# Preface

After hearing a lecture by his younger colleague Wolfgang Pauli, the renowned physicist Niels Bohr is said to have commented: "We are all agreed that your theory is crazy. The question which divides us is whether it is crazy enough to have a chance of being correct. My own feeling is that it is not crazy enough."

Many contemporary physicists acknowledge that the phenomena of their field are so odd, the problems so befuddling to our current ways of thinking, that only a completely "crazy" theoretical approach to them has any possibility of success. What I suggest in the present book is that resolving the problems of modern physics may require something "crazier" still — not just an entirely new theory, but a whole new philosophical base, a new way of intuiting the world. We are going to see that while a spate of "crazy" theories and concepts have been put forward by physicists to account for the fields and forces of nature and their evolution, all theorizing has been tacitly grounded in a set of philosophical presuppositions and postures cast in the classical mold and never opened to question. I intend to show that it is not so much an absence of the right theory that has frustrated physicists' attempts at a comprehensive understanding of the natural world, but the unacknowledged presence of deeply engrained assumptions about that world that are essentially incompatible with the radically non-classical phenomena underlying it.

In subsequent chapters, I will explore in depth the philosophical suppositions of contemporary physics and will develop in detail a proposed alternative. By way of introducing my approach in this preface, I would like to briefly situate it within the recent history of the philosophy of science.

In the first half of the twentieth century, philosophy of science was governed by the analytic tradition of logical positivism. Here "philosophers of science viewed their job as formalizing the methods of science" (Crease 1997, p. 259). However, while positivism still exerts a significant influence on the philosophy of science, in the 1960s voices of dissent be-

gan to be heard. Among the earliest was that of Thomas Kuhn (1962), whose historical take on science flew in the face of science's claim to "objective truths" that transcend the vicissitudes of history. After Kuhn's opening initiative, positivist philosophy of science has been questioned in diverse quarters, including the sociology of science, social constructivism, and feminist philosophy. The present work may be located primarily within the challenge to mainstream philosophy of science that has been mounted by *phenomenology*.

As this book unfolds, the ideas and implications of phenomenological philosophy will be extensively explored. For immediate purposes, let us say the following. Positivist philosophy looks for meaning in formally determined relationships among fixed units of knowledge that have been objectively defined. In contrast, phenomenology sees meaning as arising from the hermeneutic (interpretive) interactions of participants in an evolving lifeworld, a dynamic context of lived experience. In an issue of the journal *Man and World* edited by philosopher Robert Crease (1997), the phenomenological-hermeneutic approach to the philosophy of science is laid out systematically. Featured here are the writings of Martin Eger, Eugene Gendlin, Patrick Heelan, Don Ihde, Theodore Kisiel, and Joseph Kockelmans. More recent contributions toward grounding science in phenomenological philosophy include *Models of the Self* (Gallagher and Shear, eds. 2000), *Heidegger's Philosophy of Science* (Glazebrook 2000), *Ideas for a Hermeneutic Phenomenology of the Natural Sciences* (Kockelmans 2002), *How Scientific Practices Matter* (Rouse 2003), *Philosophy of Technology* (Scharff and Dusek, eds. 2003), *Continental Philosophy of Science* (Gutting, ed. 2005), and *Science, Understanding, and Justice* (Eger 2006). Also noteworthy is *Hermeneutic Philosophy of Science, Van Gogh's Eyes, and God* (Babich, ed. 2004), a collection of essays honoring Patrick A. Heelan. Let me focus briefly on the work of Heelan, since it is especially relevant to what I am attempting in this book.

Although alternative approaches to the philosophy of science have met with particularly strong resistance in the philosophy of space, and of quantum mechanics (Uchii 1998), Heelan (1983) has pioneered the effort to open these fields to phenomenological investigation. According to Heelan, "a hermeneutical analysis…would go far to throw light on the basic 'mysteries' of the quantum theory" (1997). Following Heelan's lead, in

the chapters to come I offer a unique phenomenological interpretation of quantum theory, quantum gravity, and cosmology — one that draws on the late writings of Martin Heidegger and Maurice Merleau-Ponty, and employs topological imagination in a reflexively intuitive way. At one point, Heelan remarks that "we do not ask of a philosophy that it contribute to the successful practice of science" (1997). In commenting thus, he appears to be implying a disjuncture between the work of philosophy and that of science. Yet is not science philosophy-laden in the sense that its practices are affected by the philosophical assumptions upon which it rests? Has not modern science assumed the Cartesian attitude presupposing the division of subject and object, and has this not strongly influenced the conduct of science, making detached "objectivity" the order of the day? I intend to demonstrate that, in the case of contemporary theoretical physics, scientific progress critically depends on shifting from the stance of Cartesian philosophy to a phenomenological posture that surpasses the subject-object split.

