

Life Without Evolution

*A Collection of Essays Challenging Scientific Theory and
Popular Belief in the Evolutionary World View*

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***The Darwin-Tinted
Spectacles***

*All philosophers, who find
Some favourite system to their mind
In every point to make it fit,
Will force all nature to submit.*

Thomas Love Peacock, *Headlong Hall*, 1816

Contents

Visible Evolution	3
Places to “See Evolution Playing Out”	3
In the Light of Evolution	6
Evolution as a Preconception	7
Mutation	9
Natural Selection	9
Adaptation	14
Degeneration	15
Competition	17
Artificial Selection	18
Speciation	20
Mass Extinctions and Macroevolution	21
Stasis in the Fossil Record	32
Summary and Conclusions	34
Authored and General Sources	37

Visible Evolution

During the last century and a half a colossal body of evidence has been raised, purporting to reveal the mechanism by which biological evolution occurs. Within that body of evidence, none could be more convincing than direct observation of the process itself actually happening. In order to persuade a curious and sometimes doubtful wider public that evolution is not ‘just a theory’, the scientific community employ real life examples in which it is suggested we are able to ‘see evolution’. Commonly used examples of ‘evolution in action’ include camouflage adaptation in the peppered moth, changing beak size in the Galápagos Finches, build up of resistance in insect pests, and mutated strains of bacteria.

But these are examples of *microevolution*, which may be defined in genetic terms as any observable change in the proportions of genes in a living population. In theory, microevolution has the potential to lead to the origin of a new specie,* if several genetic changes accumulate in a population over time. In practice, changes in the proportions of genes do not usually result in the formation of a new specie; indeed, they may sometimes be reversed, as was the experience with the peppered moth and with the Galápagos finches. So when we see microevolution it does not necessarily follow that we are seeing a way in which new species originate.

In comparison, new species appearing in the record of prehistoric life can represent genetic change of a different order of magnitude. Fossil chronology does not simply exhibit the sudden arrival of new species, but of species representing new genera, families, orders, classes and phyla. The study of these larger scale changes in the history of life is the subject of *macroevolution*.

Statements claiming that macroevolution can be ‘seen’ through fossils are somewhat equivocal, for they often make no distinction in meaning between patterns of change and the process of change. Of course we see changes in the kinds of life forms present across the fossil record, but that does not mean we see one kind of life form actually changing into another. To literally ‘see’ such a process of transmutation would require fossilised frame by frame modifications, and these never exist in reality. Much of what is ‘seen’ in macroevolution is therefore a projection of the mind.

The arguments presented in this essay focus on the unreliability of making grand assumptions about evolution. When we see microevolution in action, it does not follow that we are seeing how species are formed; and when we see patterns of change in macroevolution, it does not mean we are seeing transmutation between fossils. To these two ‘reality checks’ may be added a third: when we *do* see speciation on very rare occasions, it does not mean we are seeing a process that can easily explain macroevolutionary change. But in truth, the Darwinist will always see what the Darwinist wants to see.

Places to “See Evolution Playing Out”

By virtue of their unique assemblages of endemic species, oceanic islands have always held a special fascination in the study of speciation. If it were possible to design an experiment in geological time, we would set aside an isolated area of bare terrain, introduce a few pioneer species, and return a few million years later to observe

* I use ‘specie’ as an alternative singular form of ‘species’.

the changes in biodiversity. In the case of remote volcanic islands, such as Hawaii and the Galápagos, the conditions for this experimental design have conveniently been provided by nature, and that is why such islands have often been dubbed ‘natural laboratories of evolution’. The only drawback in these natural experiments is that, although we have the results, we were not able to follow the method.

As a slightly eccentric, amiably loveable English Professor, whose experimentation includes the sampling of local fauna and flora at his dining table, Richard Fortey is one of television’s more endearing science presenters. His mild-mannered style, avoidance of sensationalist dialogue, and preoccupation for his subject-matter rather than for his camera image, must surely win over the affections of many viewers. Richard’s 2016 inspiration *Natures Wonderlands: Islands of Evolution* maintains the highest of BBC production standards, and is, as the title suggests, a documentary about evolution. Lest we should be in any doubt about that, during the two minute introduction repeated for each of the three episodes, he phrases the words ‘evolution’ six times, ‘evolutionary’ or ‘evolving’ three times, ‘Darwin’ twice, and ‘natural selection’, ‘survival of the fittest’ and ‘origin of species’ once each. Our appetites to stay watching are enhanced by promises of ‘evolutionary wonders’, ‘evolutionary creativity’ and ‘evolution in action’, all colourfully filmed on some of the world’s most exotic tropical islands. As a career long paleontologist at London’s Natural History Museum, no one could be better equipped for understanding and teaching the facts and theories of evolution than Richard Fortey himself; but equally, no one would be more likely to view the world through Darwin-tinted spectacles.

The underlying evolutionary theme conveyed by Richard in *Nature’s Wonderlands* is the theory of *adaptive radiation*. Many times over, it would appear, single founding species have colonised islands, and then diversified or ‘radiated’ into a multitude of new species. A virgin island may contain many potential ecological resources that have remained unexploited, simply because no animal or plant has arrived to benefit from the opportunity. When an accidental coloniser does arrive, it begins to exploit not just one, but several of these available resources. As subpopulations begin to plumb each separate resource more efficiently, they adapt and specialise through natural selection. This Darwinian process of ecological adaptation continues, according to the radiation theory, until subpopulations eventually develop into morphologically distinct species, as varied and remarkable as those we recognise on islands today.

The Hawaiian subfamily of finches, known as honeycreepers, represents “one of the best examples of adaptive radiation in the world”, Richard Fortey informs us. Studies of more than 50 living and recently extinct species show that the group utilise a wide range of food sources, including flower nectar, seeds, insects and, in one case, snails. In each specialised specie, the bill is exquisitely tooled for locating, extracting and dealing with its preferred food type. The birds also exhibit a colourful spectrum of different plumages, and some are adapted to different altitudes. Aside from the honeycreepers, viewers are introduced to other famous Hawaiian examples of adaptive radiation, including the 18 species of carnivorous inch worm, 126 species of lobeliad bellflower, and 600 species of fruit fly. Biogeographical and genetic evidence combine to suggest that, in every case, these radiations resulted from single founding species arriving some time during the last few million years.

Spectacular as these unique specie groups are, they do not so much illustrate *evolution in action* as they do *evolution in retrospect*. Adaptive radiation provides a

logical and possible explanation for a natural process that could have happened in the past, but can such a process actually be observed as it is happening now? Are there any real time observations, however small, of animals or plants visibly refining their adaptations to specialised niches? The expectation is raised that there are, for the professor asserts:

“An oceanic island is a kind of natural laboratory, where we can see evolution playing out.”

As a living example of an endemic group “on their way to becoming new species”, Richard selects the Hawaiian red shrimp. Research shows that genetically distinct populations have arisen in isolated rock pools, indicating that, “This is how speciation begins: isolation and adaptation to conditions.” An interviewed researcher describes how different shrimp populations express different variations in colour, and makes much of marked differences in mitochondrial DNA. But he does not elucidate how changes in colour could be an adaptation to contrasting rock pool conditions, and he omits to explain that random mutations in mtDNA only persist in populations due to cell copying, not because they have been selected and preserved as adaptations to the environment. Based on the evidence provided, it has to be said that this example fell short of demonstrating adaptive radiation in any degree. What we were actually being shown appeared to be no more than the phenomenon of *genetic drift*, a random, non-adaptive microevolutionary process that may sometimes (or sometimes may not) contribute to speciation.

The only other real time example of “where we can see evolution playing out” on Hawaii, turns out to be even less convincing. Populations of honeycreepers have ‘evolved’ resistance to avian malaria, introduced by mosquitoes some 200 years earlier. “This is one of the fundamental rules of evolution,” Richard remarks profoundly, “it never stops.” He may call the building of resistance to infection in populations ‘evolution’, but it has nothing to do with adaptive radiation nor any other proposed mechanism of speciation.

In the second episode of *Nature’s Wonderlands*, Professor Fortey travels across Madagascar, where once again, “adaptive radiation is a feature of island life”. Among Madagascar’s extensive endemic fauna, undoubtedly the most iconic group are its famous lemurs. The first founding lemurs are believed to have arrived on a raft of vegetation from Africa about 55 million years ago, and since then “radiated into 106 species of lemur today”.* Richard introduces us to the diminutive mouse lemur, a genus that is “still actively evolving”. DNA studies indicate that many visually similar populations do not interbreed, and that what was once considered a genus of only two species has now expanded to include more than twenty. The “rapid evolution” of the mouse lemur, “has allowed it to spread to different habitats all over the island”. However, there is a contradiction in the narrative at this point, because Richard has already described the mouse lemur as a *generalist*. By definition, a generalist is a specie (or in this case a complex of very similar species) that is already able to exploit different habitats without having to adapt or evolve. And indeed,

* Not all authorities agree with Fortey’s claim of 106 species, e.g. Tattersall (2007) suggested reducing the then total (84) by more than 40%. He cited *taxonomic inflation* as the elevating of subspecies to full species status in order to enhance conservation value.

although the mouse lemur is portrayed as having “adapted to different habitats all over Madagascar”, no evidence is presented to correlate any particular habitat adaptation to any particular genetic change in any particular population. Other research has confirmed that mouse lemurs can exploit varied ecological habitats without the need for genetic adaptation.* It must therefore be questioned how this level of ‘evolution’ helps us to understand, in any way, how the greater diversity of lemurs became so anatomically and physiologically specialised in their habitat requirements.

In a further Madagascan example, where two species of frog can only be distinguished in the field by their call sounds, the presenter declares, “We are witnessing the very birth of a new endemic species here.” But changes in call sounds are no demonstration of adaptive radiation. Random manifestations of novel call sounds may create mating barriers that technically result in new species; but where are the beginnings of any specialised adaptations to new ecological niches?

The ancient volcanic rock of Madeira provides the final location for *Nature’s Wonderlands*. Although introduced as “a place where evolution is still in action”, most, if not all, of what we are shown appears to be the results of evolution presumed to have been in action in the past. The Madeiran wall lizard offers a possible example of natural selection: in cultivated areas its predominant green and brown livery is perhaps a better form of camouflage, while near the coast the more common dark colouration is “possibly” a protection against stronger ultraviolet radiation from the sun. But given that this specie of lizard is believed to have first pioneered the island nearly three million years ago, and that areas of vegetation (though now cultivated) are not a new feature, this is hardly a graphic illustration of current ‘evolution in action’. No real time observations of adaptive radiation, in any small degree, were documented in this episode.

Richard Fortey’s three part series is a fascinating and entertaining insight into island biogeography. But his depiction of oceanic islands as places “where we can see evolution playing out” is an illusory vision. The emergence of resistance to malaria tells us nothing about speciation; random mutations in mitochondrial DNA nothing about natural selection in nuclear DNA; the division of populations by selective mating calls nothing about ecological adaptation; and recent extinctions of honeycreeper and lemur species due to human activity nothing about the origins of these highly specialised groups through adaptive radiation. Yet disease resistance, mitochondrial DNA mutation, mating call barriers and extinction are all presented as elements of evolution. Are television viewers to be so easily beguiled, that when they are shown one type of evolution, they are convinced that they are seeing another?

