Epilogue

There is a story that my former teacher once told me, about a well-known lecturer at a world-class university in the United States. The lecturer decided to spend an entire day in class presenting time reversal. Unfortunately, fifteen minutes into the meeting, the lecturer became so confused that continuing was impossible, and so the class was cancelled. At the next meeting, the lecturer brought a large stack of notes to refer to and continued the lecture as before, but *again* became confused and so again cancelled the class. On the third meeting, when students arrived, they found four chalkboards filled with derivations and the lecturer standing by the door. The lecturer pointed at the chalkboards and said, "*That's* time reversal, and that's all I'm going to say about it!" — and walked out. The students duly copied the blackboards into their notebooks.

I hope this book has filled in some of the details that were missing from that lecture. The study of time asymmetry is a deep, beautiful intertwining of physics and its philosophy, but it is conceptually tricky at times. Fortunately, a simple philosophy helps to clarify this study: time is not just about moments but about the structure of those moments. So, when we study the symmetries of time, that structure must be taken into account.

The passage of time can be viewed as describing the time translations between moments. And, the structure of those time translations provides the basis for a coherent account of temporal symmetry. The account I have presented has two parts. First: time is *symmetric* if and only if reversing the time translations is a symmetry; otherwise it is asymmetric. Second: if a theory has a 'law of motion' describing change over time, then that change must share a common structure with time, through a representation. Like a table casting a shadow on the floor, the asymmetries of time cast a shadow onto our best theories of motion.

By paying close attention to those theories, and the experiments that underpin them, I hope to have clarified some sense in which time has an arrow. It is not just an asymmetry of motion, nor a matter of contingent perspective or illusion. It is a full-fledged asymmetry of time itself. So, indeed: if the structure of time were a canon by Bach, then, at least in our world, it would play differently in one direction than in the reverse.

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