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Introduction

Turhan Canli

Recent methodological advances in genetics and neuroscience have catalyzed work on the biological basis of personality and individual differences. Yet even active researchers rarely have the opportunity to learn about all of these developments, because geneticists, psychologists, and neuroscientists only rarely attend the same scientific meetings. This lack of communication motivated a remarkable conference that was held in August 2004 on the campus of Stony Brook University on Long Island, New York, entitled “The Biological Basis of Personality and Individual Differences.” Funded by the National Institute of Mental Health, this conference brought together researchers from clinical psychology and psychiatry; cognitive, affective, and behavioral neuroscience; and comparative psychology. Presentations covered the structure of personality and its mapping onto biology; the biology of traits; genetic markers for individual differences and vulnerability toward psychopathology; functional neuroimaging approaches; and the correspondence between human and animal personality.

Until now, the reader who wanted to follow these exciting developments had to seek out scholarly journals from a vast array of scientific disciplines. This book represents an attempt to offer a current and cross-sectional overview of the field and is intended for a wide audience. Practicing clinicians; social, personality, and cognitive psychologists; neuroscientists working in neuroimaging; behavioral neuroscientists; and behavioral and molecular geneticists will all find new and exciting insights in this book. The book’s major themes are divided into six sections. Starting in Part II, each chapter not only presents current empirical work placed in a larger scholarly context, but

also concludes with a section entitled “Looking Forward,” in which the authors speculate on the future of their respective fields.

Part I is a historical perspective on broad questions regarding the mapping of personality onto the brain. Few investigators had a better grasp of these questions than Jeffrey Gray. He was the first to commit to be a speaker for the Stony Brook conference. His passing a few months before the meeting came as a great personal shock and as a tremendous loss to the field. Gray’s contributions are thoughtfully represented and reviewed by Fowles (Chapter 2), to the extent that this is possible in one chapter. His summary makes for an appropriate starting point, because Gray’s work transcended animal and human studies, and included both basic physiology and clinical applications; as such, it sets the stage for the diverse set of chapters that follows.

Part II narrows the focus by presenting different research approaches to extraversion and related traits. Zuckerman (Chapter 3) opens this section with a discussion of the biosocial bases of sensation seeking, a trait related to extraversion. Depue (Chapter 4) deconstructs positive interpersonal aspects of extraversion into two independent traits of agency and affiliation. He presents recent data on the neurobiology of these traits, discussing their phenotypic, neurobehavioral, and genetic aspects. I (Canli) then look at the positive affective characteristics of extraversion to show how brain reactivity to emotional stimuli correlates with individual differences in this trait, and, furthermore, how it is associated with variation within specific genes. I argue that this “genomic imaging” approach may eventually lead to the development of neurogenetic, causal models of personality. Knutson and Bhanji (Chapter 6) focus on the interplay of positive arousal and gain anticipation in extraversion; they show how newer neuroimaging methods, particularly event-related functional magnetic resonance imaging, can be utilized to obtain a better understanding of the temporal dynamics and function localization of these processes. Innovations in neuroimaging are also the topic of the chapter by Herrington, Koven, Miller, and Heller (Chapter 7), who highlight the importance of novel analytical strategies in revealing individual differences in brain laterality, as they relate to personality, emotion, and motivation.

Part III moves from traits to other determinants of individual differences. Knight and Mather (Chapter 8) focus on the exciting emerging field of the affective neuroscience of aging, and present work on the interaction between emotion and cognition across the adult life span. Hamann (Chapter 9) discusses sex differences in neural responses to sexual stimuli, presenting data on how men and women differ in activation of limbic structures that mediate emotion, motivation, and physiological responses. Sinha (Chapter 10) concludes the section with a chapter on gender differences in the context of brain responses to emotional stress. Her chapter also marks a transition toward clinical issues, which characterize the next two sections.

Part IV presents genetic and neural analyses related to anxiety and mood disorders, and to traits linked to these. The first two chapters demonstrate the utility of large-scale twin registries in behavioral genetics. Gillespie and Mar-

tin (Chapter 11) explore the genetic and environmental contributors to neuroticism; they make the point that this trait is an ideal phenotypic candidate to discover quantitative trait loci associated with negative mood and anxiety. Middeldorp, Cath, van den Berg, Beem, van Dyck, and Boomsma (Chapter 12) investigate the association of neuroticism, extraversion, and sensation seeking with anxious and depressive psychopathology, based on data from the Netherlands Twin Register of more than 45,000 twins. The last two chapters of this section demonstrate the power of molecular genetics in conjunction with an endophenotype approach to detect genetic effects in much smaller samples. Lesch and I (Chapter 13) discuss how variation within the serotonin 1A (5-HT_{1A}) receptor gene (*HTR1A*) is associated with anxiety and emotional brain reactivity, presenting data to suggest a nonlinear relationship between *HTR1A* genotype and its influence on cognitive and neural systems engaged in attention to negative emotional stimuli. Hariri (Chapter 14) closes the section with a discussion of genetic variation within the serotonin transporter gene-linked or promoter region (*5-HTTLPR*) and its effect on amygdala activation and individual differences in fearful and anxious personality traits.

Part V narrows the topic of mood and personality disorders to children. Viding and Plomin (Chapter 15) present data on children with psychopathic personality traits who are genetically vulnerable to antisocial behavior. Lau and Eley (Chapter 16) investigate two pathways by which genetic factors may contribute to the development of anxiety and depression in children and adolescents, using a cognitive-behavioral genetic approach. Gotlib, Joormann, Minor, and Cooney (Chapter 17) close the section with an examination of the cognitive and biological characteristics of children at high risk for depression. Their preliminary findings highlight the opportunity to develop better detection tools and thus to improve the odds for successful prevention of depression.

Part VI, the closing section, serves as a bridge between research on human and animal personality. Chiavegatto (Chapter 18) starts off the section with a discussion of studies on aggression in genetically altered mice. Weiss and King (Chapter 19) present data on personality, happiness, and genes in chimpanzees. They find evidence for genes that are common to trait dominance and to subjective well-being, but also find that each factor is uniquely associated with environmental variables. Mehta and Gosling (Chapter 20) close the section with a broader look at the study of human versus animal personality. They demonstrate that personality can indeed be studied in animals, and that there are five major benefits of animal studies for research on human personality; they suggest that a better understanding of the biological basis of personality will result from the integration of human and animal studies.