In the Light of Evolution

When viewed through the lens of evolution, all observations about the living world appear either to *be* evolution or to *be the result* of evolution. It was in 1973 that leading geneticist Theodosius Dobzhansky famously convinced educationists that,

* Yoder et. al. (2000) found that in newly discovered species of mouse lemur, ‘ecological plasticity within clades [groups of closely related species or subspecies] seems to be typical, even at the intraspecific level [within one specie]’.

Nothing in biology makes sense except in the light of evolution.

The American Biology Teacher vol. 35, 1973

And many authors of school text books subsequently engaged with this principle:

The overarching theme is evolution, which accounts for the unity and diversity of life and integrates the books other themes.

Biology, Neil Campbell 1993

The term 'evolution' has a special place in the study of the history of life. It has become the unifying concept which underpins the whole study of biology.

Biological Sciences 1 & 2, Taylor, Green & Hunt 1997

Dobzhansky's maxim was still being used in the *Oxford Cambridge and RSA* advanced level GCE biology syllabus up until 2013, where it was quoted at the start of the section on evolution.

If evolution is the foundation of all biological science, it is a foundation that is easily undermined. For there are plenty of people studying and working in biological fields all over the world, who, usually for religious reasons, do not even believe in evolution; yet they do not have any trouble in understanding their subject. Indeed, a student raised in a family of fundamental creationists is hardly prevented from passing a school biology exam with a high grade, and then progressing on to biology related post-graduate research. Students and workers with religious beliefs about origins are perfectly able to understand and perform practical science, without having to relate everything to an evolutionary framework. This suggests that evolution is not the elemental principle of discovery in life sciences, but rather an imposed conceptualisation.

Non-believers in evolution are not compelled to deny the reality of micro-evolutionary processes. They know that mutation, competition, natural selection and adaptation all happen, and that some of these processes might sometimes contribute to what may be defined as a speciation event. But they do not agree that these same microevolutionary processes can explain macroevolutionary change. Neither do they see that either microevolutionary processes or macro-evolutionary theories form a necessary basis for understanding all areas of biology.

Needless to say, substituting the lens of evolution with the lens of a scriptural narrative, such as the Genesis or the Quran creation story, is no less of an imposed conceptualisation. Neither scientific nor religious dogma will lead to an objective view of the natural world: and herein lies the greatest challenge to us all. Total scientific objectivity requires us to be mindful, not just of our personal prejudices, but of all cultural expectations and peer pressures too. Few indeed, are those who can even recognise, let alone isolate themselves from all these social influences.

Evolution as a Preconception

The exclusively taught *neo-Darwinian theory* (also known as the *modern synthesis*) maintains that microevolution, speciation and macroevolution are simply different time perspectives on the one continuous process of evolution – natural selection acting

on small variations. Microevolution eventually leads to speciation, and the origin of species eventually leads to the origin of higher groups and macro-evolutionary change.

When such a theory is presented uncritically, selecting only arguments in favour and ignoring arguments in dissent, this is a form of indoctrination. In order to transcend indoctrination it is important to consider alternative opinions, and then come to your own conclusions about the reliability of a theory without merely succumbing to pressure from the majority.

By far and away the most intellectually formidable challenger to the adequacy of the neo-Darwinian theory, was the Harvard paleontologist and evolutionary theorist Stephen Jay Gould.* Never convinced that the gradual accumulation of small adaptive changes in populations could fully explain speciation, Stephen was even less convinced it could explain macroevolution. He therefore opposed the single process view, and supported the idea that different mechanisms operated at different levels:

Evolution is a hierarchical process with complimentary, but different, modes of change at its three major levels: variation within populations, speciation, and patterns of macroevolution. (Gould 1980)

In separating microevolution (variation within populations), speciation and macroevolution into ‘different modes of change’, Stephen Gould was clearly invoking the need for additional or alternative mechanisms of organic transformation. Ultimately his attack on established thinking lacked ammunition, because none of the alternative mechanisms he hypothesised (such as rapid reorganisation of the genome) could be verified by empirical evidence. But the disturbing power of Stephen’s theoretical work does not lie in what he hypothesised, rather in the unintended implications of his entire argument. If the neo-Darwinian theory offers an insufficient model – as he so cogently argued – and no other more convincing model can be produced – as he himself failed to do – then the underlying conclusion is uncomfortably apparent: no truly demonstrable or fully reliable theory of higher-level evolution is actually in existence.

Brave and independent thinkers may wish to go further than Gould. Let us consider the possibility that the construct of evolution is not the brilliantly interwoven tapestry of evidence it appears to be, but rather an artificially fabricated and skilfully touched montage: a false picture created by sticking together an assortment of natural phenomena that bear no such relationship in the real world.

Removing the Darwin-tinted spectacles does not turn one against science. On the contrary, it turns one into a better scientist, free from the constraints of preconception. There are many components to the construct of evolution: variation, mutation, competition, natural selection, artificial selection and extinction to name but a few. But does each component genuinely add to an understanding of the whole, or does the imposition of the whole influence the perception of the parts? A sharper examination of each separate component, with a critical eye rather than ‘in the light of evolution’, reveals that ‘seeing evolution’ is a faculty of the imagination.

* Stephen Gould did not question the validity of the neo-Darwinian theory, but he questioned the dominance of it. Often accused or portrayed as being anti-Darwinian, he defended himself as a great admirer of Charles Darwin and respector of his work.

Mutation

The idea of mutation is so closely bound up with the idea of evolution, that the two are often conflated in meaning. Certainly, mutation is of paramount importance to evolutionary theory; for it is considered to be the source of all genetic variation, and, ultimately, all genes. But this does not mean that every time we see a mutation we are ‘seeing evolution’:

Some contemporary biologists, as soon as they observe a mutation, talk about evolution. They are implicitly supporting the following syllogism: mutations are the only evolutionary variations, all living beings undergo mutations, therefore all living things evolve.

Pierre Paul Grassé, *Evolution of Living Organisms*, 1977

The false logic played in Grassé’s syllogism works by equating genetic change in the individual (mutation) with genetic change in the population (evolution). Only in very rare circumstances does a mutational change in the individual lead to an evolutionary change in the specie.

Despite this obvious fallacy, scientists today still fail to overcome the semantic ambiguity between mutation and evolution. In an article appearing in *New scientist* in 2009, the author interchanges the concept of genetic mutation with the notion of ‘gene evolution’ (Le Page 2009); and researchers artificially inducing DNA mutations to hunt for commercially useful new proteins and enzymes, see their work as ‘directing evolution’ (Arnold 2016) or ‘speeding up evolution’ (Rutherford 2016).

A reality check on naturally occurring mutation confirms it to be an abnormality in genetic copying that is quite independent of, and usually unconnected to, evolution:

- The great majority of mutations that affect the structure and functioning of an organism through inheritance, are harmful. They are detrimental to the development, health, viability, fitness and survival of living things.
- The great majority of all mutations (harmful or otherwise) are not novel or unique. The same old mutations tend to recur through populations over time.

At the genetic level, evolution is typically defined as a change in the frequencies of genes in a population over successive generations. A mutation is a genetic change in an individual, not in a population. Given that the majority of mutations are harmful, and that the majority of unharmed mutations already exist in a population, it is indubitably true that the overwhelming number of mutations will not result in evolution. So when we see a mutation, it is extremely unlikely that we are ‘seeing evolution’.

Natural Selection

In the 1929 preface to his seminal work *The Genetical Theory of Natural Selection*, Ronald Fisher began with a preliminary clarification:

Natural Selection is not Evolution. Yet, ever since the two words have been in common use, the theory of Natural Selection has been employed as a convenient abbreviation for the theory of Evolution by means of Natural Selection, put forward by Darwin and Wallace. This has had the unfortunate consequence that the theory of Natural Selection itself has scarcely ever, if ever, received separate consideration.

Ronald Fisher viewed natural selection as an ‘independent principle’ that need not be understood only within the framework of evolution. If, as Ronald preferred, we ‘consider the theory of Natural Selection on its own merits’, then there is no need to even speak of evolution; and indeed the author used the word ‘evolution’ very sparingly in his 284 pages of text. Yet despite Fisher’s note of caution, the passing of many decades of scientific thought and social change have failed to erode what remains set in stone in the common consciousness: that evolution equates with natural selection, and natural selection *is* evolution.

But Ronald Fisher was correct: when we study natural selection, we are not necessarily studying evolution. More significantly, when we observe natural selection in action, we are not necessarily seeing evolution. Natural selection may result in evolution, but in many cases it does not.

The most enduring textbook illustration of natural selection is that of the peppered moth. In a camouflage response to soot covered surfaces during Europe’s industrial revolution, the proportion of the black form of the moth increased in urban areas, and then reduced again after the introduction of cleaner technologies. Early experimenter Bernard Kettlewell described this example of *industrial melanism* as:

The most striking evolutionary change ever actually witnessed in any organism. (Kettlewell 1955)

Sixty-one years later, a research team isolating the genetic element responsible for the black form were still referring to the peppered moth as:

The classroom example of a visible evolutionary response. (Van’t Hof et al. 2016)

But Eugenie Scott (1996) insisted that the peppered moth was not an example of evolution, rather ‘a good example of a confused understanding of evolution’. As Executive Director of the National Center for Science Education in the USA, she advised science teachers that:

Industrial melanism is an example of natural selection, not of evolution.

Extensive research by Michael Majerus of Cambridge University between 2001 and 2006 supported the findings of Kettlewell’s earlier work. The interaction between bird predation and camouflage was confirmed to be the chief factor responsible for the colour changes observed in local populations of moths. Industrial melanism in the peppered moth is indeed a clear example of natural selection. But should it be

described as ‘an excellent teaching example of Darwinian evolution in action’ (Majerus 2009)?

Natural selection is a mechanism that allows plasticity: gene pools may swing one way, then in another, then back once again in response to fluctuating conditions. In contrast, speciation (the origin of new species) requires changes in the gene pool to be permanent or fixed. It also requires a division of the population, with at least some interruption of gene flow. In the case of the peppered moth there was no net change: pale coloured populations turned dark and then returned to pale. There was also no evidence of any restriction of gene flow between pale and dark forms. This cannot, therefore, be interpreted as the beginnings of a process of speciation.

No origin of species, no evolution.

There is, however, another classic observation of natural selection that *has* been construed by researchers to exemplify the process of speciation. It concerns the so-called ‘Darwin’s finches’ of the Galápagos Islands. The Galápagos archipelago and its finches are emotively and mythically associated with the inspiration for Charles Darwin’s evolutionary theories; and for this reason alone there is a temptation to over-interpret observations from this legendary setting. Darwin himself made no specific mention of the Galápagos finches in his *Origin of Species* (1859), though he previously noted in his *Journal of Researches* (1845) that:

The most curious fact is the perfect gradation in the size of the beaks in the different species of *Geospiza*... 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.

