What is left of the Marxian interpretation of Darwin?*

I. THE CULTURAL CONDITIONING OF DARWIN’S THEORY

Machines, competition, empire and progress fascinated the Victorians. One of the most famous scientific theories of the era, Charles Darwin’s theory of natural selection, tells of machine-like organisms that compete, colonise and improve. To notice resemblances such as these, between the context of Darwin’s theory and its content, is nothing new. In 1862, Karl Marx, in a letter to his collaborator Friedrich Engels, wrote: “It is remarkable how Darwin recognises among beasts and plants his English society with its division of labour, competition, opening up of new markets, ‘inventions,’ and the Malthusian ‘struggle for existence.’ It is Hobbes’ ‘bellum omnium contra omnes’ ['the war of all against all'].”¹ In our own day, debates over the cultural conditioning of scientific knowledge have made this old insight of Marx’s newly problematic.² This essay attempts to clarify these new problems. Drawing on recent thinking about culture and science, it
looks at how Darwin’s social, material and intellectual culture conditioned the form and content of his theory of natural selection.

One view may be dispensed with at the start: that Darwin developed the theory of natural selection because he was a genius, and, since geniuses do not belong to mundane history like most people, it is pointless to ask about the cultural conditioning of his theory. There is general consensus among historians of science that talk of “genius” does not so much explain scientific innovation as redescribe it. In Darwin’s case, moreover, two generations of scholarship have revealed how much the history of the development of his theory is a social history. The pressing issue now is more subtle. We must ask whether, in fundamental ways, the theory of natural selection is nevertheless independent of the social history that brought it into being.

We can characterise two contrary theses. An independence thesis about the theory is the more conventional of the pair. On this thesis, the resemblance between cultural context and theoretical content throws light on why a Victorian first developed the theory. Features peculiar to Victorian culture primed Darwin to recognise a timeless truth about nature. But the development of the theory was inevitable — the priming just accelerated the process. There was only so much that could be learned about plants and animals before a conclusion in favour of natural selection became inescapable. Other individuals, belonging to different societies with different histories, would have developed the theory sooner or later. Since lots of different social histories would have yielded the theory, it is independent of any particular history, including the history that happened to yield it.

On the other side is an inseparability thesis. It is a deliberately provocative newcomer. On this thesis, the close match between context and content shows that the
theory of natural selection was not at all inevitable, but a contingent result of a unique social history. The theory’s existence depends crucially on features of the Victorian context unlikely to have been replicated elsewhere. Since the theory would never have existed apart from the trends and events that in fact led Darwin to develop it, the theory is not independent but inseparable from its history. Furthermore, if Darwin, or someone much like him, with similar relations to a similar cultural context, had not developed the theory of natural selection, the biological sciences would now be different, but no less successful.

After first sketching the social history of Darwin’s theory, I shall here explore the question of its independence from its historical matrix, in order to throw light on the Darwinian tradition but also to ask how useful, now, the Marxian tradition remains for students of the history of science. The third section below looks at what, from a Marxian point of view, stands out as Darwin’s most ideologically loaded decision: to concentrate on developing a theory built upon the concept of a struggle for existence – a concept associated then and now with Thomas Malthus. I shall argue that the stability of Malthusian struggle in Darwin’s theorising is better accounted for on an inseparability thesis than on an independence thesis. In place, however, of the standard, Marxian version of inseparability, as connected with legitimation (a view which I will subject to some criticism), the fourth and final section offers an alternative version, emphasising Darwin’s views on scientific method. A general ambition in what follows is to show that in giving up, for good reasons, on a legitimation explanation of why Darwin settled on a Malthusian theory, we need not give up on the goal of making Darwin’s
Mathusianism socially explicable. And in pursuing the latter goal, moreover, we continue to be, as I see it, every bit the intellectual descendants of Marx.

