

SURVEY

Evolutionary psychology in ecological economics: consilience, consumption and contentment

Tim Jackson *

Centre for Environmental Strategy, University of Surrey, Guildford, Surrey GU2 7XH, UK

Received 12 June 2000; received in revised form 22 February 2002; accepted 26 February 2002

Abstract

This paper makes the case that if ecological economics seeks ‘consilience’ with biology it must acquaint itself with evolutionary theories about social development and human behaviour. The author reviews some of the literature in this area. Particular attention is paid to the newly emerging discipline of evolutionary psychology, which sets out a neo-Darwinian view of human nature in which individual and social behaviour is dominated by the evolutionary strategies of the ‘selfish gene’. The paper discusses the relevance of this perspective for two specific ‘problem areas’ in ecological economics. The first of these is the question of consumption and consumer behaviour. The second is the problem of ‘mismatch’ between the pursuit of economic growth and social well-being or contentment. These examples illustrate that evolutionary psychology may sometimes provide a natural ally for ecological economics, in particular pointing up certain failures of conventional economics. On the other hand, it also offers harsh lessons concerning the difficulty of changing evolved behaviour patterns. The paper suggests three possible avenues of response by ecological economists to the insights of evolutionary psychology. © 2002 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Evolutionary psychology; Consilience; Consumption; Well-being

1. Introduction

On the tenth anniversary of the first ever issue of *Ecological Economics*, a specially-commissioned article by Gowdy and Ferrer-i-Carbonell provided a useful survey of contributions to the journal over the preceding decade. In it, the authors argued that the accumulated literature represents an exemplary contribution to what the

biologist E.O. Wilson has called ‘consilience’ between different branches of knowledge. That is, they argued that ecological economics had contributed successfully to the promotion of an essential unity in knowledge, reflected in the insight that ‘the assumptions of one branch of knowledge should conform to the accepted facts of other branches of knowledge’ (Gowdy and Ferrer-i-Carbonell, 1999).

The concept of consilience was first coined in an epistemological context by the philosopher William Whewell who wrote that “the Consilience of Inductions takes place when an Induction ob-

* Corresponding author. Tel.: +44-1483-689-072; fax: +44-1483-259-394.

E-mail address: t.jackson@surrey.ac.uk (T. Jackson).

tained from one class of facts coincides with an Induction obtained from another different class. This Consilience is a test of the truth of the Theory in which it occurs” (Whewell, 1840). In much the same spirit, Wilson has argued that “units and processes of a discipline that conform with solidly verifiable knowledge in other disciplines have proven consistently superior in theory and practice to units and processes that do not conform” (Wilson, 1998).

Gowdy and Ferrer-i-Carbonell were mostly concerned to demonstrate the extent to which ecological economics has addressed Wilson’s critique of the ‘hermetic’ nature of conventional economics. “In the spirit of consilience,” they write, “ecological economists have expanded the subject matter of utility theory by recognising the complexity and social context of human behaviour and likewise have expanded the economic theory of production by taking explicit account of the constraints imposed by the environment” (Gowdy and Ferrer-i-Carbonell, 1999). Thus, the bulk of the contributions to ecological economics included in the survey falls into what might broadly be called the ‘biophysical critique’ of modern economics flowing from the work of writers such as Georgescu-Roegen (1971) and Daly (1991). In addition, the review identifies a few contributions that attempt to use evolutionary concepts to enlighten our understanding of economics. Principally, such contributions flow from the concept of coevolution, which stresses (by analogy with certain kinds of biological relationships) the dynamical interdependencies within and between natural, social and economics systems (Gowdy, 1994; Norgaard, 1994).

Virtually absent, however, from this otherwise exemplary decade of literature is any discussion of the relevance to ecological economics of neo-Darwinian theories about human nature and social evolution.¹ This omission is all the more surprising in view of the critical role occupied by such theories within Wilson’s own conception of consilience. Nor is Wilson alone in suggesting that

the evolutionary perspective is relevant to understanding the broad spectrum of human behaviour; and to the extent that human behaviour (and, in particular, consumer behaviour) is crucial to sustainable development, the absence of evolutionary theories of human nature from the literature of ecological economics is an omission of some importance.

