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Relativity and the Nature of Spacetime

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Preface

This expanded second edition of *Relativity and the Nature of Spacetime* contains several major changes and a number of additions to different chapters. Two chapters (Chaps. 6 and 7), which discussed two specific groups of arguments against the reality of spacetime, have been transformed into appendices (A and B). Two new chapters (Chaps. 6 and 10) have been added. Chapter 6, entitled *Why Is the Issue of the Nature of Spacetime So Important?*, elaborates on what was Sect. 5.6 of the first edition, and addresses some recent work on the nature of spacetime – for example, the growing (or evolving) block universe model of the world, which has recently been revived by several physicists as what appears to be the last remaining alternative to the Minkowski absolute four-dimensional world (after it had become an undeniable fact that three-dimensionalism, or presentism, contradicts the relativistic experimental evidence). Chapter 10, entitled *Spacetime and the Nature of Quantum Objects* and based on what used to be Sects. 6.2 and 6.3 in the first edition, explores the implications of the issue of the nature of spacetime for quantum physics, in order to see whether it can provide some insight into the nature of quantum objects.

Two new sections have been included, namely, Sect. 5.6 entitled *Relativization of Existence and Observers in General Relativity* and Sect. 7.6 entitled *Probing the Anisotropic Velocity of Light by a Terrestrial Experiment*. New calculations have been added to two other sections, Sect. 4.9 entitled *On Coordinate and Proper Time* and Sect. 7.7 entitled *On the Gravitational Redshift*. A new version of the twin paradox involving a third twin who accelerates twice as many times as the second twin has been included at the end of Sect. 5.5 entitled *Relativization of Existence and the Twin Paradox*. Additional explanations have been inserted in several more sections, including the explanation (in Sect. 5.3) of why length contraction does not cause the break of the thread connecting the two accelerating spaceships in the old,

apparently paradoxical thought experiment that was revived by John Bell in a debate with colleagues at CERN in the 1970s. Twelve new figures have been included (Figs. 5.5, 5.6, 5.7, 5.8, 5.12, 5.13, 6.1, 6.2, 6.3, 7.4, 7.5, and 7.7) and three have been replaced with improved versions (Figs. 4.3, 4.28, 7.6). And finally, 47 new references have been added in this edition.

I am grateful to so many colleagues and students for their comments on different issues discussed in the first edition of the book that it is impossible to mention them all by name. But I would particularly like to thank Dr. Carlos S. Leiva (University of Tarapacá, Arica, Chile) for writing in his review of the first edition at Amazon.com: “I am sure that my students are not only able to calculate, but know what they are calculating.” I was using virtually the same words when teaching relativity to physics students, but somehow omitted to stress this important point in the first edition. Now this omission has been corrected.

Montreal,
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