As Big as it Gets: 'Big Theory' and the *Collapse of Darwinism*

Gary B. Magee
La Trobe University

In recent years, the study of long-run processes that play themselves out of the course of centuries, even millennia, rather than years or decades, has become popular in the humanities as well as the social and natural sciences. In part, the emergence of this field of research reflects a growing appreciation among scholars that the structures of modern life cannot be fully understood or even placed in their proper contexts without first having adequate knowledge of how we arrived at the current state of affairs. In part, the recent expansion of this area of study is also driven by the desire (of some) to find an intellectual basis upon which a better future may be built, or at least the more obvious pitfalls of myopia avoided. In recognition of this growing interest in 'big history', a recent issue of this journal, edited by Graeme Donald Snooks (2005a), specifically devoted its attentions to this literature[1]. One of the things to emerge from that publication was the realization that to make sense of such lengthy time periods, a solid theoretic framework is absolutely essential; in other words, to be meaningful, 'big history' needs to be accompanied and informed by 'big theory'. Of course, given the large number of variables involved and the complexity of issues at hand, the construction of such 'big theories' is a daunting task. Yet, if one believes that the profound economic, political and ecological challenges that the twenty-first century poses for humanity can only be disentangled and confronted by taking a long view, it is a vitally important task. At the forefront of this re-

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cent efflorescence of research on 'big theory' and 'big history' is Graeme Snooks, the Coghlan Research Professor at the Australian National University. Over the last decade, he has made a major contribution to this field, publishing eight monographs on both global history and on, what John Stuart Mill called, social dynamics; that is, the endogenous mechanisms that propel the development of human societies (Snooks 1993, 1996, 1997, 1998a, 1998b, 1999, 2000, 2003). Together, this corpus of works represents an impressive achievement; it is an achievement, moreover, that is beginning to gain notice across a variety of disciplines. Thus, in articles recently published in *Advances in Space Research*, Snooks' contention from the *Dynamic Society* (1996: 79–82, 92–95, 402–405) that each major biological and technological transformation during the history of life on earth took only one-third of the time of its predecessor, and that the geometrically declining durations of these transformations were accompanied by an approximately proportional increase in the global biomass, has found support in astrophysics and astrochemistry (Panov 2004, 2005; Snooks 2005b). This relationship is now known as the Snooks–Panov algorithm.

The Collapse of Darwinism, or the Rise of a Realist Theory of Life is his latest contribution to the field of 'big theory'. In this book, Snooks extends the dynamic-strategy approach developed in his earlier work on societal development to the fields of biology and natural history. In doing so, his avowed aim is, in a sense, to outdo both Darwin and Marx by providing the first general and universal theory capable of explaining the 'strategic activities of the organism, society, species, and dynasty, together with all the main historical patterns in life and human civilization' (Snooks 2003: 304). This, then, is as bold a project as could be conceived: 'big theory' writ large.

Before turning to the content of the *Collapse of Darwinism,* it is worthwhile detailing, given the title and the misconceptions it might engender, what this book is *not* about. First of all, Snooks is not a creationist, wishing to discredit the theory of evolution in order to install a biblical alternative. Nor is he an advocate of intelligent design. Indeed, although Snooks does not address the notion of intelligent design directly, his dynamic-strategy model is able to account for that theory's main point; namely, that the nature of life and universe is too structured to have been the product of a random force such as natural selection. If, however, as Snooks argues, form and pattern in nature are determined by organisms responding to strategic demand, then there is no need for an external entity to impose 'intelligence' on nature – life itself ensures that. Second, this book does not engage in the character assassination of Darwin. While Snooks is a trenchant critic of Darwin's theory and methods, he is actually quite complimentary of the man himself, writing of his 'brilliance as a naturalist and his vast practical knowledge of selective breeding' (Snooks 2003: 10). As for the *Origin of Species*, we are told that this 'is a masterpiece of gentle persuasion owing to its careful construction, its logical exposition, its fair and balanced judgement, but ultimately to its analogical method' (Snooks 2003: 21). Even when criticizing the lack of dynamism in Darwin's theory of natural selection, Snooks freely acknowledges that no Victorian intellectual possessed the requisite tools or knowledge to have done better. Indeed, Snooks reserves his greatest ire not for Darwin, but for the modern neo-Darwinists, such as Dawkins (1976), who propose a form of genetic determinism that, he believes, borders on the ludicrous. The irony is that these modern custodians of the Darwinian tradition with their focus on the gene and sexual selection have preciously little in common with their master, who gave greater emphasis on natural selection operating through the economic struggle for resources between species (and of course, knew nothing of genetics). Third, the 'collapse' in Darwinian thought Snooks alludes to in the title is an anticipated, not a real one (yet). He is, of course, cognisant of the current popularity of Darwinism, but sees this as a temporary and superficial phenomenon, arising out of *inter alia* the decline of Marxism. We are told, thus, that 'former Marxist (and potential Marxist) thinkers are increasingly adopting that other mid-Victorian idea, Darwinism, often, as a shift from socialism to environmentalism' (Snooks 2003: 8). While it cannot be denied that many 'greens have red roots', it is less clear that large numbers of Marxists have suddenly been converted to Darwinism. In fact, from Marx down, Marxists have always openly embraced Darwinism, regarding it as the legitimate scientific alternative to religious superstition and perfectly consistent with historical materialism. Engels' eulogy at Marx's funeral noted this connection: 'Just as Darwin discovered the law of evolution in human nature, so Marx discovered the law of evolution in human history' (Wheen 1999: 364). One suspects the populism of Darwinism has its roots in other places; perhaps in the 'certainty' it provides in a less religious, though no less insecure, world or in its compatibility with neo-liberal thought, which has risen concurrently (and which Snooks [2000] believes will decline together with Darwinism as well). Snooks' 'collapse' is therefore a prediction, an expectation based on the belief that no theory can forever ignore its contradictions and its failure to account for reality. It is also a vivid metaphor, drawn from one of Darwin's own diary entries, where he described the collapsed cathedral he visited in Concepción in March 1835. This book aims to demonstrate that, like that great edifice, Darwinian thought is destined to become the 'grandest pile of ruins'. (Snooks 2003: 1).

