he suggested, be geared toward enabling the great man to rule, if it was chaos and falsehood which invites him?[77] In the end, Carlyle gave no assurances that anyone could ever identify the heroic, and make the crucial distinction between a leader's divine right, and rule by brute force. Frankly, without the safety nets of rational, universal principles, power simply becomes arbitrary and absolute.

Geyl also mentions Carlyle's significance as a prophet, or in any case, "an abettor of upheaval."[78] Carlyle apparently foresaw the crisis of capitalism and democracy, as it later had to contend with the irrational forces of nationalism and the like. Sadly, he was a "poor prophet,"[79] who sought comfort in the Godliness of the past, if only to escape from the despicable present.

Mark Schmeltzer, a graduate student in history, composed his paper on Thomas Carlyle for a graduate seminar on revolutions. He has been on the Historia staff since its inception in 1991. This issue represents his final year working on the journal.

[77]Carlyle, *Heroes*, locs. I, II, and VI, passim.
[78]Geyl, *Debates with Historians*, 53.
[79]Ibid.

Charles Darwin and *The Origin of Species*: Resistance, Acceptance, and Recent Challenges

BY JEFF WALDHOFF

The publication of Charles Darwin's *The Origin of Species* (1859) would stand as one of the most significant events of the modern era if it had only affected traditional views of biology. It asserted not just the ideas of evolution, but described in detail how that evolution happened. Darwin pioneered new areas in ecology by showing the intimate relationships among individuals, groups, different organisms, and their climates. However, Darwin's work transcended his specific field of expertise to become a force in social thought and philosophy not just for the elite intellectual, but also for the common person. In this respect, Darwin stands above all great minds of the past 150 years. Even Einstein's ingenious insights into the nature of light, energy, and matter, which explained nuclear fission and revolutionized human history, did not have as immediate impact on the common person as did Darwin's work.

Although Darwin's arguments were powerful and well documented, it has only been in the past fifty years or so that the majority of scientists have accepted them as valid. Darwin not only revolutionized interpretations of biology, but invented a new philosophy of science, which so profoundly challenged scientific thought in nineteenth-century Europe that it took a long time to win converts. This paper will focus solely on the effect of Darwin's work on the natural sciences, which one will see was tremendous. And it will also show how viewpoints on Darwinian theory have changed, why, and what new discoveries have been added to Darwin's theories.

Darwin described the process of natural selection in *The Origin of Species:*

> ...if variations useful to any organic being's welfare, assuredly individuals thus characterised [sic] will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance, they will tend to produce offspring similarly characterised. This principle of preservation, I have called, for the sake of brevity, Natural Selection. It leads to the improvement of each creature...[1]

These variations arise out of the genetic variability that is inherent in each organism. Although natural selection was important to his evolutionary theory, it is not the only part. He also went on to explain the importance of sexual selection, whereby the males of a species struggle with each other for

[1]Charles Darwin, *The Origin of Species by Means of Natural Selection*, with a foreward by J.W. Burrow, editor. (London: Penguin Books, 1968) 169-170.

the opportunity to mate with the most desirable females. Additionally, he examined how climate affects natural selection, and how these mechanisms explain the way in which the extinction of a species could occur. Much of the rest of the book attempted to demonstrate this process. In his first draft, Darwin did not make value judgments or refer to the "advancement" of a species. He only observed adaptations that occurred which aided organisms in their particular environment. The power of Darwin's argument "is that one simple mechanism can account both for the fact that descendants do not resemble ancestors, and for the fact that many creatures seem to be exquisitely well adapted to their lifestyles."[2]

Contrary to popular belief, the greatest initial resistance to Darwin's writings came not from the clergy, but from other scientists, who recognized (as Darwin did) that important parts of his theory were intuitive, and not based on available knowledge. As stated in *The Times'* review of *Origin of Species:*

> The majority of...competent persons have up to the present time maintained two positions,...that every species is...fixed and incapable of modification; the second, that every species was originally produced by a distinct creative act.[3]

Part of this criticism owed to a lack of geologic knowledge, and another was the lack of understanding of the mechanics of genetics. Darwin was one of the first to acknowledge the holes in his theory, and devoted an entire chapter to exploring them, which he prefaced with this paragraph.