There are about 15 named species of finch inhabiting the Galápagos and Cocos Islands, though opinion varies as to whether the true total should be greater or smaller than this number (Webb 2015). They are all dull coloured birds of sparrow-like proportions, yet despite their obvious close relationship the species have been separated into five different genera. The most remarkable feature within the group is the variation in the shape and size of their beaks, which are specialised to make use of different food sources. They range from the heavy parrot-like beak of the vegetarian finch, feeding on fruit, buds and seeds, to the delicate needle-like beak of the warbler finch, used for picking off small insects and spiders. The Galápagos finches are another classic example of (assumed) adaptive radiation, the process described by Richard Fortey in his *Islands of Evolution*; and another classic example of ‘seeing evolution in action’ that is really a case of seeing the results of evolution having been in action in the past. However, according to lead researcher Peter Grant of Princeton University:

The finches of the Galápagos... have now been observed to evolve in real time.

I have seen the finches evolve in response to climatic changes during the past dozen years.

Natural Selection and Darwin’s Finches, 1991

Peter's research, carried out with his wife Rosemary and with the assistance of graduate students, focused mainly on two species residing on the 100 acre islet of Daphne Major: the medium ground finch *Geospiza fortis* and the cactus finch *G. scandens*. The work is of exceptional value in that data has been collected annually through four decades, and within the conditions of an entirely wild environment. The genetic changes observed in the finches, however, arose from a complex interaction of ecological factors. As an example of natural selection in action, it does not mirror the relatively simple interpretation provided by that of the peppered moth. For one thing, changes in gene frequency were complicated by hybridisations between species.

From each bird the Grants took six measurements that were reduced down to three 'synthetic traits': body size, beak size, and beak shape. A surprising aspect of the results was that the mean values for these highly heritable traits were constantly changing; not simply due to random variation and environmental factors, but because 'natural selection occurred frequently in both species' (Grants 2002). One of the most dramatic of these 'selection events' took place near the beginning of the study period, during a severe 18 month drought that began in mid 1976. Owing to a shortage of food, the finches suffered very high mortality rates – 85% in the case of the medium ground finch. But in both species, survival favoured larger individuals with larger beaks. This in turn led to an increase in average body and beak size of about 4% in the next generation of *fortis*. The Grants ascertained that the normal abundance of small seeds had been exhausted, leaving the less palatable larger and harder seeds that only the birds with deeper beaks could crack.

Between 1984 and 1986 weather conditions resulted in a reversal of these trends:

A relative scarcity of large seeds, together with an ample supply of small ones, favoured small finches. Because the food supply on this island changes in composition and size from year to year, the optimal beak form for a finch is shifting in position, and the population, subjected to natural selection, is oscillating back and forth with every shift (Grant 1991).

The beak shape in the medium ground finch population also changed in the mid 1980s, becoming more pointed.

Because the Grants have witnessed modifications in body size, beak size and beak shape brought about by natural selection, and given that these three traits are the main distinguishing features among the 15 species of Darwin's finch, it is easy to make the argument that the process of speciation has actually been observed. And indeed, Peter Grant and a colleague extrapolated the results from Daphne Major to estimate how long it would take for one species of finch to transform into another. But speciation is an elusive process that many have struggled to unravel, and it requires more than just natural selection.

The development of a new species can only happen if trait changes are cumulative and also permanent. But the trait changes recorded in the Grants' study do not follow this pattern: they are either fluctuating, or liable to be temporary because they are responses to short term weather cycles. In a process of adaptive radiation we would expect to see the gradual refinement of traits toward new and unexploited resources, or toward increasing specialisation. This is not what is being seen here. The birds are adapting to changes in the composition of their food supply that occur every few

years, with the result that modifications to bill size and shape are continually changing direction.

An essential element of speciation is the divergence of character traits within or between populations. In the case of the medium ground finch and the cactus finch, no such divergence was observed either within or between populations of these two species. On the contrary,

G. scandens, a larger species, displayed more gradual and uniform trends toward smaller size and blunter beaks, thereby converging toward *G. fortis* in morphology (Grants 2002).

This convergence of species (the opposite of divergence) appears to have been brought about by their interbreeding, and not by natural selection. Other trends that might indicate the divergence of populations, rather than their convergence, would be the appearance or strengthening of breeding incompatibility, or a reduction in hybrid fitness. Neither of these phenomena were observed.

Nevertheless, a subsequent natural selection event that began in 2004 did result in a divergence of one beak trait between the medium ground finch and a third species, the large ground finch *G. magnirostris*. In another drought induced brutal cull, birds failed to breed and a high proportion died of starvation. This time it was the larger seeds that were depleted first, owing to the efficient exploitations of an immigrant population of large ground finch that had not been present in 1976. Selection now favoured the smaller beaked individuals of *fortis*, which were able to survive on tiny seeds that were of no value to *magnirostris*. Competition for food resources between the two species had thus forced an adaptive change in *fortis* towards smaller beaks, and the difference in average beak size between the two species was now greater than it had been before.

Peter and Rosemary Grant (2006) documented this event as ‘the strongest evolutionary change seen in the 33 years of the study’, and concluded that such species interactions were likely to be significant ‘specifically in the final stages of speciation and more generally in adaptive radiations’. And yet it seems extremely unlikely that what they had witnessed actually constituted any real stage in speciation or adaptive radiation. It seems more likely, during a year of more plentiful food supply, or when the large ground finch returns to being an occasional visitor to Daphne Major, that the beak trait in the medium ground finch will be reversed once again. *G. fortis* is simply a variable species that can quickly adapt to fluctuating conditions: it is not a bird that is in the midst of speciation.

In drawing attention to the ‘distinctive features’ of their long-term study, the Grants (2002) identify ‘the macroevolutionary context of an adaptive radiation’. The problem here is one of definition, for the authors appear to be including speciation within the purview of *macroevolution*. Other authors confine the term to mean the origin of groups above the level of species, and I support the view that it should only apply to the origin of groups above the level of genus. But the precise point of delineation between microevolution and macroevolution is irrelevant to those who believe they are one and the same process:

Studies of natural selection in natural environments have broader implications, for they help us understand more directly the evolution of

organic diversity over the long history of the earth, the problem Darwin tried to solve. The finches named after him provide an unusually clear illustration (Peter Grant 1991).

The above passage of scientific prose allows us to visualise the Darwinists' system of thought, without necessarily agreeing with their system of logic.

If the idea of evolution is to have *any real meaning* in accounting for the history of life, it must at the very least explain the origin of species, let alone the origin of more divergent animal and plant families. Natural selection has the potential to originate new species, but most of the time it does not. When we see natural selection in the wild we are not usually seeing speciation, nor even any stage in speciation. It is therefore a misperception to view natural selection as evolution.

Adaptation

Darwin's finches and the peppered moth are good examples of natural selection and of microevolution, but they are also examples of adaptation: a genetic response in a population that enables it to survive a change in its environment. As with natural selection and microevolution, adaptation is frequently interpreted as evolution even when it does not constitute a stage in speciation. But adaptation is also given to be the major mechanism by which macroevolution is driven: fish transformed into amphibians by adapting to land; tree climbing apes transformed into humans by adapting to walk across the savannah. Do observations of adaptation in real life offer us a visible process that we can utilise and extend to explain macroevolution?

They do not. However many times the peppered moth changes the colour of its wings, it will not give rise to a new taxonomic family of moths. Such a transformation would require multiple genetic changes to the structure and functioning of the organism. No matter to what extremes Darwin's finches change the size and shape of their bills, it will reveal nothing about how the first prehistoric beak could have transmuted from a reptilian jaw. These examples of adaptation provide us with no insight at all into how macroevolutionary change might occur, yet Darwinists still believe they are seeing evolution.

Bacterial resistance to antibiotics builds up through the survival of existing strains or mutant individuals that happen to have some natural tolerance to the effects of the drug. These tolerant individuals then multiply to become the dominant strain, and the population is said to have become resistant. This is a process of adaptation through natural selection. But a tuberculosis bacterium that has developed resistance is still a tuberculosis bacterium. It will never transform into anything more than a bacterium, regardless of how many drugs it develops resistance to. In attempting to explain the early history of macroevolution, in which bacteria were followed by the first living cells with a nucleus, adaptation to lethal drugs furnishes no information.

In just 60 years the Colorado potato beetle has developed resistance to 52 different compounds belonging to all major insecticide classes (Alyokhin et al. 2008). The process of building resistance in beetles is the same as that observed in bacteria: populations adapt to lethal factors introduced into the environment through the survival and multiplication of naturally tolerant individuals. But the prognosis is also the same: under this chemical insecticide regime resistance will continue arise for ever

more, but no Colorado beetle will be driven to transmute into another kind of beetle, and no evidence will emerge to suggest how beetles diverged from moths or grasshoppers into separate orders of insect. Nevertheless, bacterial adaptation to antibiotics and insect adaptation to pesticides are two of the most common examples used by educators to illustrate ‘evolution in action’.

The terms *mutation*, *natural selection* and *adaptation* precisely and adequately define the phenomena to which they apply. Substituting them with the catch-all term *evolution* reduces the clarity and accuracy of what is being perceived. But much more than that, it tends to evoke pretensions of some grand universal theory, loading simple observations with greater significance than they actually have.

Degeneration

Any new scientific evidence suggesting that human beings are still actively evolving is guaranteed to capture media headlines, and so it was in December 2016:

“Caesarean births ‘affecting human evolution’”

Helen Briggs, *BBC News*

“C-section births may give rise to evolutionary changes”

Randy Dotinga, *CBS News*

“Success of C-sections altering course of human evolution, says new childbirth research”

Peter Walker, *Independent*

“Are Caesareans really making us evolve to have bigger babies?”

Clare Wilson, *New Scientist*

The source of this media flurry was a theoretical research paper by Philipp Mitteroecker and colleagues, published in *Proceedings of the National Academy of Sciences*. The paper looks at the peculiarly human problem of obstructed labour: ‘Compared with other primates, human childbirth is difficult because the fetus is large relative to the maternal pelvic canal.’ Medical literature indicates that larger babies have a slight survival advantage, until they become too large to pass through the birth canal. But with the increased use of Caesareans, larger babies and women with narrower pelvises are able to survive difficult births, and pass on their genes to the next generation. With natural selection no longer eliminating the genes that contribute to disproportion in size between fetus and pelvis, the researchers predict that, ‘the regular use of Caesarean sections throughout the last decades has led to an evolutionary increase of fetopelvic disproportion rates by 10 to 20%’.

