INTRODUCTION

Charles Robert Darwin (1809–82), the English naturalist, published his great evolutionary work, *On the Origin of Species*, in 1859. At once, people seized on his ideas and applied them well beyond the *Origin*'s concern, the realm of biology. One area in which evolution was taken up was philosophy, and soon a thriving genre developed. Yet, a hundred years later, some fifty years ago—and I write with experience—the very idea that evolutionary theory might be relevant to the problems of philosophy was greeted like a bad smell at a vicarage tea party. It was not just wrong to suggest that our simian past might be relevant to the issues of knowledge, epistemology, and to the issues of morality, ethics, it was somewhat unclean. Holding such views certainly showed that you had no understanding of modern professional philosophy, and in a way hinted at an unfortunate weakness of intellect and character, somewhat on a par with those who express an enthusiasm for spiritualism or colonic irrigation. Had not the great G. E. Moore in his epoch-making *Principia Ethica* (1903) shown in full detail what happens when you suggest that moral behavior is somehow connected to our animal past? Had not the even greater Ludwig Wittgenstein said in his defining *Tractatus Logico-Philosophicus*: "Darwin's theory has no more relevance for philosophy than any other hypothesis in natural science"? (Wittgenstein 1923, 4.1122).

From enthusiasm to disdain to—what? Today, how things have changed! Turning to the empirical for help in philosophy has become all the rage, and although there are as many ideas about the empirical as there are empiricists—not to say different assessments of what this all implies for philosophy—it has meant that evolutionary approaches to the problems of knowledge and morality have become commonplace, if not expected. This collection reflects this newfound excitement and carries the discussion further. Here, you will find a guide to the ideas, both positive and negative, that surround the evolutionary approach to philosophy, together with the major papers that have tried to put the approach into action. Much of the collection is devoted to the thinkers of today. However, I have bigger aims than that of simply offering a tool, a sourcebook, for the person who wants to try his or her hand at using evolution to tackle problems of a philosophical nature. I believe that there is a story to be told here. Whether intended or not, I see work being done today on evolution and philosophy as part of a broader cultural movement. In some very deep sense, it is part of a movement to see human beings in a naturalistic fashion, this being set against more traditional attempts to locate humans in a religious, a spiritual, a non-naturalistic world.

I do not mean that everyone who has written on evolution and epistemology or evolution and ethics is setting out to destroy Christianity or to render redundant any spiritual understanding of ourselves. But I do argue that there is something interesting and important going on here in that direction and that we should try to reveal the perhaps-hidden, certainly broader issues. It is to this end, as well as from a desire to be reasonably comprehensive, that, before introducing today's thinkers, I have included selections that address earlier attempts to relate biology to philosophy. Being an evolutionist—without at this point committing myself to what that might mean in the realm of ideas—I believe that the

understanding of the present must begin in the past. So do keep in mind that there is no history for its own sake. A major reason for introducing the earlier writings is to illuminate the present.

One aim, as you might already have guessed, will be to show that the story is not quite as straightforward as one might have expected. If indeed the use of evolution to tackle philosophy is part of a broader movement to understand ourselves naturalistically, one might think that this would be a fairly smooth history, with successes building steadily on successes. As we shall see—as we have already hinted—this was far from so. Initially, after the *Origin* was published, many turned to evolution for insight on philosophical issues. Yet, as my own experiences show, for a long time the evolutionary approach to philosophy fell out of favor. So at least part of the story—and here history is crucial, but still as a tool for understanding the present and perhaps helping today's practitioners in their efforts—must include the telling of this fall. As you might expect, this was a bit of a two-way thing. Although there were reasons for turning from evolution, there were also reasons why philosophers felt that they could turn from evolution. And, most obviously for our purposes and interests, there exist reasons why philosophers have felt that they can turn back to evolution.

