

EVOLUTION

STILL A THEORY IN CRISIS

MICHAEL DENTON

Description

More than thirty years after his landmark book *Evolution: A Theory in Crisis* (1985), biologist Michael Denton revisits his earlier thesis about the inability of Darwinian evolution to explain the history of life. He argues that there remains “an irresistible consilience of evidence for rejecting Darwinian cumulative selection as the major driving force of evolution.” From the origin of life to the origin of human language, the great divisions in the natural order are still as profound as ever, and they are still unsupported by the series of adaptive transitional forms predicted by Darwin. In addition, Denton makes a provocative new argument about the pervasiveness of non-adaptive order throughout biology, order that cannot be explained by the Darwinian mechanism.

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Publisher’s Note

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Praise for *Evolution: Still a Theory in Crisis*

“Of all the books that have been critical of Darwinian evolution in recent years, Michael Denton’s *Evolution: Still a Theory in Crisis* stands out for doing more than simply compiling the full range of evidence—from cosmology through all of biology to the origins of human language—that goes against a blind, incrementalist view of the development of life. To be sure, Denton does that very well. But the book’s real triumph is to frame this criticism in terms of an alternative paradigm, one indebted to Darwin’s great rival Richard Owen. This proposed new paradigm is founded on the idea of discrete biological forms, or ‘types,’ which have the standing of natural laws. Denton is consistently clear and scrupulous about how the evidence bears on neo-Darwinism vis-à-vis what might be called his ‘neo-Owenism.’ All told, *Evolution* is the one book that I would recommend to any student or lay person who wants to think in positive, scientific terms out of Darwin’s black box.”

Steve Fuller, Auguste Comte Professor of Social Epistemology, University of Warwick, UK, and author of *Science vs. Religion?* and *Dissent over Descent*

“Darwinists often deflect trenchant criticisms by kicking the can down the road. In ten or twenty years science will surely show their theory is correct, they say. Now thirty years after his groundbreaking book, *Evolution: A Theory in Crisis*, Michael Denton calls their bluff. Not only hasn’t Darwinism overcome its challenges, severe new problems have made the crisis much worse.”

Michael Behe, PhD, Professor of Biological Sciences, Lehigh University, and author of *Darwin’s Black Box* and *The Edge of Evolution*

“Based on a great variety of indisputable facts from biology and paleontology, Michael Denton presents in his new book a highly competent and very thoughtful critique of the neo-Darwinian paradigm. His arguments convincingly suggest that modern biology prematurely dispensed with the notions of typology, essentialism, structuralism, and laws of biological form as promising alternative approaches to the origin of biological complexity and diversity. His affirmation of common descent with modification also demonstrates that well-founded doubts concerning the capabilities of the neo-Darwinian mechanism cannot be easily dismissed as anti-evolution propaganda, but should rather be welcomed even by neo-Darwinists as heuristically fruitful.”

Günter Bechly, PhD, Paleontologist

“In this book Michael Denton moves adroitly from the history of ideas to scientific explanation. *Evolution: Still a Theory in Crisis* is really two books in one: an insightful and fearless historical analysis on the one hand, and a provocative manifesto for a ‘new’ biology on the other. It is a rare and powerful combination that demands careful reading.”

Michael A. Flannery, Professor and Assistant Dean for Special and Historical Collections, University of Alabama at Birmingham, and author of *Alfred Russel Wallace: A Rediscovered Life*

“Biologist Michael Denton has written a devastating critique of Darwinian evolution. Denton is not a creationist, but a structuralist. He makes a compelling argument, supported by abundant evidence, that the most basic structures of living things—their forms or body plans—are not adaptive and cannot be explained by the cumulative selection that is at the core of evolutionary theory. Instead, he argues, those forms are part of the very fabric of nature. Everyone involved in the controversies over evolution should read this book.”

