A Critical Analysis of the Grants' Finch Studies

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ABSTRACT

This paper examines the distinction between phenotypic plasticity and evolution through the case study of the Grants' research on finches. While changes in beak size of the finches are often cited as examples of evolution in action, they more accurately are adaptive flexibility within species rather than permanent transformation. Phenotypic plasticity reflects the divinely endowed capacity of organisms to adjust for survival, not the emergence of new forms. The lack of transitional fossils and the reversibility of adaptive traits suggest that large-scale evolutionary claims often rest on assumptions rather than empirical evidence.

Keywords: Evolution, Adaptation, Finches, Phenotypic plasticity, divine wisdom

INTRODUCTION

The distinction between adaptation and evolution is still a critical yet often blurred boundary in contemporary biological discourse. Adaptation refers to the capacity of organisms to change certain traits or behaviours in response to environmental pressures, thereby enhancing their survival and reproductive success (West-Eberhard, 2003). These changes, while observable and reversible, do not necessarily imply the emergence of new species or the transformation of one life form into another. Evolutionary theory, however, extends this principle of adaptation into a broader, historical narrative of common descent, suggesting that all organisms share ancestral origins through gradual modification over vast geological timescales (Darwin, 1859).

Despite the widespread acceptance of this framework, the fossil record provides limited evidence for the gradual, continuous transitions that such a model would predict. Prominent paleontologists have acknowledged that fossil discoveries often reveal the sudden appearance and stability of species rather than their progressive transformation (Gould & Eldredge, 1977). This discontinuity suggests that while adaptation is an observable and scientifically demonstrable process, the assumption from adaptation to large-scale evolutionary change rests significantly on theoretical inference rather than direct evidence. As a result, adaptation may be more accurately understood as a divinely endowed feature, an inherent flexibility within species that allows them to endure and flourish under changing conditions, rather than as proof of evolutionary transformation.

Objective

To examine whether the observable changes in species, such as those seen in Darwin's finches, represent true evolutionary transformation or are instead examples of phenotypic plasticity.

Background of the Problem

Darwinian evolution proposes that small adaptive changes accumulate over long geological timescales to form new species (Darwin, 1859). However, studies such as those by Peter and Rosemary Grant on Darwin's finches show rapid, reversible changes in beak size, indicating adaptation rather than permanent evolutionary transformation (Grant & Grant, 2002). This has revived interest in phenotypic plasticity, the ability of organisms to change traits within genetic limits (West-Eberhard, 2003). The lack of clear transitional fossils further challenges the assumption that adaptation necessarily leads to macroevolutionary change (Gould & Eldredge, 1977).

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Natural Selection and Finches

Peter and Rosemary Grant's long-term studies of Geospiza finches on the Galápagos Islands have become emblematic of evolution seen in real time. Over the course of four decades, their meticulous field observations documented shifts in finch beak size and shape that correlated with changes in climate and food availability (Grant & Grant, 2002). During drought years, birds with larger, deeper beaks survived preferentially because they could crack hard seeds, while in wetter years, smaller-beaked individuals thrived when soft seeds were plentiful. These rapid, reversible changes show the action of natural selection within measurable timescales and have often been cited as clear evidence of evolution in progress (Grant & Grant, 2006).

Figure 1: Ground finches on Daphne Major differ in the thickness of their bills, and this variation causes some individuals to be more efficient at processing hard seeds.

Reference: Zimmer, C., & Emlen, D. J. (2016). Evolution: Making sense of life (2nd ed.). W. H. Freeman and Company.

However, the finch studies also raise an important conceptual question: Do such observable changes stand for true evolutionary transformation, or are they an example of phenotypic plasticity, the capacity of a single genotype to produce multiple phenotypes in response to environmental variation? Phenotypic plasticity enables organisms to adjust their morphology, physiology, or behaviour without undergoing permanent genetic alterations (West-Eberhard, 2003). It is a form of adaptive flexibility that enhances survival across fluctuating environments and may not lead to evolutionary change.

From this perspective, the finches' fluctuating beak morphologies might reflect plastic adjustments within a pre-existing genetic framework rather than new evolutionary innovations. The fact that beak traits oscillated back and forth as environmental conditions changed suggests reversible adaptation rather than directional evolution. This challenges the view that all observable variation results in evolutionary progress; rather, it highlights the role of plasticity as a short-term buffer against environmental stress.

