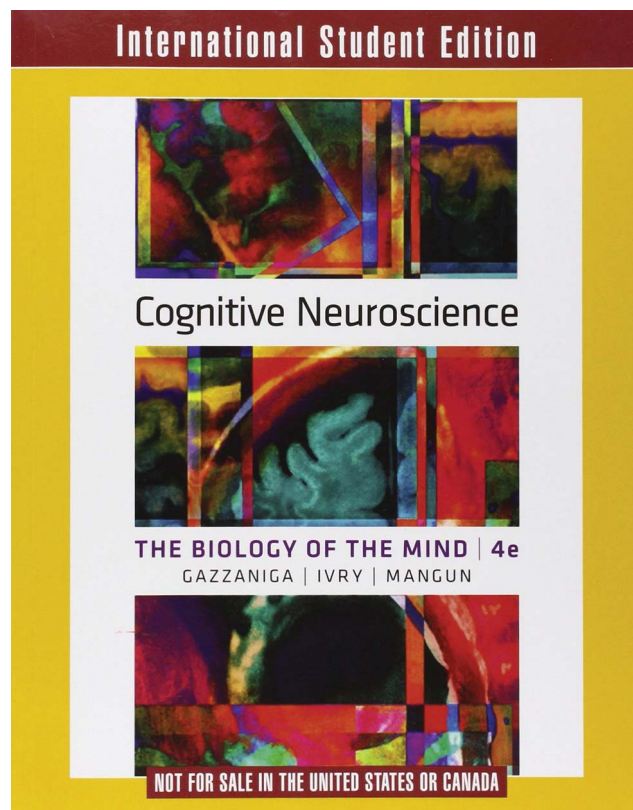

BOOK REVIEWS

Michael S. Gazzaniga, Richard B. Ivry and George R. Mangun
Cognitive Neuroscience: The biology of the mind (International student edition) (4th ed.)
New York, NY: W. W. Norton & Company, 2013, 752 pp.
ISBN: 978-0-3939-2228-8

Since the 1970s, the field of neuroscience has earned great interest and respect among scientists and psychologists. Over the years, neuroscience and psychology became increasingly intermingled due to the importance of neuroscience in basic psychological science in the applied fields such as clinical work, treatment of addictions and counselling, thereby creating a need for a comprehensive handbook for students and researchers. Gazzaniga and his colleagues published the first edition of this book in order to fill this niche. This volume is a basic yet highly detailed manual of the fundamental scientific approaches and research results in the field of neuroscience. Nothing represents its utility and the field's rapid development more than the fact that the international student edition of *Cognitive Neuroscience: The biology of the mind* is already celebrating its 4th edition.

In this edition of the handbook, the authors have implied some major changes in the structure and the text as well. The text became much more user-friendly and inspiring for students, as well as for psychologists from a variety of subfields such as clinical psychology, addictions, or even social psychology who aim to gain a better understanding of neuroscience. Figures bound into the text are helpful and elaborate, enabling the readers to understand the structural and functional connections of the human brain. The anatomical orientation boxes in the beginning of each chapter further help in developing a real 3D image of the human brain and its core and higher mental functions. Finally, take home messages, summary, a list of key terms, thought questions and suggested readings at the end of each chapter help students to deeply process the information they have acquired when reading the text, initiating further questions



and possible associations between the subtopics of the chapter as well.

The structure of the book follows a logical setup of three consecutive parts, starting from the very basics of cognitive neuroscience, followed by the core processes that are dependent on the functioning of the basic neuronal mechanisms, lastly reaching complex questions like what is consciousness, how free will can be explained and how law can be applied to these processes in everyday life.

The first part of the volume explains the very basics of neuroscience through which one can understand how the field of neuropsychology and cognitive neuroscience emerged, how the nervous system works and which are the main methods in researching neuroscience. Integrating

the structural and the functional explanation of the nervous system within one chapter provides a better perspective of the nervous system. In addition, the first part of the volume also contains a chapter about the history of cognitive neuroscience and another chapter about the methods that this science uses. As a result, the reader receives a comprehensive overview of how cognitive neuroscience evolved and what this field has to offer for contemporary psychology and science.