II. VICTORIAN POWER, DARWINIAN KNOWLEDGE

Was Darwin a genius? His notebooks reveal little sign of those flashes of insight that, since the Romantic era, have been the mark of the scientific genius. But however high one’s regard for Darwin’s intellectual powers, those powers did not enable him to transcend his outward circumstances. He did not develop the theory of natural selection by communing with the truth about nature, isolated from the bustling world around him. At every step toward the mature theory, worldly power enabled cognitive advance.

Three steps in particular can stand for the whole, complex sequence. First, there was Darwin’s coming to believe, within half a year of his return from the Beagle voyage, that new species arose through natural causes acting on pre-existing species: the transmutation thesis. If Darwin had never persuaded himself that transmutation was true, it is hard to see why he would ever have bothered with theorising about its causes at all, much less with developing the theory that natural selection was its principal cause.

Darwin seems to have committed himself to transmutationism in the course of reflections on some surprising news about his Beagle collections. In the spring of 1837, the London-based Darwin learned, among other things, that many of his Galapagos specimens belonged to species found only on the Galapagos archipelago. Moreover, those species belonged to genera peculiar, not to other rocky oceanic islands around the world, but to the South American mainland, where the lush tropical conditions could hardly have been more different from the conditions on the Galapagos. For Darwin, the best explanation of
this taxonomic and biogeographic puzzle was that the Galapagos species had arisen through transmutation from mainland species ancestral to the ones currently inhabiting the mainland.  

Darwin had this crucial puzzle to ponder, then, because he had travelled on the Beagle, had collected certain birds from the Galapagos, and those birds had been classified in a certain way. Each element in this package has its place in a uniquely Victorian order. The Beagle voyage was not, after all, a quest to discover the origin of species. The idea for the voyage was Captain FitzRoy’s. He had returned from a previous trip to South America with four Fuegians, and now wanted to take the three survivors back, to serve as Christian paragons among the savages. The Admiralty funded the new voyage for its own purposes, because better maps of the South American coastline would benefit trade and so increase national treasure. Darwin was no mapmaker, and the ship already had a naturalist; but he was rich and refined, and therefore a suitable dining companion for the aristocratic captain.  

Once aboard, Darwin hired a crewmember, Syms Covington, to act as a personal servant in collecting plants, animals and fossils. Back in England, Darwin eagerly handed over his collections to museum-based experts in taxonomy. Such deference on the part of voyaging collectors had made the museum collections vast; and this vastness in turn underwrote the authority of expert classifications.

Theoretical content and wider context likewise intertwine at a second step: Darwin’s turning to the domestication of animals and plants for insights into transmutation. Darwin began making incursions into the breeding literature soon after opening his notebooks on the transmutation problem. Later, as an established gentleman
of science, he went along to the breeders’ meetings. The enterprise of plant and animal breeding was as far advanced in Darwin’s Britain as anywhere else in the world. Well organised and intensely competitive, breeders kept tabs on their art and each other through periodicals, clubs, societies, exhibitions and prize competitions. Darwin’s wealth enabled him to inquire about trade secrets without posing a threat to profits. The breeders may even have seen in Darwin’s interest a means of elevating the cultural standing of breeding. Famously, an analogy with stockbreeding would become the centrepiece of Darwin’s public presentation of the theory of natural selection in the *Origin of Species* (1859).

A third and final step to consider is Darwin’s so-called “Malthusian moment.” Darwin developed the theory of natural selection over several months beginning in the autumn of 1838, after reading in the political economist Thomas Robert Malthus’ *Essay on the Principle of Population*. Malthus had written in part to dampen utopian hopes aroused in the wake of the French Revolution. He had claimed to show that, other things being equal, human populations outgrow available subsistence, bringing hunger, war and other miseries. Extrapolating from Malthus, Darwin came to believe that population pressures in nature were so intense that all plants and animals were locked in a struggle for existence. Given inheritable variation among those struggling plants and animals, over time there emerged, slowly but surely, new and better adapted species.