> Long before having arrived at this part of my work, a crowd of difficulties will have occurred to the reader. Some of them are so grave that to this day I can never reflect on them without being staggered,; but, to the best of my judgment, the greater number are only apparent, and those that are real are not, I think, fatal to my theory.[4]

The first substantive arguments against Darwin's ideas addressed the amount of time it would have taken for the mechanism of selection to act. If species of organisms were the result of an evolutionary process, rather than of spontaneous, simultaneous generation from a higher power, it would have taken millions of years. However, there was very little evidence pointing to how old the Earth really was in 1859. Most people ascribed to the Biblical account that the earth was approximately 6000 years old.[5] Also, if such selection had taken place, where was the physical evidence of such gradual adaptations? Georges Cuvier, the nineteenth-century French anatomist, pointed out that the depictions of animals in the tombs of the ancient Egyptians extraordinarily resembled those in the 1800s.[6] However, Darwin and others had doubts about the geologic record.

[2] "The Missing Links of Evolution," *The Economist*, 23 May 1987, 86-87.
[3] Review of *Origin of Species*, by Charles Darwin, in *The Times of London* , 26 December 1859, 8.
[4] Darwin, *Species*, 30-31.
[5] Ibid., 26.
[6] Ibid., 30.

In his *Red Notebook*, which contained notes about his voyage upon the *Beagle* and its 40,000-mile circumnavigation of the globe, Darwin began to ponder about the true age of the Earth. Upon seeing the cliffs and highlands in South America and understanding the creeping slowness of nature's work, Darwin wondered how such magnificently huge rifts formed if the Earth were so relatively young.

> There are some arguments which strike the mind with force. —the exact yearly rise of the great rivers prove better than any meteorlogical [sic] table the precise periods over immense areas...The grand cliffs of a thousand feet in height, of the solid lavas—proportionally high to age...If man could raise such a bulwark to the ocean, who would ever suppose that its age was limited.[7]

Also, contemporary scientists did not understand genetics. Many believed that the union of two organisms resulted in offspring that was a balance of features of the two. How could new physical structures develop if organisms mated within their own species?

Finally, and perhaps most significantly, Darwin's theories met ideological opposition. Natural theology, which cited the wonders of nature as proof of the existence of God still dominated contemporary scientific thought. Natural theology saw how perfectly animals adapted to their respective climates, and saw a divine explanation. What source of wisdom but God could place polar bears at the North Pole and chimpanzees in the jungle, instead of vice-versa? Any challenge to this interpretation of the laws of nature seemed to be a challenge to the very existence of God.

Another common intellectual framework was essentialist, or typological thinking. In nineteenth-century Europe, biologists used this method. Essentialist thinking defined objects by their invariability. For example, triangles could have different angles and sides of different lengths, but the invariable qualities of always having three angles adding to 180 degrees and three sides was what defined a shape as a triangle. Darwin believed species were not "classes but variable populations composed of uniquely different individuals."[8] Variation was a necessary part of Darwin's theories, but to an essentialist, "the idea was the only thing that was real, and variation simply meant an 'error' or 'accident.'"[9]

Finally, teleological, or finalistic, views of the world also predominated. These interpreted all developments as being directed towards a specific goal, that is, progress and development.[10] Many tried to interpret Darwin's views on evolution and selection as culminating in man. The *Origin of*

[7] Charles Darwin, *The Red Notebook of Charles Darwin*, ed. Sandra Herbert in *The Bulletin of the British Museum (Natural History)* (London: 24 April 1980), 59-60.
[8] Darwin, *Species*, 31-32.
[9] Ernst Mayr, "the Ideological Resistance to Darwin's theory of Natural Selection," *the Proceedings of the American Philosophical Society Held at Philadelphia for Promoting Useful Knowledge* 135 (1991): 126-133.
[10] Ibid., 129.

Species certainly implied (and Darwin's *Descent of Man* stated explicitly) that the human animal was affected by natural selection and evolution. However, he never wrote that man was the high point of all evolution. "Improvement" became only an ability to survive. This does not make one organism better than another in any metaphysical sense, but rather only better at surviving.

In short, Darwin's theories challenged the existing scientific mind. It would take a massive intellectual shift before his ideas could become accepted. This shift took the combined forces of many different fields. Eventually, other fields of science began to communicate and share information that provided evidence supporting Darwinian theory.