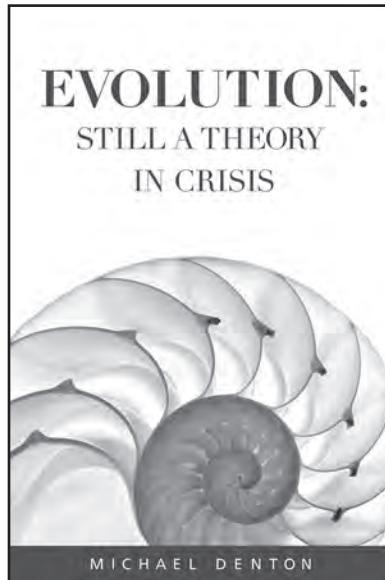
Jonathan Wells, PhD, Biologist and Senior Fellow, Discovery Institute, and author of *Icons of Evolution* and *The Myth of Junk DNA*

“Michael Denton’s new book *Evolution: Still a Theory in Crisis* is a substantial reworking of his classic book of (nearly) the same name. In this new book, he expands his argument against Darwinian adaptation as a mechanism capable of explaining the patterns we see in life. Using his considerable knowledge of historical and modern biology, he makes a fresh and compelling argument about the origins of animal form that will be completely new to many readers. I urge anyone interested in these questions to read this book.”

Ann Gauger, PhD, Senior Research Scientist, Biologic Institute, and co-author of *Science and Human Origins*

Learn More about the Work of Michael Denton

You can access more information about Michael Denton, reviews of his new book, and a series of video conversations with him at the book’s website.



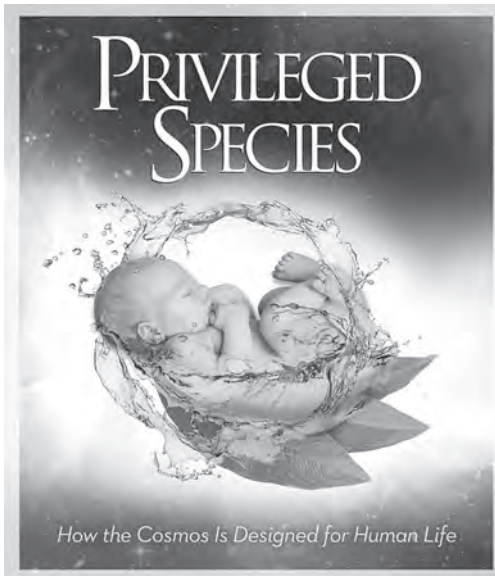
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The Biology of the Baroque

“The Biology of the Baroque” is a documentary featuring Michael Denton that explores the mystery of non-adaptive order in nature, order that cannot be explained by Darwinian evolution.

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2. GALÁPAGOS

Most of the organic productions are aboriginal creations, found nowhere else; there is even a difference between the inhabitants of the different islands... Considering the small size of the islands, we feel the more astonished at the number of their aboriginal beings, and at their confined range.

Charles Darwin, *Voyage of the Beagle* (1845), Chapter 17.

SIX HUNDRED MILES OFF THE WEST COAST OF SOUTH AMERICA, SITTING almost exactly on the equator, lies a small archipelago consisting of eighteen barren volcanic islands scattered over a circle of sea some 150 miles across. The largest is about the size of Rhode Island, and four others are about one-quarter this size. Most are far smaller, and some are mere rocky outcrops in the vastness of the Pacific Ocean. Volcanic craters reaching up to three and four thousand feet surmount many of the larger islands. In places their flanks are studded with innumerable small volcanic cones and covered with large areas of barren volcanic scree.

The climate is remarkably cool for islands sited on the equator, the result of the Humboldt Current, which for many months of the year brings cold Antarctic waters northward along the western edge of South America. The Humboldt also brings rich nutrients to the surrounding seas, which teem with marine life. As a result of the cool waters, little rain falls on the coastal strips, which are arid and barren or vegetated by stunted shrubs. Well-vegetated areas and trees are mainly restricted to the central higher regions of the islands, which are often bathed in damp clouds. The islands are fringed in places by steep cliffs, in other places by flat rocky lava flows. Occasional sandy bays provide access from the sea. Remote, arid, and somewhat uninviting, the Galápagos Islands are a curiously inauspicious site for the first dawning of an intellectual revolution.