Later Darwin would recall picking up Malthus’ *Essay* “for amusement,” as though, of a dull afternoon, he had reached for whatever was near to hand. Maybe so. But Malthus was on a lot of minds at the time. The Whig party, political home for the Darwins, the Lyells and other gentlemanly families, had recently come to power, and in
the name of Malthus was introducing harsher measures for the provisioning of the poor. Darwin had long been familiar with arguments in favour of these changes. While he was on the Beagle, his sisters sent him pamphlets full of pro-reform propaganda. Their author, Harriet Martineau, soon became an acquaintance. Malthusian doctrine was the stuff of dinner conversation at London parties — and Darwin was there. When Darwin at last read Malthus for himself, the London papers were full of news of riots, marches, workhouse burnings and other protests against laws acknowledged on all sides as Malthusian in spirit.\textsuperscript{15}

So Darwin’s theory of natural selection was no gift of sheer, sublime, solitary genius, but in several key respects a product of Victorian culture. This conclusion is not obvious. We have contextualist historians of science to thank for it. Their labours have not so much ended the debate over context and content, however, as raised its level. Aware as never before of the theory’s ties to its historical matrix, we can now pose the difficult issue of the independence or inseparability of the theory from that matrix.\textsuperscript{16}

III. THE MALTHUSIAN STRUGGLE FOR EXISTENCE

In Darwin’s day, and to his later Russian readers in particular, the stamp of his matrix was most visible in his appeal to a struggle for existence identified as Malthusian.\textsuperscript{17} Describing that struggle in the Origin, Darwin wrote: “It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms.”\textsuperscript{18} He argued that the diversity and adaptedness of species were the consequence of generations of struggle among organisms who had passed at least some adaptive variations on to their offspring. This argument for natural selection, developed between September 1838 and
March 1839, emerged only after much previous and wide-ranging theorising on the causes of adaptive change. Once he had the argument, however, Darwin’s allegiance to it never seriously faltered. How, then, to explain this stabilisation of Darwin’s theorising around a doctrine as contentious as Malthus’ population principle? Why the decision to stick with Malthus?

For some commentators, then and later, the best explanation is that Darwin stuck with Malthus in order to legitimate hierarchical relations of power in Victorian Britain. The explanation has rarely been stated this baldly. It derives from an analysis of ideology associated now with Marx. In a diffuse way, of course, Marx’s influence extends over all the territory covered in this chapter. It was Soviet Marxist historians who pioneered the anti-genius historiography of the sciences. Marx’s most famous comment on Darwin’s theory and his society, quoted above, was in part a comment on the naturalness of the kinds that appear in the theory. It was not Marx but Engels who gave the classic Marxian reading of Darwin’s Malthusianism:

The whole Darwinist teaching of the struggle for existence is simply a transference from society to living nature of Hobbes’ doctrine of “bellum omnium contra omnes” and of the bourgeois-economic doctrine of competition together with Malthus’ theory of population. When this conjuror’s trick has been performed, . . . the same theories are transferred back again from organic nature into history and it is now claimed that their validity as eternal laws of human society has been proved.
If this was indeed what Darwin was doing, then his decision to stick with Malthus appears inseparable from its matrix. Making competitive struggle look natural is an ambition that makes little sense outside a social context where there is not only competitive struggle but potentially much discontent with the results. Nearer our own day, the historian Robert Young has similarly argued that, just as the theory of special creation was “a theory suitable for a pastoral, agrarian, aristocratic world,” so Darwinian natural selection, with Malthusian struggle at its core, was a theory “which reflects a competitive, urban, industrial one.” For Young, the transition from natural theology to natural selection was but “the substitution of one form of rationalization of the hierarchical relations among people for another.”

To come to grips with this explanatory tradition, two quite different claims about Darwin, Malthus and legitimation need to be distinguished. One is that Darwin in his theorising on species stuck with Malthus for reasons having nothing to do with legitimation, but that, in sticking with Malthus, Darwin happened to produce a legitimating theory. The other is that Darwin stuck with Malthus precisely because a Malthusian theory would be legitimating. Young does not discriminate between these two possibilities. Neither do Young’s historiographic successors, Adrian Desmond and James Moore, in their biography of Darwin. In a representative passage, Desmond and Moore set the scene in 1842, when Darwin’s Malthusian theorising was well developed: “And with Chartists massing, it was time for middle-class Malthusians to stand up and show that nature was on the side of the bosses.”