Each section has its own introduction, so there is little need to review here the expositions and arguments to be made later. Now, for the benefit of the reader who needs more background information, since the theme is the relevance of evolution—Darwinian evolution especially—for the problems of philosophy, this general introduction offers a brief sketch of evolutionary thinking and its history. It does not pretend to be comprehensive, but it should help the reader when we come to the discussions of the past and of the present. Also, it will begin the task of uncovering the full story of the engagement of evolution with philosophy. At the end of this collection, I have added a discussion of articles and books that you might find useful if you want to explore the topics in more detail. This includes the content and claims of this Introduction.

Evolution: The Early Years

Evolution thinking is the child of the idea of Progress, the belief that through our own efforts humans can make a better life here on earth.[1] Through science and technology and medicine and education and the like, things can be improved for ourselves and our children. This is an idea of the eighteenth century, the Enlightenment, and it was only then that people started to speculate about the origins of organisms. People, like the French encyclopedist Denis Diderot (1943), thought that such origins might be connected to Progress, in this case however a progress in the animal and plant worlds as life climbed a chain of being, from the simple to the complex, or, as some put it, from the monad to the man.

Entirely typical was Erasmus Darwin, physician, inventor, poet, friend of leading industrialists, and grandfather of Charles. He saw life going up the chain, from the blob to its apotheosis, the civilized man of the West.

> Organic Life beneath the shoreless waves
> Was born and nurs'd in Ocean's pearly caves;
> First forms minute, unseen by spheric glass,

Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire, and larger limbs assume;
Whence countless groups of vegetation spring,
And breathing realms of fin, and feet, and wing.

Thus the tall Oak, the giant of the wood,
Which bears Britannia's thunders on the flood;
The Whale, unmeasured monster of the main,
The lordly Lion, monarch of the plain,
The Eagle soaring in the realms of air,
Whose eye undazzled drinks the solar glare,
Imperious man, who rules the bestial crowd,
Of language, reason, and reflection proud,
With brow erect who scorns this earthy sod,
And styles himself the image of his God;
Arose from rudiments of form and sense,
An embryon point, or microscopic ens!
(Darwin 1803, 1, ll. 295–314)

This was not an atheist's vision of life's history, although as a Progressionist Darwin was opposed to the Providentialist, who sees all of human history bound up with God's saving grace through the sacrifice on the Cross. Darwin, like so many back then, was a deist, believing in a God who works through unbroken law. For him, therefore, evolution—the word did not take on its present meaning until the middle of the nineteenth century, but the idea was alive back then—was a proof of God's existence and power, rather than a theological obstacle. The key was that it was all bound up with the cultural idea of Progress. As Erasmus Darwin said explicitly: "This idea [that the organic world had a natural origin] is analogous to the improving excellence observable in every part of the creation; . . . such as in the progressive increase of the wisdom and happiness of its inhabitants" (Darwin 1801, 509).

To be candid, for Erasmus Darwin and other contemporary enthusiasts for evolution, this was the beginning and the end of the matter. The empirical facts such as they were—and they were not great—were essentially irrelevant. It was the idea that counted. Indeed, having projected the cultural notion of Progress into the biological world, most people then in a happy circular fashion read out biological progress and used it as confirmation of their social and cultural commitments! Great or not, what about the empirical facts? One needs to take care in answering this question. Most particularly, it is important not to exaggerate the ignorance or the slavish devotion to biblical stories about origins. Back at this time, few individuals, Christian or otherwise, believed in a biblically based 6000-year earth. Enthusiasm for this view today is a function of idiosyncratic events in American Protestant religion, not the least the influence of Seventh-day Adventist theory, which (given the significance it imparts on the Sabbath) has its own peculiar reasons for a literal, six-day creation and a short, earth-history span. In the early nineteenth century, people believed the days of creation were lengthy periods of time—"a thousand years is as a day in the eyes of the Lord"—or that there were unmentioned large epochs between the days of creation.