The present paper has three specific purposes. Firstly, it provides a brief historical review of evolutionary approaches to human behaviour and social psychology. In pursuit of this aim, the first section sketches out a brief overview of early evolutionary approaches to social theory. More importantly, the second section discusses the re-emergence of neo-Darwinian views of human nature during the late twentieth century, in the guise of ‘evolutionary psychology’, and sets out some of the fundamental assumptions and implications of this resurgent body of work.

Next, the paper provides two specific illustrations of the way in which the insights of evolutionary psychology might be considered relevant (if not unequivocally useful) to ecological economics. The first of these illustrations is concerned with the critical light that evolutionary psychology throws upon our understanding of consumption and consumer behaviour. The second relates to the so-called ‘mismatch’ hypothesis, which seeks to explain the divergence between economic growth and human well-being or contentment, upon which many critics of modern industrial society (including a number of ecological economists) have commented.

Finally, the paper discusses the implications of these case studies (and the generic project of evolutionary psychology) for ecological economics. In particular, it highlights three distinct ways in which ecological economists might seek to respond to the evolutionary psychology literature.

2. Early approaches to social evolution

Thorstein Veblen’s essay “Why Is Economics Not an Evolutionary Science?” represents an early attempt to instil biological concepts into economics (Veblen 1898). There is clearly a sense in which

¹ A modest exception to this generalisation is reference to the attempt by Norton et al. (1998) to understand how and why human preferences evolve over time.

one of the aims of the discipline of ecological economics is to provide a continuation of that same intellectual programme (Costanza, 1989). Veblen believed that the evolutionary metaphor was crucial to an understanding of the dynamics of socioeconomic systems, and in particular to an understanding of technological change in capitalist society. “An evolutionary economics”, he wrote, “must be a theory of a process of cultural growth as determined by the economic interest, a theory of a cumulative sequence of economic institutions stated in terms of the process itself” (Veblen, 1919, p. 77).

Hodgson (1994) argues that Veblen had two main aims in adopting an evolutionary viewpoint. Firstly, he wanted an economics which reflected a process of cumulative causation, an unending process of change built on the back of change, in place of the traditional picture of an economic system that is consummated in equilibrium. Secondly, he wanted to build a theory of economics in which development could be modelled by analogy with the Darwinian model of evolution, namely, as a process of adaptation and selection.

Whether or not he was successful in building such a model², it is clear that Veblen’s insights were influential in the formation of later theories of institutional economics (such as those developed by Kaldor (1972), Kapp (1976), Myrdal (1978)) and evolutionary economics (such as those developed by Schumpeter (1939), and more latterly by Day (1987), Boulding (1981), Witt (1992) and others. These theories are, however, mainly interested in providing nonequilibrium models with which to understand the dynamic evolution of business cycles and economic systems. They make only limited attempts to incorporate explicit mechanisms of agency based on a biological understanding of human nature.

Of more direct interest to the main thrust of this paper is the work of some of the social theorists who preceded Veblen, and exerted some influence on him. Foremost amongst these was

Herbert Spencer. Veblen was not a Spencerian; indeed, he criticised Spencer on a number of grounds (Veblen, 1898, pp. 402–405), specifically for assuming that the evolutionary mechanism would lead, through the ‘survival of the fittest’, to the perfectibility of society. What Veblen shared with Spencer was the common aim of providing a theory for understanding social development, which drew upon insights from biology. For Spencer, this understanding was provided by the realisation that ‘the struggle for existence has been the indispensable means to evolution’ (Spencer, 1969, p. 176) and that ‘competition... is the chief cause of social integration’ (Spencer, 1878, p. 218). In similar vein, Veblen argued that “the life of man in society, just as the life of other species, is a struggle for existence, and therefore, it is a process of selective adaptation. The evolution of social structure has been a process of natural selection of institutions” (Veblen, 1899, p. 188). The two writers sought something more than a biological analogy for the evolution of social systems. They attempted to articulate evolutionary mechanisms within society, which drew explicitly from a biophysical basis.

Nevertheless, Veblen’s view of evolution differed markedly from Spencer’s. Specifically, Veblen accepted the Malthusian ‘struggle for existence’ as the motivation for adaptation and selection, but refused to equate this kind of evolution with progress, in the sense of social improvement or advance. Spencer, by contrast, believed firmly that evolution was headed inexorably in the direction of the perfect society. His *laissez-faire* optimism was far closer to the nineteenth century utopians—Rousseau, Condorcet and Godwin—than it was to Malthus (Young, 1969, p. 137). In this sense, Spencer’s theory of social evolution was quite specifically pre-Darwinian, and espoused the common Victorian ideal of the universe as a place ordered by a benevolent deity in which higher purposes would prevail in humanity’s man’s best interests. Veblen by contrast was attempting to construct a post-Darwinian view of social evolution in which change was effected through fundamentally mechanistic processes—adaptation and selection—and was neither purposive nor necessarily benign.