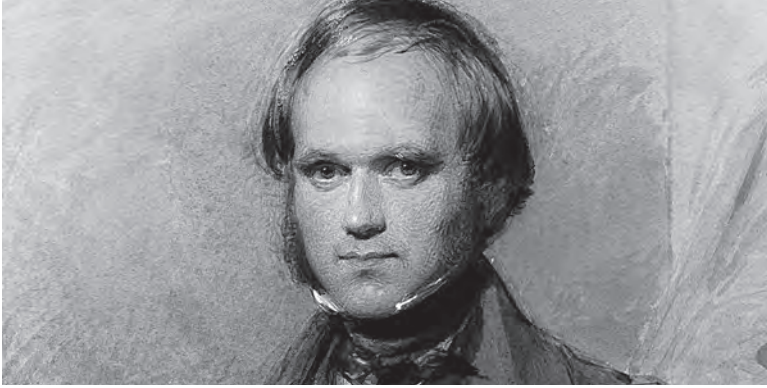


FIGURE 2-1. CHARLES DARWIN. Drawn after he returned from the voyage of the *Beagle* in the late 1830s.

Named Galápagos from the Spanish word for saddle (*galápagos*), after the shells of the famous saddle-backed Galápagos tortoises, this remote archipelago entered the iconography of evolutionary biology because of the fateful visit in September 1835 of a British survey ship, the HMS *Beagle*. What Darwin saw on the Galápagos archipelago during his five-week stay in 1835 would be seminal in the development of his radical new evolutionary worldview. As Jonathan Weiner wrote in his wonderful book, *The Beak of the Finch*: “These islands meant more to him than any other stop in his five-year voyage around the world. ‘Origin of all my views, he called them once.’”¹ The evolutionary significance for Darwin of the Galápagos and other similar oceanic biotas is highlighted by the fact that in the first edition of the *Origin*, Darwin devoted eighteen pages of discussion to the topic, a point alluded to by Gould.²

2.1 MICROEVOLUTION

AMONG THE most remarkable of all the unique species of the archipelago are a set of thirteen closely-related types of finch. Their close relationship is indicated by the fact that they all exhibit the same nest architecture, egg coloration, and complex courtship display³ and has been confirmed by recent DNA analysis.⁴ However, they are in many other respects distinct in terms of plumage, behavior (including feeding habits), and beak

morphology. Each species is peculiarly adapted to a particular ecological niche on one or several of the islands of the archipelago and possessed of a unique beak morphology adapted to a particular type of food—seeds, insects, etc. In fact they are, as Weiner remarks, “spectacularly and peculiarly diverse.”⁵ In any suburban garden, they would all be judged as different species.⁶

Reflecting on this remarkable group of birds Darwin famously (and rightly) inferred: “Seeing this gradation and diversity of structure in one small, intimately related group of birds, one might really fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends.”⁷

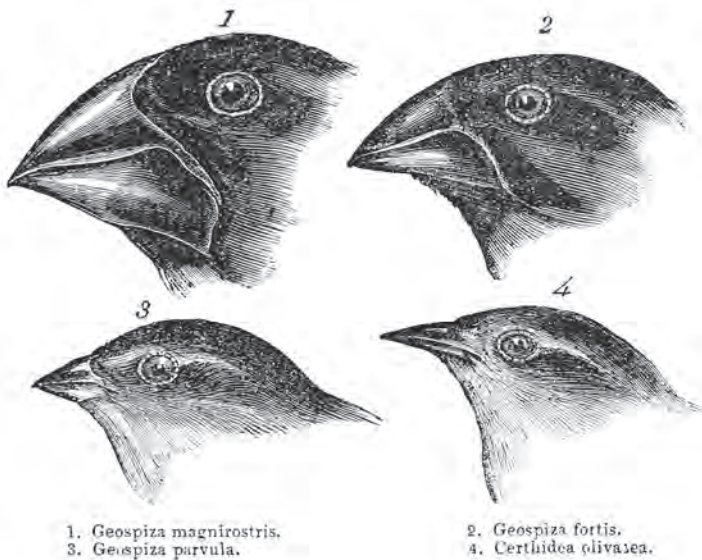


FIGURE 2-2. GALÁPAGOS FINCHES.