The authors’ prediction is based on a mathematical model, which cannot be validated by any reliable body of medical data. There is no way of knowing whether Caesareans have in reality led to a genetic or ‘evolutionary’ change in the human population. The genetic architecture governing the relationship between fetus size and pelvis size is very complex, and bodily proportions are also influenced by environmental factors such as nutrition and general health. In addition, the increased

use of Caesareans is often a matter of choice over necessity. Yet I wonder how many readers of these media headlines will have been led to believe that this ‘evolutionary change’ has actually been observed.

Victorian and early 20th century eugenicists made a somewhat different prediction. They proposed that technologically advanced societies would gradually suffer physical and mental degeneration, and become increasingly dependent on medical assistance. But they did not regard this potential threat as a continuation of evolution; rather, it was considered to be the cessation of evolution. The dystopian future they feared would not come about as a result of natural selection, but by the absence of it; not through the survival of the fittest, but the survival of the unfit.

If the prediction made by Mitteroecker’s research team were correct, it would represent a human genetic change away from fitness. Historically, natural selection would have brutally maintained an optimum balance between baby size and pelvis size. But if Caesarean sections are moving that balance toward a greater incidence of fetopelvic disproportion, there will be a feedback effect of ever greater dependence on medically assisted births. This is precisely the kind of degeneration that the old eugenicists predicted.

Like most features of human anatomy, size of fetus at birth and female pelvis width are highly variable. Caesarean sections may allow a slightly greater range of variation to survive in the population, and, if so, this would technically count as a microevolutionary change in some demographic groups. But do such minor microevolutionary changes offer any solution to the mysterious processes of speciation and macroevolution? Variations in pelvis width predict nothing about how the quadrupedal pelvis of a presumed chimpanzee-like ancestor, could have gradually transformed into the functionally different structure of the bipedal human pelvis. Nor do such variations suggest any other aspect of macroevolution, nor any indication of impending speciation.

In evolutionary biology, degeneration is defined as ‘the reduction in size or complete loss of organs during evolution’ (*Oxford Dictionary of Biology*). It is thought that when organs fall into disuse they are no longer maintained in prime condition by natural selection, and suffer an accumulation of deleterious mutations. Two commonly given textbook examples are the atrophy of wings in flightless birds, and the loss of eyes in a wide range of cave fauna.

In the case of flight degeneration it is not just the anatomy of the wings that has been reduced. Flight is an energy demanding activity, and there is evidence to suggest that the mitochondrial process that provides cell energy has been compromised in flightless birds. Mutations that would have been quickly selected out in flying birds, have been allowed to accumulate in flightless birds where the energy demand is not so high (Shen et al, 2009).

In some instances of cave blindness, it seems that the traditional theory of degeneration has been superseded by a new understanding. Environmental factors, such as light intensity, affect the selection or switching of genes that simultaneously arrest eye development and enhance other sensory organs. In the Mexican cavefish *Astyanax mexicanus*, in which surface and cave populations of the same specie

interbreed, the aborted development of eyes may be to some extent a plastic adaptation rather than a permanent degenerative feature.*

Like all genetic mechanisms, those responsible for degeneration are complex and integrated, and far from fully understood. Regardless, degeneration is perceived to be an ‘evolutionary phenomenon’: at the microevolutionary level because it entails genetic change to populations, and at the macroevolutionary level because it is assumed to have played an important part of the history of life (e.g. loss of limbs in whales). Yet it offers no serious insight into how medleys of genes arose and organised themselves in the first place to produce wings, eyes and other sophisticated organs, before degeneration may have ensued.

The loss of functionality or reduction in efficiency of structures that no longer serve any survival purpose, informs nothing about how those structures were constructed in their original form. Degeneration is not a creative process. On the contrary, it has sometimes been regarded as the opposite of evolution.

Competition

Following its introduction from North America in the 19th century, the grey squirrel began to displace the native British red squirrel from much of its former range. ‘The grey squirrel is widely accepted as the main reason for the decline of the red squirrel over the past century’, and ‘without conservation management, red squirrels will become extinct from the UK mainland’ (The Wildlife Trusts 2017). The grey out-competes the red for food and habitat resources, but also spreads the deadly squirrel pox virus to which the red has little immunity.

The red squirrel is the Squirrel Nutkin of Beatrix Potter, and is particularly cute with its long, tufted ears and bushy red tail. Its conservation management, on the other hand, includes the trapping and shooting of greys. These are emotive issues.

Some years ago the topic caught my attention on a radio broadcast, in which the invited wildlife expert dispassionately dismissed the plight of the red squirrel as “evolution at work”. The grey squirrel was better adapted, she reasoned, and we should “let evolution take its course” (anecdotal). The recurring topic was raised again through the medium of radio by BBC presenter Paddy O’Connell in 2017:

What do you think about killing one species of squirrel to save another...?
Perhaps you’d need to tell me to let nature take its course. One squirrel is the same as another squirrel, and if the red is weaker than the grey, that is the way the system works – evolution!

The Darwinian theme of *survival of the fittest* is hard to miss in Paddy’s prompting of the listeners’ responses.

Competition is a key principle of Darwinian evolution; it is the same principle that Darwin himself more commonly referred to as *the struggle for existence*. In the ecological interplay between grey and red squirrels we are certainly seeing the survival of the fittest, acting through competition between species: the grey is surviving well and the red, without the intervention of conservation measures, would be threatened

* For further discussion and research into competing hypotheses about visual degeneration in *Astyanax* see Jeffery et al. (2003), Cabej (2011), and Bradic et al. (2012).

with extinction. The radio personalities mentioned above had drawn the obvious connection between survival of the fittest and evolution. In this case though, nothing has evolved. There have been no genetic changes in either population to suggest any new adaptations towards a competitive edge, and certainly no changes to indicate the beginnings of a speciation event. Competition between squirrels has not led to the potential origin of a new specie, only to the potential extinction of one.

Competition is enacted every day on garden bird tables, as the larger, more aggressive birds (and squirrels!) take precedence over the smaller, more timid species. And competition is viewed in the human condition on the daily news, as rival ethnic groups fight wars over territory and resources. In nature we observe competition, or the struggle for existence, or the survival of the fittest, all the time. But the vast majority of these observations do not result in any microevolutionary genetic changes, let alone in the origin of a new specie. So when we see competition, it is very unusual to be seeing evolution.

Artificial Selection

I once heard a television gardener who was breeding roses say that he was 'only continuing evolution'. This equating of the artificial with the natural was pushed a little further in the early 2000s, when biotechnologists began to introduce alien genes into food crops: public alarm was countered with the reassurance that this too was 'only doing what nature had been doing for millions of years'. It is now common practice in the scientific community to refer to artificial selection and genetic engineering as 'evolution'. No distinction is seen between the course of natural biodiversity and the course of human ingenuity, simply because both involve genetic change.

Charles Darwin used artificial selection as an analogy for evolution by natural selection. The selection by nature of varieties favourable to survival, was explained as being comparable to selective breeding by humankind of varieties favourable to economic benefit. If man could modify the form of living things then so could nature, though not in exactly the same way. However, the two original co-exponents of the theory of specie modification by natural selection, Charles Darwin and Alfred Russel Wallace, disagreed as to the value of this comparison. Charles build his argument upon observed variation and modification in domestic breeds, and repeatedly made use of the analogy in his *Origin of Species*:

I have called this principle, by which each slight variation, if useful, is preserved, by the term Natural Selection, in order to mark its relation to man's power of selection. (p58)

Can the principle of selection, which we have seen is so potent in the hands of man, apply in nature? (p75)

As man can produce and certainly has produced a great result by his methodical and unconscious means of selection, what may not nature effect? (p78)

But Alfred Wallace considered the analogy inappropriate, as documented in his paper “On the Tendency of Varieties to Depart Indefinitely from the Original Type,” presented to the Linnean Society in 1858 along with the first public unveiling of Darwin’s theory:

We see, then, that no inferences as to the permanence of varieties in a state of nature can be deduced from the observation of those occurring among domestic animals. The two are so much opposed to each other in every circumstance of their existence, that what applies to the one is almost sure not to apply to the other. Domestic animals are abnormal, irregular, artificial; they are subject to variations which never occur, and never can occur, in a state of nature.

Wallace’s objections to the analogy have been long ignored; but Darwin’s perception of artificial selection, as an analogy to evolution by natural selection, has been transformed in more recent times into the perception that artificial selection *is* evolution. Thus, scientific authors now speak of ‘the evolution of the dog’ as though it were the same process as, and a mere continuation of, the evolution of the wolf. The Berkeley University of California website *Understanding Evolution* (accessed 2017) states that the cultivation of vegetables from wild forms ‘is evolution through artificial selection’. Researchers now refer to the relationship between humans and their crops as ‘co-evolution’ (e.g. Jackson 1996). This conceptual merger between artificial and natural processes is taken to the extreme by science writers and science fiction writers, who speculate on the future potential for the human specie to ‘control its own evolution’ using genetic implantation, embryo selection, and other laboratory techniques.

These re-presentations of artificial selection and genetic engineering as mere continuations of a natural system of evolution, are founded on the meaninglessly broad notion that any kind of genetic modification should be regarded as evolution, *regardless* of the circumstances. But such technological practices use methods and generate products that would not arise in natural ecosystems, as Wallace made clear long ago. Artificial selection and bioengineering could hardly have contributed to the natural origin of species, or to the history of macroevolution. It is therefore a distortion to rebrand these practices as ‘evolution’. The metamorphosis of an analogous process into the process it is supposed to be an analogy of, is an extraordinary departure of scientific thinking.

The inclusion of artificial methods among forms of evolution also raises a serious philosophical difficulty. The whole notion of material evolution is that of a self-transforming mechanism, undirected by any external purpose or intelligence. Contrived human intervention is nothing less than intelligent design, the very antithesis of Darwinian evolution.

It is essential to appreciate that artificially manipulated life forms are developed through purposeful intelligent guidance in circumstances detached from the normal multifarious influences of nature. We need to be wary of drawing close parallels between what breeders and bioscientists achieve, and what the unaided forces of nature are imagined to achieve. Artificial selection should not be regarded as equivalent to, or tantamount to, any natural process of evolution.

Speciation

Considering the total number of species on planet Earth (excluding bacteria) is probably in the order of 7 to 10 million (Mora et al. 2011), direct observations of natural selection and adaptation are fairly rare. Documentations of selection and adaptation actually resulting in a visible new specie are extremely rare; but one example is provided by the McNulty Mine monkeyflower *Mimulus cupriphilus*. Researcher Mark Macnair of Exeter University described the appearance of this specie as ‘a recent evolutionary event’:

The evolution of this taxon [specie] has probably occurred within the last 150 years, and most probably within the last 50 (Macnair 1989a).

M. cupriphilus is derived from the common yellow monkey flower *M. guttatus*, a highly variable wild flower found commonly throughout northwest America. The novel form developed within the semi-natural landscape of disused copper mine workings at a locally confined site in California.

