

Figments of Reality
by Ian Stewart and Jack Cohen
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Reviewed by Melanie Mitchell

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In popular books about science these days, big theories about Big Questions are everywhere. A scan through the science shelves of your local bookshop will produce titles such as “The Origins of Order”, “Dreams of a Final Theory”, “Consciousness Explained”, and many more, describing unifying theories about elementary particles, evolution, life, mind, and culture. Is the time now ripe for the diverse threads of science to be pulled together into a single skein?

Ian Stewart and Jack Cohen think it is, and have written a fun and useful book in this spirit with the odd title “Figments of Reality”. This is the second book by the Stewart and Cohen team, both of whom are prolific writers about science in addition to being academics (in mathematics and biology, respectively) at the University of Warwick.

Figments of Reality asks (and tries to answer) most of the Big Questions: What happened at the beginning of the universe? How did life originate? How did intelligence evolve? How did culture emerge? What kinds of beings are conscious? What is free will? These are exciting and difficult questions indeed. *Figments of Reality* tries not only to answer them, surveying some of the most interesting recent scientific and philosophical approaches to these conundrums, but also tries to link them together into a coherent story about how the history of the universe has lead to the kind of world in which such questions can be asked.

The major questions posed by the book are “What is ‘mind’, and how did it get here?” Stewart and Cohen’s answer is the source of the book’s title: “Minds are figments of reality, processes going on inside structures made from ordinary matter whose behaviour evolved *in order* to mimic, model, and manipulate natural processes.” In other words, “figments of reality” are mental constructs such as perceptions, ideas, internal representations, and even consciousness and free will. They exist in the brain but are tied to reality via interactions with the environment, other minds, culture, and ultimately evolution.

The processes by which these interactions take place are termed by Stewart and Cohen “complicity” (a merging of “complexity” and “simplicity”-puns like this are rampant throughout the book). Complicity is a kind of mutual co-evolution among two initially separate processes-human intelligence and human culture being the main examples here- which as a result become inextricably intertwined and thus turn into a single, much more complex process. According to Stewart and Cohen, the beginnings of the complicity between intelligence and culture can be traced to the discovery by evolution of “privilege”-non-genetic ways in which parents smooth the way for their offspring in the world, ranging from the provision of nutrients in the yolk of the developing egg, to the assurance of temporary safety given by a bird’s nest, all the way to lessons in piano, table manners, driving, and ultimately (for the very privileged) tuition at Harvard and the establishment of trust funds.

Such privileges, according to Stewart and Cohen,

led to a whole new kind of intelligence, involving the new tricks of *learning* and *teaching*. Parents became part of the behavioural context of their offspring. It is from this kind of cultural transmission of special forms of behaviour...that the specifically human mind has evolved. Mind is not just a matter of sophisticated brain structure; it is something that arose through the cultural trick of passing on behaviour through teaching and learning.

A nice positive feedback loop gets set up here. The passing on of privilege allows brains to develop “minds”-the loci of those figments of reality so essential to complex thought. At the same time, the increasing complexity of minds produces ever more complex forms of cultural privilege, again in turn producing ever more complex minds. In a characteristically light-hearted but wonderfully apt analogy, Stewart and Cohen liken this complicit evolution to a game of Snooker, and particularly to the phenomenon known as a “break”. This is a situation in which a player is able to keep “potting” balls-knocking them into pockets with the cue ball-by using each turn to simultaneously pot a ball and land the cue ball in a position from which another ball will be easily pottable. Such a “reproductive” strategy is possible in many games; Snooker is only one particularly vivid example.

According to Stewart and Cohen, exactly this type of strategy was discovered by evolution when it produced the complicit co-evolution between mind and culture. “Potting the ball” corresponds to producing offspring, and “positioning the cue ball for the next turn” corresponds to providing those offspring with non-genetic privileges that will make it more likely for *them* to reproduce in the next generation and be able to confer similar non-genetic privileges on their own offspring, and so on. This often requires parents to make short-term sacrifices for longer-term advantages-it takes precious energy resources to provide a yolk for a developing fetus or to build a nest or to send one’s children to dance class, but in the long run the hope is that such sacrifices, like the Snooker player’s passing up an easy shot in favor of a more difficult one that nonetheless will be more likely to result in a break, will in the end make it more likely that one’s genes will be more likely to survive in future generations.