Furthermore, scientists have found that one genetic makeup can give rise to many possible forms, depending on how the environment interacts with it. As West-Eberhard (2003) explains, genes respond flexibly to environmental signals, shaping traits without changing the genetic code itself. A clear example is seen in identical twins, who share the same DNA but often differ in appearance, health, or personality because of lifestyle and environmental influences (Fraga et al., 2005). In animals like Daphnia water fleas, the same genotype produces spines or helmets only when predators are present (Tollrian & Harvell, 1999). These examples show that a change in appearance or behaviour often reflects adaptability, not evolution, an organism's built-in ability to adjust rather than transform into something new.

Figure 2: The water flea Daphnia longicephala in two different forms. On the left is the unarmoured version of the species. On the right is the same animal with a large head crest and long tail spines. D. longicephala develops this body armour in response to chemical cues from Notonecta glauca, an aquatic insect known as a backswimmer. (Image credit: Dr Linda Weiss)

Reference: Pappas, S. (2016, July 6). Armour up! Water fleas grow helmets and spines for battle. LiveScience. https://www.livescience.com/55297-how-water-fleas-grow-body-armor.html

Comparable phenomena have been observed in other species, such as the rapid colour change of the peppered moth in response to industrial pollution (Kettlewell, 1958) and the evolution of antibiotic resistance in bacteria (Davies & Davies, 2010). Yet, these examples, like finches, primarily illustrate shifts within existing species boundaries rather than the origin of fundamentally new forms.

Figure 3: Industrial melanism in peppered moths. Peppered moths (Biston betularia) displaying industrial melanism, with dark (melanic) morphs at left and light-coloured morphs at right.

Reference: The Editors of Encyclopaedia Britannica. (2025, October 8). Natural selection. Britannica. https://www.britannica.com/science/natural-selection

Nevertheless, the Grants argued that these microevolutionary shifts could accumulate over time, leading eventually to speciation, especially if populations become reproductively isolated (Grant & Grant, 2006). Supporters of this interpretation view phenotypic plasticity as a crucial precursor to evolution: plastic responses expose latent genetic variation, which natural selection can then refine into stable evolutionary traits (Pfennig et al., 2010). In this model, plasticity and evolution are not opposites but successive stages in an adaptive continuum.

Critical Perspectives

Biochemist Michael Behe has been one of the critical voices challenging the claim that adaptation leads to large-scale evolutionary change. In his work, Behe (2019) notes that the small, observable shifts seen in living organisms, such as bacterial resistance to antibiotics or variations in finch beaks, do not create new biological species but rather change or reduce existing ones. He describes this process as a kind of ‘devolution,’ where organisms adapt by losing functions rather than gaining new ones. Behe argues that such adaptations show the remarkable flexibility built into the genetic code, yet they stay within clear biological limits. In his view, these changes reveal the depth of design in life rather than evolution, suggesting that adaptation is a maintenance mechanism for survival, not a driver of species transformation.

Even within evolutionary circles, some scholars have expressed serious reservations about the idea that gradual adaptation can account for the emergence of new species. Palaeontologist Stephen Jay Gould, along with Niles Eldredge, argued that the fossil record does not show the smooth, continuous transitions Darwin’s theory would predict. Instead, species tend to appear suddenly and remain stable for long periods before disappearing, a pattern they described as punctuated equilibrium (Eldredge & Gould, 1972). Gould accepted evolution outright, but he admitted that the evidence for slow, adaptive transformation is weak. His observations suggest that adaptation, while real and observable, mostly supports stability rather than change. The absence of transitional fossils and the persistence of well-defined species boundaries raise questions about whether adaptation can truly account for the diversity of life as evolution claims.

Similarly, the concept of adaptability in living beings can be traced in Ikhwan al-Safa as mentioned by Imam Ahmed al-Mastur [AS], he states:

وعلى هذا القياس بدل كل عضو عدم منه عضوا آخر مشاكلا لابدانها ومناسبا لاجسادها بحسب مآربها ومنافعها ودفع المضار عنها كل ذلك اسباب وعلل لبقاء اشخاصها ودام نسلها مدة ما اطول ما يمكن في **طبائعها وجبلتها**

Imam [AS] elucidates that adaptation, or phenotypic plasticity is among the profound signs of Allah Ta’ala’s wisdom in creation. Every species has been endowed with the inherent capacity to adjust to its surroundings, ensuring its survival and continuity. This adaptive ability, therefore, is not merely a biological mechanism but a reflection of divine mercy and a testament that creation unfolds under purposeful guidance, not randomness.