The opportunity for *Mimulus* to adapt to a new environment probably arose in the following sequence of events. A local population of *M. guttatus* became genetically tolerant to the copper contaminated soils left by mining activities, through the process of natural selection. *Guttatus* thrives best in moist habitats, and it grows along the stream beds traversing the polluted area. But it can also survive on the drier mine waste heaps. Here, it grows less vigorously as a smaller plant producing fewer flowers and seeds; but it is able to maintain a population in these harsher conditions because there is little or no competition from other species. The arid, nutrient poor soil of the heaps also forces *guttatus* to finish its life cycle early in the season, in contrast to the more favourable stream locations where plants are able to continue as perennials. Having established themselves in a hostile environment, colonisers were then under pressure to adapt to their new conditions.

While visiting the Californian site in 1985, Mark Macnair discovered the previously undescribed form of monkeyflower. It appeared more branched and more floriferous, and the stems showed no tendency to turn red. The flowers themselves were smaller, featured less spotting, and had different shaped petals. Genetic breeding experiments carried out using seeds collected from the aberrant and typical forms, confirmed that this was a new specie of *Mimulus* that differed in ‘at least six independent genetic systems’ (Macnair 1989c).

The common yellow monkeyflower is generally insect pollinated; but the new form is less attractive to insects, and, owing to its smaller flowers, freely self-pollinates. Exchange of genes between the new and typical forms is therefore limited, and *cupriphilus* conforms to the definition of a biological specie.

As Macnair and his co-researchers (1989b) make clear, this example of speciation in *Mimulus* occurred mainly through ecological adaptation. By transforming into a committed early season annual, the new specie is able to set more seeds before the hotter, drier conditions of late spring ensue. It also produces more seeds per plant than *guttatus*, where the two species grow together on arid soils. Many plant species are believed to have originated through chromosome mutations or through hybridisation, but in this example natural selection and adaptation have played a major role.

The McNulty Mine monkeyflower has only been found growing on two neighbouring mine waste heaps, despite a thorough search of the surrounding area. Given that these heaps have only been in existence since copper mining began here in the 1850s, and would have suffered disturbance until activities ceased around the 1950s, it seems highly probable that the divergence of this specie from the common yellow monkeyflower is a very recent event. This is indeed an instance of speciation being observed within a known historical time frame: an example of speciation actually being seen in action.

It is also an example of the origin of a new specie according to traditional Darwinian theory – natural selection acting on natural variation. But the slight modification of one kind of flower into a different, but still very similar new kind, does not lend any great insight into macroevolutionary change. It provides no understanding, for example, of how the complex reproductive structure of a flower originated in the first place; nor of how flowering plants as a group might have transformed from some simpler plant group. Seeing natural selection and adaptation leading to the divergence of two very similar species is one thing; but to equate this with seeing a mechanism that could account for fundamental biological differences at the macroevolutionary level is a leap of the imagination.

Mass Extinctions and Macroevolution

The studies of population genetics so far discussed have been concerned mainly with small-scale modifications within species. They represent varied aspects of *microevolution*, which may be more fully defined as dynamic fluctuations in the relative abundance of genes in breeding populations that can be observed through generations in real time. Although all such observations are regarded as ‘evolution in action’ in academic teaching, they are very rarely seen to actually result in the origin of a slightly different new specie, and never in a markedly different specie. But surely the one place where evolution must really be visible, on a larger scale and over the greater expanse of time, is in the fossil record:

The fossil record provides snapshots of the past that, when assembled, illustrate a panorama of evolutionary change over the past four billion years.

Understanding Evolution, UCMP (2017)

Most of the evidence for evolution comes from the fossil record.

BBC Schools (2014)

Within the fossil record we see the emergence not just of new species, but of new genera, families, orders, classes and phyla. This long history of large-scale organic change constitutes the study of *macroevolution*.

The problem with phrases such as ‘panorama of evolutionary change’ and ‘evidence for evolution’ is that they are ambiguous. They are terms of convenience that make no distinction in meaning between patterns of change and process of change; between a simple list of fossils arranged in geological order, and a complex assumption of transmutation between fossils. Evolutionary teaching does not encourage students to critically evaluate this distinction in meaning – its only aim is to persuade students to accept ‘evolution’ as a total concept.

The pattern of macroevolutionary change in the fossil record is not one of continuous gradual development alongside gradual extinction (as Charles Darwin wished to believe), but of cycles of appearances and disappearances. Periods during which countless new forms arise, typically lasting tens of millions of years, are brought to an abrupt end by *mass extinction events*. References document five or six major mass extinction events, but more than twenty have been cited in total. The fossil assemblages either side of these extinction lines are so remarkably different, they have long been used to define boundaries between geological time intervals.

The most well-known mass extinction occurred some 66 million years (my) ago, and resulted in the end of the dinosaurs as the dominant land animals. It is thought to have been caused, or caused in part, by the devastating impact of a large meteorite. Many other animal and plant groups were affected, and it has been calculated that something in the order of 75% of all species and 50% of all genera were lost. But an even more catastrophic event, classically known as ‘The Great Dying’, appears to have happened around 250my ago. On this occasion it is estimated that more than 90% of all species and 80% of all genera were eliminated. Prolonged volcanic activity, with its climatic and environmental effects, is implicated in at least four major mass extinction events, but a full understanding of all the factors involved in each event is far from complete.

Cyclical patterns of origination and extinction among groups of fossils document the chronological history of life on Earth, as new forms replace the old. But do these patterns of change reveal *how* new forms replace the old? In reading some evolutionary narratives one could be led to believe that mass extinction, aside from being the destroyer of biodiversity, is an active force in its recreation. In the words of Richard Fortey (2011), mass extinctions ‘redesigned the biological face of our planet’. Numerous authors tell of the ‘importance’ or ‘role’ of extinction in evolution, and of mass extinctions ‘driving’ or ‘accelerating’ evolution. Researchers Halliday and Goswami (2015), for instance, state that, ‘mass extinction events have long been suggested to be important drivers of evolutionary novelty’. It is as though something of a mechanism that regenerates completely new forms of life, can be seen in extinction itself:

Mass extinction prunes whole branches off the tree of life. But mass extinction can also play a creative role in evolution, stimulating the growth of other branches (*Understanding Evolution* 2017).

The suggestion here is that the tree of life functions very much like an apple tree: give it a hard prune and numerous young branches will sprout forth to replace the old. We can observe this response in a real tree, as plant growth hormones stimulate the production of new water shoots around the base of the injury. But what is the proven mechanism by which extinction promotes new evolutionary branches to grow on the tree of life?

The standard explanation, echoed here once again by *Understanding Evolution*, focuses on the process of *adaptive radiation*:

By removing so many species from their ecosystems in a short period of time, mass extinctions reduce competition for resources and leave many vacant niches, which surviving lineages can evolve into.

It is the same principle by which species are believed to have diversified on oceanic islands. In the case of islands, a small number of original colonisers discover available niches into which they adapt and diverge; in the case of mass extinctions, it is the small number of survivors that are presented with new opportunities.

Geologist David Rothery, author of *Teach Yourself Geology* (1997), states that the causes of most mass extinctions are ‘uncertain’, but impresses upon the reader,

What is certain is that after each mass extinction, those varieties or organisms that had survived were able to take advantage of the demise of their competitors to adapt, through evolutionary change, to new lifestyles. This is described as adaptive radiation.

A willingness to accept unknown factors in the causes of mass extinctions, coupled with an unquestioned ‘certainty’ about the process by which biodiversity is regenerated, is the orthodoxy projected in the majority of teaching texts. And yet extinction and adaptive radiation offer no real certainty about the process of macroevolutionary change whatsoever. Extinction does no more than clear the ground before the next round of macroevolutionary change begins, while adaptive radiation is simply an abstract idea about ecological opportunities that fails to explain how major genetic reconstruction is enacted in order to fulfil those opportunities.

Even for an explanation as to why macroevolutionary change is stimulated – let alone as to how it actually happens – adaptive radiation may be a flawed construct. Though superficially logical, the model relies upon principles that are somewhat notional. In the real life complexities of natural ecosystems, decrease of competition and increase of available niches are relative factors that are difficult to define and measure. This would be especially true after a mass extinction event when the environmental consequences would be very unpredictable. All animal niches (and many plant niches) depend on interactions with other animal and plant species. There are consumers and predators, parasites and symbionts, pollinators and dispersers, and one specie may present several opportunities for each. It would be just as easy to argue that a drastic cut in the number of species in a region, rather than increasing the number of available and potential niches, would seriously reduce them. Applying the notion of ‘empty niches’ is therefore somewhat arbitrary.

Invoking reduced competition as a key factor in speeding up evolution also courts contradictory ideas. It is axiomatic to Darwinian thinking that evolution is driven by competition for resources – the so-called ‘struggle for existence’. Yet in this widely accepted post-extinction scenario, we are to understand not only that evolution blossoms following a reduction in competition, but that it positively accelerates beyond its normal rate. At the microevolutionary level, I have not been able to locate any solid experimental or field evidence to support the hypothesis that extinction in one specie leads to an increased rate of mutation or quickening of selection of variants in a second specie, in order to fill the niche vacated by the first. At the macroevolutionary level, it is difficult enough to account for large-scale change in the fossil record at a slow rate; to account for it at an accelerated rate, and in the absence of competition, would seem to be both beyond and in opposition to fundamental Darwinian principles.

All objections, however, concerning the feasibility of mass extinction and adaptive radiation as drivers of macroevolutionary change, might be rendered academic if only

the fossil record were to demonstrate how animals and plants underwent physical change. While the mineral preservation of past life is the exception rather than the rule, and we could hardly expect to find every stage of every gradual transformation, we should expect to find some of the stages some of the time. To evaluate whether these stages really can be 'seen' in fossil history, no better source of evidence could be found than from the most recent and perhaps best documented major mass extinction event. Familiar to us all as the extinction of the dinosaurs, the event is known to geological science as the end-Cretaceous, K-T (Cretaceous-Tertiary) or K-Pg (Cretaceous-Paleogene) boundary.

The Cretaceous was the last geological period of the Mesozoic Era, or Age of Reptiles. Almost all large vertebrates at the tops of the food chain were reptiles, with dinosaurs on land, pterosaurs in the air, and plesiosaurs and mosasaurs in the seas. All these dominant groups died out completely,* though other reptiles lived on in the form of crocodiles, turtles, snakes and smaller lizards. Other groups to suffer major casualties during the global extinction were tropical invertebrates (including the last of the ammonites), corals (and whole coral reef communities), land plants and plankton. A curious phenomenon of the worldwide ecological catastrophe was not the extinction, but the survival of certain groups:

The survival of birds is the strangest of all K-T events... Smaller dinosaurs overlapped with larger birds in size and in ecological roles as terrestrial bipeds. How did birds survive while dinosaurs did not?

Richard Cowen, *History of life*, 2013

The selectivity of survival during the end-Cretaceous event may be one mystery, but what followed was a far greater one: the extraordinary generation of radically new life forms in a geologically short period of time. So spectacularly contrasting are the fossil faunas either side of the K-Pg boundary, that they not only define the geological division between the Cretaceous and Paleogene periods, but the greater division between the Mesozoic and Cenozoic Eras. The Cenozoic Era, which continues to the present day, is traditionally known as the Age of Mammals, because mammals replace reptiles as the dominant large animals on land and in water. But mammals are by no means the only group to have diversified following the extinction line. A great multiplication of forms is also seen in the fossil remains of insects, fish, snakes, and, above all, birds. In the plant kingdom flowering plants, including grasses, undergo an equally remarkable proliferation of variety.