In other words, species were not specially created. Existing species had descended with modification from pre-existing species. This realization was for Darwin, as he later described it, “like confessing to murder,”⁸ so entrenched was the then universally accepted doctrine of the fixity of species. Darwin also inferred (again rightly, as the work of subsequent

researchers on Galápagos has amply confirmed⁹) that the major causal mechanism responsible for their adaptive divergence—the shaping of their beaks for example—is the simple mechanism of natural selection. More specifically, the cumulative selection of successive small adaptive changes has fashioned each species step-by-step with a morphology perfectly suited to thriving in “its” special ecological niche.¹⁰

Moreover, Darwin also speculated (in Chapter 4 of the *Origin*) as to how cumulative selection might gradually lead to increasing morphological and behavioral specialization of well-adapted varieties, which over time might lead to the origin of new species.¹¹ Although there is still some question as to whether the species of finches are “true species” and not just well-differentiated subspecies,¹² subsequent work on the finches has largely confirmed his basic intuition as is obvious from Weiner’s description of the extraordinarily painstaking research of Peter and Rosemary Grant over the past several decades.

Intriguingly as far as the beak forms are concerned, recent developmental genetic studies have thrown light on how the adaptive diversity might have been come about by revealing that the two genes involved in the generation of the different beak forms of the finches are used in all avian species to modulate beak form.¹³ One gene, *Bmp4*, encodes bone morphogenetic protein 4, and the other gene encodes calmodulin (CaM), a molecule involved in mediating Ca²⁺ signaling. If the *Bmp4* gene is turned on early and at high levels in the beak of a developing bird, the beak becomes deeper and broader. When calmodulin is expressed at high levels in the beak of a developing bird, the beak becomes elongated. These genes are fairly similar to one another in different finch species, but they are turned on and off at different times. Altogether the evidence suggests that, over evolutionary time, simple genetic changes in the patterns of expression of these genes (e.g., when and where they are turned on and off) produced the diverse set of finch beak shapes we see today. These studies have shown that the diversity of beak morphology can be readily explained by the gradual, functional fine-tuning of microevolutionary changes in a few key genes that shape the form of the beak in all

birds. Just as it is easy to envisage gradual morphological change in beak form to serve functional purposes, so it is relatively easy to envisage the fine-tuning of the expression of these two key morphogenetic genes to actualize these changes.

As far as the evolution of finch beaks is concerned, there is no need either at the morphological or genetic level to call for any causal agency other than cumulative selection. Here I concur with classic Darwinism. The beaks are clearly adaptations and their evolution is entirely explicable within a classic functionalist framework. As the different beak forms are clearly contingent adaptations which evolved to meet the unique environmental demands on a group of volcanic islands that only emerged from the Pacific a few million years ago, their evolution is beyond any structuralist or “laws of form” type of account.

As Darwin explains in the introduction to the *Origin*, it was because he had in natural selection a mechanism that might explain “how the innumerable species inhabiting this world have been modified so as to acquire that perfection of structure and coadaptation which most justly excites our admiration” that he finally set about composing his great work.

The lesson of the Galápagos, and one of the repeated mantras of *Evolution: A Theory in Crisis* (see Chapters 2 and 4) is simply this: Cumulative selection will work its magic *as long as the novelty of interest is adaptive and there is a functional continuum (at the morphological or genetic level) leading from a putative ancestor species or structure A to a descendant species or structure B*. Even in the absence of any empirically known functional continuum, if a convincing hypothetical continuum can be readily envisaged linking A to B, then the possibility of B “evolving from A” via cumulative selection can be plausibly inferred.¹⁴

To repeat: Where an evolutionary novelty can be construed as being adaptive and where a sequence of small incremental changes leading to the novelty can be cited (or envisaged), *functionalist accounts are clearly plausible*. This is the case with the Galápagos finch beaks and many other cases of microevolution, but as this book shows in the chapters ahead, adaptive sequences, either empirically known or hypothetical, *are lack-*

ing in the vast majority of cases of macroevolution, especially those involving the evolutionary actualization of the taxa-defining homologs—e.g., leading from the fin of a fish to the tetrapod limb, from the scale of a reptile to the feather of a bird, or from a “pine cone” or some other putative antecedent structure to the angiosperm flower.