The phrase في طبائعها وجبلتها offers a way of understanding what modern science refers to as genetic predisposition. Arabic lexicographers described tabīʿah as the natural disposition that shapes how each being acts according to the way it was created (Al-Asfahani, 1992), while jibillah refers to the innate mould that defines an organism’s essence (Ibn Manzur, 1990). Al-Zabidi (1965) adds that the two together describe both physical form and instinctive behaviour embedded by design. Seen this way, when Imam Ahmed al-Mastur [AS] explains adaptation as something occurring fī tabaʾiʿiha wa jibillatiha, it points to a built-in capacity for adjustment within species, a kind of natural flexibility, and not evolving into something entirely new.

Another example of phenotypic plasticity is the Arctic fox. Its coat colour changes seasonally, from brown or grey in summer to pure white in winter, to keep camouflage against predators and prey (Fuglei & Tarroux, 2019). This transformation is triggered by changes in daylight duration and temperature, not by genetic mutation or speciation.

Figure 4: A shedding arctic fox photographed mid-moult by Arin Underwood in Svalbard, Norway, on June 9, 2018. By July, this fox will have the summer coat.

Reference: Woodford, R. G., & Underwood, A. (2021, April). Foxes wear new coats for spring. Alaska Fish & Wildlife News, Alaska Department of Fish & Game. https://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=985

This adaptive trait enhances survival but does not indicate evolutionary transformation. The fox is still genetically the same organism before and after the seasonal change. Across centuries of observation, there is no empirical record of such adaptive traits producing a new species of fox. The adaptation thus is a built-in flexibility within the species' genetic design, not a step toward evolutionary divergence as expounded by Imam Ahmed al-Mastur AS:

وهذه من اتقان حكمة الله جل جلاله وعجيب صنعه ولطيف تدبيره بخلقه من الحيوان وحسن سياسته له اذ جعل لكل داء وعارض دواء شافيا ثم الهمه اياه كما ذكر الله تعالى حكاية عن موسى عليه السلام لما قال له فرعون ولاخيه هارون فمن ربكما يا موسى قال ربنا الذي اعطى كل شيء خلقه **ثم هدى** يعني **خلقه وصوره وعرفه منافعه ومضاره وقواه واعانه وحفظه ورعاه ودبره وساسه** كما شاء وكيف شاء فتبارك الله احسن الخالقين

This divine guidance (هدى) can be interpreted as the foundational principle of adaptation; an embedded system enabling species to preserve their existence. The Arabic term hada (هدى) signifies 'guidance,' 'direction,' or 'that which leads one to the right path' (Lane, 1863, p. 2927). In theological usage, it extends to an inbuilt orientation instilled by Allah Ta'ala within every creature, directing it toward what sustains its life and supports balance in nature. As al-Asfahani, a linguist, explains that hada refers not only to external instruction but also to an inner capacity for right movement and discernment granted by the Creator (Al-Asfahani, p. 532). In this sense, adaptation can be understood as a form of mechanism through which creation responds intelligently to its environment. As Nasr (1996) notes, 'the order of nature, therefore, reflects and has its roots in the Divine Order' (p. 61), highlighting that the harmony seen in living systems manifests divine wisdom rather than random occurrence.

Moreover, Imam Ahmed al-Mastur AS elucidates how birds' instinctive awareness of the good season لعلمها بطيب (الزمان) shows the knowledge embedded within their natural disposition. He states:

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اعلم يا اخي ايدك الله وايانا بروح منه بأن من الطيور ما يتزاوح ويتعاشق ويهيج ويسفد في سائر فصول السنة ويعاون الذكر منها الانثى في تحصين البيض وفي تربية الاولاد كالحمام ومنها ما لا يعاون لا في الحضانة ولا في تربية الاولاد كالديك ومنها ما لا يهيج في السنة الا مرتين عند الفصلين المعتدلين الربيع والخريف وفي الصيف واكثر الطيور لا تهيج ولا تسفد الا في آخر الشتاء عند استقبال الربيع وتبيض فيه وتضن وتربي اولادها لعلمها بطيب الزمان واعتدال الهواء وكثرة الريف والقوت الموجود في اكثر الاماكن

Despite extensive research on adaptation and genetic variation, there is still no direct empirical evidence that adaptation alone can transform one species into another, even among microorganisms, where genetic change occurs rapidly. Long-term experimental studies, such as Richard Lenski's E. coli evolution experiment, have demonstrated that bacteria can develop new adaptive traits, like the ability to metabolise citrate. Yet they are still E. coli after tens of thousands of generations (Lenski et al., 2015).