Does the ambiguity matter? It does if we are after an explanation of why Darwin’s theorising stabilised as it did. Suppose Darwin just happened to stick with
Malthus at a time when middle-class Malthusians were keen to show the poor and powerless that a law of nature had ordained their position in the social hierarchy. In this case, there would be no explanation for the stability of Malthusian doctrine in Darwin’s theorising on species. There would simply be a remarkable coincidence between what was happening in Darwin’s notebooks and what was happening outside his window. I doubt that this is how Young or Desmond and Moore want to be read. Theirs are fighting words. Claims about coincidence do not raise the temperature of debate. Claims about explanation do.

Suppose their claim is indeed the explanatory one, that Darwin stuck with Malthus because his society needed a theory that legitimated competitive social struggle by naturalising it. There are honourable reasons for interpreting Darwin’s theorising along these lines. Almost from the outset, Darwinians have enjoyed tremendous cultural authority. Their science is so much a part of the established order that Darwin’s portrait now adorns the British ten-pound note. So much authority lends itself to abuse. Directing attention to an ideological function for the theory of natural selection is one strategy for countering uncritical deference. Moreover, as we have seen, some of the natural-theological writers who shaped Darwin’s concept of adaptation did write with propagandist intent. Signs are good that, if Ray or Paley had been asked why they wrote about the divine design of animals, they would have said something about the need to forestall revolution. But there is no serious suggestion that Darwin, had he been asked, would have said that he stuck with Malthus to forestall revolution. Rather, the claim must be that Darwin was not aware of the legitimating needs to which the stability of Malthusian doctrine in his theorising was a response.
There are at least three clusters of difficulties with a legitimation explanation so construed. First, there are historical difficulties. The closer we look at the Victorian scene, the harder it becomes to maintain the tidy generalisations on which the explanation depends. Consider that equation: Malthusian = middle-class = Darwin = bosses. Yes, Malthus had supported the middle-class cause of Poor Law reform. But he had opposed that other middle-class cause, reform of the Corn Laws. Those laws protected the domestic grain market from foreign competition. In opposing their reform, Malthus sided with the interests of aristocratic and gentlemanly land owners against middle-class factory bosses (who wanted grain costs to fall so workers’ wages could fall in consequence). Indeed, for all the growth in industrialisation, the dominant elite in England in the 1830s were the land owners. The Darwin family’s wealth came more from land and property than from manufacture. So Darwin’s sticking with Malthus was not straightforwardly in the interests of the Chartist-threatened factory bosses.

Second, there are evidential difficulties. A number of apparently relevant sorts of facts turn out, on inspection, to be irrelevant to evaluating the legitimation explanation’s truth or falsehood. It is irrelevant, for example, whether the poor and powerless in fact became complacent upon encountering Darwin’s Malthusian theory. Rather, if the theory pacified the poor, then it successfully fulfilled its function; and if not — as appears to be the case — then it simply failed to function properly. It is likewise irrelevant what Darwin himself thought he was doing in sticking with Malthus. On the legitimation explanation, whatever Darwin’s conscious motives in keeping with a Malthusian theory, it was at an unconscious level that he responded to the need for such a theory. If unconscious motives do not announce themselves in the documentary record, then, it
seems, so much the worse for the documents, and the desire for explanations that draw upon them.