2.2 CUMULATIVE SELECTION AS CAUSAL AGENCY

THAT CUMULATIVE selection necessitates a long series of adaptive intermediates linking ancestor with descendant was conceded by Darwin in many places in the *Origin*. Indeed, over and over again he confesses the need for “innumerable transitional forms.”¹⁵ Acknowledging “that natural selection generally acts with extreme slowness,”¹⁶ he admits that “as natural selection acts solely by accumulating slight, successive favorable variations, it can produce no great or sudden modifications; it can only act by short and slow steps.”¹⁷ And he declares, famously: “If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous successive slight modifications, my theory would absolutely break down.”¹⁸

Darwin, perhaps more than any subsequent evolutionist, was committed to an extremely gradualistic model, insistent that evolution by natural selection can never take jumps,¹⁹ and that the individual variants upon which selection acts are very small. Indeed, in the *Origin* he talks about the differences that natural selection exploits being “absolutely inappreciable by an uneducated eye—differences which I for one have vainly attempted to appreciate.”²⁰ Holding the individual steps to be so extremely small, it is no wonder Darwin envisaged the building of organic complexity to have required “an interminable number of intermediate forms,”²¹ and he even concedes that a reader who does not admit “how vast have been the past periods of time, may at once close this volume.”²²

Self-evidently, to go from ancestor A to descendant B via cumulative selection does require, as Darwin rightly infers, a long sequence of adaptive transitional forms. But there is another compelling reason for postulating “an interminable series of intermediates,” if selection is to

be the causal engine directing the actual evolutionary change. Although Darwin never explicitly expands on the point, Gould brings it out with great clarity in his *The Structure of Evolutionary Theory*, where he shows that natural selection can only play a creative role in molding new evolutionary forms if two stringent conditions are met:

- (1) if nothing about the provision of the raw materials—that is, the sources of variation—imparts direction to evolutionary change; and
- (2) *if change occurs by a long and insensible series of intermediary steps, each superintended by natural selection—so that “creativity” or “direction” can arise by the summation of the increments.*²³

Regarding the sources of variation (condition 1), Gould reminds us that:

Variation must exist in sufficient amounts, for natural selection can make nothing, and must rely upon the bounty thus provided [by natural variation]; but variation must not be too florid or showy either, lest it become the creative agency of change all by itself. Variation, in short, must be copious, small in extent, and undirected...

If the variations that yielded evolutionary change were large—producing new major features, or even new taxa in a single step—then natural selection... as a theory of evolutionary change, would perish... variation itself would emerge as the primary, and truly creative, force... For this reason... saltationist (or macromutational) theories have always been viewed as anti-Darwinian.²⁴

Commenting on the necessity that evolutionary change occurs via a long series of incremental steps (condition 2), he continues:

We now come to the heart of what natural selection requires... in going from A to a substantially different B, evolution must pass through a long and insensible sequence of intermediary steps—in other words... ancestor and descendant must be linked by a series of changes, each within the range of what natural selection might construct from ordinary variability. Without gradualism in this form, large variations of discontinuous morphological import—rather than natural selection—might provide the creative force of evolutionary change.²⁵

If these two conditions hold, as all Darwinian advocates assume that they do, then natural selection can be conceived of as Darwin did in the *Origin*: as the sole director and creative agent in evolution,²⁶ responsible for all the complexity and variety of life and the phylogenetic branching pattern of the tree of life. As I pointed out previously:

Darwin's central and entirely unique claim in the *Origin* was not that natural selection occurs and is bound to eliminate the unfit... Rather, his revolutionary claim was that natural selection could be the main *creative agent* in evolution if it superintended the ever so gradual accumulation of tiny undirected mutations... Selection per se is not the defining characteristic of Darwinism, but only where it acts as the creative agent, building complexity incrementally resulting in what Gould terms "additive aggregates."²⁷

Consequently, Darwin's interminable series of transitional forms is necessary for straightforward mechanistic reasons (how else can one get from A to B by cumulative selection?), but it is also essential if the sole agency of change is to be natural selection. Where a complex adaptation—no matter how complex—can be reached in a series of tiny adaptive steps, then natural selection can indeed function, in Dawkins's description,²⁸ as a *blind watchmaker* and change A into B no matter how complex the transition, without any other causal agency being involved. And it is this elimination of the need for any alternative or additional directive mechanism guiding the evolutionary process which is, for atheists and materialists like Dawkins and Dennett, its great attraction.