This kind of positive feedback loop is characteristic in systems that are said to “self-organize”, and the complicit co-evolution of intelligence and culture is a preeminent example of a self-organizing process. A considerable part of *Figments of Reality* is devoted to discussing the notion of self-organization, as well as the possibility of scientific understanding of the “emergent” behaviour of self-organizing systems. By definition, the traditional reductionist approach to science can’t explain emergent behavior; the microscopic links of causality are just too complicated for all of them to be elucidated. Instead, a different approach is needed, in which an appropriate macroscopic vocabulary must be invented for describing such systems. Developing such a vocabulary is a major goal of the scientific efforts now known as the “sciences of complexity”. Stewart and Cohen, referring to these efforts by the misnomer (in my opinion) “Complexity Theory”, say

What we *really* need...is Simplicity Theory, an effective and relatively painless way to extract the big simplicities from the underlying rules.

They don't seem to grasp that this is precisely the goal of the sciences of complexity, which have made some significant progress in this direction, progress that forms the basis for some of the research results described in this book.

Figments of Reality covers a lot of really interesting territory in a very accessible and entertaining way. Like Stewart and Cohen's previous book, *The Collapse of Chaos*, *Figments of Reality* is filled with jokes and puns, mostly quite amusing, but sometimes going a bit over the top on silliness. The text is punctuated by dialogues among members of the mega-intelligent alien race of Zarathustrans (presumably named after the ancient sage and prophet Zarathustra, made famous in philosophical circles by Nietzsche) who discuss the ideas of each chapter from their own perspective. These things are a matter of taste, but I personally found these dialogues rather too silly and more distracting than useful in understanding the issues being presented. As for the main text, in a book with this kind of scope and ambition, maintaining some kind of coherence among all the ideas being presented is a challenge, to say the least. In the early chapters I found this kind of coherence lacking. The discussion is locally fascinating, ranging from long discussions of games and game-playing strategies to descriptions of new theories about how our sense of smell works and of the recent controversies surrounding the notion of a "mitochondrial Eve", the single ancestor of us all. However, the connections among all these individually interesting topics, as well as connections to the major themes of the book, are often unclear.

In later chapters, when the discussion turns to intelligence, consciousness, culture, free will, and other characteristics of human thought, the overreaching themes of the book come together in a much more coherent way. In reading these chapters, I began to get a much better sense of what this book was meant to be about. I also found myself becoming more engaged in the controversies and questioning some of the assertions made by Stewart and Cohen. For example, Stewart and Cohen seem to adhere strongly to the "adaptationist" school of evolution, believing that most of the traits possessed by biological organisms came about because those traits are (and always were) useful for survival, and that evolution is very powerful in being able to design such traits. Stewart and Cohen assert that "Whatever evolution wants, and *can* get, it *does* get", without describing some of the current controversies in evolutionary biology as to how much flexibility natural selection has and how much power it has to shape biological adaptation. They also assert as fact certain highly controversial claims about sociobiology, for example, that certain behaviors are due directly to sexual selection ("In human societies men play contact sports, drink to excess, or drive very expensive cars to demonstrate...[an] immunity to handicaps"). I would have been much happier with the book if the discussion of such issues had been a bit less dogmatic and a bit more inclusive of more recent, skeptical points of view.

The thorny problems of consciousness and free will are the focus of the last few chapters, and readers will find much to enjoy and many things to disagree with. Stewart and Cohen make a number of controversial (and, to my mind, ill-supported) assertions such as that certain intelligent animals (e.g., cats, dogs, humans) have consciousness and others (e.g., bees, octopi, mantis shrimp), while intelligent, do not have consciousness or self-awareness. I'm personally more in favor of a "continuum" view of consciousness rather than the "yes-or-no" view that *Figments* seems to espouse. I also found some of the assertions about the nature

of consciousness and its relation to evolution somewhat naive, particularly the notions that we “know” what it’s like to be conscious, and that consciousness and its associated “qualia” (the “subjective” feelings that go along with pain, perception of colors, and other mental phenomena) are evolutionarily advantageous because “the more vivid your qualia, the more effectively you will react to your sensory impressions and the more likely you are to survive.” This assertion seemed to me to indicate a misunderstanding of the philosophical notion of what “qualia” are and the concomitant philosophical paradoxes now being widely discussed in the “science of consciousness” community. But I did enjoy the discussion and found it stimulating for my own thoughts on this and other subjects. I think other readers will feel the same way, and will be grateful for this latest provocative, ambitious, and quite enjoyable attempt to ask and answer some of the most interesting Big Questions of modern science and philosophy.