Against this background and comfortably confirming a long, earth history, in the time period from the eighteenth century to the publication of the *Origin*, empirical discoveries pertinent to evolutionary thought did begin to unfold. Most notably, people began to uncover the fossil record and most agreed that it seems to have a roughly progressive nature—from fish, in the lowest levels, to amphibians and reptiles, and then on to mammals. Human remains or evidence—tools and the like—were scant, but such as they were they confirmed that we are a recent species.

Nevertheless, right through to the middle of the nineteenth century, evolutionary speculations continued to be little more than epiphenomena on the cultural notion of Progress, and naturally those favorable to Progress tended to be favorable to evolution and those against Progress tended to be unfavorable to evolution. This means that most Christians were not sympathetic to evolution; but note that this opposition was far more a function of the opposition between Progress and Providence than because of a simplistic reading of the early chapters of Genesis. As with geology, this was never a major factor influencing the thinking about biology.

The Origin of Species

In major respects, the arrival of the *Origin* changed things dramatically. In other respects, paradoxically, the arrival of the *Origin* made little difference. On the positive side, now finally the world had a work that laid out in a professional way the case for evolution and, moreover, provided a mechanism—the mechanism that we hold today. In a two-part argument, Darwin argued for something that he called "natural selection," shortly also to take on the name of "the survival of the fittest." Drawing on the rather gloomy thinking of the political economist Thomas Robert Malthus (1826), Darwin argued that population pressures will always exceed the available space and food supplies. There will therefore be a "struggle for existence."

> A struggle for existence inevitably follows from the high rate at which all organic beings tend to increase. Every being, which during its natural lifetime produces several eggs or seeds, must suffer destruction during some period of its life, and during some season or occasional year, otherwise, on the principle of geometrical increase, its numbers would quickly become so inordinately great that no country could support the product. Hence, as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life. It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of food, and no prudential restraint from marriage. (Darwin 1859, 63)

(Responding to criticism, in later editions of the work presenting his thinking Malthus had agreed that perhaps human effort, especially "prudential restraint from marriage," might attenuate or even remove the struggle.)

Darwin now drew attention to the fact that among organisms, both those in the care of humans and those in the wild, we find large amounts of variation.

One organism, even if of the same species, is rarely if ever exactly like another. Darwin therefore inferred that in the struggle to survive (and to reproduce) perhaps those differences might make the difference between success and failure. The successful organisms will be different from the unsuccessful organisms—there will be a natural kind of selecting or picking, akin to the selecting or picking of the animal or plant breeder trying to improve stock—and given enough time this will lead to change or evolution.

> Let it be borne in mind in what an endless number of strange peculiarities our domestic productions, and, in a lesser degree, those under nature, vary; and how strong the hereditary tendency is. Under domestication, it may be truly said that the whole organization becomes in some degree plastic. Let it be borne in mind how infinitely complex and close-fitting are the mutual relations of all organic beings to each other and to their physical conditions of life. Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favourable variations and the rejection of injurious variations, I call Natural Selection. (Darwin 1859, 80–81)

Notice what is most important, both for Darwin and for us in our future discussion. Selection does not merely produce change; it produces change of a particular kind. It gives organisms the tools to survive and reproduce—it cherishes "adaptation." The things that the natural theologians, like Archdeacon William Paley (1802), took to be evidence of the existence of God—eyes, hands, teeth, leaves, bark, shells, and so forth—what today's biologists call "adaptive complexities," are the end result of the Darwinian mechanism of selection.