The *Collapse of Darwinism* has three parts. In the first two parts, which constitute the first half of the book, Snooks critically outlines the development of Darwinian thought from Darwin himself through to contemporary neo-Darwinians. His main contention is that, when confronted by the empirical record of life on this planet, this school of thought is found wanting: it simply cannot account for reality. In particular, he is critical of the inherent Malthusianism of Darwin, who believed that the population of all life forms inevitably grows exponentially and that the extreme competition for resources this eventually engenders provides the stimulus for speciation. Snooks, however, points out that the available fossil evidence actually indicates the converse – that speciation occurs in times of fairly low, 'normal' competition. In fact, extreme competition appears to lead to wars of survival and higher rates of extinction rather than genetic change. Snooks also draws our attention to human history, making the valid point that if Darwinism can truly account for the dynamics of life, as it purports, then surely it must be able to explain the actions and history of the dominant species on our planet – humans. That the theory's advocates patently struggle to do so and are often forced to regard humans as a special case for which the normal laws of evolution do not apply is certainly a matter of concern.

According to Snooks, the root of the Darwinian paradigm (and its putative problems) can ultimately be traced to Darwin's methodology. Snooks contends that much of the argument of the *Origin* *of the Species* relies upon a ‘farmyard analogy’; that is, a belief that the mechanisms of natural selection closely parallel those used by the farmer engaged in artificial selection. He argues that while this analogy may have been a very successful tool of persuasion, it was an inappropriate basis upon which to build a theory of life. After all, controlled breeding in the farmyard is not the same as selection in the wild. Rather Snooks believes – and attempts to demonstrate – that inductive methods offer a far superior foundation for scientific analysis than the analogical approach used by Darwin. While Snooks' point about the limits of comparing natural and artificial selection cannot be denied, the value of analogical thinking, however, is not merely to provide a tool of persuasion; it also can be employed as a catalyst for creative and original thought, even if the analogical pairing of experiences itself is not realistic (Magee 2005). To be sure, this process need not produce right answers (since ideation is not the same thing as truth) – so Snooks may be right in his assessment of the outcome – but the method of analogical reasoning in itself need not be intrinsically flawed. Indeed, psychological research indicates how fruitful and widespread its use is (Weisberg 1993; Holyoak and Thagard 1995; Dasgupta 1996). Interestingly, such findings are not inconsistent with the mechanisms of individual decision-making employed by Snooks in his dynamic-strategy model. Later in the book, Snooks (2003: 226–227) argues convincingly that organisms economize on intellect; they prefer to imitate the actions and choices of those who are successful, instead of processing rationally all the vast amounts of information available to them. Could it not be contended that analogical thought represents one of the forms of imitation that individuals use to emulate winners? After all, analogical reasoning is not based on an assessment of a wide range of information, but rather on an intuition that something that works in one situation might also be successful in a different context.