² Jennings and Waller (1998) dispute this point, arguing that Veblen ‘was never willing to articulate the [selection] mechanism in sufficient detail to argue conclusively that he intended an actual biological analogy’.

An interesting variation on this theme is provided by the writings of Gumplowicz (Gumplowicz, 1898, 1963) who was also convinced that Darwinian evolutionary theory held the key to scientific progress in the social sciences. Emphasising that natural selection operated on groups rather than individuals, he formulated a view of the behaviour of modern nation states in which the subjection of the weaker by the stronger was a universal law and all states were drawn into the struggle for power and territory in an unrelenting *Rassenkampf* or racial war (Hawkins, 1995).

Like Spencer, Gumplowicz saw competition and warfare as the principle architects of social evolution. However, Gumplowicz' view of human progress was unrelentingly bleak: he refused to countenance the possibility of any moral progress in human affairs and argued that the behaviour of modern states was no different from that of primitives. "Lying, deceit, breach of confidence and betrayal is on every page of their history", he argued. "Indeed it is generally recognised that states oppose each other like savage hordes; that they follow the blind laws of nature; that no ethical law or moral obligation, only fear of the stronger, holds them in check" (Gumplowicz, 1963, p. 229). In contrast to Spencer's Panglossian optimism, Gumplowicz predicted a cyclical view of change in which 'communities expanded through conquest and assimilation up to a certain point, beyond which they disintegrated and the process recommenced' (Hawkins, 1995).

Amongst the interesting features of Gumplowicz' model of social development is his identification of the root cause of social conflict in the attempted satisfaction of human needs. According to Gumplowicz, there were two fundamental social processes which generated conflict between social groups: on the one hand, the insatiable desires of human beings to improve their material welfare; and on the other, the exploitation of the services of foreigners (i.e. those outside the social group) to achieve this end. Since the motivation for the second process was the pressure of the first, these two processes essentially reduce to one: the desire to satisfy current material needs and ensure the satisfaction of future needs. "Moreover, this evolution cannot cease," wrote Gumplowicz (1963, p.

229). "For nature has provided that man's needs shall not stand still. Higher and 'nobler' wants are constantly awakened. At the very point where natural ethnic divisions would disappear, artificial 'social' divisions arise to perpetuate the antagonism of human groups". The modern resonances of this thesis—particularly concerning the language of needs—are, of course, striking. But where the Brundtland Commission, for example, saw needs as the basis for an equitable and sustainable distribution of resources, Gumplowicz saw them as the source of limitless conflict.

Implicit within any theory of social evolution lies a theory of human behaviour. According to Gumplowicz, humans behave in such a way as to maximise the possibilities for material consumption for themselves and for their social group, both now and into the future. This is the process that drives both the exploitation of foreigners and ultimately the destructive conflict which results from that. One possible avenue of escape from the bleakness of this social vision is to question the psychological model of human behaviour which underlies it. How defensible is Gumplowicz' view of human nature? Is it consistent with scientific understanding of our own biological nature? Ironically, it has really been possible to address these questions in the last few decades only. The discipline of evolutionary psychology, however, presents us with an intellectual construct which claims scientific authority for a neo-Darwinian theory of human behaviour. It is to this theory that we now turn

3. Evolutionary psychology

As Moore (1986) and Young (1985) have both pointed out, the foundation for an evolutionary view of human behaviour was laid down by Darwin himself. In the final chapter of *The Origin of Species*, he suggested that 'in the distant future' the study of human psychology would be based on an evolutionary footing (Darwin, 1968). He himself ventured some way towards this project in *The Descent of Man* (Darwin, 1871) where he set out the notion of sexual selection, namely: that evolutionary adaptations were selected, in part,

according to their success in attracting sexual mates. In *The Expression of the Emotions in Man and Animals* (1872) he posited that the development of emotions was itself an example of an evolutionary adaptation.