Similarly, while viruses and bacteria show remarkable adaptability through mutation and gene regulation, these changes are modifications within existing genetic frameworks rather than the emergence of new species. Paleontological observations further support this limitation, as transitional forms that would show gradual transformation are absent from the fossil record (Eldredge & Gould, 1972). Thus, while adaptation clearly enhances survival, it works within defined biological boundaries, and there is no experimental or molecular evidence confirming that such changes have ever produced a completely new species.

In addition, Templeton (2006) examined the coalescence of alleles across several human genes and found that their estimated times of divergence vary widely, some even predating the emergence of Homo sapiens. This finding highlights the complexity of tracing genetic history with precision. While scientists acknowledge that, in theory, it is possible to reconstruct the complete genealogy of all alleles at a given locus, achieving such accuracy within natural populations remains an immense challenge. Consequently, genetic data are primarily used to make informed inferences about evolutionary history rather than to provide definitive evidence of species transformation (Zimmer and Emlen, 2016). This limitation underscores a broader issue within evolutionary studies: while micro-level variations and genetic adaptations are observable, direct empirical evidence showing a transition from one species to another remains largely interpretative and inferential rather than conclusive.

Another major limitation in evolutionary theory is its reliance on inference rather than direct observation. Even after decades of paleontological study, the fossil record continues to show large gaps that make it difficult to trace gradual transitions between species. As Eldredge and Gould (1972) saw in their theory of punctuated equilibrium, fossils tend to appear suddenly and then remain unchanged for long periods, a pattern that contrasts with Darwin's idea of slow, continuous evolution. Researchers such as Bechly (2018) and Meyer (2013) have also pointed out that many major groups of organisms appear abruptly in the record without clear transitional forms, suggesting that fossil data alone cannot confirm the gradual mechanisms evolution proposes. The same challenge appears in genetics, where models like phylogenetic trees or coalescent analyses depend on assumptions about mutation rates and population history (Templeton, 2006; Benton & Pearson, 2001). Hence, these models are still interpretative rather than observational. Taken together, both fossil and genetic evidence offer reconstructions of history built on assumptions; they do not directly show one species transforming into another.

CONCLUSION

In conclusion, the Grants' finch research provides powerful evidence for adaptive responsiveness in nature, but whether that responsiveness constitutes evolution or phenotypic plasticity depends on the permanence and heritability of the observed changes. The distinction underscores a critical issue in evolutionary biology: not all adaptation is evolutionary, and not all evolution is adaptive. The finches, therefore, serve as a vivid illustration of how nature's flexibility blurs the boundary between short-term plastic responses and long-term evolutionary transformation.

Suggestions and Further Reading

Further research could examine how genetic regulation and environmental factors interact to produce adaptive variation without species transformation. Studies on gene expression and epigenetics may clarify the limits of phenotypic plasticity and may provide useful foundations for understanding adaptation beyond traditional evolutionary interpretations.