Having made the case for selection, Darwin then used it to explain phenomena right across the spectrum of biological inquiry. Why does the honey bee make cells of exact hexagonal shape and with so fine a wall between one cell and the next? Because this is the most efficient use of wax and hence those bees who are good designers are going to be more successful than those who waste or overuse the wax. Why do fossil organisms often seem to be midpoint between different forms living and thriving today? Because the primitive organisms are the linking ancestors of today's different forms, which have evolved in different ways through the pressure of natural selection. Why are the finches of the Galapagos archipelago like the birds of South America and not like those of Africa—and conversely for the denizens of the Canary Islands? Because the Galapagos finches came from South America and evolved apart on the Galapagos. They did not come from Africa any more than the denizens of the Canaries came from South America. Why do organisms fall into patterns, a kind of natural order, as mapped by the great Swedish systematist Linnaeus? Because of evolution through natural selection. Why are the forelimbs of man and of horse and of fish and of amphibian alike in having the same bones in the same order, even though the functions

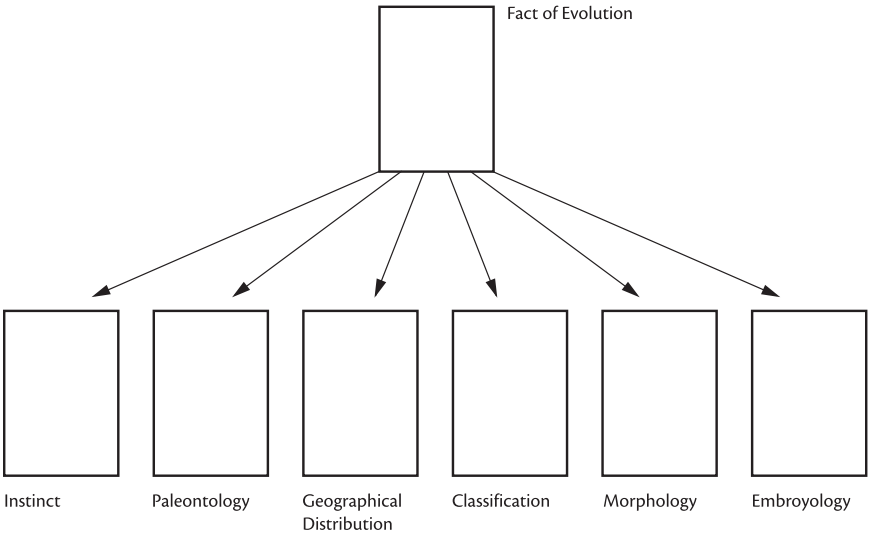

FIGURE I.1. The structure of Darwin's theory.

are very different? Same answer as before—evolution through selection. And why are the embryos of humans and dogs so similar when the adults are so different? Because natural selection has separated the adults, but the selection pressures on mammals in the womb are more or less the same for every species.

In fact, Darwin offered a two-way sort of argument. Having explained things through evolution by natural selection, he also used these explanations to justify the belief in natural selection. This was not so much viciously circular as a kind of feedback argument, of the kind we use in the law courts. The butler's guilt for the murder of his lordship explains the bloodstains, the method of killing, the weapon, the broken alibi, the motive and so forth. Conversely, these clues point to the guilt of the butler. The fact that his lordship was stabbed in an expert fashion is explained by the fact that the butler joined the commandos as a young man. Conversely, the expert stabbing supports the hypothesis that the butler was the killer.

The accompanying diagram shows the fan-like structure of the argumentation of the *Origin*. It should be said that Darwin did not stumble upon this by chance. It is the kind of argument, known as a "consilience of inductions," recommended by the early Victorian historian and philosopher of science, William Whewell (1840). Not only did Darwin know Whewell well but he read his works with care and took pride that he had been able to measure his work up to the best standards of science.

The Reception

This is the positive side to the *Origin*. After Darwin published, evolution as such became common sense. Nigh everyone came onside about organic origins, with the exception of the American South and fellow travelers—these latter were often the lower-middle classes of the great Northern cities, who felt that the great move

to industrialize yielded few benefits for them and who also felt threatened by the huge number of non-Protestant (Catholic, Jewish) immigrants from Europe. For most, however, whatever the causes, life came naturally. No longer did evolution depend on Progress for its existence. Yet, this said, Darwin was far from successful in his aims. Few indeed accepted natural selection, except as a minor, house-cleaning form of change. Most opted for other mechanisms—large jumps or "saltations" were one set of favorites; analogously, Lamarckism or the inheritance of acquired characteristics was yet to have a long shelf life. Adaptation likewise was not generally an overwhelming favorite. Many pointed out how much that seems important in organic life, those similarities between limbs noted above, for example, has little or no adaptive or functional significance.