It is only a small step from these two insights to suggest that the form and expression of human emotions—more broadly of human behavioural characteristics—are determined in no small part by their success as evolutionary adaptations. Nevertheless, for over a century after the publication of *The Origin*, there was little or no advance in our understanding of the evolution of human behaviour, so that in 1960, the Oxford anthropologist J.S. Weiner could remark that this subject was ‘one large baffling topic on which our evolutionary insight remains meagre’ (Wright, 1994).

Within a few years of this comment, however, a quiet revolution had started. In 1963, the biologist William Hamilton first proposed that it is in fact the gene rather than the individual that operates as the unit of selection.³ His objective in making this supposition was to solve one of the long-standing problems associated with Darwinian selection: the existence of altruism. If selection takes place at the level of the individual it should, in the long run, favour the evolution of individuals who exhibit only selfish (i.e. self-preserving) behaviour. However, the existence of genuinely altruistic behaviour is a fact of biology that Darwin himself at first believed was ‘insuperable, and actually fatal to my whole theory’ (Darwin, 1968, p. 257). Darwin’s attempt to solve the problem was to suggest that selection operates not only on individuals but also on families or groups. Hamilton’s proposal provided a mechanism for the evolution of altruism—even the pure altruism of self-sacrifice—without recourse to group selection as an evolutionary mechanism. Though the individual may perish, the genes that he or she shares with other members of the species have a better chance of survival as a result of the sacrifice (Hamilton, 1963).

³ The foundations of modern genetics were laid within Darwin’s lifetime by the Moravian monk, Gregor Mendel. Ironically, his work was virtually unknown and largely ignored at the time.

Aside from its import in addressing the problem of altruism, Hamilton’s work was a landmark for another reason, namely, that it set out a basis for the genetic evolution of behavioural characteristics (Hamilton, 1964). In other words, it laid a foundation for the long-awaited continuation of Darwin’s project to provide an evolutionary basis for human psychology.

During the next decade this foundation was strengthened and broadened through the work of other biologists. George Williams set out an evolutionary basis for male and female sexual behaviour—and the differences between them. Specifically, he cast the genetic interests of male versus female behaviour in terms of the sacrifices required by each of them in order to achieve reproduction (Williams, 1966). This work was extended a few years later by Trivers (1972) who started by replacing William’s concept of reproductive sacrifice with one of parental investment. He then used this concept to provide a simple extension of Darwin’s idea of sexual selection in which, by quantifying the balance of parental investment between mother and father in any species, we could better understand a variety of behavioural characteristics within the species. Thus, behavioural characteristics such as ‘the extent of male eagerness and female coyness, the intensity of sexual selection, and many subtle aspects of courtship and parenthood, fidelity and infidelity’ (Wright, 1994, p. 42), all became explicable on an evolutionary model.

These ideas might have remained within the confines of biology had it not been for the publication in the mid-1970s of two ground-breaking popular books. In 1975, E.O. Wilson (Wilson, 1975) himself published a landmark volume on *Sociobiology*, a new science of human behaviour based firmly on the newly-developed neo-Darwinian insights into human behaviour. A year later, a young Oxford scientist named Richard Dawkins (Dawkins, 1976) published a book called *The Selfish Gene* in which he pursued the implications of Hamilton’s insight that the fundamental unit of evolutionary selection is the gene. Together these two books brought the new evolutionary theories about human behaviour to a wide and diverse audience, and caused a furor of renewed interest, and not a little controversy.

Although genetic inheritance was by this time well established as an explanatory mechanism for the evolution of physical characteristics in the natural world, the idea that the same mechanism could be used to explain human traits and behavioural characteristics—as popularised by Wilson in *Sociobiology*—was greeted with a mixture of horror and derision; so much so, that most practitioners of the field he defined prefer now to avoid his label (Ashworth, 1996). Nonetheless, the ideas themselves persisted, and in the hands of a whole new generation of biologists and psychologists (e.g. Brittan, 1997; Buss, 1991; Buss and Schmitt, 1993; Cronin, 1991; Daly and Wilson, 1983; Miller, 2000; Tooby, 1987; Tooby and Cosmides, 1990; Wright, 1994), they became a new and powerful theory about human behaviour.

The prevailing view of human nature that emerges from this body of literature possesses several critical features. In the first place, evolutionary psychology proposes that human nature is in certain key respect, universal. It argues, secondly, that these universal characteristics of human nature are the products of biological evolution, and represent genetic dispositions towards certain kinds of behavioural responses, which have been selected on the basis of evolutionary fitness. Thus, according to the theory, humans share many of their fundamental behavioural characteristics with other close mammals, and indeed with many other species. Furthermore, specifically human adaptations stem historically from the ‘environment of evolutionary adaptation’, that is to say, from the period when *Homo sapiens* emerged as a distinct species (Tooby and Cosmides, 1990).