Third, there are ontological difficulties. If we accept the legitimation explanation, we accept a holistic ontology for social life, with collective needs that are unconsciously harboured, unconsciously communicated and unconscionously acted upon, by mechanisms wholly mysterious. In one sense, to indicate this is merely to flag the point that, at present, there is an ontological job of work to do. But that would be disingenuous. There is a long tradition of Anglophone flinching from holism in social explanation. Indeed, it might well be that squeamishness about collective needs and unconscious lines of action is itself evidence of the legitimating power of Darwin’s theory. Bred to Darwinian thinking, Anglo-Americans ever after regard individualist explanations as sensible and holistic explanations as suspicious. The social function of the theory of natural selection has thereby become invulnerable to exposure, for wherever the theory goes, it takes an obfuscating prejudice about ontology along with it.

IV. THE VERA CAUSA IDEAL AND THE SOCIAL USES OF MALTHUS

What are the alternatives? It is no explanation to say that Darwin’s theorising settled on a Malthusian theory because, when he developed that theory, he hit upon the truth. If the independence thesis requires this view of Darwin’s sticking with Malthus, then that thesis is a non-starter. People cannot be said to accept a theory because it is true. They may accept it because they believe the evidence shows the theory to be true, or because the theory is more parsimonious than its rivals, or because it fits well with prior beliefs and attitudes. They may accept it because those in authority have pronounced the theory
“true.” In the case of Darwin and Malthus, some combination of the above, properly understood, indeed constitutes a more satisfying version of the inseparability thesis than the Marxian one, or so I argue below. But the truth of a theory, any theory, has no power to explain why this or that individual or community accepts the theory.\(^{36}\)

There is another reason, specific to the history of evolutionary biology, for dismissing the truth of the Malthusian theory of natural selection as explanatory. Since the synthesis of Darwinism and Mendelian genetics in the 1930s and 40s, Darwinians have not regarded the struggle for existence as a cause of natural selection. As they now understand the theory, selection occurs whether or not resources are scarce. All that matters is that there are differences of fitness within a population. Commenting on the previously central role of Malthusian population pressure, Ronald Fisher, a pre-eminent synthetic theorist, wrote in 1930 that there was “something like a relic of creationist philosophy in arguing from the observation, let us say, that a cod spawns a million eggs, that therefore its offspring are subject to Natural Selection . . .”\(^{37}\) With the passing of Victorian society, struggle passed out of the foundation of Darwin’s theory.

So Darwin cannot have stuck with Malthus because the Malthusian theory was the true theory. Nor can any other scientific seeker after truth, in whatever social context, have settled on a Malthusian theory because it was true. To explain the stability of struggle in Darwin’s theorising, we need to look to a local and, quite probably, unique context. On this issue, the inseparability thesis looks to be the winner. But, as we have seen, the Marxian version of the thesis wins at high cost, demanding permanently blurred historical vision, cavalier disregard of Darwin’s likely self-description and baroque ontological commitments.
A more attractive version of the thesis is now emerging. It centres on the principle that guided Darwin’s reasoning, the *vera causa* ideal. According this distinctively British ideal, which derived via Thomas Reid from Newton’s methodological reflections, one had to establish that the causes featuring in one’s explanatory theories were not merely hypothetical but had a real existence, attested on independent grounds. What is too little noticed about this ideal are its cultural politics. When Charles Lyell, Darwin’s great mentor and model, published his three volumes of *vera causa* geology in the 1830s, the character of the sciences in Britain was beginning to change in a fundamental way. At that time, Anglican clerics alone held the small number of scientific posts at the two ancient universities, Oxford and Cambridge, that dominated the life of the nation. Church, state and science thus enjoyed strong institutional links. However, thanks especially to Scottish dissatisfactions and to movements within the Whig party — now reaching out to groups in dissent from Anglican doctrine — those links were coming to be increasingly contested. In the late 1820s, when the self-consciously Scottish Lyell began to write his *Principles of Geology*, his sympathies were becoming ever more Whiggish; and he saw his books as an attempt to expunge Biblical religion from geology.