The next part explains the core processes of mental functions. Starting from the anatomy of the two hemispheres of the human brain, this chapter overviews evidence from split brain patients and finishes with the hemispheric specialization, including an evolutionary explanation of hemispheric specialization. Chapters include processes such as sensation and perception, object recognition, attention, action, memory, emotion and language which all are relevant core processes of the human brain and cognition. Most

importantly, these processes are all approached in an integrative way. For example in the sensation and perception chapter, the authors present how sensation and perception are linked, how multimodal perception works and also how perceptual reorganization occurs in the brain. A second example for the integrative mindset of this handbook is the chapter about emotions. Following the definition of “emotion”, we can read about how the nervous system is involved in the processing of emotions, and towards the end of this chapter, the authors explain the possible interactions between emotions and other cognition processes. In the chapter of object recognition, we can learn the principles of object recognition and even get a taste of how mind reading works and may be used in the future.

In the final, third part the authors introduce the highest human-specific mental functions such as cognitive control, social cognition, and even controversial topics such as the questions of consciousness and free will. In the cognitive control chapter, the anatomy behind control functions is explained, and decision-making and the possible transmitter systems involved in it are unfolded. Furthermore, areas upon which goal-based cognitive control mostly depends on are specified, as well as the areas that are designed to successfully govern goal-oriented behaviours. The last chapter about consciousness, free will and the law explains the anatomical orientation of our consciousness and what consciousness really means. The following thoughts concern questions about the human specificity of consciousness, and how (why) the concept of free will is to be abandoned. The last part of this rather controversial chapter shares some

insights about how law should approach the question of consciousness and responsibility, under what circumstances do felony counts as a crime, and what judges can do in their everyday practice to make the best possible decisions in court.

In this 4th edition of this handbook the authors focus on representing scientific and neuroscientific evidence-based research, which is deeply permeated by psychological theory. Keeping in mind all related interdisciplinary fields such as biology, neuroscience, psychology and philosophy are essential to delivering a nuanced picture of higher mental functions, which this handbook aims to deliver and has great success in performing it. In summary, this handbook is highly recommended to those who are seriously interested in how neuroscience and neurology form our understanding of basic psychological processes, how these processes affect our lives, and what the possible limits of the fruitful relationship between neuroscience and psychology can be. The level of the content is satisfactory for those who have no previous knowledge about this topic, nonetheless, it can also offer important new information and an integrated view of certain topics for researchers who are more up to date in this field.

Virág Márta

Doctoral School of Psychology
Eötvös Loránd University
Budapest, Hungary
E-mail: marta.virag@ppk.elte.hu

Trevor W. Robbins, Barry J. Everitt and David J. Nutt

The Neurobiology of Addiction

Oxford, UK: Oxford University Press, 2010, 318 pp.

ISBN: 978-0-1995-6215-2

This book summarizes important results from the field of addiction which were originally presented at the Royal Society discussion meeting held in 2008. This conference brought together several eminent experts of the topic. The book has approximately forty contributors presenting the latest scientific findings in eighteen chapters.

Nothing underlines more the importance of this topic than the prevalence of drug abuse and its well-known consequences. According to the WHO's data, in 2010 approximately 6.2 litres of pure alcohol was consumed per person aged 15 years or older. Furthermore, in 2008, 155 to 250 million people were estimated to use other psychoactive substances, such as cannabis, amphetamines, cocaine, opioids, and non-prescribed psychoactive medication. In 2004, according to WHO estimation, 0.7 percent of the global burden of disease was due to cocaine and opioid use. In 2012, about 3.3 million deaths were related to alcohol consumption.¹

This volume focuses on the neurobiological aspect of addiction. Each chapter has different authors presenting their own findings as well as the results of other researchers. Along the presentations of these works we find results on each biological level: starting with genes, transcription factors and epigenetic processes through molecules of cell signaling pathways, receptors and neurotransmitters to important brain areas or complex neuronal pathways. Similar to the topics, applied methods vary as well. Papers present study results from rodents, monkeys, and human subjects. Neuroimaging studies, molecular techniques, behavioral models and cognitive tasks are used to reveal potentially important changes in addiction. As a result of this variety we gain a deep insight into the present knowledge about the biological basics and consequences of addiction.

The book consists of four parts, all exploring different aspects of addiction. Part one introduces theories of drug addiction.

First Koob and Moal present the opponent motivational theory of addiction which emphasizes the importance of stress-related systems in addiction, besides the altered reward function of the brain. This work underlines for

¹http://www.who.int/substance_abuse/facts/en/

example the importance of the corticotropin-releasing factor in the so-called extended amygdala.