The second half of the book outlines a new ‘realist theory of life’. His dynamic-strategy theory is the book's main intellectual contribution, the first endogenous demand-side theory of life to have been developed. The foundation stone of this dynamic-strategy theory is the ‘materialistic organism’, which seeks at all cost to survive and, having survived, to prosper by maximizing consumption subject to prevailing physical, genetic and technological constraints. The ‘strategic desire’ to increase access to natural resources generated by these materialistic instincts is ever-present and provides his model with its self-starting and self-sustaining mechanism. Snooks, thus, attributes the driving force of his system to the organism. In attempting to meet their desires, organisms and the societies in which they live opt to pursue one of four different types of dynamic strategies: genetic/technological change, population growth and territorial expansion (family multiplication), commerce or interaction with other species (symbiosis), or conquest. Of these the least familiar to readers will be the genetic strategy, which describes a situation where organisms deliberately adopt successful mutations. This is achieved by organisms activating 'smart' genes and then 'cooperating and mating with those individuals who have an edge in accessing natural resources as demonstrated by their material success' (Snooks 2003: 317). The process by which one of the four dynamic strategies is chosen is called 'strategic selection'. Strategic selection is the outcome of an interaction between the organism and strategic demand. It operates through the widespread imitation in a species of successful 'strategic pioneers', individual organisms, which through intuition and a process of trial and error uncover a new and efficient way of enhancing prosperity. If such success continues, over time, this process of emulation brings about a strategic re-orientation of the species and potentially all species of an epoch. The emergence of a strategy to dominance within a species and beyond, however, is neither automatic nor inevitable. Along the way it faces conflict for resources from individuals wishing to pursue alternative strategies. Dynamic strategies are also subject to exhaustion, a condition that, once approached, ushers in crisis, intensifying internal conflict, and ultimately the emergence of a new dominant strategy. This sequence of exploitation and exhaustion of strategies gives rise to the development path of life, a central feature of which, at least until the advent of the 'Intelligence Revolution' about 2 million years BP (when mammals developed the capacity to create and employ technology – the so-called 'technology option' – in the pursuit of survival and prosperity), is the 'eternal recurrence' of biological rise and fall. Working 'above' this strategic selection and imposing an upper-bound constraint upon it is the prevailing genetic/technological paradigm, that collection of specialized genetic/technological styles common to all species/societies of a particular epoch. These set the ultimate limits on life at any point of time, so that when all potential within a given genetic/technological paradigm has been utilized, no further biological expansion is possible and the collapse of the species/society/dynasty ensues. Only with the emergence of a new paradigm permitting a more intensive use of resources (a paradigm which itself is induced by the collapse of the previous one) is decline arrested and the ceiling on further biological expansion raised. In the past 4,000 myrs, four such shifts in genetic paradigms have occurred – the Prokaryotic, Eukaryotic and Endothermic Revolutions – while human society in the last two million years has worked its way through three technological paradigms – the Palaeolithic, Neolithic and Industrial Revolutions. This pattern of strategic and paradigmatic exhaustion, we are told, gives rise to the 'great waves and steps of life' exhibited in global biomass over the past 4,000 million years.

The great strength of the dynamic-strategy theory is its explanatory power[2]. Not only does it provide a logically consistent framework that can account for many of the enigmas thrown up by the fossil record, such as punctuated equilibrium, but it can also shed light on the economic, social and political development of human societies. Along the way, it also raises interesting questions in unexpected areas – another test of an intriguing and useful theory. In the *Collapse of Darwinism*, Snooks, for example, addresses the question of life elsewhere in the universe. Much existing thought on this issue, such as that underpinning the SETI program, starts from the assumption that if there is life elsewhere its progress and level of development must be a positive function of time. As there are older planetary systems than ours in the universe, then, should there in fact be life there, it follows that it must be of a more advanced form than our own. However, such an expectation may be misplaced if the course of life is neither predetermined nor linear by nature; if, as Snooks contends, 'strategic selection', rather than 'natural selection' drives life. Seen in this light, the rise of humanity and its escape from the 'eternal recurrence' was little more than 'a long sequence of highly unlikely events' (Snooks 2003: 300), which need not be replicated in the same way and as successfully elsewhere in the universe. Snooks takes the argument one step further by noting that even if alien life did manage to escape the eternal recurrence, it is unlikely to be more or even as intelligent as humanity, since our species was fortunate to have made its escape after 'a mere 65 myrs' as a result of 'an early intellectual revolution' (Snooks 2003: 300). Moreover, there are physical restrictions to consider, since 'brain size and complexity will grow only until a threshold level is reached that enables the life form in question to substitute the technology option for the genetic option'. Once this is achieved, we are told that 'the average level of intelligence of this species will remain static' (Snooks 2003: 300). While this represents an intriguing new contribution to the debate on alien life, it needs to be acknowledged that Snooks' contentions here particularly in relation to levels of intelligence are highly speculative. Without actual knowledge of life on other planets, how can we tell that 65 myrs is indeed a short time for a species to escape from the eternal recurrence? Perhaps, it is a late escape? We simply cannot tell from a sample of one. Similarly, how do we know that average levels of intelligence must be comparable across advanced life forms? Might not an alien species exist with such a mastery of biotechnology that it has already increased its intellect genetically beyond these limits? While Snooks' arguments about alien life are appealing and certainly consistent with his reading of the history of life on earth, the fact of the matter is that till we have more (indeed any) information on the experience of life in contexts elsewhere in the universe, they must remain hypothetical.