Human nature, argues evolutionary psychology, is driven primarily by strategies which would have maximised the opportunities for genetic succession in the ancestral environment. Some of this behaviour emerges as selfish, predatory and sexually aggressive. But the theory also attempts to account for the cooperative and moral characteristics of human behaviour (Ridley 1996) through concepts such as male parental investment (Trivers, 1972), kin selection (Hamilton, 1963), reciprocal altruism (Trivers, 1971) and status hierarchies (Williams, 1966).

It is not possible within the scope of this paper to set out all the details of this new view of human nature. Ridley’s (1994) exposition is, however, masterful. Human nature, he argues, is fundamentally determined by the strategies and ploys of the ‘selfish gene’. By definition, those genes which have survived thus long are those that convey traits and characteristics which have increased the chances of genetic succession. Genetic succession depends upon two critical factors: one, surviving long enough to reach reproductive age, and two, finding a mate with whom to reproduce. Accordingly, human nature is conditioned in part by the need to access the (material, social and sexual) resources required for these tasks. In particular, argues evolutionary psychology, we are disposed towards a continuing need to ‘position’ ourselves in relation to the opposite sex, and with respect to our sexual competitors. Moreover, this fundamental element of sexual competition never abates. Rather, we find ourselves having to run faster and faster as time goes by, like the Red Queen in Lewis Carroll’s *Alice in Wonderland*, precisely because our competitors are all engaged in the same unending struggle.

The metaphor of the Red Queen was first proposed by the biologist van Valen (1973) on discovering that the probability that a family of animals will become extinct does not depend on how long that family has already existed. For van Valen, this fact ‘represented a vital truth about evolution that Darwin had not wholly appreciated. The struggle for existence never gets easier. However well a species may adapt to its environment, it can never relax because its competitors and its enemies are also adapting their niches’ (Ridley, 1994, pp. 61–62). That this process is equally true of competition within species is one of the fundamental insights of evolutionary psychology.

It is important to note that evolutionary psychology, though clearly reductionist (in that it seeks evolutionary explanations for the source of human behaviour), is not (or at least not always) deterministic. Accordingly, evolutionary psychology tends to reject monocausal explanations (Wright, 1994) and suggests that we inherit ‘dispositions not destinies’ (Rose, 1995). Some of

these dispositions relate to our ability and propensity for learning; and in any given situation specific responses will depend on a number of factors including (innate) dispositions, learned behaviour, and environmental factors (which include both natural and cultural influences).

The epistemological parsimony introduced by these distinctions is to some extent diluted by the fact that evolutionary psychology regards both learning and culture as being mediated by ‘epigenetic’ rules. Thus, Wilson sets out a ‘coevolutionary’ model of the relationship between genes and culture in which ‘genes prescribe the epigenetic rules, which are the regularities of sensory perception and mental development that animate and channel the acquisition of culture’ (Wilson, 1998). Thus, genetic succession remains the ultimate or ‘distal’ explanation for both human behavioural dispositions and for cultural evolution. But the ‘proximal’ cause for individual actions includes both individual genetic predispositions and environmental factors.

As an illustration of the plurality inherent in the behavioural lexicon of evolutionary psychology, it is worth considering two strikingly different models of behaviour that emerged in the early years of evolutionary psychology. Williams (1966) articulated the idea of dominance-subordination (status) hierarchies drawing on the earlier idea of a ‘pecking order’, attributed to the Norwegian biologist Schjelderup-Ebbe. Status hierarchies are not functional organisations; rather, they are the ‘statistical consequence of a compromise made by each individual in its competition for food, mates and other resources’ (Williams, 1966, p. 218). Individual strategies within the hierarchy vary. Dominance ‘pays off’ as a strategy if the additional resources accrued through dominance exceed those expended in fighting one’s corner. Submissiveness pays off when the resources expended fighting one’s corner exceed those foregone by accepting a lower status within the group.