In the second chapter Everitt et al. suggest a theory on the neuronal transition mechanism leading to compulsive drug seeking. One component of this transition is supposed to be a shift from prefrontal cortical to striatal control of drug-seeking behavior.

In the next chapter Robinson and Berridge hypothesize that in addiction-related problems the incentive salience of certain mesocorticolimbic systems are sensitized to reward-associated stimuli. They also deal with the possible role of the learning mechanism in this process.

In the last chapter of part one Stewart reviews the contributing factors of addiction and their neurobiological basis. She examines the neural changes accompanied by drug exposure, the role of learning and their connection to a few well-known factors (such as drug-associated stimuli or stress) that may cause relapse. Stewart also summarizes the main neuronal circuits involved in these processes such as certain nuclei of the prefrontal cortex, amygdala, hippocampus or the substantia nigra reticulata.

Part two, *Extending the concept of addiction*, extends the concept of addiction beyond the “classic” substance abuse and focuses on food intake and gambling.

In the first chapter of this section Markou summarizes the relevant knowledge about the neurobiology of nicotine dependence. The author highlights the importance of research on nicotine as it is more prevalent than any other drugs of abuse. She reviews potentially involved neurotransmitters such as GABA, glutamate, acetylcholine, dopamine, their receptors and the important brain circuits affected by nicotine reward, intake, withdrawal and dependence.

In the next chapter Stephens and Duka focus on the cognitive and emotional consequences of binge drinking examining the role of amygdala and prefrontal cortex. The authors present evidence both from human and rodent studies suggesting that alcohol consumption may lead to impaired learning and increased impulsivity. Examining long-term potentiation they found impaired neural plasticity in hippocampus and amygdala as well as impaired aversive conditioning and associative learning on the behavioral level.

In Chapter 8 Potenza presents results regarding pathological gambling which is considered to be a behavioral

addiction. Brain imaging findings and neurotransmitters involved in pathological gambling are presented.

In the last chapter of this part Volkow et al. start with an interesting assumption. They propose that there is a link between drug use and large quantity of food intake as both are sources for reinforcement. Hence they suggest a common model for the two phenomena as a conclusion of PET imaging studies on dopamine. They suppose that both reinforcers modulate reward threshold and both sources activate certain learning and memory processes. Moreover, drug use or excessive food intake both damage cognitive control. The above-mentioned changes can lead to inability limiting drug or food intake.

Part three gives an insight into the possible factors leading to vulnerability to drug addiction.

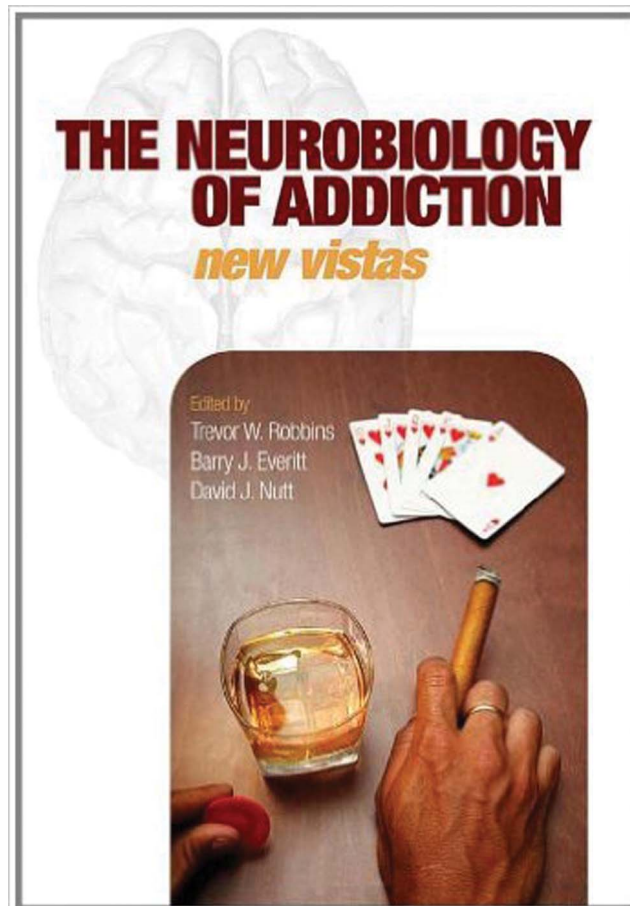
In Chapter 10 Crabbe reviews genetic contribution to alcohol dependence. These results rely substantially on rodent genetic models examining differences in certain genes. Furthermore, gene expression alterations (e.g. examining changes nearly in the entire genom) and epigenetic changes in connection with alcohol use are summarized in this part.

