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Book Review

Crossing disciplinary boundaries to better understand expertise. A review of Fernand Gobet's book *Understanding expertise*: A multi-disciplinary approach

Fernand Gobet has been studying expertise for decades. And it is fascinating to read a book that attempts to synthesize all that expertise on expertise, not just within his own field of psychology, but across multiple disciplines, including neuroscience, sociology, artificial intelligence, and philosophy.

In *Understanding expertise*: *A multi-disciplinary approach* (Gobet, 2016), we are treated to a detailed review of multiple literatures on expertise culminating in an attempt at a synthesis and interpretation of all that we know and ideas for future research directions. Throughout the book, Gobet explores three intellectual tensions between: 1. talent and practice, nature and nurture, 2. positive versus negative aspects of experts themselves, and 3. unlimited rationality and bounded rationality. From the very beginning, he notes that the study of expertise potentially has very pragmatic benefits. These include the ability to develop better methods of instruction and training from research on the learning and acquisition of knowledge, how expertise research can lead to better ways of coaching experts, and even how research into human expertise can inform the development of artificial expert systems. Given the current public discussion on the importance of education and the role of teachers/coaches along with the recent high-profile match between AlphaGo and Lee Sedol (Nielsen, 2016), this book is timely.

Each chapter builds upon what comes before. Gobet begins with a discussion of research on perception, which he argues lies at the heart of expertise. He then argues that superior perception is linked to the amount of knowledge stored in long term memory during the thousands of hours needed to reach expert status. This is followed by a review of how differences in perception and knowledge impact problem solving and decision making, as well as intuition, insight, and creativity. Gobet then tackles personality and intelligence, much of the literature from differential psychology, and discusses the role of talent and gender differences in domains such as mathematics, science, and chess. He then explores the interplay between expertise, learning, and education, moves on to expertise across the lifespan, and then discusses the links between expertise, biology and neuroscience. Experts and their place or role in society are considered. And then prior to his final synthesis chapter, Gobet discusses the role of philosophy in expertise research as well as the literature on artificial intelligence and expert systems. In addition to chapter summaries giving the core insights from each body of literature, each chapter concludes with some recommendations for further reading. I found the further reading and the list of references a treasure trove of useful information for readers interested in the various fields the author read to be able to write this book.

The last chapter on "putting it all together" is probably the most useful for his unique synthesis of all the literature reviewed and where we are currently regarding the state of expertise research. Gobet humbly admits that he didn't cover every "precinct" of the social and human sciences or discuss expertise from every point of view, but from my perspective it is amazing just how much ground he was able to cover. One of the most insightful sections here is on "how to become an expert." Regarding performance-based expertise, he acknowledges that considerable practice is required over many years and that a coach or teacher is helpful to keep ones intrinsic motivation at continuously high levels. The role of luck is acknowledged, including an ideal set of factors: "genes, family characteristics, where and when one was born, and gender. Luck also consists in not being unlucky and avoiding accidents, illnesses and, of course, death" (p. 249). He stresses that the strategic choice of domain is critical, and it's best you select a domain in which you have talent. He discusses how this domain choice will have multiple tradeoffs, such as putting your eggs in one basket early on versus keeping backup options open. Finally, Gobet says that such a choice might be fortuitous and part of luck, and that one must be in a suitable environment to have all these elements converge to provide the crucible for expertise development.

Considering the constant media headlines about whether experts are "born versus made," *Understanding expertise* shows the wide disconnect between how the media cover this area of research and where our scientific understanding really is. For example, Gobet notes that (p. 237) "a successful theory of expertise will be complex, with mechanisms interacting at different levels." This is the kind of conclusion that needs to be more widely discussed and unpacked for the public. In his conclusion, he also discusses the importance of an integration of research on expertise, including how researchers tend to focus on niche issues rather than more balanced coverage, as well as how theories of expertise are vaguely operationalized making it very difficult to make precise predictions or provide coherent explanations. However, the final point he makes I think is the most insightful: "research into expertise as a whole suffers from fragmentation, each discipline essentially ignoring research carried out in other disciplines, and integration across disciplines is an urgent necessity" (p. 250). This links with the insight of Gottfredson (2010, p. 28), who also emphasized the importance of connecting literatures across disciplines to solve apparent puzzles, and how challenging this process can be: "My experience is that solid, replicable contradictions are more likely to come into view when juxtaposing contrasting bodies of thought and evidence. The contradictions will not be obvious to the disciplinary tourist, but will materialize only after immersion in some part of the foreign discipline…Doing interdisciplinary research is like moving to a foreign land with a different history, language, and culture." Gobet's book is an important step towards this goal of field integration, and other researchers have also recently provided important multidisciplinary syntheses on expertise that deserve wider discussion (e.g. in *Intelligence*: Detterman, 2014; Hambrick, Macnamara, Campitelli, Ullén, & Mosing, 2016).

In *Understanding expertise*, Gobet (p. xv) writes: "Addressing these topics has required discovering entire new literatures and has taken me way beyond my comfort zone. It has also challenged some of the views I had held for decades. I had always found it surprising that nobody had written such an integrative, single-authored book before

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about expertise. Now, I know why." If only more researchers were willing to take this truly multi-disciplinary and open approach to science, science would, I believe, be much better for it.

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