In geological terms, the diversification of mammals is generally described with colourful adjectives such as 'rapid', 'dramatic', 'explosive', or even 'instantaneous'. The true scale of this biotic change is somewhat understated by the expression 'rapid radiation of new species'; for what actually occurs is the sudden appearance of entirely new mammal families and orders:

* Following the discovery of 'feathered dinosaurs' in the 1990s, the majority view holds that birds live on as 'avian dinosaurs'. It may or may not be true that birds evolved from reptilian dinosaurs, but, either way, they are not reptiles now. In terms of classification, modern birds do not share the fundamental characteristics of modern reptiles; it is therefore nonsensical to place living birds and living reptiles in the same class.

During the Paleocene* mammals evolved explosively, their diversity rising from 8 to 70 families (Cowen 2013).

The fossil record documents an extensive and rapid – often described as “explosive” – adaptive radiation of mammals during the first third of the Cenozoic... Nearly all the modern mammal orders, as well as many extinct orders, first appear in the fossil record during this interval.

Kenneth Rose, *The Beginning of the Age of Mammals*, 2006

All sources agree that the only placental mammals definitely known to survive the end-Cretaceous extinctions were small, scurrying, largely insectivorous forms that were generally not highly specialised to utilise a wide range of ecological roles. So how did the transformation into animals as varied as elephants, sloths, cats, dolphins and apes happen, and does the fossil record show us some of the intermediate forms? This appraisal from Richard Cowen, author of the university course book *History of Life* (2013), gives us a strong clue that typically it does not:

The Paleocene radiation of mammals that we see in the fossil record apparently occurred so fast that we cannot identify the very great number of branching events that resulted in the great morphological diversity of the major groups of mammals alive today.

Yet there is a further problem. Before we could even begin to identify the branching events of which Richard Cowen speaks, it would be essential to know exactly what mammals lay at the roots of those branches. According to a joint publication by the London Natural History Museum and The Open University, the evidence for these root mammals is also sparse on the ground:

The end of the Cretaceous is defined by the extinction of many animals... Mammals and birds were among the groups that did not become extinct; some – the fossil record is vague about exactly which – survived the mass extinction.

Jonathan Silverton (editor), *99% Ape: How Evolution Adds Up*, 2008

Given that the fossil record is ‘vague’ about which mammals survived the end-Cretaceous event, the task of identifying branches of descent must be all the more difficult. How do we identify intermediates if we do not know precisely what they are intermediate between?

Despite this inauspicious fragility of evidence, teachers of evolution still insist that ‘thousands of transitional forms are seen in the fossil record’. To put this claim to the test, I have chosen two very familiar groups of mammals to critically evaluate whether any rationally understood *process* of evolution can be detected through these supposed transitional forms. Firstly whales, because they are now vaunted as one of the best examples of visible evolution through a sequence of fossils; and secondly bats,

* The Paleocene is the first geological epoch of the Paleogene Period and Cenozoic Era, lasting from around 66 to 56my ago.

because they represent one of the largest, most diverse, and most unique orders of mammals alive today.

Whales, dolphins and porpoises belong to the mammalian order *Cetacea*, a group that includes more than 80 existing species. Cetaceans are classed as mammals because females feed their live-born young with mammary glands (milk). They are also warm-blooded, breath with a diaphragm, and have 3 middle ear bones – all features characteristic to mammals. Because they are mammals, the evolutionary assumption has always been that they must have descended from a more typical four-legged land mammal, through a series of semi-aquatic and increasingly fully aquatic intermediates. Following a harvest of relatively recent fossil discoveries that peaked in the 1990s and early 2000s, paleontologists now believe they can trace a line of descent from a small deer-like walking mammal through to a fully adapted aquatic whale. So apparently convincing are the interpretations placed on this timeline of fossils, that the whale has now become a showcase of Darwinian evolution:

Now, cetacean origin is one of the best known examples of macroevolution documented in the fossil record (Thewissen et al. 2009).

Whales are as interesting an example of evolution, evolutionary transition, and evolutionary transformation through time as anyone could hope to find in the fossil record (Philip Gingerich 2015).

The number of named fossil species assigned to *Cetacea* runs into the many hundreds. However, only a proportion of these extinct forms are considered to be direct ancestors of modern whales, and among these, a very much smaller proportion have been found with relatively complete skeletons. A well preserved skeleton provides a very clear indication of an animal's locomotory functioning: its limbs, for example, may be adapted to walking or running on land, or to swimming or steering in water. Some animals are adapted to moving both on land and in water: the limb bones of a crocodile are sturdy enough to support its body weight on land, but the large, laterally flattened tail bones are a reflection of its mode of propulsion in water. Unlike a crocodile, a whale or dolphin generates thrust by up and down undulations of the tail. Living whales have no externally visible hindlimbs, and their forelimbs are modified into flippers.

In searching for a *process* of evolution, it would not suffice to simply find fossils that illustrate different modes of locomotion, and then to arrange them into a convenient order. What are required are fossils that illustrate *how* one mode of locomotion gradually mutates into another.

In choosing the best examples of 'intermediate forms' between a terrestrial walking mammal and a fully aquatic whale, I defer to the selection of a leading expert in the field, Philip Gingerich of Michigan University. In his contribution to *Great Transformations in Vertebrate Evolution* (2015), Philip focuses on three particular fossils as 'transitional stages':

Viewed in hindsight, the main line of archeocete [ancient whale] evolution was through or near *Pakicetus*, *Maiacetus*, and *Duradon*.

So let us have a close look at these three exemplars of visible macroevolution, not through the eyes of a willing Darwinist, but through the scrutiny of a Darwinian sceptic.

Pakicetus is a genus of extinct, carnivorous toothed, medium sized mammal, known only from fossil deposits in Pakistan and western India. Reconstructions are based on composite skeletons; that is, skeletons assembled from the jumbled up and fragmentary remains of more than one individual. No complete, fully or partially articulated skeleton of any pakicetid has yet been found. Although *Pakicetus* is termed a 'whale' by paleontologists, it was undoubtedly a four-legged animal that would not have looked or behaved anything like any familiar whale.

The ankle bones of *Pakicetus* are characteristic of the mammalian order *Artiodactyla* – the even-toed ungulates or cloven-hoofed mammals. Living representatives of the *Artiodactyla* include cattle, goats, sheep, deer, pigs and hippos. *Pakicetus* itself is thought to have had hooves. Its classification as a cetacean, and not as an artiodactyl,* rests upon a single obscure and somewhat technical point. The bone surrounding the middle ear exhibits a small projection known as the *sigmoid process*, and a thickened margin termed the *involucrum*. These particular structures are only found in living and extinct whales. However, it might be argued that they are also found in some extinct artiodactyls, such as pakicetids, which were in fact not whales at all.

The relatively long and thin ungulate type limb bones of *Pakicetus* might suggest an adaptation to running. But the high density of these bones, together with the presence of a long and robust tail, led Madar (2007) to conclude: 'pakicetid cetaceans were highly adapted for an aquatic niche'. Heavy bones provide ballast in shallow water – a feature that benefits the hippopotamus – and the powerful tail could have been used for propulsion or stabilisation in some form of swimming. The placement of the eye sockets close together at the top of the skull suggests another aquatic habit: an ability to remain almost completely submerged, concealed from prey in the manner of a crocodile.

Artistic impressions of *Pakicetus* are imaginatively varied. In Thewissen et al. (2009) the animal is depicted standing on a shoreline with a superficially wolf-like appearance. The illustration in Gingerich (2015) of *Pakicetus attocki* is reminiscent of a swimming dinosaur, powering through the water with webbed feet. However, the interpretation offered in Silverton (2008) is unquestionably the most deviant. Here, *Pakicetus* is apparently well on its way to becoming a modern whale, with a nose hole half way along the snout, small eyes to the sides of the head, no neck, and four stumpy, paddle-like limbs. To complete the effect, the drawing merges the body seamlessly into the relatively short tail, with body and tail gently undulating in the vertical plane. Perhaps these individualistic sketches will move towards greater parity upon discovery of a more complete pakicetid skeleton.

The extent to which pakicetids spent their time in and out of water remains a question of speculation. Of course, arguments in favour of their spending more time in water make them sound more whale-like. What is absolutely clear, is that the skeletal anatomy of a *Pakicetus* 'whale' bears no resemblance at all to that of a living

* Traditionally *Cetacea* and *Artiodactyla* were recognised as separate orders. Just as modern taxonomists now say that birds *are* dinosaurs because birds are believed to have descended from dinosaurs, they similarly argue that whales *are* even-toed ungulates.

whale. The body plan of this fossil genus appears to conform to that of any typical four-legged terrestrial mammal. There is nothing in the form of the limb, girdle, spine, rib or tail bones to indicate they are transitional towards those of our highly specialised modern day cetaceans.

Philip Gingerich's second 'transitional stage', *Maiacetus inuus*, also had artiodactyl ankle bones, and the shape of its terminal hand and foot bones indicate some of the digits ended in a small hoof. Like *Pakicetus*, *Maiacetus* is classed as a whale by virtue of the shape of the bone surrounding its middle ear. But the *Maiacetus* skull has one additional feature in common with living cetaceans: enlarged *mandibular canals*. These fluid filled cavities of the lower jaw are used by whales as part of their underwater sound detection systems. Nevertheless, a mandibular canal and a sculptured ear bone do not make a whale.

The remains of *Maiacetus* were discovered in marine deposits, and the animal appears to be more adapted to the aquatic environment than *Pakicetus*. Its limbs are shorter (a characteristic of many aquatic mammals), the long bones of the hands and feet mean that they were almost certainly webbed, and it had a larger and more powerful tail that would have served well in swimming. The life style of *Maiacetus* is interpreted as being analogous to a sea-lion's, fishing at sea for food and returning to land for resting and breeding. But this extinct semi-aquatic mammal lacked the streamlined neck, body and flippers of a sea-lion, and certainly would not have had the acrobatic agility of either a sea-lion or a dolphin.

Maiacetus fossils are only known from two Pakistani specimens, but, unlike *Pakicetus*, the first find was a partially complete articulated skeleton, and the second a fully complete articulated skeleton. These exceptional preservations reveal much detail about the biology of the specie, especially since the former find transpired to be a near term pregnant female. But they also show the skeletal plan of *Maiacetus* to be that of a conventional four-legged mammal. Gingerich's interpretation is one of a foot-powered swimmer:

Thrust was provided by powerful muscular extension of the hind limbs, pushing water with webbed toes extended... The heavy tail, narrow and deep, served as an inertial stabilizer to minimize yaw.