By contrast, Trivers suggests an altogether different set of behaviours in which success is allied not to dominance and aggression but to cooperation and affiliation. In fact, Williams (1966) had already remarked that “an individual who maximises his friendships and minimises his antago-

nisms will have an evolutionary advantage, and selection should favour those characters that promote the optimisation of personal relationships” (op. cit. p. 94). Trivers (1971) developed this suggestion into a fully-ledged theory of reciprocal altruism by using the game-theoretic context of the ‘prisoner’s dilemma’ to show how cooperative strategies can contribute strategic advantage over purely individualist strategies.

In general terms one would expect to see both strategies in operation within any social group. Axelrod (1984) developed a computer model to illustrate how the two strategies might evolve in conjunction with each other. The model indicated that in the long run, and provided that cooperation is given some kind of head start, conditional cooperation (sometimes called tit-for-tat behaviour, in which agents cooperate at least until they are persuaded that others are not cooperating) is a stable evolutionary strategy. Once enough agents are cooperating, conditional cooperators tend to survive, and thus conditional cooperation (as a strategy) also survives. As Wright (1994, p. 200) puts it, “even if several steadfast noncooperators arrive on the scene all at once, they still can’t subvert a population of TIT FOR TATS”. One of the interesting aspects of this work is that the success or failure of individual strategies depends crucially on the social environment. Affiliative (cooperative) strategies tend not to be particularly successful within strong status hierarchies. (Thus, unconditional cooperators do not fare well at all in most of Axelrod’s simulations.) But likewise, dominance strategies tend to be less successful in affiliative environments, where dominating behaviour is mistrusted (Wilkinson, 2000).

In summary, evolutionary psychology attempts to understand human behaviour on the basis of evolutionary strategies for genetic success. As such, it presents us with one of the most obvious—and the most up-to-date—candidates in the search for a consilient model of human agency within ecological economics. Given this promise, it is clearly worth asking what insights evolutionary psychology might have in addressing specific aspects of ecological economics. The next sections of this paper discuss, by way of illustration only,

the application of insights from evolutionary psychology to two particular ‘problem areas’ in ecological economics. The first of these is the question of consumer behaviour. The second is the ‘mismatch’ between conventional development paths and human well-being or contentment.

4. Evolutionary psychology of consumption

Consumer behaviour is clearly a vital subject for consideration within ecological economics (Daly, 1996; Jacobs and Røpke, 1999; Jacobs, 1991; Myers, 1997; Norgaard, 1994; Redclift, 1996). In spite of observations that modern industrial economies have experienced a shift towards post-material values (Inglehart and Abramson, 1994), consumption patterns in the developed world have shown increasing trends over the last 50 years (Jackson and Marks, 1999). Fashion-driven, often fetishistic consumer behaviour (Fine and Leopold, 1993; Goodwin et al., 1997; Rosenblatt, 1999) continues to drive an increasing reliance on material commodities and to thwart our best efforts to reduce the material throughput of modern socioeconomic systems.

The conventional economic view of the consumer—as a rational self-maximiser of utility—has been criticised widely within ecological economics (van den Bergh et al., 2000; Siebenhüner, 2000a). In a recent attempt to present an alternative vision of consumer behaviour, Jackson and Marks (1999) developed a perspective based on the Max Neef (1991) characterisation of fundamental human needs. Building on a line of reasoning which includes Plato, Maslow (1954), Fromm (1976), the Max Neef framework defines a set of human needs which are finite, few, and universal across humanity. Crucially, this framework supposes a critical distinction between needs and satisfiers. Though the needs themselves are finite, the means chosen for the attempted satisfaction of those needs are potentially infinite and may vary widely over time and across cultures.

Moreover, these ‘satisfiers’ are not all equally successful in terms of meeting the underlying needs. On the contrary, some ‘satisfiers’ offer only pseudo-satisfaction of the underlying needs, while

others again inhibit or even destroy the satisfaction of a need. Jackson and Marks garner evidence to suggest that pseudo-satisfaction is particularly prominent in the attempt to use material goods to satisfy non-material needs such as affection, participation, creativity and so on. On the basis of this evidence, and in the light of the environmental damage caused by material consumption, the authors suggest that one way of conceiving a more sustainable society (without compromising human welfare) lies in redesigning the process of needs-satisfaction.

Both the conventional economic model and the needs-based model of human welfare rest on certain underlying assumptions about human nature. Thus it is reasonable to ask, first, what evolutionary psychology has to say about these underlying models.