Here we touch on an important point, which needs emphasis: Organisms are complex systems, and their assembly during the course of evolution, by universal assent (e.g., Darwin, Fisher, Dawkins, Fred Hoyle, Dennett), could never have occurred by "pure chance." Some form of direction is essential! This is why, as stressed below (see Chapter 11), both Darwinists and their opponents reject the idea that undirected chance (or trial and error) could assemble any sort of complex biological structure. Only if evolution is directed by some mechanism can the complexity of living things be explained.

Darwin's theory of cumulative selection was—and is—a brilliantly simple theory to provide an account for *adaptive* design and *adaptive* order in the living world without recourse to additional guidance from any other agency. Daniel Dennett calls it the “best idea anyone has ever had.”²⁹ Yet clever though it may be, it can only work, firstly, if the “form” of interest can be shown to be adaptive and, secondly, if the “form” is led up to via a functional continuum through which cumulative selection can find its way and work its magic. And this, to a very large extent, is why so many in the mainstream academic community, enamored as they are with the Darwinian worldview, must look the other way, if—as it is certainly the case, as I will show—many of the taxa-defining homologs actualized during the course of evolution have *never* been shown to be adaptive and even in the case of those homologs which are apparently adaptive, functional continuums are either unknown or very hard to envisage. To acknowledge their absence is to acknowledge that the paths of evolution must have been ordered and directed by additional causal factors, i.e., that cumulative selection is not the sole or even the major directive agency.

2.3 ELIMINATING TELOS AND TELEOLOGY

BECAUSE CUMULATIVE selection acts only to adapt an organism to its immediate environmental conditions, without any concern for what the long-term consequences of any specific adaptation might be or where it might lead, it has no foresight.³⁰ And without foresight, the ends or designs it can achieve are those (to employ Dawkins's aptly-chosen analogy) of a “blind watchmaker.”³¹ It is the absolute blindness of the process that is its hallmark and carries such radical implications.³² As Ernst Mayr put it, “The truly outstanding achievement of the principle of natural selection is that it makes unnecessary the invocation of ‘final causes’—that is, any teleological forces leading to a particular end. In fact, nothing is predetermined. Furthermore, the objective of selection even may change from one generation to the next, as environmental circumstances vary.”³³

By providing a mechanism to account for order and adaptive design without a designer, natural selection upended the biological argument to design that had been the mainstay of English natural theology since the seventeenth century. It also upended the widespread belief of many of the structuralists and typologists before Darwin (including Richard Owen and many other leading nineteenth-century biologists)³⁴ that the paths of evolution were predetermined by natural law; and it overturned the notion of a lawful biology where the major Types were as much a part of the world order as were inorganic forms. After Darwin, all such causal theories came to be seen as “skyhooks,” as Dennett contemptuously refers to them.³⁵

It is worth noting that the typologists of the nineteenth century, though seeing life’s forms as the result of laws and hence “natural,” also interpreted these laws as causal agents within a comprehensive teleological framework. Louis Agassiz, for example, saw the Types as ideas in the mind of God³⁶ and saw the whole taxonomic system as part of God’s grand plan of creation. In his *Essay on Classification* he argued: “To me it appears indisputable, that this order... [is] in truth but translations into human language of the thoughts of the Creator.”³⁷ Owen also viewed nature’s order as the result of a Divine plan. He even went so far in his *On the Anatomy of Vertebrates* to declare “the Horse to have been predestined and prepared for man.”³⁸ However, although Owen saw nature as the result of design, he believed that God had used natural laws to achieve His ends.³⁹ As Owen commented, one of his aims was “to show in these structures [i.e., “the parts and organs” of vertebrate animals] the evidence of a predetermining Will, producing them in reference to a final purpose.”⁴⁰