A group of English geologists known as the uniformitarians began to question the geologic record. Uniformitarians felt that it did not take rapid and dramatic natural disasters to create mountains, river beds, and valleys, but rather that the gradual processes of nature could accomplish this. The most relevant aspect of the uniformitarian theory to Darwin's work was that the Earth was actually millions of years old.[11] In the twentieth century, a great deal of information about the nature of atomic structure became available. Pierre and Marie Curie discovered radiation and radioactive isotopes. This lead to the discovery of a radioactive carbon isotope, Carbon-14, which could be used to date living matter. Carbon-14 had a radioactive half-life of just over 5,000 years. Using this information to examine plant matter revealed approximately how long ago a plant died. Anthropologists discovered fossilized remains to be not just a few thousand years old, but rather hundreds of thousands, or even millions of years old.

Also, at the turn of the twentieth century, anthropologists made some startling discoveries in East Africa. They discovered fossilized remains of animals that were similar in shape and appearance to contemporary animals, but with several markedly different structures. The famous discovery of Australopithecus provided some evidence that even man may have had ancient relatives. In sites dating back thirteen million years, diggers unearthed remains of advanced, bipedal ape-like creatures. The more direct (yet still distant) relative to *Homo Sapiens* dated back to around three million years ago, and the comparison of skulls from epoch to epoch seemed to indicate a modification of brain size.[12]

Furthermore, a greater knowledge of genetics became available. Mendel's work with the genetic mixing of peas became popular in the 1930s. This demonstrated how parents passed traits to offspring, and showed the existence of dominant and recessive genes which could explain variations and mutations that occur in offspring that were not visible to parents. When James Watson and Francis Crick made their ground-breaking discovery of the double helix shape of DNA, science became aware of just how much an

[11] Charles Hamrum, ed., *Dawin's Legacy* (San Francisco: Harper & Row, 1983), 31-33.
[12] Harum, *Legacy*, 32.

organism could vary from minute changes in amino acid structures.

Darwin's acknowledgment of the discrepancies in his theories showed that he was not dogmatic in his beliefs, and this lent to their strength and flexibility. Second, the sheer weight of scientific observation and documentation presented in Darwin's work was incredible. This made his evidence hard to deny. He documented graduated differences in species of birds, insects, lizards, fish, bacteria, and plants in a multitude of settings. Most scientists felt that only *experimentation* could provide proof of a theory. Darwin helped bring the tool of observation to a new level of credibility. Also, as mentioned before, Darwin challenged the process of studying organisms as individual entities separate from each other. He emphasized the importance of systems and thinking of nature in terms of the relations of organisms to each other and to their external environment.

Ideologically, many parts of Darwin's new philosophy of science and thought challenged traditional ideas. Darwin rejected the ideas of determinism, which stated that if all current facts were known, all future events could be predicted. Darwin felt that variations were infinite, and that chance played a heavy role in these variations, at least on a genetic level. In this way, Darwin's challenge to determinism preceded a similar pronouncement in physics by nearly fifty years—Heisenburg's Uncertainly Principle.[13] Finally, the simplicity and power of Darwin's ideas made them hard to deny.

Any intellectual revolution of such power must take a long time to settle into the minds of scientists. Indeed, although social Darwinists applied Darwin's ideas to business and human action in the late nineteenth century, biologists generally rejected many of Darwin's ideas. Because of Darwin's enhanced level of intuition, it took scientists in other areas until the 1930s, '40s, and '50s to provide the tools that verified Darwin's ideas. These ideas were shared, new tools were applied, and by the 1960s, most of Darwin's ideas had become accepted as truth.

Although biologists accepted the general idea of evolution, new theories challenged and modified Darwin's process of natural selection. Ironically, these challenges have come from the very areas that helped prove the validity of Darwin's ideas: geology, anthropology, and genetics.

The first theory was called punctuated-equilibrium theory, which, briefly, stated that evolution occurs in fits and starts. Dr. Stephen Gould, a Harvard biologist, based this theory on fossilized remains. He believed that recent fossilized evidence demonstrated that species remained unchanged for millions of years. Then, in a fit of change, they evolve suddenly. Organisms with adaptations which were advantageous then invaded areas where the parent species exists. Thus, gradual adaptations did not occur, but instead long periods of stability were broken by rapid change and invasion.[14] This did not fundamentally reject Darwinism, but did challenge

[13] Mayr, "Resistance," 129.
[14] *Economist*, "Missing Links," 86.

some of Darwin's ideas.