There were a number of reasons why Darwinism—meaning now, by this term, evolution by natural selection—failed to convince. For a start, there were serious scientific questions about the theory of the *Origin*. For instance, and most important, Darwin had no really strong theory of heredity—what we would call "genetics." A major worry was about the stability of variation. However good a particular variation may be in one generation, unless it is preserved for future generations, selection can have no lasting effect. Darwin could never really see how this preservation could happen, and with reason critics jumped on him. Another major worry—a series of worries in fact—came through the fossil record. Not only were there major gaps between forms, but before the Cambrian (a time which we now know started about 540 million years ago) there were no fossil forms at all. How could selection have brought everything into being in one fell swoop? The organisms of the Cambrian, like trilobites, are complex—Not at all what you would expect of early forms.

And on top of all of this, there was the age-of-the-earth worry. Clearly, natural selection was a rather slow, leisurely sort of process. Calculating from such indicators as the salinity of the sea and the radiation from the sun, the physicists fixed the age of the earth at about one hundred million years. There simply was not enough time for Darwinian evolution. Today, of course, we know that the physicists were wrong. They were ignorant of radioactive decay and its warming effects. For Darwin and his fellows, however, there was no answer and simply another reason to downgrade natural selection.

Yet one suspects that science was only part of the picture. The early 1860s and the decades after were the times when in both Britain and the United States (the latter after the Civil War) reformers were working hard to improve education and medical practice and the efficiency of the armed forces and local government and the like. The leader in Britain was Thomas Henry Huxley (grandfather of Aldous Huxley, the novelist) and a devoted evolutionist—he called himself "Darwin's bulldog." Huxley worked long and hard—and successfully—to improve university science teaching. He knew that the key to success would be money—for himself and his students. This meant he had to sell his work—his work in the classroom—to others, as valuable. Physiology and embryology he sold to the medics, convincing them that the doctors of the future should have three years of pure science before being trained as physicians—an argument they bought and that remains in place to this day in Britain. Morphology he sold to the teaching profession. He argued that for the modern world a child had better have hands-on experience of cutting up dogfish rather than learning dead languages like Latin and Greek. Here also, Huxley was successful in his aims, sitting on the

London School Board and starting summer schools for teachers. His most famous pupil was the novelist H. G. Wells, author of the *Time Machine* and *The War of the Worlds*.

Evolution did not really fit into this picture. It does not cure a pain in the belly and was thought a bit risqué for school curricula. But for Huxley and his friends it did have a role to play. With good reason they saw Christianity—the Christianity of the established church, the Church of England (Episcopalian to Americans)—as the ideological bulwark of the conservative landowners and military and others who opposed their reforms. So they sought their own ideology—their own secular religion—and evolution with its story of origins lay ready to be used to this end. Huxley and sympathizers grabbed it and embroidered it into their banner, they made it their world picture, a modern, late nineteenth-century secular one that countered the old picture of the creation, the fall, and the salvation history of Christ and his death on the cross.

To do this successfully, the evolution of the reformers had to be more than just a story of change—it had to be a story of progressive change, from the monad to the man. A story of change where we humans have triumphed and now the task is to make an even brighter tomorrow. Unfortunately, Darwinian selection is not that warm toward biological progress. In fact, in respects it opposes it. Who will be successful in the struggle? Well, it all depends. As Peter and Rosemary Grant (P. R. Grant 1986; R. B. and P. R. Grant 1989) showed in a brilliant, decades-long study of finches on the Galapagos, in times of drought it is the big-beaked finches that survive and reproduce. In times of rain, when foodstuffs are abundant, it is the small-beaked finches that can eat the most and are the most successful in the struggle. There really seems not to be any better or worse, higher or lower on the Darwinian picture.

