Review of John L Casti, The One True Platonic Heaven:

A Scientific Fiction on the Limits of Knowledge

by
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Ever since I got to know what the axiomatic-deductive system was, I have been fascinated by how we obtain knowledge in mathematics. I picked up some logic (the mathematical study of systems of truth and proof) and computability theory (the study of what computers can and cannot do), but they were mostly presented in a technical and academic style. Imagine my joy when I saw Casti's book! It was a thin volume (160 pages) and it was in prose! Anticipating the joy I would have with such a light reading, I grabbed the book of the shelves of the National Library.

"The one true Platonic heaven" in the title refers to the Institute of Advanced Study (IAS) in Princeton. The IAS is an institute where pure, theoretical work in mathematics and physics is done, a breeding place for knowledge that gives us a glimpse of the metaphysical mathematical reality. Casti uses the genre of "scientific fiction", known as shosetsu in Japanese. The book is a fictional chronicle of the events that occurred around 1946 in the IAS. Casti uses famous personalities in math and theoretical physics like von Neumann, Godel, Einstein and Oppenheimer who were faculty at the IAS at that time as his characters. Casti takes the liberty to distort historical time so that the plot can move smoothly in narrative time. Although the reader cannot be sure whether some of the conversations actually occurred, the viewpoints expressed by the characters are serious, and do represent actual philosophical schools of thought. As such, the reader unknowingly learns some mathematics and philosophy, even as he enjoys the narrative.

A plus point of scientific fiction over academic writing in the treatment of a philosophical topic like the limits of mathematical knowledge is that the proponent of the viewpoints maintains a human character. Subjects like the implications of Godel's incompleteness theorems and how they should be interpreted, like in what way does abstract mathematical models in theoretical physics give us knowledge about our actual physical universe, etc. are covered. But when the viewpoints are strongly held by real people, rather than argued by an impersonal third person, we see how these strongly held views impinge on and affect their scientific output.

For example, Godel strongly believed that the mathematical universe was Platonic. To him, the predicated statements describing arithmetic were as concrete as the numbers and operations themselves. Thus, to demonstrate the incompleteness of arithmetic, he looked at the parallel universe where the statements (as opposed to numbers) were the objects of study. If incompleteness was a characteristic of that parallel self-referential universe, Godel could translate, via coding, this characteristic back to the arithmetical realm. In Chapter 1, Einstein noted that this manner of approach was very similar to the manner in which Godel's argument for the plausibility of time travel. Other mathematicians who were not Platonists would have faced the difficulty of trying to prove results about arithmetic while working within arithmetic itself. They would be blind to Godel's crucial idea of viewing

mathematical statements as more than academic's rhetoric, but as actual objects in themselves. More severely, the constructivists would never have got such an incompleteness result, which rests on the subscription to the belief of the excluded middle, something the constructivists never took for granted.

The reader takes away the lesson that mindset can affect the direction of one's productivity. The philosophical viewpoints are not artificial debates. When one assumed a particular viewpoint, one's beliefs of what is worthy and what is workable is altered, leading to a change in how one interacts with the academic world and in one's output.

Other than their philosophical viewpoint, academics may limit themselves and others with respect to the pursuit of knowledge due to very practical reasons. A problem that went on throughout the book was the IAS academics' antagonism towards von Neumann building a computer at the Institute. Von Neumann argued that a lot of scientific knowledge involved computations and that "the computer amplifies the power of the human mind to see further and further into the secrets of nature." (p. 94) In modern day, we know that this is true; we have the discipline of computer science to attest to that. The academics said they were against the idea because the IAS was founded on theoretical ideas and thus should not house an applied project. However, it seems from the narrative that a deep-seated fear of the computer superseding their positions was the thing really striking their hearts. The lobbying against the computer ironically shows that beyond than the abstract limitation of knowledge, the fragilities of human nature can impede us in our quest of knowledge.

One problem with Casti's books is that many of the philosophical discussions end before reaching some form of resolution. A common scenario begins with a number of the academics having a conversation on a philosophical topic. After the outlines of the respective arguments are been made, the academics begin to get overly-passionate about their point of view and an older faculty would step in, asking them to continue their conversation another day. In the context of the narrative, such a turn of events is quite realistic. The academics form a close-knit community, and it is quite possible that older faculty would intervene to prevent disharmony. However, readers interested in an elaboration of the ideas would be disappointed. Casti does in fact acknowledge this point. "The limits of scientific knowledge, remains as murky and unsettled as ever." (p. 159) As such, he refers to a book coauthored by Karlqvist and himself in the Epilogue for further reference.

I think that this book is very suitable for secondary school and JC/polytechnic students looking for a gentle introduction to mathematical logic and the limits of mathematical knowledge. More students are studying philosophy and Knowledge & Inquiry in school. This book can give a brief introduction on these aspects and is useful as it ties together epistemology, mathematics, logic, theoretical physics and computer science. The students can have a glimpse at how life is like as an academic, in a manner that biographies, which tend to be drier, cannot. Most popular books on mathematics do not touch on logic, as it is difficult to give examples and to avoid being technical. This book manages this problem by relating the ideas on logic with the other topics that it touches on, giving the reader an idea of the relevance of logic. I believe that whatever view the pre-tertiary student has about mathematics, reading this book would enlighten him or her by providing a more complete idea of what mathematics really is.

I really love this book for the way it ties in the human aspects of the academic world neatly with a central epistemological theme, while straddling a number of related, but diverse, disciplines of study. Casti, an academic himself, has written a number of popular mathematics books and this book is his second semi-fictional book. His familiarity with the material shines through and I heartily recommend this book to anyone.