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‘Foundations of the Mind, Brain, and Behavioral Relationships’: a combined faculty and student’s perspective of a new textbook on clinical neuroscience

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'Foundations of the Mind, Brain, and Behavioral Relationships': a combined faculty and student's perspective of a new textbook on clinical neuroscience

Jahangir Moini, Anthony LoGalbo and Raheleh Ahangari, Elsevier Academic Press, 2023-2024, 600 pages, \$250, ISBN: 978-0-323-95975-9

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BOOK REVIEW

‘Foundations of the Mind, Brain, and Behavioral Relationships’: A combined faculty and student’s perspective of a new textbook on clinical neuroscience, Jahangir Moini, Anthony LoGalbo & Raheleh Ahangari, Elsevier Academic Press, 2023–2024, 600 pages, \$250, ISBN: 978-0-323-95975-9

The textbook, *‘Foundations of the Mind, Brain, and Behavioral Relationships’* (Moini et al., 2023), is one of the newest textbooks in neuroscience to arrive. The market for textbooks in the field of neuroscience is competitive among several excellent comparators, but critical market gaps still remain to be filled, notably the area of clinical neuroscience that is both advanced in content but accessible to students. One of the reasons that this gap has existed in the field is precisely because it can be a very difficult a mark to hit: how does one present neurobiological content that is inherently complex in a way that can be distilled to those beginning their forays into the field, yet enriching for those who have earlier basic courses and are seeking advanced knowledge in applied clinical disorders of the nervous system? Moini et al. (2023) deftly navigates this challenge, and the text succeeds in providing a superb fit to this niche of clinical neuroscience—offering an ideal clinical focus on the neurobiology of the nervous system and related disorders that is both advanced yet accessible.

One of the defining features of the book is its versatility: in that it can be used for both advanced undergraduate courses as well as beginning graduate coursework, while also serving as an effective desk reference for professionals. The book seamlessly integrates neural and clinical psychopathologies in ways that other textbooks do not. This is a major advantage for students and courses oriented toward clinical neuroscience. For context, the authors have previously reviewed and/or taught from several other similar competing textbooks in the field of neuroscience and physiological psychology for graduate and undergraduate courses at various public and private institutions (or, taken these courses). We found that the texts were either encumbered by poor figures (Garrett, 2015), too specialized in advanced neurobiology (Kandel, 2013; Purves, 2010), or lacking a focus on clinical neuroscience (Breedlove, 2015; Breedlove & Watson, 2013, 2017).

The book is well-designed by being separated into two core divisions: first, Basic Neuroscience, and second, Clinical Considerations. The first section on Neuroscience ranges from historical foundations to neurobiological basics, to high cognition and emotion. The second section on Clinical Applications then explores a range of neurological and psychological disorders, as well as substance abuse. This is a good overarching organization, but what the text also does so well is integrate clinical examples into basic neuroscience. We noticed that other competing textbooks often opt to wait until later chapters for complexities of applied clinical

elements of neural fundamentals. This approach used here of entering right into those topics is both engaging and preferable since it captures the student’s interest early on in a course by showing how and why the material is both relevant, interesting, and important. The content is modern and relevant, and also advanced in a progressive, cumulative fashion. A particularly good pedagogical feature is that Chapters contain brief summary boxes that conclude chapter sections, which provide great reviews for readers to consolidate what they have learned along the way and provide effective transitions to new topics. Chapters also include a “Check Your Knowledge” section though students may find that incorporating more interactive elements throughout the text (such as quizzes, thought experiments, or prompts for reflection) could make the learning experience even more engaging.

