Review of The Biggest Ideas in the Universe 1

Space, Time and Motion by Sean Carroll

By MGH

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With this book Sean Carroll wants his readers to actually understand some of the core classical physics that our world is described by. Clearly that requires mathematics! But Carroll does not shy away from this, but rather helps illuminate the mathematical principles as well as the physics for the reader. I find this approach very refreshing, it is not a slog of a text book, but the reader is not left feeling cheated by promises of understanding that cannot be met in a book without mathematical details. Sean Carroll entices us into an understanding of the maths as well as giving crystal clear physical insight.

Our host begins with conservation laws and a discussion of Noether’s Theorem (unsurprisingly without any serious equations). This is followed by an introduction to calculus and although we are not given any exercises there is a handy appendix to further your calculus (and another on the maths of General Relativity for when you get there.).

Chapters 3 and 4 are on dynamics and space. Here Newtonian, Lagrangian, and Hamiltonian formalisms are introduced and here we find the only suggestion of exercise in the book but it is a good one. Indeed it is an invitation to play with analytical mechanics – brilliant! Space is discussed as setting the backdrop to relativity. Space and the reason we discuss position and momentum in Hamiltonians is explained as well as action at a distance.