2.4 FROM MICROEVOLUTION TO MACROEVOLUTION

IF DARWIN had gone no further than providing an explanation for the evolution of finch beaks and other cases of microevolution, he might have gone down as a notable Victorian naturalist. But Darwin (as I pointed out in Chapters Two and Three of *Evolution: A Theory in Crisis*)

went much further. He became one of the most influential thinkers in Western intellectual history by making the radical claim that the origin of all the novelties in the history of life, all the taxa-defining traits, all complexity, all order, could be explained by extending or extrapolating, over great periods of time, the same simple, undirected, and 100-percent-blind mechanism of cumulative selection that fashioned the different finch beaks on Galápagos.

The significance of Darwin's extrapolation can hardly be exaggerated. If it was correct, the problem of evolution would be essentially solved, and the emergence of all species, including mankind, finally explained without any recourse to teleology or "laws of form." And for some current hardline Darwinists, the problem of evolution is indeed regarded as solved: New forms of life are the outcome of the machinations of a "blind watchmaker." Daniel Dennett writes: "The fundamental core of contemporary Darwinism... is now beyond dispute among scientists... the hope that it will be 'refuted' by some shattering breakthrough is about as reasonable as the hope that we will return to a geocentric vision and discard Copernicus."⁴¹ Similarly, according to Richard Dawkins, "Darwinism is true, not just on this planet but all over the universe wherever there is life to be found."⁴²

The extrapolation from micro- to macroevolution is certainly seductive. But as I pointed out in *Evolution* (Chapter 4) the fact that an unseeing watchmaker can work his magic on a small scale (as on the Galápagos), the fact that Darwin's mechanism works in a restricted area, the fact that adaptation exists in nature—none of this warrants the assumption that *all* the order of nature (including *all* the Type-defining novelties) is adaptive and can be assembled via functional continuums. There is an almost universal precedent, as the history of science testifies, that over and over again theories that were once thought to be generally valid have proved eventually to be only valid in a restricted sphere.⁴³

Moreover, the greatly-touted success of Darwinism in the restricted field of *microevolutionary* adaptation—classically illustrated by its ability to account for the adaptive diversification of the fauna of Galápagos and

other oceanic islands⁴⁴—is a two-edged sword. While these cases demonstrate that cumulative selection can generate small degrees of adaptive evolutionary change in tiny incremental steps, they illustrate that the mechanism depends on the satisfaction of a demanding condition: *Descendant species (or structures such as novel homologs) must be linked with their putative ancestral species (or structures) via a long series of empirically known or theoretically envisaged functional sequences of intermediate forms.*

This need for adaptive continuums brings us to the nub of the problem, the core contention of *Evolution: A Theory in Crisis*, and the major point defended here: Practically all the novel, taxa-defining homologs of all the main taxa are *not* led up to via adaptive continuums. Moreover, as argued later in this book, many of these novel *Bauplans* do not convey any obvious impression of being adaptive—a fact admitted by Darwin in the *Origin* with regard to one of the classic *Bauplans*, the pentadactyl design underlying the tetrapod limb. It is ironic that the very evidence for believing that microevolution has indeed occurred in cases like the finches—an empirically known or readily envisaged continuum of forms leading from an ancestral form A to descendant form B—is precisely the evidence that is lacking when attempting to account for macroevolution and the origin of the defining features (feathers, hands, mammary glands, hair, the placenta, flowers, body plan, etc.) of the major taxa.

As we will see in coming chapters, it is widely acknowledged—indeed common knowledge—that the great majority of novelties which define the taxa are not led up to via the adaptive continuums that might have endowed selection with causal directive agency. Unfortunately, very few are prepared to follow the logical implication of this absence: namely, that the origin of the basic Types of nature must have been determined or directed by causal factors other than gradual cumulative selection.

In the next chapter, we will begin to examine just how widespread taxa-defining novelties actually are—and how many evolutionary biologists are now acknowledging that evolutionary theory has yet to account for them.