

Chapter 3 Summary

In this chapter the idea of a multiplicity of frames of space has been extended to a multiplicity of frames of space and time. The system of location in space, called a frame of space, is only a part of a fuller system of location of events in space and time. Nature provides no indication that one of these frames is to be preferred to the others. The particular frame in which we are relatively at rest has a symmetry with respect to us which other frames do not possess, and for this reason we have drifted into the common assumption that it is the only reasonable and proper frame; but this egocentric outlook should now be abandoned, and all frames treated as on the same footing. By considering time and space together we have been able to understand how the multiplicity of frames arises. They correspond to different directions of section of the four-dimensional world of events, the sections being the "world-wide instants". Simultaneity (Now) is seen to be relative. The denial of absolute simultaneity is intimately connected with the denial of absolute velocity; knowledge of absolute velocity would enable us to assert that certain events in the past or future occur Here but not Now; knowledge of absolute simultaneity would tell us that certain events occur Now but not Here. Removing these artificial sections, we have had a glimpse of the absolute world-structure with its grain diverging and interlacing after the plan of the hour-glass figures. By reference to this structure we discern an absolute distinction between space-like and time-like separation of events—a distinction which justifies and explains our instinctive feeling that space and time are fundamentally different. Many of the important applications of the new conceptions to the practical problems of physics are too technical to be considered in this book; one of the simpler applications is to determine the changes of the physical properties of objects due to rapid motion. Since the motion can equally well be described as a motion of ourselves relative to the object or of the object relative to ourselves, it cannot influence the absolute behaviour of the object. The apparent changes in the length, mass, electric and magnetic fields, period of vibration, etc., are merely a change of reckoning introduced in passing from the frame in which the object is at rest to the frame in which the observer is at rest. Formulae for calculating the change of reckoning of any of these quantities are easily deduced now that the geometrical relation of the frames has been ascertained.