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Logical and Philosophical Review on Theoretical Physics

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Abstract. Since it started about three centuries ago, Theoretical Physics went through a huge advancement and, particularly in the last century, the development was material. Its application to engineering brought a massive revolution in the way we humanity live now. Its interpretation opened up astoundingly deep understanding of the universe we live in. One important research activity for future is to further develop our theories and further deepen our understanding of our universe. However, as Tomonaga said, when we are in a phase of looking for new paradigm, it is important to understand how our current theory was developed. The purpose of this monograph is to present a logical and historic study of the conceptual development of Theoretical Physics. As the field of Theoretical Physics is so vast, of course we cannot cover all theories we have now. We will therefore focus on most fundamental theories of physics. As this field of physics is as deep and intricate as that of pure mathematics, if not more, it will be helpful to compare our difficulty with that pure mathematicians are facing in their own field of the foundation of mathematics. Such common ground will inevitably lead us to deeper philosophical issues. After all what we call physics started with Newton, a theologian of Orthodox faith who developed both calculus and dynamics. He called it not physics but natural philosophy. So, it is naturally expected that philosophy, mathematics and theoretical physics develop hand in hand. It has been about a century since these fields started to develop separately and it is about time to restart original interaction between these three intrinsic intellectual activities. Certainly this will help our timely search for new paradigm.