Geology in particular had attracted the devout. Lyell’s first teacher in geology, the Oxford cleric William Buckland, had claimed to find evidence of the flood that bore Noah’s ark. In Buckland’s view, this flood was but the most recent in a series of catastrophes that God had visited upon the Earth in preparation for the arrival of humans. Where Buckland offered narratives that arguably harmonised with Scripture, Lyell eschewed such narratives as altogether unscientific. According to Lyell, a scientific, *vera*
causa geology did not admit the existence of catastrophes, the likes of which had never been observed. Lyell’s reforms struck at the English elite and their complacencies. If the reforms succeeded, the views of the cleric-geologists would cease to count as scientific explanations. Just as important, the cleric-geologists, beholden to the Church of England for their livelihoods, would cease to count as men of science.\textsuperscript{42}

Recall that Darwin, disciple of Lyell, was searching for a \textit{vera causa} theory of species origins. In the months following his reading of Malthus, Darwin believed he had found the beginnings of an even better version of the \textit{vera causa} theory he already had. His theorising stabilised around a Malthusian core in part because he had read Malthus’ \textit{Essay} in the autumn of 1838, and in part because, in Darwin’s estimation, the Malthusian theory he developed thereafter conformed more closely than any of his previous theories to the \textit{vera causa} ideal. With the cultural setting of that ideal now in view, the two parts of this explanation can each be tied to the Whig reform drive, in and out of the sciences.

Let us take the reading of Malthus first. Commenting in his \textit{Principles} on competitive struggle as the true cause of species extinction, Lyell had quoted, not Malthus, but the Swiss botanist Augustin de Candolle: “All the plants of a given country are at war with one another.”\textsuperscript{43} Lyell had made no reference to Malthus’ \textit{Essay} at all. At a moment of unrest over the Poor Law, however, Darwin — eager to resolve the conflict between his own observations and Lyell’s theory of extinction — found a resolution in the writings of Malthus. The effect was to initiate that series of modifications in Darwin’s thinking which, over the next months, would develop into the theory of natural selection. To the extent that Darwin’s position among the Whig chattering classes predisposed him to associate Malthus with the idea of intense, competitive, providential
struggle, Darwin’s Whig affiliations thus help explain why he read Malthus’ Essay when he did. As for Darwin’s espousal of the vera causa ideal in the first place, it was not so much Darwin’s as Lyell’s Whig affiliations that matter. As we have seen, Lyell had advocated the ideal as part of the Whig drive to reform British institutions. When the Lyellian Darwin conformed his theorising on species to the vera causa ideal, he thus aligned his theories with Whig ambitions for British science and society generally.

The history of changing views on method can often seem remote from the social history of the sciences. When it comes to explaining the stability of struggle in Darwin’s theorising, however, an attempt to integrate these histories offers several advantages. First, doing so enables us to explain Darwin’s Malthusianism without explaining it away. There is no denying or trivialising of the social uses of Malthus in Darwin’s time and place. On the contrary, we see how crucial was Darwin’s proximity to the Whig conversation about Malthus. Second, there is no need to ignore what Darwin thought he was doing. Darwin’s self-conscious motives and allegiances are the starting point for the social-vera causa explanation. Third, we are saved from postulating obscure mechanisms of unconscious response to social needs. The explanation points toward mediated causal sequences, complicated but intelligible, leading from Darwin’s Malthusian culture to the stable Malthusianism of his science. The upshot is a new option: inseparability without Engels.

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K. Marx to F. Engels, 18 June 1862, quoted in Schmidt 1971, 46.

Hacking 1999, esp. ch. 3, provides the best overview of these debates. For a summary, see Radick 2002. The analysis of this chapter owes a great deal to Hacking’s arguments and example. On the “constructivist” or “contextualist” turn among historians of science, see Golinski 1998 and Lightman 1997, introduction. For another assessment in relation to Darwinian biology, see Ruse 1999, discussed in Radick 2003.

On the history of such talk, see Schaffer 1990.

Inevitable, that is, so far as the scientific enterprise as we know it remained a going concern. See Hacking 2000.

One item on Marx’s 1862 list that I shall not discuss here is the idea that competition in nature results in an increasing division of labour. For discussion, see, e.g., Ospovat 1981, chs 7–9; Limoges 1994; Tammone 1995; Ruse 1999, 241–5; Hodge, 2003; and the Introduction to this volume.