Firstly, of course, it is clearly relevant to call on Wilson’s critique of economics as ‘hermetic’. The utility calculus on which consumer behaviour is based in the economic model is a crude and ill-formed model of human nature when compared with the multiplicity of behaviours and complexity of proximal motivations highlighted by evolutionary psychology. In some sense, even the ‘rationality’ of utility maximisation in the economic model is called into question by evolutionary psychology. Classical utilitarianism supposes that reason alone is capable of identifying and distinguishing between different actions, the outcomes of those actions and the pleasures or pains associated with them. Evolutionary biology sets out a much more complex terrain in which reason itself is construed at best as an emergent property of emotional responses laid down as ‘somatic markers’ in the physical body (Damasio, 2000). Evolutionary psychology portrays humans almost as unwitting collaborators in genetic selection, carried along by drives and persuasions over which we have little individual or collective control, victims of the evolutionary strategies of the selfish gene.

By comparison, the needs-based approach at least shares with evolutionary psychology the assumption that certain aspects of human nature are universal. Moreover, the thesis of multiplicity in satisfaction—or attempted satisfaction—bears

some similarity to the thesis of multiplicity in behavioural patterns deriving from the universal drive for genetic succession. On a closer inspection, however, the consilience between evolutionary psychology and the needs-based view appears shakier. In particular, though offering the prospect of sustainable consumption (by a revisioning of the way in which needs are satisfied), the needs-based model offers little in the way of explanation as to why current consumption patterns should have proved so seductive.

Evolutionary psychology, by contrast, offers the insight that seduction is precisely the point. If the lessons from evolutionary psychology are correct, much of our behaviour as economic consumers derives from our nature as biological animals attempting to maximise our opportunities for genetic succession. Amongst other things, this means that we are driven constantly to position ourselves as advantageously as possible, both with respect to the opposite sex and in relation to our sexual competitors. There is clear evidence that a certain proportion of consumer behaviour is geared precisely towards this end (Fine and Leopold, 1993; Rosenblatt, 1999). Moreover, this thesis borrows considerable credibility from elsewhere in the ecological economics literature. Veblen himself put forward the idea that at least some of consumer behaviour is directed at ‘conspicuous consumption’—consumption which advertised our wealth (and therefore, our social position) relative to those around us (Veblen, 1899).

Hirsch argued more than 20 years ago that we are led to consume not solely on the basis of the functional value of material goods, but also on the basis of their value in positioning us with respect to our fellow humans (Hirsch, 1977). Hirsch even highlighted the never-ending ‘Red Queen’ struggle associated with positional consumption. As he described it, ‘it is a case of everyone in the crowd standing on tiptoe and none getting a better view. Yet at the start of the process some individuals gain a better view by standing on tiptoe, and others are forced to follow if they are to keep their position. If all do follow... everyone expends more resources and ends up with the same position’ (Hirsch, 1977, p. 49).

Thus, at one level at least, evolutionary psychology purports to offer a theory of human behaviour which is not only consilient with biology, but also has clear resonance with some insights from within ecological economics and social psychology. As such, its interpretations of the roots of consumer behaviour—however, bleak for the prospects of sustainable development—deserve to be taken seriously.

5. The evolutionary psychology of contentment

We noted above that, in contrast to the utilitarian view, evolutionary psychology ascribes no over-riding authority to the rationality of individual utility maximisation. Clearly, pleasures of one kind and another may have developed as evolutionary mechanisms to reinforce successful genetic strategies. Love, friendship, family, peer approval, career success and (perhaps most obviously) sex all seem to come with some kind of feeling of pleasure or contentment attached to them; and it has been argued (Wright, 1994) that all of these aspects of life assume important roles in kin selection (Hamilton, 1972), reciprocal altruism (Trivers, 1971) and other strategies for genetic succession.

Conversely, it is clear that excessive unhappiness or misery can be detrimental to genetic succession, particularly when it is severe enough to invoke suicide or otherwise impede reproductive success. Nevertheless, claims Wright (1995), ‘rates of depression have been doubling every decade, suicide is the third most common cause of death among young adults in North America, 15% of Americans have had a clinical anxiety disorder’. In Wright’s view, these kinds of statistics support a kind of ‘mismatch’ hypothesis: a claim that in some sense the socioeconomic system in which we are currently embroiled is misaligned with the psychological make-up of *Homo sapiens* as an evolved species.