Maiacetus may have been more aquatically adapted than *Pakicetus*, but its skeleton and locomotory functioning are in no way transitional between a four-legged foot-powered swimmer and a two-flipper tail-powered whale. There is no sign of degeneration of the hindlimbs: on the contrary, they are larger than the forelimbs and provide the necessary thrust for swimming. There is no hint of the forelimbs beginning to transform into flippers, and there is no evidence that the tail is beginning to develop flukes. It might be said that *Maiacetus* is a small transitional step from *Pakicetus* in its further aquatic adaptation, but it has an enormous leap to go before it becomes a whale.

Dorudon atox is represented by Philip Gingerich as 'the final transitional stage in the evolution of whales from land to sea'. However, *Dorudon* was already a fully aquatic whale. It did not have all the specialised features of living toothed whales, but in its essential appearance, method of swimming and life style, it would not have been dissimilar to some varieties of cetacean we would recognise today. Is it perhaps

misleading to describe *Dorudon* as transitional between a four-legged land mammal and a fully aquatic whale, when it was already a fully aquatic whale?

Several virtually complete skeletons of *Dorudon*, and numerous other specimens of portions of the skeleton, have been collected from Egypt. Analyses of the skeletal anatomy show that '*D. atox* was incapable of supporting itself on land', and that '*D. atox* was a caudally [tail] propelled swimmer, much like modern cetaceans (Uhen 2004). In comparing the skeleton of *Dorudon* to that of *Maiacetus*, together with their inferred locomotory functioning, a proposed transmutation from one to the other could not be envisioned as anything short of dramatic.

Changes to the vertebral column are numerous and radical. In *Dorudon* the number of vertebrae increases by 27%, with each vertebra being different in shape to the corresponding vertebra of *Maiacetus*. There is also much greater uniformity of shape along the length of the column. These differences in shape relate to differences in function. The cervical (neck) vertebrae in *Dorudon* are compressed into a shorter neck, giving a more streamlined shape between head and body. An additional 4 thoracic (chest) vertebrae support an additional 4 pairs of ribs. The 6 lumber (lower back) vertebrae of *Maiacetus* are multiplied to 20 in *Dorudon*, making the latter's body considerably longer and more sinuous. The 4 sacral (pelvic) vertebrae that are fused in *Maiacetus* to form a solid attachment for the pelvis and hindlimbs, are absent in *Dorudon*, so that the whole spine is more flexible for undulating movement. Evidence that *Dorudon* had tail flukes is seen in the flattened shape of the last 9 caudal (tail) vertebrae. Whereas the caudal vertebrae in *Maiacetus* allow flexion in the horizontal plane, the caudal and lumber vertebrae in *Dorudon* are modified for greater flexion in the vertical plane.

The forelimb of *Duradon* is modified into a flipper, such that every bone in the shoulder, arm and hand differs in shape and proportion to that of *Maiacetus*. The ways in which the bones of the forelimb articulate are also different, movements of the joints generally being more restricted. Living cetaceans use their flippers for steering and braking, and we can assume *Duradon* used them for the same purpose. The hindlimb is so greatly reduced in size and capacity as to offer no locomotory function. (It may have served a purpose in copulation.) The whole skeleton, including the skull and ribcage, contributes to the torpedo body shape that would have reduced resistance to *Dorudon*'s passage through water. Even the processes on the lumber and caudal vertebrae gradually reduce in size towards the tail end, helping to maintain the streamlined form.

A detailed comparison of *Maiacetus* and *Duradon* fossils reveals that every single bone differs between them in shape, proportion and function; and that furthermore some bones are lost and others gained in *Dorudon*. No one knows how many genetic mutations – or indeed what kind of mutations – would be required to effect this total bodily reconstruction. But one can imagine the figure would need to be in the order of hundreds or thousands at the very least. In association with this suite of bone changes, all the supporting muscles, nerves, blood vessels and other soft tissues would have to be adapted in unison.

I have only compared one functional feature between *Maiacetus* and *Duradon*, namely the skeletal structure and its relation to mode of locomotion. There are a host of physiological factors that might merit equal discussion concerning respiration, nutrition, hydration, thermoregulation, reproduction and sensory perception. When the sum total of morphological, anatomical, physiological and behavioural differences

are taken into account, an imagined transmutation between *Maiacetus* and *Duradon* would likely require the recoding of a significant percentage of the total genome. Philip Gingerich states that ‘individual characteristics changed step by step during the transition from land to sea’. Whilst we might accept that some characteristics changed by a single step between *Pakicetus* and *Maiacetus*, the changes between *Maiacetus* and *Duradon* surely represent several flights of steps. Philip’s three exemplar ‘transitional’ fossils do not, in any way, show us how a four-limbed walking, paddle swimming mammal, transmutes into a two-flipper, tail swimming whale.

Given the age of *Pakicetus attocki* at 48my, *Maiacetus inuus* at 47my, and *Dorudon atrox* at 37my, the geological time frame available for this very significant macroevolutionary change is remarkably short. In perusing the great breadth of documentation surrounding microevolutionary change, including both real time and historically dated observations, it is difficult to find an example that might suggest this degree of genetic change in a mammal could be possible within a span of 11my. Reconciling observable speeds of microevolutionary change with time scales of macroevolutionary change in the fossil record is especially problematic in the case of whales, where generation times are very slow and populations relatively small.

Another problem with this ‘best’ example of macroevolution is the fossil gap between *Pakicetus* and the survivors of the end-Cretaceous extinction. Researchers point to fossils of a tiny deer-like ungulate called *Indohyus*, which lived between 55 and 45my ago. Once again, the only distinctive skeletal feature in common between this earlier fossil and existing whales is the shape of the bone surrounding the middle ear – an intriguing but rather tenuous link. Beyond *Indohyus* the postulated fossil trail runs dry. As is the case with other mammalian orders, no representative fossils have been discovered that appear intermediate between *Artiodactyla/Cetacea* and the end-Cretaceous small mammal survivors.

Whereas the order *Cetacea* numbers some 80 plus species, the order *Chiroptera* (bats) numbers more than 1200. That bats make up over a fifth of all living mammal species, ranging in size from the 2g Kitti’s hog-nosed bat to the 1.5kg giant golden-crowned flying fox, is a fact likely to surprise many people. Lest anyone be led to believe that a bat is no more than a slightly adapted flying mouse – the ‘flittermouse’ of old – here is a brief if technical description of *some* of the complex and radical structural modifications required to deliver its aerial mode of locomotion:

The most obvious characteristic of bats is the presence of wings consisting of skin membranes (patagia) supported by specialized forelimbs with greatly elongated manual digits. In comparison with other mammals, bats are also characterized by a complex series of structural changes in the axial skeleton and pectoral girdle, and lateral reorientation of the hindlimbs, features that are related to flight and the upside-down roosting posture adopted by resting bats (Gunnell & Simmons 2005).

The list of formally recognised ‘transitional forms’ between the Cretaceous small mammals and the *Chiroptera* makes for short reading. There are none. The earliest known 50my old bat fossils, some of which are excellently preserved and complete, are extremely similar to some living families. They give us little or no clues as to how

a generalised four-legged scurrying or tree-climbing small mammal could have transmuted into a highly specialised flying bat:

The phylogenetic [evolutionary history] and geographic origins of bats (chiroptera) remain unknown (Gunnell & Simmons 2005).

...the fossil record of bats extends over 50 million years, and early evolution of the group remains poorly understood (Simmons et al. 2008).

Bats have small, light skeletons that do not preserve well and we have little information on the early evolution of this group (NHC Univ. of Edinburgh, accessed 2017).

Note that the last quote attempts to explain away the lack of fossilised transitional ancestors by reason of poor preservation of bats. Yet well preserved fossil bats have been found, while fossils of transitional bat ancestors have not.

The one posited exception to this is the 52my old Wyoming fossil *Onychonycteris*. In a statement to the press by Nancy Simmons, a member of the research team that described the new fossil specie (Simmons et al. 2008), it was reported:

It's clearly a bat, but unlike any previously known. In many respects it is a missing link between bats and non-flying ancestors.

The Guardian 13/Feb/2008

Note that Nancy's claim that *Onychonycteris* was a missing link between a bat and a non-flying ancestor is self-contradicted by her initial conclusion that it was 'clearly a bat'. The fact that *Onychonycteris* has been classified in a family of its own might suggest a divergence from modern bat families at the macroevolutionary level; but the anatomical differences relating to mode of locomotion are hardly fundamental. The forelimbs are shorter and the hindlimbs longer, meaning that the wings were broader and perhaps less efficient. However, the researchers concluded that, 'forelimb anatomy indicates that the new bat was capable of powered flight like other Eocene* bats' (Simmons et al. 2008). Other features that label the fossil as 'primitive' are its possession of five claws on each forearm instead of the one or two found in modern bats, and its apparent lack of an echolocation system. But the loss of claws in modern bats would be an example of degeneration, not of the origin of a new feature; and some modern bat families also lack echolocation systems. The argument that this fossil discovery represents some kind of intermediate at the macroevolutionary level is a very weak argument indeed.

The fossil record has, as yet, shown us absolutely nothing about any gradual transition of bats from non-flying Cretaceous mammals. The media claim by a leading scientist that *Onychonycteris* is a 'missing link' is, I am afraid to say, another instance of misleading language being used to shore up the public face of Darwinism.

Through mass extinction and macroevolution in the fossil record we do 'see evolution' in the sense of a history of life, revealed in the appearance and

* The Eocene Epoch 56 to 34my ago.

disappearance of different life forms over time. But we do not ‘see evolution’ in the sense of one type of life form gradually transmuting into a completely different type of life form. I have discussed only two examples of macroevolution in the fossil record, but I am confident in the generalisation that no other examples exist to demonstrate *how* macroevolutionary change occurs. The *process* of evolution is something which is seen only in the imagination.

Stasis in the Fossil Record

As one of the pioneer thinkers in the ‘modern’ synthetic theory of evolution, Julian Huxley wrote in 1953:

My grandfather, Thomas Henry Huxley, was among the first to focus attention on what he called ‘persistent types’ – animals or plants which remain unchanged over enormous periods of time while life around them is changing and evolving.

The grandson continued:

Persistence of type, we now realize, is the demonstration that natural selection can and does produce stability as well as change, and that the restriction of improvement is a commoner phenomenon than its continuance.

Note the movement in emphasis between these two statements. In the first, the implication is that persistent types are the exception while all around is evolving. In the second, it is revealed that stability in the fossil record is actually more common than change.

The author then lists some of the classic examples of ‘living fossils’ including the ginkgo tree, with fossils of the same genus up to 200my old, and the brachiopod sea-shell *Lingula*, whose external appearance is unchanged in 400my. As an example of a ‘persistent group’, he found the ant most remarkable. In insects entombed in 50my old amber Julian observes: ‘Every detail of the structure is preserved in the amber, and thus we find that they differ in no essentials from genera of ants living today.’