REFERENCES

1. Al-Asfahānī, A. R. (1992). Mufradāt alfāẓ al-Qurʾān (M. S. ʿĀmir, Ed.). Dār al-Qalam.
2. Al-Zabidi, M. M. (1965). Tāj al-ʿArūs min jawāhir al-Qāmūs (Vol. 6). Kuwait: Maṭbaʿat Ḥukūmah al-Kuwayt.
3. Bechly, G. (2018). Fossil discontinuities and the limits of Darwinian mechanisms. Bio-Complexity, 2018(4), 1–10.
4. Behe, M. J. (2019). Darwin Devolves: The New Science About DNA That Challenges Evolution. HarperOne.
5. Benton, M. J., & Pearson, P. N. (2001). Speciation in the fossil record. Trends in Ecology & Evolution, 16(7), 405–411.
6. Coyne, J. A., & Orr, H. A. (2004). Speciation. Sinauer Associates.
7. Davies, J., & Davies, D. (2010). Origins and evolution of antibiotic resistance. Microbiology and Molecular Biology Reviews, 74(3), 417–433. https://doi.org/10.1128/MMBR.00016-10
8. Darwin, C. (2009). On the origin of species (150th anniversary ed.). Harvard University Press. (Original work published 1859)
9. Eldredge, N., & Gould, S. J. (1972). Punctuated equilibria: An alternative to phyletic gradualism. In T. J. M. Schopf (Ed.), Models in Paleobiology (pp. 82–115). Freeman, Cooper.
10. Eldredge, N., & Gould, S. J. (1972). Punctuated equilibria: An alternative to phyletic gradualism. In T. J. M. Schopf (Ed.), Models in Paleobiology (pp. 82–115). Freeman, Cooper.
11. Fraga, M. F., Ballestar, E., Paz, M. F., Ropero, S., Setien, F., Ballestar, M. L., ... & Esteller, M. (2005). Epigenetic differences arise during the lifetime of monozygotic twins. Proceedings of the National Academy of Sciences, 102(30), 10604–10609.
12. Fuglei, E., & Tarroux, A. (2019). Arctic fox dispersal from Svalbard to Canada: One female's long run across sea ice. Polar Research, 38, 3512.
13. Gould, S. J., & Eldredge, N. (1977). Punctuated equilibria: The tempo and mode of evolution reconsidered. Paleobiology, 3(2), 115–151.
14. Grant, P. R., & Grant, B. R. (2002). Unpredictable evolution in a 30-year study of Darwin's finches. Science, 296(5568), 707–711. https://doi.org/10.1126/science.1070315
15. Grant, P. R., & Grant, B. R. (2006). Evolution of character displacement in Darwin's finches. Science, 313(5784), 224–226. https://doi.org/10.1126/science.1128374
16. Ibn Manzur. (1990). Lisān al-ʿArab (Vol. 11). Beirut: Dār Ṣādir.
17. Imam Ahmed al-Mastur [SA], Rasail Ikhwan al-Safa, Risalat fi kaifiyat takween al-haiwanaat wa asnafaha, Pg 192-194, Dar Sader
18. Imam Ahmed al-Mastur [SA], Rasail Ikhwan al-Safa, Risalat takween al-Ma'din, Pg 111, Dar Sader
19. Jablonski, N. G., & Chaplin, G. (2000). The evolution of human skin colouration. Journal of Human Evolution, 39(1), 57–106. https://doi.org/10.1006/jhev.2000.0403
20. Kettlewell, H. B. D. (1958). The evolutionary significance of industrial melanism in the lepidoptera. Clarendon Press.
21. Lenski, R. E., Wiser, M. J., Ribeck, N., Blount, Z. D., Nahum, J. R., Morris, J. J., & Turner, C. B. (2015). Sustained fitness gains and variability in fitness trajectories in the long-term evolution experiment with Escherichia coli. Proceedings of the Royal Society B: Biological Sciences, 282(1821), 20152292.
22. Meyer, S. C. (2013). Darwin's doubt: The explosive origin of animal life and the case for intelligent design. HarperOne
23. Pappas, S. (2016, July 6). Armour up! Water fleas grow helmets and spines for battle. LiveScience. https://www.livescience.com/55297-how-water-fleas-grow-body-armor.html
24. Pfennig, D. W., Wund, M. A., Snell-Rood, E. C., Cruickshank, T., Schlichting, C. D., & Moczek, A. P. (2010). Phenotypic plasticity's impacts on diversification and speciation. Trends in Ecology & Evolution, 25(8), 459–467. https://doi.org/10.1016/j.tree.2010.05.006
25. The Editors of Encyclopaedia Britannica. (2025, October 8). Natural selection. Britannica. https://www.britannica.com/science/natural-selection

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26. Templeton, A. R. (2006). Population genetics and microevolutionary theory. John Wiley & Sons.
27. Tollrian, R., & Harvell, C. D. (Eds.). (1999). The ecology and evolution of inducible defences. Princeton University Press.
28. West-Eberhard, M. J. (2003). Developmental plasticity and evolution. Oxford University Press.
29. Zimmer, C., & Emlen, D. J. (2016). Evolution: Making sense of life (2nd ed.). W. H. Freeman and Company.