Coda

So where are we? What have we accomplished? What have we learned from our discussions in this book?

We started off with an analysis of objectivity and subjectivity. We based it on the definition of “objective” as existing as part of reality, independent of thought or of an observer, and the definition of “subjective” as existing in the mind, belonging to the thinking subject rather than to the object of thought. We considered external reality, the objective outer world, and saw how we gain knowledge of it through our physical senses and by means of social interaction. Thus this knowledge is actually intersubjective, but we referred to it as objective for the sake of our discussion. Then we looked at our individual subjective inner worlds, the worlds of our fantasies, emotions, feelings, perceptions, beliefs, and so on. Subjective inner worlds are incommensurate with one another.

We discussed three kinds of truth: objective, subjective, and logical. Objective truth is consistency with reality, passing the reality check, and is in the public domain. Subjective truth, however, is strictly a private affair; its domain of validity is confined to the subjective inner world of an individual. Thus, for example, ostensibly conflicting beliefs, if they do not deal with the real world (if they did, they could be tested and compared), are not in contradiction. Logical truth is the truth of logical deductions, including mathematical theorems, within the self-consistent logical structures in which they are derived. A logical truth may also be an objective truth, although it does not need to be.

We devoted some discussion to dealing with the subjective. Dealing with the objective real world, however, is best done through
science. Objectivity is a goal of science, as indicated by the definition of science as our attempt to understand objectively the reproducible and predictable aspects of nature.

Then, based on this definition, we considered what science is about and how it operates. Taking nature as the material universe with which we can, or can conceivably, interact, we saw that in doing science, we first search for order among the reproducible phenomena of nature. We then attempt to formulate laws that describe the collected data and predict new results. After finding such laws, we try to explain them by means of theories.

In this connection, we studied what reproducibility and predictability are, and their relation to order and law, where laws are descriptions of and abstractions from order. We considered Kepler’s laws of planetary motion as an archetypal example of laws of nature. An objective explanation of a law of nature is a theory.

We looked into what makes a theory acceptable, and examined the properties of theories that scientists consider to be advantageous. For a theory to be acceptable, it must explain what it is designed to explain (the theory must be objectively true) and what is doing the explaining must logically imply what is being explained (the theory must be logically true). In addition, the following are advantageous: What is explaining should be as much an aspect of nature as what is being explained (naturality). The former should also be more general (generality), more fundamental (fundamentality), more unifying (unification), and simpler (simplicity) than the latter and should be perceived as causing the latter (causation). Theories should be falsifiable (falsifiability), in the sense that they offer predictions that allow them to be tested. Beautiful theories are preferred.

We considered Newton’s laws as an archetypal example of a theory, in this case a theory to explain Kepler’s laws.

After dealing with science, we briefly examined what metaphysics, in the sense of the philosophical framework in which science operates, is about. We compared science and metaphysics and their respective domains, and noted that, in contrast to science, metaphysics lacks
criteria for objective truth. Thus worldviews, which are conceptual frameworks and lie within the domain of metaphysics, are highly subjective and personal. Then we considered two particular types of worldview and compared them: transcendent worldviews, which involve the existence of a reality beyond nature, and nontranscendent worldviews, which make do with nature as all there is.

We examined the character of the universe as a whole and recognized that, as far as science is concerned, the universe is a unique phenomenon. As such, the universe is intrinsically irreproducible and thus lies outside the framework of science. As a result, order, law, predictability, and theory are irrelevant to the universe as a whole; it is orderless, lawless, unpredictable, and unexplainable through science.

It follows that cosmological schemes, such as the inflationary big-bang scenarios, as useful and valuable as they are, cannot be and are not theories: they are attempts to describe, not scientifically explain, the working of the universe. Hence cosmology, to the extent it attempts to deal with the universe as a whole, is basically metaphysics.

Since the universe as a whole is orderless, lawless, unpredictable, and unexplainable, how is it that the universe possesses aspects and phenomena that are orderly, lawful, predictable, and explainable? How is it that within our lawless universe there are laws of nature? In other words, how can we be doing science? This question was the subject of our subsequent discussion, which led us through a number of diverse considerations.

