Preface

So certain is this that we may boldly state that it is absurd for human beings even to attempt it, or to hope that perhaps some day another Newton might arise who would explain to us, in terms of natural laws unordered by intention, how even a mere blade of grass is produced. **Kant, *Critique of Judgment* (1790)**

The book in your hands shows Kant to be wrong. It articulates and defends the zero-force evolutionary law, evolution's analog to Newton's first law, the law of inertia.

We did not set out to write a book refuting Kant. Kant has been shown wrong on so many points that such a task would not have motivated us. Nor do we wish to compare ourselves to the incomparable Newton, for we fear that there is some chance that we might come up on the short end of that comparison. Finally, neither of us suffers from physics envy (at least according to our friends and families). So what explains this book?

Here's the story. The ideas behind this work have been fermenting in the heads of the coauthors for decades. One of us (Brandon) is a philosopher, who argued as early as 1978 that to understand natural selection one had to be able to distinguish differential reproduction due to selection from that due to chance. Accordingly, no understanding of selection is possible without a conceptually clear, and operationalizable, conception of drift. Thus, from an interest in natural selection Brandon was led to an interest

in drift. Many of his publications (Brandon and Carson 1996; Brandon and Nijhout 2006; Brandon 2005, 2006) are intellectual ancestors to the present work. The other of us (McShea) is a paleobiologist who has written about complexity in evolution for 20 years now. In a 1991 review, he briefly discussed Herbert Spencer's work on evolution, in particular Spencer's principle of "the instability of the homogeneous" (Spencer 1900). Given a homogeneous object, different accidents will happen to different parts of it, producing a heterogeneous object, or, in the terms we develop in this book, a more complex one. The idea lay dormant for some years, reemerging again in a 2005 paper for a volume in honor of Stephen Jay Gould (McShea 2005a). It was Gould, after all, who informed our collective consciousness in evolutionary studies about the central importance of chance in macroevolution. How better to honor him than to return to Spencer, an entire metaphysic with accidents, chance, at its heart. Finally, after Spencer and Gould, a third intellectual ancestor is David M. Raup. As will be obvious to those who know Raup's work, his thinking on the dynamics of randomly evolving clades is foundational, both for the 2005 paper and for this book.

So we each have our own intellectual precedents, but the present book is collaborative. And we will get to the origin of this collaboration, but first some deep background. We have known each other since 1978, when we were both *very* young men, getting degrees at the same university. (One of us was a graduate student and an undergraduate-thesis mentor and reader for the other.) We went our separate ways after that but ended up together again—improbably—at Duke in 1996. Here we coteach courses, and we are both participants in Duke's biweekly Philosophy of Biology Discussion Group. On a personal level, we tolerate each other about as well as could be expected from a pair consisting of one diehard Red Sox fan and one who bleeds Yankee pinstripe blue (a neat feat that). We will not dwell on how these allegiances came about. But we will note, as Mark Twain (1963) did, that people don't pick their religion. They inherit it from their parents. Similarly for baseball. Imprinting on a baseball team is a product of the contingencies of time and place of one's upbringing. That is how a working-class populist can root for the most corporate, buttoned-down team in professional sports. And that also explains how a devout agnostic about almost everything could for 35 years believe in a team that, during that stretch, won not a single championship.[1]

So we have known each other for a long time. But the precise date (precise enough for a paleobiologist) of the start of this collaboration is quite recent. It can be traced to Brandon's handing a manuscript, the one

that ultimately would be published in the *Journal of Philosophy* in 2006, to McShea in the fall of 2005. McShea read the manuscript and found himself unusually enthusiastic. And he discovered that his enthusiasm arose from his having already made what seemed to him the same argument (McShea 2005a, 2005b). But was it really the same? Brandon's work was on drifting means, while McShea's was on diffusing variances. Brandon's was microevolutionarily oriented; McShea's was macro. McShea was talking about a force or drive, while Brandon was insisting that what he was thinking about should be thought of as a zero-force condition. Was it really the same idea? It seemed obvious that it was. After four or five months of hard thought and back-and-forth argument, we concluded that the arguments were indeed the same. And further we concluded that, yes, in fact, it was obvious. Thus, the birth of the book.

Well, not immediately. First there was the idea of writing a short article that summarized the main points and their implications for diversity and complexity. That didn't fly. This book tries to effect a fundamental gestalt shift in how we view evolutionary phenomena. It is built, not on surprising new discoveries, but on a variety of things already well known among evolutionary biologists in scattered specialties ranging from molecular evolution to paleobiology. How all of this adds up to a fundamentally new view of evolution is hard to convey. We hope to have come close to doing so in this book. We had no hope of doing so in a short article.

A word on hubris. It may seem to some that by claiming to have found a law of evolution we have invited the wrath of one or more Greek gods, perhaps the wrath of Athena, the goddess of wisdom—and if not of gods, then at least of certain contemporary colleagues for whom one of the essences of Darwinism is its recognition of the particularity of biology, the uniqueness of every individual, every species, every ecological circumstance. From this follows, some would say, an unpredictability, an absence of regularity, that must be simply accepted if not celebrated. But there is another view, not in ascendance in our time but with roots in Darwin as well, that holds out a hope of finding regularity. It has always been just a hope. One cannot be a Darwinian without admitting the possibility that history might be just, as Henry Ford put it, one damn thing after another. But, this alternative view asks, wouldn't it be exciting, wouldn't biology be so much more fun and fascinating, if laws did exist, if amid the blooming buzzing confusion of evolutionary change there were some underlying order? Now we do not claim to have found a first-order regularity. We do not claim to be able to predict how any given species will change. What we think we have is a second-order regularity,

one that governs not the precise changes occurring in evolution but the distributions of those changes. Further, and luckily for us, we can advance this more modest regularity while claiming little originality for its discovery. As we explain later, the underlying principle is present, in various disguises, in subfields throughout biology. So we think, we hope, that we are safe from hubris. We think Athena would approve.

And indeed, when all is said and done, we think Kant would approve as well. Kant was an exponent of explanation by natural law. His skepticism about laws in biology came from his doubts about our ever explaining the teleological aspects of biology in terms of laws. Kant, like most of his contemporaries, saw nature as being thoroughly infused with purpose. Of course, neo-Darwinians find this less problematic than did Kant, because they think that natural selection can explain apparent teleology (i.e., adaptation) in a scientifically respectable way. We agree with that. But we think there is more to evolution than adaptation. There is diversity and complexity. And there is no reason that there could not be laws about these. In particular, we think—and we hope to have shown in this book—that there is always and everywhere a tendency for diversity and complexity to increase, a tendency that does not depend on natural selection. We boldly state that Kant would have been pleased.