But is that not what we desire from 'big theory': explanations, for sure, but also new ideas and hypotheses for exploration? The *Collapse of Darwinism* has these in abundance. Let me briefly mention here just three areas central to the dynamic-strategy theory of life that cry out for further research from specialists. First and foremost, that most controversial aspect of Snooks' theory: the belief that genetic change does not occur randomly, but is 'deliberately pursued by organisms' (Snooks 2003: 235). How is this possible? How can mutation be produced on demand? In life forms without brains, we are told that the presence of 'smart' genes that turn 'on' and 'off' in differing physical and social environments are the instruments through which the genetic strategy is activated. To support this view, research on the role played by switching genes in viruses (by Arkin) and in bacteria (by Cairn and Hall) is adduced. No doubt, this is a promising start, but as Snooks himself acknowledges this research is still in its early stages. One would feel much more comfortable on this issue once this field of research has been more thoroughly explored. Till that time, many readers will undoubtedly retain a certain degree of scepticism about the ability of organisms (at least those without a sophisticated knowledge of biotechnology) to consciously control mutation in its species. Second, Snooks argues that strategies diffuse throughout species and dynasties by a process of strategic imitation, whereby ‘followers’ copy successful ‘pioneers’. While one can see how this might work in human society and in life forms with intelligence – since humans, for example, can detect cause and effect and consciously attempt to emulate it – it is less clear how this mechanism might apply to lower life forms. How do followers in such species (let's say, single cell life forms) ‘perceive’ imitative information provided by other individuals of their species; in other words, how do they recognize the success of the pioneers among them and act upon these data if they do not have a consciousness? While Snooks offers some useful discussion of this issue in chapter 7, there is clearly a lot we still do not know about the processes underlying this phenomenon. Third, it should be obvious from the foregoing discussion that pioneers play a crucial role in initiating strategic selection. But who or what are these pioneers? We are told that they are ‘few in number’ and they are ‘more driven’, ‘more ambitious, possess greater skills, and have more faith in themselves than do their “normal” peers’ (Snooks 2003: 225). Pioneers are also said to rely on intuition rather than rational benefit-cost analysis. Moreover, while most pioneers ultimately fail, ‘the rewards, in terms of favourable access to natural resources, are great, so that ‘there is always a steady stream of “aberrant” individuals willing to be tested’ (Snooks 2003: 225). What, though, is the mechanism that produces pioneers and makes them so different from the rest of the population? How can pioneers be driven by intuition and self-belief and yet the overall supply of them be governed by the perception of rewards? Is the supply of pioneers a function of strategic demand so that more will appear at times of crisis, such as when the exhaustion of a genetic/ technological paradigm approaches, or is the distribution spread more randomly across time? Further research on these and related issues would indubitably strengthen Snooks' model.

The *Collapse of Darwinism* is an important, learned and strikingly original book that not only challenges the foundations of one of the 'big ideas' of the modern world – natural selection – but also offers a fresh new perspective on the dynamics of life. Like all 'big theory', of course, it will find its critics, especially amongst area specialists and those whose predilection is to think 'small'. While these critics may score minor victories here and there, this in a way misses the point of why 'big theory' is done in the first place. After all, no single book can hope to account for every social, economic, political and biological phenomenon that has ever occurred. No, if 'big theory' is worth doing at all, it is because it provides a fruitful framework by which these multiplicity of phenomena as well as the fundamental questions of life can be better understood and studied. The strength of the *Collapse of Darwinism* is that it offers such a framework. Its many powerful insights will undoubtedly fuel research and vigorous debate for years to come.

NOTES

[1] *Social Evolution and History* 4 (1): 1 (March 2005).

[2] This is something which only really becomes apparent after one has read and absorbed the arguments of all of his books since the *Dynamic Society*. Indeed, much of the evidence underlying the case made in the *Collapse of Darwinism* is found in earlier publications. One, therefore, cannot fully understand and grasp the significance of this book in isolation.

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