We compared the metaphysical positions of realism and idealism. Realism holds that the order and laws of nature we find are really “out there,” objective and independent of observers, whereas idealism claims that the order and laws of nature are wholly subjective, in the mind of the observer. Then we considered the hybrid position that order is an objective property of nature, but laws are mental constructs.

We examined and compared the worldviews of holism and reductionism. The former states that nature can be understood only
in its wholeness or not at all. The latter claims that nature is understandable as the sum of its parts and should be studied by analysis and synthesis. We saw that although nature is an integrated whole, reductionism nonetheless succeeds to a great extent, since science, which generally operates reductionistically, is successful in achieving a good understanding of many aspects and phenomena of nature. Yet nature does possess nonseparable aspects as well.

We examined three ways in which science reduces nature to its parts, as well as the limitations of the three ways, to wit:

1. Observer and observed, which works well down to the limit set by nature’s intrinsic quantum nonseparability, that is, it works for phenomena that are not too small.
2. Quasi-isolated system and surroundings, where a quasi-isolated system is a system that is isolated from its surroundings to the best of our ability and understanding. Such isolation is necessarily imperfect, due to inertia and the uncontrollable quantum correlations involved in nature’s nonseparability. Nature’s order is manifested in quasi-isolated systems, and it is for them that laws of nature are found.
3. Initial state and law of evolution. This reduction allows lawfulness to be found for the time development of quasi-isolated systems, but it is not applicable to the universe as a whole.

We considered the Mach principle, that the origin of inertia lies with all the matter in the universe, and also its generalization to the extended Mach principle, that the origin of the laws of nature for quasi-isolated systems lies with the universe as a whole. Thus the orderless, lawless, unpredictable, and unexplainable universe not only possesses, but can actually be thought of as engendering, orderly, lawful, predictable, and explainable behavior in aspects and parts of itself. Still, nature’s orderlessness reveals itself on various scales. Science can offer no conventional explanation for the existence of laws of nature within the lawless universe.
We turned to an examination of science as a human endeavor: (1) science is a by-product or our existence; (2) it is our conception of nature that we are attempting to explain; and (3) a valid explanation is one that satisfies us. That led us to the anthropic principle, which states that the existence of Homo sapiens may, within the framework of science, serve as an explanation for phenomena and aspects of nature, and moreover that such explanations are the most fundamental. Fundamentality follows from the fact that our existence is the most fundamental aspect of nature for us.

But anthropic explanations should be used only as a last resort, and only for aspects of nature that are apparently so fundamental that no conventional explanation is available. One reason this is so is because they suffer from the subjective difficulty that our existence seems neither more general, more unifying, nor more simple than whatever it is explaining, and neither is it perceived as causing whatever it is explaining. Anthropic explanations suffer also from the objective difficulty of the invariant-context problem, when they are used by comparing the actual state of the universe with hypothetical alternative situations and studying how the alternatives would affect our existence. Such a use involves the hypothetical variation of some aspect of nature, while keeping all other aspects unchanged. But—and this is the invariant-context problem—we can never be sure the variation cannot be compensated for by concomitant change in other aspects of nature.

Since science offers no conventional explanation for the existence of order within the orderless universe, we turned in desperation to the anthropic principle, which, as we saw, allows a rather weak anthropic explanation. But we found a clean, unqualified anthropic explanation for space and time, for which no conventional explanation seems to be available.

Our final discussion in this book concerned the nature of reality, in particular what science tells us about it. Using arguments and justifications based on common sense, on our understanding of nature, and on reasonableness, utility, conceptual economy, and motivation, we’re led by science to the belief in an objective reality. We
saw, however, that our scientific knowledge of this reality is indirect. But science should nevertheless give us a literal description of objective reality, at least for those aspects of it that strongly and frequently affect our survival as individuals and as a species. Yet quantum theory, which is the best theory we have, cannot be a literal description of this reality. Thus objective reality is at least partially hidden from us. Since this reality transcends nature, we’re thus led to a transcendent worldview. There’s more to objective reality than meets the eye, it seems.
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