24.8: Closing Remarks

In this chapter, we introduced the first hints of how the laws of physics become counter-intuitive, and quite bizarre. One can wrap one's head around Newton's Second Law, $\vec{F}^{net} = m\vec{a}$, and develop some intuition as to how an object may behave. However, it is difficult to imagine how people age slower if they travel faster, and how cars become shorter when they are moving. However, as far as we can tell, this is the best way to describe the Universe around us.

This all goes back to our original statements about physics. The goal is to come up with rules that allow us to describe Nature. It's nice when those rules make sense, but, unfortunately, that is not a requirement. It does appear that the rules that describe Nature do not make sense, at least not based on our common experience, living in a macroscopic world where speeds are much less than the speed of light. With Special Relativity, we introduced the modern framework for modeling dynamics. We have not introduced Quantum Mechanics, which describes how elementary particles behave.

Quantum Mechanics is even less intuitive than Special Relativity, as it implies that particles act as if they are in multiple places at the same time. Even worse, Quantum Mechanics requires us to abandon the concept of determinism that is critical in Classical Mechanics; in Quantum Mechanics, we can only ever determine probabilities. For example, we can only determine the probability that a particle will be at a particular location at a particular time, but we cannot use kinematics and dynamics to predict where it will be at some time based on the forces acting upon it.

If you decide to pursue further studies in physics, you will get to learn more about these theories, which are quite marvelous. It should not bother you that physics is not intuitive, as that is not the purpose. The exciting part of physics is that, even if Nature behaves in an exquisitely weird way, it does appear that this can all be described with a rather limited set of mathematical equations. One can argue that there is beauty in the fact that succinct mathematics can describe a large number of seemingly unrelated phenomena, as Newton's Universal Theory of Gravity was able to describe both the motion of a falling apple and the orbit of the moon.