What seems more remarkable to me is that Huxley viewed persistent groups as an ‘evolutionary phenomenon’. Wherever or whenever fossils showed that animals and plants were not changing, not transforming, *not evolving*, he still interpreted it as an act of evolution. Julian Huxley was very definite in his assertion that natural selection was ‘*the* only effective agency of evolution’; so the steps in his logic must be as follows:

1. Natural selection *is* the process of evolution
2. Natural selection produces stability (i.e. no evolution)
3. Therefore the process of evolution produces no evolution.

So when we see no evolution between fossils in the history of life, we are really seeing evolution at work.

Gould and Eldredge's theory of punctuated equilibria, first aired in 1972, challenged the established notion that Darwinian gradual change could be 'seen' in the fossil record:

Phyletic gradualism [i.e. gradual evolution] was an a priori [theoretical] assertion from the start – it was never “seen” in the rocks; it expressed the cultural and political biases of 19th century liberalism (Gould & Eldredge 1977).

In reality, the two authors argued, the pattern of change in the fossil record was one of long periods of stability, or stasis, punctuated by rapid events of speciation.

Realising that 'a punctuational view of change may have wide validity at all levels of the evolutionary process', Gould and Eldredge ventured their own interpretation of this newly accepted pattern of change. Essentially, they adopted an existing theory proposing that new species originated in small subpopulations at the periphery of the main population, and that this was the reason why a continuum of change was never caught in the fossil sequence. As the authors themselves admitted, their own interpretations about the evolutionary process were no less biased, and no less theoretical, than those of the traditional Darwinists. The point is, any number of theories may be invented or imagined, but when the fossil evidence shows no change, clearly, no process of evolution can be seen.

It is strange that in a book about life forms that have not changed in millions of years, Richard Fortey (*Survivors: The Animals and Plants that Time has Left Behind*, 2011) repeatedly doubts the validity of his own title:

There really is no such thing as 'no change' ... p17

Nothing remains completely unchanged... p198

There is no such thing as no change at all... p198

We have seen before that there is no such thing as no change at all... p211

...no organism remains *completely* unchanged through long periods of time
p281

To say that 'nothing remains completely unchanged' is no more than a meaningless truism. In this case Richard is referring to the fact that, while the fossilised morphology of an organism may have changed little over tens or hundreds of millions of years, there are likely to have been some genetic changes. This intended insight is also nothing more than a statement of the obvious: we sometimes observe micro-evolutionary changes over just a few generations, so, of course, there may have been countless such changes across periods of millions of years. But however significant these small genetic changes might be in number, they are unlikely to be of any macroevolutionary significance if there has been no cumulative effect on the physical structure of the organism.

Is Richard Fortey in denial about stasis in the fossil record, invoking micro-evolutionary change in the absence of macroevolutionary evidence, in order to convince himself that he is still seeing evolution? ‘Living fossils’ and ‘persistent types’ are now, apparently, not so: they may not have changed on the outside, but must have changed on the inside.

In reading of the perceptions of these various authors, one cannot help being reminded of the fine and colourful new suit worn by a certain fairy tale emperor.

Summary and Conclusions

A scientific education teaches that seeing is believing. We do see micro-evolutionary changes in living populations, and we do see macroevolutionary changes in the fossilised history of life. What we do not see, except on extremely rare occasions, are genetic changes in populations leading to the origin of new species; and we never see continua between radically different life forms in the fossil record. It must be frustrating for the Darwinist that evolution always proceeds at exactly the wrong speed: too slowly, apparently, for speciation to be observable in real time; and yet too rapidly and erratically, apparently, for intermediate forms to be captured in fossil sequences.

Richard Fortey’s 2016 television series *Nature’s Wonderlands* is a wonderful example of how believing is seeing. On oceanic island settings we see resistance to malaria developing in honeycreepers, genetic drift in shrimps, barriers to breeding due to selective mating calls in frogs, the recent extinction of many vulnerable species, and lots of other wonderful wildlife. We also see how a generalist lemur is able to exploit different habitats without any natural selection or adaptation. What we do not see is any immediate or direct evidence of ongoing adaptive radiation, the process which is supposed to explain the origin of so many ecologically specialised endemic species. But this need not be dwelt upon, since the professor has already assured viewers, repeatedly, that they are able to see evolution. In reality, Richard Fortey’s claim that an island is “a wonderful place to understand the processes underlying the origin of species” is not supported by any of the evidence he presents. Promises of seeing ‘evolution in action’ turn out to be, in the main, preconceptions of how evolution might have acted in the past.

If it were true that, ‘nothing in biology makes sense except in the light of evolution’, then people of religious faith, who may not believe in evolution, would not be able to learn biology. In the practical application of biology – in medicine, agriculture and conservation – topics such as antibiotic resistance, artificial selection, and extinction of species are very important; but they do not cause everybody to believe that all life descended from a single common ancestor according to Darwinian theory.

Evolution is not a unifying concept: it is an imposed concept. Students are indoctrinated to see evolution in every aspect of biology, and not given the opportunity to challenge or question this prescribed doctrine.

Many natural processes are viewed as ‘evolution’ and labelled as ‘microevolution’, even though they hardly ever result in the origin of a new specie, or even in any small stage in the origin of a new specie. Mutations refer to genetic changes in the individual, not to genetic changes in the population. Natural selection may be observed – though not commonly – in wild environments, but it usually results in fluctuating change rather than the permanent directional change required for the

divergence of new species. The resistance gained by bacteria and Colorado beetles to the application of artificial agents is one form of adaptation; but the major structural and physiological adaptations seen across varied orders of animals and plants, enabling them to live in hugely diverse habitats, is something quite different – the former does not result in the latter. The terms *mutation*, *natural selection* and *resistance* refer to well defined and clearly understood phenomena, which then become less well defined and less clearly understood by viewing them as evolution. The term *evolution* refers to the origin of species: if we are not seeing the origin of species, we are not seeing evolution.

Other so-called evolutionary processes that actually furnish no useful evidence about the origins of biodiversity include degeneration, competition and artificial selection. Degeneration refers to the loss of structures or fitness, not to their creation. Competition or ‘the struggle for existence’ forms a major element of Darwinian theory, but competition resulting in the origin of species is much more difficult to see in Darwinian reality. There are countless historical cases of native species going into decline or extinction due to competition with introduced alien species, but I am not aware of any case of competition resulting in speciation, or any clear stage of speciation. Indeed, the real life instance of speciation documented here in the monkey flower group, came about in the absence of competition. Artificial selection and bioengineering use methods and generate products that would not arise in nature. Furthermore, artificial selection is manifestly a form of deliberate and premeditated intelligent design: it could not be more removed in principle from evolution as an unguided and contingent natural process.

Reports of caught-in-the-act speciation are extremely unusual, but one of the clearer examples brought about through ecological adaptation is that of the McNulty Mine monkey flower *Mimulus cupriphilus*. In this instance the progenitor specie *M. guttatus* (the common yellow monkey flower) was already a highly variable plant capable of colonising a range of different habitats. A ‘specie barrier’ is maintained because *cupriphilus* flowers are less attractive to insects, cross-pollination is reduced, and self-fertilisation ensues. Each *cupriphilus* plant is therefore not only reproductively isolated from *guttatus*, but also from other members of its own specie. With little genetic mixing and a very limited area of semi-natural habitat, the new specie may not be long-lived. But all contemporary claims to witnessing speciation figure a new specie, whether long or short-lived, that is extremely similar to the parent specie. These observations provide no realistic insight into possible mechanisms of structural change at the macroevolutionary level.

Science books tell us that the fossil record is where we see most of the real evidence for evolution. But evidence of change is not evidence for the process of change. What the fossil record most definitely does not show, is the gradual, continuous development of new life forms according to Darwinian principles. Rather, the pattern of macroevolution is one of cyclical periods of rapid origins, stability, and mass extinctions. Even within the periods of rapid origins, the fossil evidence never shows complete sequences of gradual transmutation at any level.

Theorists believe that mass extinction is a driver of evolution, acting as a catalyst for the burgeoning of new designs of life. But the idea of ‘rapid adaptive radiation’ brought about by mass extinction is contradictory. The collapse of an ecosystem is as likely to result in the loss of available niches as in any gain, and the notion of organic innovation being accelerated by the absence of competition is surely counter-

Darwinian. I find no empirical evidence for the extinction of contemporary species resulting in the increased genetic divergence of remaining species. The phrase ‘rapid radiation of new species’, as applied to the pattern of macroevolution following mass extinction events, is a downplaying of the truth: fossils from these moments in time show the appearance of new families and orders, something much harder to explain. Extinction and sudden origins are part of the history of life – the story of evolution; but they reveal nothing about the agency of organic transformation – the process of evolution.

I have reviewed the macroevolutionary origins of the cetaceans (whales) and the chiropterans (bats), two of the many mammalian orders to appear in the fossil record following the end-Cretaceous mass extinction. The evolution of whales is now showcased as one of the best illustrations of transformation in the fossil record; yet the so-called ‘transitional fossils’ do not show, in any way, how the fundamental anatomical change from a four-legged-foot-powered swimmer to a two-flipper-tail-powered whale could have happened. A single fossil has been headlined as a ‘missing link’ in the evolution of bats; but it is simply another kind of bat that happens to have more claws and differently shaped wings. There are no fossils that show how a generalised four-legged scurrying or tree-climbing small mammal could have transmuted into a highly specialised flying bat. Where the Darwinist sees an intermediate fossil, the sceptic sees an active imagination.

Over the expanse of time, stability or stasis in the fossil record is more prevalent than change. Many Darwinists are uncomfortable with this observation, and invent scenarios to explain it away. Julian Huxley believed that stability was a product of the evolutionary force of natural selection, acting not to modify organisms but to maintain them in their optimum state. Steven Gould and Niles Eldredge imagined that speciation and macroevolutionary change always occurred in limited space and time, thereby escaping capture in fossil evidence. And Richard Fortey argued in favour of invisible evolution, in which fossils do not change in external appearance but continue to evolve on the inside. When theories become this desperate, the Darwin-tinted spectacles have been exchanged for Darwin-reinforced blinkers.

For those entranced by the idea of evolution, everything appears to *be* evolution. When one seedling grows stronger than another, “that’s evolution”; when a chimpanzee happens to stand on two legs, “that’s evolution”; and when women enjoy shopping more than men, “that’s evolution”. Any living thing doing any thing, is evolution; and any dead thing in the fossil record must be doing evolution too. Those who interpret each and every observation of life as ‘evolution’, will inevitably ‘see’ evolution in each and every observation of life. But the problem with all these observations is that they are trivial: the Darwinist is awarding them far greater significance than in reality they have. Like a discontented lover who is always looking for evidence of reciprocation from their cold partner, the Darwinian obsessive feels an insatiable need for evidence of evolution, because they never truly see the real thing.

...thinking of so many cases of men pursuing an illusion for years, often and often a cold shudder has run through me, and I have asked myself whether I may not have devoted my life to a phantasy.

Charles Darwin, letter to Charles Lyell November 23rd 1859

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