And so, after the *Origin*, once again there was reason why selection was downplayed and ignored, as evolution became a popular science, a secular religion, that backed the reforms of the new and energetic leaders in Victorian Britain and elsewhere, especially across the Atlantic. These new men even built cathedrals dedicated to their ideology—except they did not call them cathedrals. They called them museums of natural history, and stuffed them with displays of dinosaurs, those fabulous beasts of the past now being dug up in their thousands from the rocks of the newly opened (thanks to the railways) lands of the American West. Instead of going to services on Sunday morning, now the modern family went to the museum on Sunday afternoon, and wondered at the displays—progressivist displays going from primitive fossils right up to *Homo sapiens*.

The Arrival of Genetics

This was the state of evolutionary affairs for over half a century, until about 1930. As almost everybody knows, around the beginning of the century biologists had discovered the true principles of heredity. Or rather they had rediscovered them, for an obscure Moravian monk, Gregor Mendel, had worked them out in the 1860s, around the time of Darwin. Unrecognized for many years, the logjam was then broken and people saw that there are basic units of function—what were soon to be called "genes"—that are passed on unchanged from generation to generation. Considered as units in a population, what came to be known as a "gene

pool," one could readily show that these genes remain in constant proportions down through time unless acted upon by external forces, selection for instance.

Finally, then, it was possible to put Darwinian selection to work, and around 1930 a number of theoreticians—Ronald A. Fisher (1930) and J.B.S. Haldane (1932) in Britain, and Sewall Wright (1931, 1932) in America—showed how one could build a fully satisfying theory of evolution, one that starts with Mendelian genes in populations, and which then postulates factors of change, specifically natural selection working in these populations. The theory in place, the empiricists moved in, showing how now it was possible to explain the biological changes that one actually finds in nature. In Britain, E. B. Ford (1964) and his school of "ecological geneticists" were very important. In American, the key figure was the Russian-born geneticist Theodosius Dobzhansky, author of *Genetics and the Origin of Species* (1937). In short order, he was joined by the German-born systematist Ernst Mayr, author of *Systematics and the Origin of Species* (1942); paleontologist George Gaylord Simpson, author of *Tempo and Mode in Evolution* (1944); and a year or two after by botanist G. Ledyard Stebbins, author of *Variation and Evolution in Plants* (1950). Back in England, another grandson of Thomas Henry Huxley, Julian Huxley, the older brother of Aldous, was doing his part by writing a semi-popular overview of the new evolutionism, *Evolution: The Modern Synthesis* (1942).

Sociobiology

The years since the "synthesis" (of Darwinism and Mendelism) have not stood still for evolutionary biologists. There have been times of great excitement and times of great tension. In the early years—in America the modern theory is usually called the "Synthetic theory" whereas in Britain it is usually called "neo-Darwinism"—it seemed as if tension was going to be the general state of affairs for evolutionary theory. The 1950s were the times of great excitement for others but less so for evolutionists. Spurred by the discovery of the double helix by James Watson and Francis Crick, at last life could be studied and understood at the molecular level. To many, it seemed that this approach was simply the only proper way to do biology. It also offered great hope in the medical and technological realms, with promised cures for cancer and the like. Whole-organism biology, like evolutionary theory, seemed dated even before it really began. The Darwin-Mendel synthesis was good only for the knacker's yard.

Fortunately, it did not take long for sanity to reassert itself. The evolutionary biologists soon saw how the tools of molecular biology could yield answers to evolutionary problems, for instance about the variations in populations, that older techniques simply could not tackle. Conversely, molecular biologists having worked out the basic principles of their science turned increasingly to more complex questions, and before long these started to involve questions about long-term change, namely questions about evolution.