A notable difference between mainstream and phenomenological approaches to physics is that while the former is inclined to deny its philosophy-ladenness, the latter openly acknowledges it. This recognition of philosophical influence lends itself to the integration of philosophical, theoretical, and practical levels of scientific activity. In the phenomenological physics I will undertake, the doing of science and the doing of philosophy merge into a joint endeavor. This vitalizes the philosophy and makes it generative. Rather than merely explaining, analyzing, or critiquing extant physics from a detached vantage point, the philosophy now contributes something new to the physics that specifically addresses physics' own questions concerning space and time, matter and force. The fusion of science and philosophy embodied in the phenomenological physics I shall unfold leads to a *new* physics, with new solutions to long-standing problems that have proven intractable when approached in the conventional manner.

To prevent semantic confusion, let me point out that the term "phenomenological" is already widely used in physics, though with a meaning that differs markedly from the one given here. In his introduction to the phenomenological movement in philosophy, Herbert Spiegelberg (1982) identifies a variety of meanings associated with the word "phenomeno-

logical," several of these being "extra-philosophical" (see pp. 7–11). This is the sense in which the adjective "phenomenological" is commonly employed in contemporary physics. "'Phenomenological' laws are understood to be generalizations which simply *describe* regularities in physical events of various types, without regard to their *explanation* or derivation" (Willard n.d.). This descriptive way of doing physics normally involves less technical analysis and mathematical rigor than do formal approaches to the field. The phenomenological approach adopted in the present volume is also less technical and quantitatively exacting than is formal mathematical physics. But unlike the phenomenology widely practiced in physics today, the phenomenological physics of this book is an intuitive enterprise that takes as its point of departure the philosophical insights of thinkers like Merleau-Ponty and Heidegger.

*The Self-Evolving Cosmos* is intended for philosophically-oriented, interdisciplinary readers drawn to current developments in physics and cosmology. But it may not be enough to say that this work is interdisciplinary. "Transcultural" may be a better term, in the general sense of C. P. Snow's "two cultures." Snow (1959) commented on the regrettably deep division between the sciences and humanities, the latter including literature, art, and traditional philosophy. Doesn't the philosophy of *science* bridge the cultural divide? Mainstream philosophy of science clearly does not, since it has come down squarely on the side of the natural sciences. I venture to say that the approach to philosophy of science offered in this book — submitted in the spirit of Patrick Heelan and other "dissident" philosophers of science (see Chapter 11) — does contribute to spanning the cultural gap in that it exposes the "soft" phenomenological core of the "hardest" of the "hard" sciences, viz. physics. My hope is that readers will share my sense of the significance of the project to the extent of being willing to take up the transcultural challenge. Although the background and training of such readers may bring them to science from the outside, they will be disposed to extending themselves across the cultural chasm. By the same token, transcultural readers initially socialized *within* the language system of science will not be dismayed by the "foreign dialect" they may hear but will be inclined to listen in a new way.

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The opening chapter of the book situates the development of physics within the context of human development as a whole. Both are seen to involve the quest for unity and individuation. After examining in Chapter 2 the obstacle to unification under the prevailing orientation of contemporary physics, the phenomenological alternative is introduced in Chapter 3. Here we find that the very goal of physics shifts from a quest for static unity to the exploration of a dynamic unity-in-diversity. In Chapters 4 and 5, the *topological* nature of phenomenological physics is considered and a family of primary topodimensional structures is described. Far from being isolated physical objects, these wave-like dimensionalities are seen to constitute whole psychophysical lifeworlds. The next two chapters take up the *evolution* of lifeworld dimensions. In Chapter 6, I employ the idea of symmetry to articulate some essential principles of dimensional transformation and stages of dimensional development. Chapter 7 details the precise pattern by which dimensional vortices evolve in relation to one another. The principles of topodimensional development are applied to physics and cosmogony in the next three chapters. Chapter 8 features a phenomenological rendition of the extra-dimensional (Kaluza-Klein) approach to force-field unification. In Chapter 9, phenomenological intuition is specifically brought to bear on the question of how the universe evolves. The account of cosmic evolution is completed in the following chapter, where the generation of fundamental force fields and matter particles is worked out in detail via a cosmodimensional matrix. The book concludes with a chapter that highlights the *psychophysical* nature of cosmogony. Psychical aspects of all fundamental particles are identified and the reflexive character of phenomenological physics is explored.

*The Self-Evolving Cosmos* is the culmination of work dating back to the 1970s when I first applied intuitive topology to physics and other natural sciences. These efforts were carried forward in a series of essays later published as a collection under the title *Science, Paradox, and the Moebius Principle* (1994). One essay in particular paved the way for the present work. Titled "A Neo-Intuitive Proposal for Kaluza-Klein Unification," this paper is a preliminary attempt to address physics' problem of unified field theory via a phenomenological use of topology. Though problems in theoretical physics were subsequently examined in my *Dimensions of Apeiron* (2004), the question of unifying the forces of nature was not sys-

tematically engaged. In my more recent volume, *Topologies of the Flesh* (2006), topological phenomenology is advanced by working out the details of basic topodimensional processes and their co-evolution, but no attention is given here to issues in physics or cosmology. Building on these earlier initiatives, the present volume offers a full-blown phenomenological rendering of nature's unity-in-diversity in our self-evolving cosmos.

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