There was once a time, long before William Whewell coined the term “scientist”, when questions about the whole of physical reality belonged to the realm of *philosophia naturalis*, or “Natural Philosophy”. Physicists usually chaired Natural Philosophy departments in old universities, and wrote treatises on natural philosophy, that shaped the development of modern science. Two famous examples for the latter are Newton (1687) and Kelvin & Tait (1867).

With modern science came specialization; physics and the philosophy thereof left their shared cradle and turned to be two separated disciplines. Nevertheless, they still share today a common desire to answer questions about physical reality, to the extent that one may be regarded as continuous with the other. This shared desire comes with a bit of an antagonism, a kind of a turf–feud. John Archibald Wheeler, for example, has famously stated in an interview that “[p]hilosophy is too important to be left to the philosophers”, and Richard Feynman was openly hostile toward scholarly philosophy, and did not hesitate to express his opinions bluntly. A reminder that not a lot has changed in the last two generations in this sense may be found in the public, and quite vocal, dispute between the physicist Lawrence Krauss and the philosopher of physics David Albert, that recently took place in ”the secular press”, on the notion of nothingness.

A grain of this antagonism has made it into this little, condensed, and well–written book. In it, Tim Maudlin, a philosopher of physics now at NYU, takes on himself to clarify some muddles in the physics of space and time, with a promise to follow suit in a sequel on theories of the constitution of matter (thermodynamics, statistical, and
quantum mechanics). The two volumes target a readership of both disciplines, physics and the philosophy thereof, but, as the author himself notes in the introduction, they were written with the a certain type of physics students in mind, the ones who “are fascinated by these more foundational questions” but “find themselves frustrated by physics classes that refuse to address them”.

The first three chapters of the first volume deal with Newtonian and Galilean spacetimes. These subjects have been discussed by so many writers, physicists and philosopher alike, that it would be hard to come up with an original contribution. Nevertheless, one can find some pedagogical gems even here, as, for example, in the view of geometry as a mathematical discipline involving structures more and more complicated, characterized according to the tools the geometer uses to discern them. I found this kind of an operationalist “Erlangen” program highly illuminating, and would certainly use it in my next seminar on the philosophy of spacetime physics. Furthermore, true to its purpose to dwell on foundational issues that are often brushed aside by physicists, the author does an excellent job in clarifying the difference between arithmetics and geometry. We often tend to forget that the mathematical structure we represent events in space with, namely, the coordinate system, is much richer than the structure it is supposed to represent. Modern textbooks on Newtonian mechanics, such as Herbert Goldstein’s, seem to do just this, but while they may achieve a high level of efficiency in solving problems, they also obscure the original motivation of the theory, that of understanding what it says about the world.

The next two chapters focus on the special theory of relativity. Also here the author faces the challenge of adding a drop of water to the sea, but he does, again, an excellent job in extracting the essence of the theory, which in his hands boils down to one empirical postulate, that the trajectory of light in a vacuum is independent of its source. The assumption that in a vacuum there is no structure apart from that of spacetime itself tells us that in vacuum it is the geometry of spacetime alone that determines this empirical fact. This simple observation leads immediately to the light cone structure, and to Minkowski spacetime.

On the standard view of special relativity, the theory is exhausted either by the (empirical) principles of relativity and light, or by the Lorentz covariance of the dynamical laws that govern the behavior of material bodies, Minkowski spacetime serving as a cod-
ification of the spatiotemporal relations dictated by either approach. The philosophical debate in recent literature is about the epistemic priority of one approach over the other. Two famous “paradoxes”, the Twins paradox and Bell’s thread, serve as a battle ground for these two approaches, as they are “solved” either by the kinematics of Minkowsky spacetime, or by dynamics of the physical objects which abide by the Lorentz covariant laws. In Maudlin’s hands this recent debate is sidestepped elegantly by emphasizing a single ”clock hypothesis”, namely, that clocks measure the interval along their trajectory. This hypothesis explains the age discrepancy between the twins, and the fact that a thread which connects two spaceships that begin accelerating ultimately breaks down, without committing the error of a frame–dependent narration of the chain of events.

In between the lines of this clear and elegant exposition, one finds a few darts which are thrown at famous physicists, such as Wolfgang Rindler and Richard Feynman, and which exemplify the kind of turf–feud I was alluding to above. In addition, uninitiated readers would find it hard to grasp what the fuss is all about here. The debate on the essence of special relativity is indeed an important one, and has critical consequences on matters philosophical, such as the precedence of geometry over dynamics, and the role of primitive geometrical notions in theory construction, but without a sufficient background in both the history and the philosophy of special relativity, this entire debate, and the place of the author’s thoughts in it, loses its appeal, and may look pointless.

The next chapter is devoted to the general theory of relativity. Also here one finds the author’s precision to be refreshing. For example, he reminds us that the complete distribution of matter and energy does not determine the spacetime geometry, but only constrains it; the situation when the former vanishes is consistent with both spacetime being flat (Minkowskian) or with the existence of gravitational waves. The chapter also contains cursory expositions of spacetime singularities and of the famous “Hole Argument”. Uninitiated readers would have to consult, again, further literature, which the author gives some reference to, in order to feel comfortable with the text.

The book ends with a chapter on the direction and the topology of time, a subject on which the author has made his stellar career. The author condenses these subjects into less than 15 pages, and many of the important philosophical questions that arise here are only briefly addressed, e.g., the notion of a consistent mathematical model which is nevertheless “unphysical”, or the different levels of modalities that one can entertain when
deciding whether a certain process, such as time travel, is physically possible. Interested readers would have to look elsewhere (and the author does give some references, including his own work) in order to deepen their understanding of these intricate issues.

All in all, this little book does an excellent job in introducing the core philosophical themes that surround the physics of spacetime to non experts, both from philosophy and from physics. Short and concise as it is, it leaves its reader eager to delve further into the philosophy of space and time and to ponder the serious issues raised by the author. I look forward to its sequel.