But the recent history of evolutionary theory has been more than one of simply learning how to get on with others. It has been very positive in many respects, most notably in the area of social behavior. Darwin always appreciated that behavior is important in the struggle for existence. There is little point in having the physique of Tarzan if you have the indifferent sexual interests and activities

of the hermit. What Darwin also saw was that the matter of social behavior raises problems of particular importance and difficulty. Why should an animal ever do something for another, given that it seems not to be in its own interests? In the social insects, the hymenoptera (ants, bees, and wasps) particularly, why do the workers sacrifice their own fertility to serve the ends of the nest, of their mothers and sisters and brothers?

The obvious answer is that natural selection can work for the benefit of the group over the individual—a process known somewhat naturally as "group selection." However, with qualifications to be noted later, Darwin was never very keen on that solution. He thought it too vulnerable to cheating or exploitation. Suppose you have two organisms, one devoting its efforts exclusively to its own ends of survival and reproduction ("selfish") and the other giving some of its efforts to others ("altruist"). The selfish organism is going to get more of life's good things than the altruistic organism and hence will do better in the struggle for existence. It will be selected over the altruist, and soon it will be the only form in the population. Darwin therefore favored a notion of "individual selection" that works for and only for the organism acting on its own. In the case of the hymenoptera, somewhat uneasily he decided that the nests are so tightly integrated, it is permissible to regard the individual organisms as parts of the whole, rather than as actors in their own rights. Hence, selection can act on the whole nest, and the selfless workers are to be regarded more as organs helping the whole body—just as the heart and lungs act for the whole body rather than for themselves—than as organisms trying to maximize their own survival and reproductive chances.

Darwin (as we shall see) also hinted at another way out of the dilemma, namely by arguing that in fact help given to others—altruism—can rebound to the benefit of the helper. This is true most obviously when we have a "you scratch my back and I'll scratch yours" type of situation. Think about people living in a group. We all need the help of others occasionally—when we are young, when we are sick, when we are old. If some mechanism can be put in place that will ensure that cheating is kept to a minimum, then individual selection can promote help to others as well as self-regard. Without going into more detail here—we shall be discussing things later at the appropriate times—this kind of thinking opens up major new vistas for Darwinian evolutionists, and in the past fifty years this has been an energetic and fruitful area of activity. "Sociobiology," as the field came to be known, has been (and continues to be) a real jewel in the crown of evolutionary studies.

The same is true of other areas. The fossil record continues to improve, and with molecular techniques aiding the inquiry, we now have very detailed maps of the course of life history, virtually right back to the beginning of life (about 3.75 billion years ago) here on this planet. Studies of geographical distributions, "biogeography," have been transformed by the coming of the geological theory of continental drift, with the mechanism of plate tectonics. All kinds of formerly puzzling patterns are now seen to be the immediate consequences of the ways in which large landmasses have moved around the earth. Systematics has benefited immeasurably from the coming of computers. Massive amounts of information can be gathered, recorded, and quantified, and then the figures crunched by the new technology. What was hitherto but a dream is now something that a graduate assistant can do in an afternoon. Finally, we should mention the ways in

which the study of development, embryology, has been transformed by the molecular revolution in biology. Researchers can trace the actions of the genes in very great detail, showing how the final physical body is put together, and how evolution has left its mark. This area of investigation—"evolutionary development" (or "evo-devo" for short) has come up with some stunning findings, for instance about the similarities in the development of very different organisms—humans and fruit flies, for instance, share some of the same genes and the same methods of growth.

Charles Darwin would be amazed and incredibly excited. The Volkswagen Beetle or Bug today shares not one part with the original people's car planned back in the 1930s in Germany. Yet in a real sense it is obviously the same car. This is as it is for Darwin's theory of evolution through natural selection. There is not one part of his theory that has not been revised, augmented, changed, improved. Yet the theory today is still recognizably the theory of the *Origin of Species*. Although it took a long time to realize this fact, Darwin got it right. Now the time has come to see how this plays out in philosophy.

NOTE

1. Here and throughout I follow convention by capitalizing Progress when I am referring to the cultural notion and not doing so when I am referring to the biological notion.