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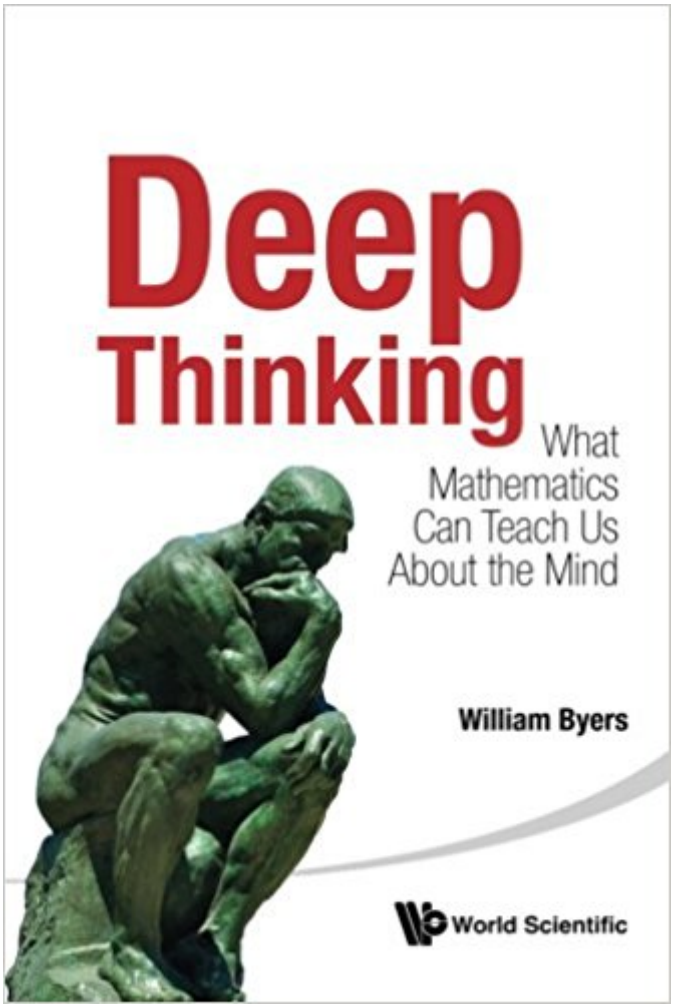
# Deep Thinking: What Mathematics Can Teach Us About The Mind

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## Synopsis

There is more than one way to think. Most people are familiar with the systematic, rule-based thinking that one finds in a mathematical proof or a computer program. But such thinking does not produce breakthroughs in mathematics and science nor is it the kind of thinking that results in significant learning. Deep thinking is a different and more basic way of using the mind. It results in the discontinuous “aha!” experience, which is the essence of creativity. It is at the heart of every paradigm shift or reframing of a problematic situation. The identification of deep thinking as the default state of the mind has the potential to reframe our current approach to technological change, education, and the nature of mathematics and science. For example, there is an unbridgeable gap between deep thinking and computer simulations of thinking. Many people suspect that such a gap exists, but find it difficult to make this intuition precise. This book identifies the way in which the authentic intelligence of deep thinking differs from the artificial intelligence of “big data” and “analytics”. Deep thinking is the essential ingredient in every significant learning experience, which leads to a new way to think about education. It is also essential to the construction of conceptual systems that are at the heart of mathematics and science, and of the technologies that shape the modern world. Deep thinking can be found whenever one conceptual system morphs into another. The sources of this study include the cognitive development of numbers in children, neuropsychology, the study of creativity, and the historical development of mathematics and science. The approach is unusual and original. It comes out of the author’s lengthy experience as a mathematician, teacher, and writer of books about mathematics and science, such as How Mathematicians Think: Using Ambiguity, Contradiction, and Paradox to Create Mathematics and The Blind Spot: Science and the Crisis of Uncertainty.

## Book Information

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## Customer Reviews

The only enjoyable part I found was the nice review of how mathematics thought builds upon itself from elementary through graduate school; it did bring back a lot of memories and I agreed with most of the premises of the discontinuous, difficult, and informal nature of true understanding. The book takes this to some really far fetched conclusions like therefore no algorithm of human level creativity can ever exist and ramblings on how bad the educational system is without giving any new ideas on how to improve it. It was difficult to pay attention to the last third of the book as it just seemed to be rehashing the same points over and over again.No mention that psychologists have for decades pointed out (and even more recently provided some neural level proof using fMRIs) that our conscious perceptions of such things are somewhat illusory since our unconscious does the heavy lifting only alerting our conscious thoughts when it thinks it is on to something; this is the spontaneous discontinuous model of understanding and creativity. It is most likely actually a continuous process with natural neural randomness driving it but our consciousness is only like the CEO of a big company who facilitates information sharing and allocates thinking time between divisions but is only informed when attention worthy events occur.While I agree that we are very far away from any AI system even close to the flexibility of human thought, his conclusion from Godel-like incompleteness logic that it can never happen fails to notice that other researchers are very aware of Godel's theorems and know the loophole-- use randomness to make it not be a closed system. This lapse of thought is kind of odd considering he does mention the theory of evolution as a form of deep thinking since that's how it also escapes the limitations of Godel's theorems; I guess he never made the connection. A correct argument might be that humans will never be able to actually understand such an AI system since it at least equals them and therefore it can not be pre-designed or understood by humans and must be stumbled upon by randomness or brute force exact mimicking of how the brain does it; but it can be done.

This book is required reading for those who wish to move beyond the superficial or inconsequential ideas of our era.

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