On the nature of Darwin’s intelligence, see Gould 2000.

An old but still useful “big picture” view of how capitalism begat Darwinism is Sandow 1938. On the social and economic history of Britain in this period, see Daunton 1995.


On the run-up to the Beagle voyage, see Browne 1995, ch. 6. On the imperial context and content of Darwin’s theorising, see Hodge 2003.

McDonald 1998 is a novel about “Mr Darwin’s Shooter.” Covington’s Beagle journal is currently available on the web. See Covington 1995.
For a study of authority, classification and museums in nineteenth-century natural history, see Barton 2000. On museums in science generally, see Pyenson and Sheets-Pyenson 1999, ch. 5.


Malthus 1826. Darwin read the sixth edition. The first, quite different edition was published in 1798. On Malthus, see Winch 1987.

Darwin 1958, 120.


For an attempt to use computer modelling to settle similar issues about the history of quantum physics, see Pessoa 2001.

Todes 1989, chs 1–2.

Darwin 1859, 63.

Here I shall not address the separate problem of how to explain the stability of Darwinian theory within the biological sciences. My primary concern is with Darwin’s own theorising, not with the public reception of his theory.

The Darwin-Malthus relationship has been much examined. For a survey of the literature up to the mid-1980s, see La Vergata 1985, 953–8. Notable among more recent efforts are Gordon 1989 and Benton 1995.
21 See esp. Marx’s preface to A Contribution to the Critique of Political Economy (Marx 1859, 1959). One of the most influential philosophical discussions is Cohen 1978.

22 See the papers collected in Bukharin 1971.

23 On Marx’s ambivalence toward Darwin’s theory of natural selection, see Weikart 1999, ch. 1.

24 F. Engels to P. L. Lavrov, 12–7 November 1875, quoted in Schmidt 1971, 47.

25 Young 1985a, 240. Young explicitly allied himself with the interpretative tradition of Marx and Engels. See, respectively, Young 1985a, 239 and Young 1985b, 631–2.

26 My analysis here is indebted to the example of Rosen 1996, esp. 52, 184–200.


28 Muñoz-Rubio 1999 is in much the same vein.

29 Hilary Rose, for example, adduces the Darwin-Malthus connection as part of a critique of evolutionary psychology (Rose 2000, esp. 107–10). For similar attacks on the older sociobiology, see Lewontin 1993, ch. 1, esp. 9–10; Sahlins 1976, xv, ch. 4.

30 Asking Darwin why he stuck with a Malthusian theory is, of course, not the same as asking him whether, in light of his Malthusian theory, competitive struggle is a social good. See Paul 2003, for Darwin’s affirmative response to the latter question.
Winch 1987, esp. ch. 5.

Hodge 1994 and this volume.

The miner Chester Armstrong read Darwin en route to reading Marxist economics. See Rose 2001, 74.

Rosen 1996, 197.

Roughly the same difficulties attach to the legitimation explanation of Darwin’s public claims that natural selection is progressive (as in Gould 1996, ch. 12). For a critique, and an attempt to supply a better explanation, see Radick 2000. On the general history of theorising about evolutionary progress, see Ruse 1996.


Fisher 1930, 43–4, quote on 43. For discussion, see Depew and Weber 1995, 269 and Gayon, this volume.

What follows is a modified version of the argument in Depew and Weber 1995, esp. chs 3 and 5. For discussion, see Radick 1998, 353–5.

For the history of the ideal from Newton to Darwin, see Kavaloski 1974. See also Laudan 1981, ch. 7.

Turner 1993, ch. 7.

Secord 1997.

On Scriptural geology and its opponents, see Gillispie 1951. Rupke 1996 helpfully summarises later historical work on this topic. On Lyell’s *vera causa* geology, see Laudan 1982.

Lyell 1832 (II), 131.
44 Cf. the strictures in Shapin 1982, 178; Shapin and Barnes 1979.