Chapter 1 begins with fundamental philosophical concepts that helped shape modern day neuroscience and physiological psychology, like reductionism, consciousness, and treatment of the mind-body issues arising from antiquity through modern day understandings of dualism and monism. The chapter approaches it in a fair way that captures the modern landscape of sophisticated views that capture the deeper complexity inherent to this difficult mind-body problem (McNabb, 2014), as it is becoming more appreciated that the human mind may not be so easily reduced to monism as had been commonly thought in the past (Kuhn, 2024). Our student coauthors noted that, unlike other textbooks they have used, *Foundations of the Mind, Brain, & Behavioral Relationships* doesn’t dwell too much on past concepts that have influenced modern neuroscience; rather it introduces those concepts as quickly and concisely as possible to start moving to the main focus of physiological psychology. Later, each chapter in Part 2 (Clinical Considerations) has a section that gives students examples of real clinical cases and then asks the reader questions to apply the information they learned in the chapter. Our student coauthors noted that: “*I think this section is good in helping readers apply what they learned, allowing them to utilize learned information in real clinical situations.*”

Chapter 2 follows with a natural dovetail to topics of genetic disorders of the mind and brain, and specifically offers very good figures on the topic of genetics, which helps to make complex concepts become accessible to students who may not have formalized backgrounds in genetics courses as neuroscience students often come from diverse academic backgrounds. The chapter touches deftly upon the

basics of DNA structure, the difference between coding and noncoding DNA, and the implications of genetic variations and abnormalities- but not so much as to overwhelm the reader. Our student coauthors liked how simple the sentence structure is to start off. This sentence structure feels less overwhelming given the depth of the topic. They also found that the use of examples was both interesting and beneficial, including specific conditions such as Down syndrome, Klinefelter syndrome, and Duchenne muscular dystrophy, which helps readers understand the real-world implications of the genetic abnormalities being learned.

Chapter 3 describes Neural Tissue and neural signaling- both core concepts shared across nearly all textbooks. Future iterations of the text might mention that in addition to the canonical structural roles played by glial cells, they are now also known to engage in neurotransmission signaling akin to action potentials (Gundersen et al., 2015), and how diseases such as multiple sclerosis have shown promise for therapeutic treatments of stem cell replacement therapy (Burt et al., 2019; Christodoulou et al., 2024; Genc et al., 2019). Chapter 4 goes on to introduce readers to multiple neurotransmitters and their various functions- as well as being a primer on the clinical implications of neurotransmitters, such as their links to metabolic disorders, synthesis, and characteristics of their pre-synaptic release. The chapter describes the monoamine hypothesis for various disorders like depression and anxiety despite the evidence for that hypothesis being mixed if not refuted (Ang et al., 2022; Breggin, 2008; Dean & Keshavan, 2017; Goldberg et al., 2014; Moncrieff et al., 2023a, 2023b; Wilson, 2023).

Chapter 5 introduces a model of long-term memory that could be enhanced by the delineation into classical divisions of semantic and episodic memory types (Eichenbaum et al., 2007; Yonelinas et al., 2019), and the three constituent episodic memory processes of recollection, item familiarity, and context familiarity (Addante et al., 2012, 2024; Montaldi & Mayes, 2010). It also makes note of the modality-specific or material-specific encoding specificity hypotheses (Gottlieb & Rugg, 2011; Rugg et al., 2008), and introduces the reader to emerging consensus of the role that endogenous pre-stimulus activity in the brain can play in memory encoding (Addante et al., 2015; Cohen et al., 2015; de Chastelaine & Rugg, 2015; Guderian et al., 2009; Koen et al., 2018; Liu et al., 2020; Otten et al., 2006; Park & Rugg, 2010; Yeh & Koen, 2023) and retrieval (Addante et al., 2011) in addition to the evidence of benefits to memory accrued from both invasive and noninvasive neural stimulation of frequencies such as theta that are known to be heavily involved in core facets of episodic memory (Addante et al., 2021; Ezzyat et al., 2017; Hanslmayr et al., 2019; Roberts et al., 2018; Topalovic et al., 2023). Chapter 5 and Chapter 12 both touch upon the fascinating topic of consciousness and memory, where EEG is known to provide one of the most powerful measures of the unconscious mind in both normative and clinical populations (Addante, 2015; Addante, Ranganath, Olichney, et al., 2012; Addante et al., 2023; Bengson et al., 2014; Düzel et al., 1997; Muller et al., 2021; Ozubko et al., 2021; Pesciarelli et al., 2021; Rugg et al., 1998; Voss & Paller, 2008, 2009, 2010).