Another more recent theory was the renewed belief in catastrophism. As the name suggests, this theory asserted that life forms stay the same until huge catastrophes kill off the dominant life forms, clearing the way for new organisms. Much evidence has become known that demonstrates how just such a catastrophe occurred sixty-five million years ago when a comet struck the Earth, massively changing the environment and killing off the dinosaurs.

A third challenge came from geneticists. As more was learned about genetic mechanisms, geneticists have discovered a lot of "junk" in DNA strands: long chains of amino acids that served no apparent function. Also, genes are unpredictable, disappearing from one generation and reappearing much later.[15] Thus, one possible explanation for trait continuity could be some process of natural selection at a molecular level. However, more evidence pointed to the theory proposed by Japanese biologist Dr. Motoo Kimura that genes do not experience a "selection" process, but instead mutate in a neutral manner. Some mutations are beneficial, others are harmful, but most are neither. Strict Darwinians believed that no change is "silent." The "junk" in a DNA strand must be either helpful or harmful.[16] None of these ideas completely rejected Darwinian evolution. Instead, all of them attempted to modify the mechanisms described by Charles Darwin.

Darwin achieved a balance of genius and humility. He was not dogmatic or too rigid in his theories. He admitted their weaknesses, but backed up his assertions with as much information that he had at his disposal. Most importantly, he looked outside his particular area of expertise. In a stroke of intuitive genius, he invented a new intellectual framework. The most important and far reaching idea that can be gleaned from Darwin's work is that no area of thought operates in a vacuum separate from its sister disciplines. Physicists, biologists, anthropologists, and philosophers all have shaped the acceptance of Darwin's theories, and continue to do so today. No field of thought or study is so comprehensive that it can find all of its answers in itself. Scientists, philosophers, historians, and lay persons not involved in these intellectual professions must look outside their own experiences and disciplines to fully understand the world. This was Darwin's truest and most lasting legacy.

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[15] Ibid., 87.
[16] Ibid.

Protector or Monarch: Images of Kingship 1656-1657

BY SETH D. RODGERS

On 30 January, 1649, a decade of civil conflict ended in England with the execution of Charles I.[1] The war, according to the victors, was fought to end the tyrannical power of kings and to establish "a commonwealth and free state."[2] Yet eight years later, the Parliamentarian government founded by anti-monarchial forces offered the crown to the Lord Protector, Oliver Cromwell.[3] Despite the efforts of Parliament and the Army, the idea of Kingship had not been eliminated by the years of fighting. While there were practical reasons for offering the crown to Cromwell, there was also a cultural underpinning to the offer. The English people had an attachment to the crown that the revolution could not eradicate, an attachment that exhibited itself in the writings and attitudes of the time. While the Commonwealth and Protectorate had abolished the monarchy in name, a positive image of Kingship still existed in post-revolution England. This paper will argue the idea of Kingship was inseparable from the idea of government in England during the 1650s.

The King, in seventeenth-century England, represented more than just the head of state.[4] Englishmen thought that the Monarchy "taught fundamental truths about human behavior and human value," and was the "center of the English structure of power—the center of politics, of culture, of law, and of religion."[5] The English saw the monarchy as vital to the social and political cultures of the 1600s and early 1700s. A mere fifty years after the Protectorate, Queen Anne would unify the nation through the "revival and exploitation of royal ritual and symbol.[6] Respect and reverence for Kingship had become so ingrained in English society that not even a regicide republic could eradicate its existence.

It is important to understand how entrenched these images of kingship had become in the thought of virtually every English person. The Parliamentarians had come to power by opposing the rule of Charles I, though, even in the 1640s, they claimed they had fought the revolution to protect

[1] Derek Hirst, *Authority and Conflict: England, 1603-1658* Cambridge: Harvard University Press, 1986), 287.
[2] Ibid., 292.
[3] *Mercurius Politicus*, 26 March to 2 April 1657.
[4] Cynthia Herrup, "Beyond Personality and Pomp: Recent Works on Early Modern Monarchies," *Journal of British Studies* Vol. 28 (April 1989): 175.
[5] Ibid.
[6] R. O. Bucholz, "'Nothing but Ceremony': Queen Anne and the Limitations of Royal Ritual," *Journal of British Studies* Vol. 30 (July 1991): 288.