



## Review: The neuroscience of intelligence by Richard J. Haier

**The Neuroscience of Intelligence, R.J. Haier. Cambridge University Press (2017). (251 pp.), ISBN: 978-1-107-46143-7**

Haier is a pioneer in the brain imaging studies of the differences in intelligence. The *Neuroscience of Intelligence* melds a century's worth of psychometrics with the most recent advances in genetics and neuroimaging to reveal the cutting edge of intelligence research. This book is an impressively broad review of the current state of the field that does not compromise on depth. It can serve as a crash course for budding researchers in the field while highlighting many exciting prospects for those already involved. Haier introduces the current conception of human intelligence and also refers to the historical context within which IQ testing emerged. Some scientific literacy is assumed but Haier provides a good overview of the relevant statistical and biological knowledge. Haier addresses the controversies that have ensued in response to past research in the field, pointing out that although facts concerning differences in intelligence are likely useful in the realm of social policy, they are usually viewed as harmful. A captivating narrative, rife with controversy, is interwoven between data-driven conclusions concerning the true nature of human intelligence. Taboos aside, the focus of the book is on the recent advances in genetics and neuroimaging with respect to intelligence research. Countless studies are elaborated on in a step-wise fashion, outlining findings that are no longer disputed. Established facts are examined alongside inconsistencies, past misconceptions and mysteries in the field.

The relationship between general intelligence (g), IQ and other mental abilities is made clear. The opening of the book frames the discussion by emphasizing the predictive validity of g with respect to long-term life outcomes. Criticisms levelled against the relevance of IQ tests are put to rest in a straightforward manner. Haier reviews adoption, sibling and twin studies in order to demonstrate the relative contributions of genes and environment to a person's intelligence as they age. As research is presented, the belief that environment fully determines intelligence differences is refuted, making clear the large genetic contribution to cognitive ability differences. Haier uses discussions on the high heritability of intelligence to segue into the field of genetics.

Haier delves into early efforts to identify genes that underlie human intelligence, citing many studies that seemed promising but could not be replicated. As he explains, however, more recent studies now point to specific candidate genes as well as large polygenic networks related to cognitive ability. Haier dedicates a whole section to the recent progress made in the field of molecular genetics, discussing various advanced approaches that have made meaningful strides in collections of single nucleotide polymorphisms as well as proteins associated with intelligence. Results that have sprung from advanced DNA technologies and impressive multi-site collaborations suggest that understanding intelligence on a molecular level is not an insurmountable goal.

Haier provides his own perspective on the pioneering work that was conducted in the early years of brain imaging technology. Without the use of jargon, Haier clearly outlines the initial advances made within the intelligence field using positron emission tomography (PET) and magnetic resonance imaging (MRI). He details numerous studies investigating the relationship between intelligence, brain activity and brain structure. Haier sticks to a chronological order in this portion of the book to display the manner in which scientific progress is made. "Phase one" of applied brain imaging technology, as Haier calls it, culminates in the Parieto-frontal Integration Theory (PFIT) – the result of a comprehensive review of the literature amassed during this period, compiled by Haier and his colleague, Rex Jung. The PFIT identifies 14 specific areas in the brain related to cognitive ability and to this day serves as the main distributed model of intelligence. Haier goes on to discuss more advanced and promising developments in the field of neuroimaging, some of which involve quantitative and molecular genetics. At every opportunity, Haier emphasizes the complexity of these topics, echoing a statement he made in the preface: "three laws govern this book: (1) no story about the brain is simple; (2) no one study is definitive; (3) it takes many years to sort out conflicting and inconsistent findings and establish a compelling weight of evidence".

The popular topic of increasing intelligence is met with due scepticism. Haier discusses amusing anecdotes like state-mandated purchasing of Mozart CD's for newborn babies in an effort to boost their IQ – an initiative that was inspired by a paper published in *Nature*. Many other claims of IQ increase are examined, but under Haier's scrutiny, they are discredited. Haier explains why he sees no evidence for the purported claims of increased intelligence, although he remains hopeful about new methods that are arising. His hopes mainly lie in the growing understanding of intelligence genes as well as related epigenetic factors. Haier views the subject of intelligence increase as important given that intelligence is so critical in daily life and life-long success and considers that any attempt to remedy arbitrary inequalities in intelligence as positive.

Haier's concluding chapter expands on exciting initiatives that could yield important insights, newly emerging methods and tools, as well as sobering thoughts regarding the implications of intelligence research in social policy. Among other fascinating topics, Haier mentions a functional MRI study of individuals with super-memory, the development of machine intelligence, and studies on creativity and consciousness. Arguably one of the most important sections covers the relationship between socio-economic status and intelligence. Haier does not steer clear of controversy and he employs the same data-driven approach that characterizes the rest of the book in order to shed light on this uncomfortable issue.

In our estimation, Richard J. Haier's *The Neuroscience of Intelligence* is a thorough and honest overview of the progress made in intelligence research. Its breadth cannot be overstated. The book is inspiring and enjoyable to read, and it is structured in a way that “forces thinking” while capturing the passion that Haier feels for this exciting field.

Arseni Sitartchouk, Alan C. Evans  
*McGill University, Canada*  
*E-mail address: alan.evans@mcgill.ca*

---

\* Corresponding author.