One refreshing facet not usually seen in neuroscience texts was how, in Chapter 7, Moini et al. devotes important attention to covering a basic introduction to signal detection framework (SDT), given its importance in so many studies of psychophysics, attention, sensation, and memory (Macmillan & Creelman, 1991, 2005; Parks & Yonelinas, 2007; Yonelinas, 1997, 2002; Yonelinas et al., 1996, 2010; Yonelinas & Parks, 2007) that other texts usually ignore. Our student coauthors found it to be well-structured- effectively breaking down complex topics into more manageable parts. It starts with basic definitions and then moves on to explain related concepts in a logical order. This clarity and logical progression is quite valuable for teaching such intricate processes. Our student coauthors liked that the definitions for key terms are reiterated throughout, and also appreciated the inclusion of examples (e.g., stubbing a toe for bottom-up processing) that aided in understanding via connecting abstract concepts to everyday experiences.

Chapter 10 thoroughly outlines the olfactory system, including mechanisms of smell perception, its anatomical basis, and some insights into the practical implications and peculiarities of olfaction to provide a rich, detailed understanding of the topic. Our student coauthors appreciated the use of relatable examples (e.g., the inability to discern flavors of ice cream when the nose is pinched) that help readers intuitively grasp how the sense of smell impacts daily life. This theme is echoed throughout the book: things are always related back to one another. For example, when discussing gustation (taste) and its relation to olfaction, the text does well to illustrate the interconnectedness of the sensory system, enhancing the reader's understanding of how senses work together to interpret the environment.

Chapter 12 covers a broad spectrum of concepts related to consciousness, arousal, the psychological and physiological bases of our sensory experiences, and the various states of consciousness, including sleep, dreaming, and altered states. It's comprehensive and informative, aiming to provide a student audience with a deep dive into the intricacies of human consciousness. The chapter does an excellent job in touching upon both the psychological and biological bases of these phenomena, the use of relatable examples, such as texting while holding a conversation or daydreaming, and helps illustrate complex concepts in a way that is accessible to readers. Students will find that the inclusion of questions at the end is a great tool for reinforcing learning and encouraging active engagement with the material. Later, in Chapter 13, the text provides a terrifically thorough figure on the visual fields that students are bound to find especially useful in their studying. While Chapter 13 also provides an extensive summary of different learning styles, it creates opportunities in the future to introduce students to questions that exist in the literature about the validity of the common conceptualization of there being different "learning styles" (Clinton-Lisell & Litzinger, 2024; Newton & Miah, 2017; Patil & Newton, 2023), which may not be as universally accepted as originally thought in the field. Nevertheless, Ch. 13 left students appreciating the various processes of human cognition, and the multiple disorders such as aphasia, alexia,

agraphia, and amnesia that affect the functioning of cognitive processes and executive functioning. Chapter 14's focus on Emotions similarly found our coauthor student's appreciating the explanations of levels of happiness being explained well, and noted that it "made the reader realize the applications of the book in a holistic- and not just scientific- context.

Chapter 15 is very thorough with how detailed and comprehensive it is when talking about cerebrovascular accidents, neurodegenerative disorders, seizure disorders, and other neurological disorders. The classical treatment of Alzheimer's disease is in line with historical mainstream models of beta amyloid plaque theories of the disease, but would be remiss if not also mentioning critical new developments that has shaken the field by questioning the integrity, validity, and replicability of amyloid plaques as a primary element to the disease (Piller, 2022; 2024). This point of critique extends to Chapter 19's reference to questioning traumatic dissociative amnesia patients while under hypnosis, as it should be noted to be a controversial practice amid mixed results and variable issues in controls (Bell et al., 2011; Garry & Loftus, 1994; Holden, 1980; Kihlstrom, 1997; Loftus, 2003, 2005; Loftus & Davis, 2006; Loftus & Polage, 1999; Mazzoni & Loftus, 1996; Otgaar et al., 2021; Wilson et al., 1986). That being said, the chapter provides an excellent breadth in covering a range of other major neurological disorders that will surely capture and inform the student's interests. Especially good in Chapters 15 and 16 are the various clinical case examples that walk a reader through patient scenarios with multiple choice questions/answers for each, in addition to the critical thinking questions that are provided to follow. These terrific exercises help this text stand out from other books and are a valued addition that will serve the student long after the reading is completed.

