.

The methodological approaches of cognitive neuroscientists now are assisting social scientists (e.g., social psychologists, evolutionary anthropologists, behavioral neuroeconomists, etc.) in understanding the complex manner in which the central nervous system mediates social interactions and makes decisions (Kolb & Whishaw, 2014) through growing interdisciplinary research involving the neural, hormonal, cellular, and genetic mechanisms underlying the emergent organizations beyond the individual that characterize social species (Cacioppo & Decety, 2011). In their recently released edited volume, *New Frontiers in Social Neuroscience*, Jean Decety and Yves Christen bring together 17 of the leading researchers in the emerging discipline of social neuroscience to discuss the key concepts and findings that define this new field of investigation.

The 12 papers included in this fascinating and important new book demonstrate the power of taking an interdisciplinary approach to social and emotional behavior in both humans and animals through the emphasis on various domains of research, including behavioral neuroscience, system neuroscience, behavioral ecology, and social psychology. As noted in the volume's Foreword, this collection of articles bridges the gap between animal and human studies, identifies the laws that link different levels of analysis, provides genetic and molecular insights into social behavior, and offers an excellent counterpoint to the dominant trend in the social sciences toward greater and greater specialization.

Social neuroscience, which also has been referred to as social cognitive neuroscience or the social brain sciences (Adolphs, 1999; Cacioppo, Bernston, Sheridan, & McClintock, 2000; Ochsner & Lieberman 2001), offers a way of integrating and testing disparate disciplinary theories and so provides a more complex and subtle picture that is not as reductionistic as some earlier attempts to identify the physiological and neurological foundations of human behavior. Indeed, the editors insist that neuroscience does not aim at reducing or eliminating higher levels of analysis.

Many of the chapters highlight the immense role of emotional and social factors in human life, including their part in shaping the human brain. Rudimentary forms of emotional and social intelligence emerge early in infancy, and these fundamental forms of intelligence continue to rapidly evolve throughout childhood and early adulthood. Indeed, although the later phases of adult development are not addressed in this book, it is clear that social and emotional abilities can continue to develop throughout most of the human lifespan. Some of the main capacities studied in this book include empathy, emotional perception, emotion understanding, emotion communication, emotional and social bonding, social cooperation (usually with conspecifics), solicitation of others' attention or assistance, social and moral evaluation of others (as friend/foe, trustworthy/untrustworthy, helper/hinderer, fair/unfair), and understanding others' intentions, goals, and perspectives. Most of the behaviors discussed are prosocial, but some attention is also given to aggression and competition. The phylogenetic and ontogenetic development of empathy is of particular interest to several contributors, many of whom cite J. Kiley Hamlin's important work on socio-emotional evaluation in infants. Some of these contributors focus on the social and emotional capacities that are crucial to survival in apes, primates, and other social animals, arguing that these capacities shape the relationships between parents and offspring as well as between conspecifics, whether young or mature. For example, Sarah Hrdy asserts that

significant parental emotional investment in rearing offspring often translates into greater prosocial behavior toward conspecifics.

Not surprisingly, many chapters identify or attempt to identify the various brain regions and circuits (especially the amygdala, hypothalamus, insula, anterior cingulate cortex, orbitofrontal cortex, pulvinar, and prefrontal cortex), as well as neurotransmitters and hormones (particularly, oxytocin and dopamine, but also testosterone) involved in animal and human emotion and social behavior. Usually, the general functions of these regions, circuits, and substances are described well enough for nonspecialists to follow the arguments. Most chapters demonstrate the complex connectivity of the brain and the multiple regions and circuits involved in any particular behavior.

Many of the contributors emphasize neuroplasticity and the epigenetics of phenotypic expression in both human and nonhuman species. One dramatic example of epigenetics, as discussed by Stephen Rogers, is the locust, which typically is asocial, but when environmental changes periodically favor an increased supply of food changes (due to increased rainfall), the population density surges, and the locusts are compelled to be more social. To adapt to the increased need for and complexity of social relations, their brains change size and structure, as do other anatomical features. Several chapters compare and contrast the emotional and social capacities in humans and their evolutionary ancestors. Compelling arguments are made that much of the growth in size of the human brain is associated with the increasing complexity of the social-emotional lives of humans and their hominid and primate ancestors.

The early speculative works by philosopher and psychologist G. H. Mead about the development of self through social relationships is given evolutionary, biological, and neurological support by many of the findings in this book. The capacity to understand others has a crucial impact on self-understanding. Like other recent evolutionary psychologists, several contributors demonstrate the importance of cooperation, not just competition, to the evolution of human intelligence and fitness. Such cooperation not only requires a larger and more complex brain but also contributes, when expressed in alloparenting to sustaining the long period of maturation required for a complex brain to grow, as Sarah Hrdy has shown. Robin Dunbar discusses the social brain hypothesis that addresses the relationship between social group size in primates and the volume of the neocortex, particularly the frontal lobes. Mark van Vugt identifies four behavioral traits that are consistently associated with leadership across species: motivation (as indicated by energy and autonomy), bold personality, experience, and dominance. In animals, leadership not only helps to coordinate group movement but also to coordinate hunting, group defense (against predators), peacemaking, teaching, and learning. Human leadership differs from that of other animals by being more flexible, situationally dependent, and tied to the ability to further group goals. Jay Van Bavel, Leor Hackel, and Y. Jenny Xiao demonstrate that minimal group identities—such as being briefly assigned to a mixed race group—can override racial biases and increase the likelihood of evaluating others as individuals. They argue that top-down social influences, such as group affiliation, need not emerge only after unavoidable automatic responses, controlling these responses through strategies like suppression or reappraisal, but that these top-down influences may actually be able to modify which responses become active in the first place through a form of pre-appraisal. The evolutionary arguments made in the book are generally more nuanced and compelling, and less reductionistic, than those used in support of Richard Dawkins's (1976) selfish gene theory.

The book has important implications for such cognate fields as developmental psychology, cognitive psychology, biological psychology, evolutionary psychology, and even sociology, criminology, and philosophy (particularly ethics). It provides a solid overview of research in the new subspecialty of social neuroscience and would serve as excellent supplementary reading for various courses across a number of disciplines. Unlike some edited works, the articles in this volume, even though discussing diverse areas of investigation within the field, flow well together. Although many of the authors explain potentially confusing terms and topics, the book is not for beginners and may be beyond the comprehension of all but advanced undergraduate students. At a minimum, it requires a basic foundation in biology, chemistry, and behavioral science as well as an understanding of experimental methods. In this light, it may be most appropriate for graduate students and professionals interested in acquiring a broad understanding of social neuroscience.

As the larger field of neuroscience continues to expand and technological advances lead to new techniques for studying the brain, it can be expected that additional subspecialties will emerge within the discipline. Indeed, the December 2014 issue of *Current Directions in Psychological Science* includes an article defining the new field of health neuroscience, which represents the interface of health psychology and neuroscience and is concerned with characterization of the bidirectional and dynamic brain-behavior and brain-physiology relationships that are determinants, markers, and consequences of physical health states across the lifespan (Erickson, Creswell, Verstynen, & Gianaros, 2014). *New Frontiers in Social Neuroscience* illustrates how far this particular subspecialty has come already but shows too how far there still is to go. Much has been learned about social neuroscience, but much is left to be learned. The future of this new area of study is intriguing!

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