Chapter 11, written by Wong, Clarke and Schumann, describes the strategies for examining the genetic structure, phenotypical differences, environmental factors and substance use and the main results coming from these researches. They emphasize the importance of gene–environment interaction and the

polygenic nature of drug addiction vulnerability.

Chapter 12 by Nader et al. summarizes the effect of certain environmental and internal factors on addiction more precisely on cocaine use. They review results coming from brain imaging studies suggesting for example a relationship between dopamine receptor availability and cocaine self-administration. Using monkeys as model animals they present results which prove the role of environmental factors such as social rank, stress or the extent of available natural reinforcers. They demonstrate that entering a new social group or the size of the living space can alter the reinforcing effect of cocaine. The authors underline that results from non-human primate models are very important as it is the closest way to model human drug use.

The topic of Chapter 13 is about the context-induced reinstatement of drug seeking. The review is written by Hans et al. It is well known that drug-associated cues trigger drug use and the authors address the question of possible



mediator mechanisms of this phenomenon. First they present results from rodent models which confirm contest-induced reinstatement of drug use. In the second part they discuss the potential psychological mechanisms, such as Pavlovian conditioning, and the potentially involved neurotransmitter systems and brain areas contributing to context induced drug use.

The title of part four is *Causes and consequences of addiction*. In Chapter 14 Nestler summarizes results regarding the transcriptional mechanisms induced in addiction, focusing on the transcription factor *delta-fosB*. Changes in genetic level are a very interesting aspect of addiction, and these genetic alterations may be possible mediators in numerous phenomena associated with drug dependence. The author emphasizes the importance of *delta-fosB* as it is induced in the reward pathways by all drug of abuse causing genetic changes. *Delta-fosB* is a stable protein and as a result of this it can lead to long-lasting alterations in the nervous system. The author summarizes results regarding the induction and role of *delta-fosB* in the nucleus accumbens, the target genes of *delta-fosB* and the role of *delta-fosB* in other brain areas. He also presents the epigenetic mechanisms related to this transcription factor. In the conclusion part Nestler discusses an interesting hypothesis regarding the possible role of *delta-fosB* in the normal brain. If the hypothesis is correct measuring *delta-fosB* level alterations can have interesting clinical implications.

Porrino et al. in Chapter 15 review the cognitive impairment experienced in cocaine use and the possible contributing neuronal changes. They link findings of non-human primate models with results from human subjects. They summarize results showing cognitive changes in executive functions and alterations in prefrontal cortical activation pattern.

In Chapter 16 Garavan et al. present a single experiment where they examined the effect of cocaine use in impulse control. They administered cocaine or placebo to the

subjects and measured their performance on a cognitive 'go – no go' task and they also registered MRI to monitor changes in relevant frontal cortical areas. The theory behind the experiment was that cocaine enhances brain areas contributing to impulse control while these areas are hypo-functional during the withdrawal state due to the chronic substance use.

Last but not least Chapter 17 by Brien gives us a very useful summary about the treatment of addiction. We receive an overall picture about the pharmacological possibilities and their mechanism of action. The topic is logically built up by drug type, effect on the target (e.g. agonist, antagonist) and indication for use.

Chapter 18 is a summary of discussions among the authors of the current book regarding various aspect of addiction.

This volume provides a solid insight into the field of addiction summarizing wide variety of the aspects of addiction. Certain findings presented in the book are relatively well known (e.g. the rewarding role of the dopaminergic pathway between the ventral tegmental area and nucleus accumbens) while other results and ideas are new and their role requires more investigation to see a clearer picture. Hence the book may be useful for those readers who wish to familiarize themselves with the biological basis of addiction as well as for those who are interested in latest findings in the field.

Tamás Kollár

Doctoral School of Psychology
Department of Personality and Health Psychology
Eötvös Loránd University
Budapest, Hungary
E-mail: ktamas@hotmail.com