One area that is worth commending the authors on is their having deftly integrated clinical neuroscience topics with the respective relevant socio-cultural connections throughout the book. For example, Chapter 23's discussion of the opioid crisis in America mentions that the crisis effectively began by over-prescription of pain medications, which is a valuable point in understanding etiologies of how such neurobiological crises can emerge from organizational efforts. The authors expertly present the controversy in a balanced way that encourages critical thinking to be encouraged by the reader, rather than taking a hard stance in either direction that would tell the reader what to think. It would even do in the future to consider adding recent findings that have since emerged to reveal the active role played by the pharmaceutical manufacturers in advancing the opioid crisis (Breggin, 2008; Meier, 2018). In such ways, the Moini et al. textbook deserves appropriate praise for having identified the complex socio-cultural and geopolitical factors that drive modern substance abuse disorders that are often easily ignored by other texts. Our student coauthors remarked about the value of the authors having included a section on the topic of cannabis that addressed its related issues and disorders such as cannabinoid hyperemesis syndrome that can arise with the

continuous use of cannabis. Overall, Chapter 23 was a very comprehensive chapter, and our students felt that they learned a huge amount of information about substance abuse via information provided about the risk factors, causes, symptoms, and treatments for many of the substance abuse disorders.

The final Chapter (24) focuses on clinical disorders related to various childhood dysphorias, discussing increased social acceptance, awareness, and shifting attitudes that have emerged over time. There are places in these topics where there were no supporting citations to the claims being made, however, and it would thus improve future editions if the text would cite primary empirical sources. Authors note the current social controversy about surgical transition procedures, but should also note that such matters are far from resolved in the scientific community (Taylor et al., 2024a, 2024b; Turban et al., 2020), and that a more nuanced and complex story is emerging with more time passing in the field (Cass, 2024; Hughes, 2024) including corrections of earlier findings ("Correction to Bränström and Pachankis," 2020; Economist, 2024). With the passage of time, there is sure to emerge better-controlled empirical studies that cover longer ranges of developmental time trajectories, and include assessment of retrospective analyses from those who have undergone various treatments (Paul, 2024). Caution thus ought to be urged in making conclusory statements on such sensitive topics in the field (Cass, 2024; Hughes, 2024), as scientific consensus is still emerging amid conflicting interpretations and perspectives (Block, 2023; Kingdon, 2024; Taylor et al., 2024b), and it may likely be too early for definitive clinical conclusions to be drawn for codifying such important topics in textbooks amid a relative paucity of quality evidence (Block, 2024).

In summary and conclusion, this valuable textbook by Moini, et al. is perfect for both beginning graduate students and advanced undergraduates who have already completed a primer course in basic physiological psychology. When I teach our clinical doctoral students, oftentimes they don't come with a very strong background in the biological foundations of behavior yet have high ambitions for what they would like to learn. This is an ideal textbook to guide their learning that I will assign in future courses. Likewise, it's an ideal fit for advanced undergraduate students who have had a reasonable background in foundational course material and are seeking to take that to the next level with advanced upper level courses. Finally, for the professional or clinical practitioner who has particular expertise in one domain but benefits from a reference summary in other domains, this too serves as a great fit. Our student coauthors commented about how "information from early chapters does a great job in setting up later chapters," and that they "enjoyed it more because of how everything in the later chapters was established in the earlier chapters." We believe that this book will make a terrific (and much needed) addition to a crowded field of neuroscience textbooks by offering to fill a clear niche of advanced topics in basic and applied clinical neuroscience, and we commend the authors on their foray into the field where a

new generation of students will be exceptionally well-served by their efforts.

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