In making this claim, Wright—and other evolutionary psychologists—are echoing something ecological economists and others have been saying for years. Almost 40 years ago, Lewis Herber argued that human society had ‘reached a degree

of anonymity, social atomisation, and spiritual isolation that is virtually unprecedented in human history” (Herber, 1963). Fromm (1976) was appalled at the alienation and passivity, that pervade modern life. Scitovsky (1976) highlighted the destructive nature of consumer behaviour. Wachtel (1989) argued that “the consumer way of life is deeply flawed, both psychologically and ecologically”. The literature even highlights the Red Queen characteristics of this obsessive addiction to material consumption. Like most psychopathological behaviour, it tends to generate decreasing returns to scale, and involves running ever harder and faster in order to stay in the same place (Douglas and Isherwood, 1980).

The ecological economics critique tends to place the responsibility for this ‘mismatch’ in the hands of the existing economic and social structures, and in particular in the relentless pursuit of economic growth at the expense of both social welfare and ecological health. Daly and Cobb (1989) and others have highlighted the divergence in recent years between rising trends in economic output (gross domestic product) and falling trends in ecologically sustainable human welfare. Max Neef (1995) has used this evidence to suggest a ‘threshold’ hypothesis, namely: that in the early stages of development economic growth delivers increasing levels of human well-being; but, once a certain threshold has been reached, continued economic growth actually impedes further progress and reduces well-being.

Evolutionary psychology approaches the ‘mismatch’ between socioeconomic institutions and human well-being from a different perspective. Specifically, evolutionary psychologists point out that our conditioned behaviour evolved during a quite specific period of history, namely, the period of ‘evolutionary adaptation’ (Tooby and Cosmides, 1990). Thus, our responses to each other, to other social groups, to other species and to the environment are ones that evolved during a time at which humans were essentially nomadic hunter-gatherers. Our current social environment, particularly in developed economies, is increasingly divergent from the ancestral environment. As Nesse and Williams (1997) point out: “adaptations that lead to genetic success in a population

are likely to operate effectively in historically normal conditions. For our species, this means the Stone Age”. Thus, the mismatch responsible for the burgeoning discontents of modern life, according to the evolutionary psychologists, is the mismatch between the society we find ourselves in and the environment for which we were ‘designed’.

The explanatory uses of this thesis are extensive and diverse. Aside from the evidence of increasing suicide rates and rates of depression, the theory has been used variously to explain homicidal tendencies (Daly and Wilson, 1988), the rise in divorce rates (Wright, 1997), increases in vagrancy (Wright, 1994), the increasing ineffectiveness of antibiotic treatments (Nesse and Williams, 1997), the failure to achieve political solutions to real world problems (Miller, 1997, 2000), the growth in chronic diet-related illnesses such as heart disease and diabetes (Cronin and Curry, 1997) and a good deal more besides.

The question of devising appropriate policy responses to this mismatch is, as I have argued in more detail elsewhere (Jackson, 2000), considerably more clouded. The critical point here is that policy responses form a part of the cultural fabric of society. Whilst evolutionary psychology clearly does not preclude cultural change towards sustainable policies and practices, it suggests that cultural evolution is to some extent influenced by the epigenetic rules (Wilson, 1998) that circumscribe human behaviour. Thus, as Dawkins has recently argued quite explicitly, evolutionary psychology suggests that ‘sustainability does not come naturally’ to the human species (Dawkins, 2001).

6. Discussion

This paper has reviewed a number of different approaches to understanding social evolution and human behaviour. In particular, it has examined in some depth the emerging science of evolutionary psychology and argued that it has some important lessons for ecological economics. Not all of these lessons are happy ones. Evolutionary psychology, for example, informs us that there is

a clear evolutionary logic (albeit one which is now outdated in survival terms) behind the behaviour of human beings as consumers. In particular, the tendency to accumulate material goods for positional reasons appears to occupy a critical place in our evolved strategies for genetic success.

On the other hand, evolutionary psychology reinforces one of the key insights of ecological economics, namely, that the institutions and conventions of modern society (and in particular of modern economic systems) are ill-suited either to defend the integrity of its environment or to enhance well-being. In fact, evolutionary psychology goes further than this to suggest that modern society is ill-suited to defend the long-term reproductive success of the gene pool. Thus, our failure to develop sustainable economies becomes, in the hands of evolutionary psychology, an emergent property of an evolutionary system (a coevolutionary system) in which genetic evolution has failed to keep pace with cultural evolution—a system, one might say, which appears to all intents and purposes to be fatally flawed!

It seems to me that ecological economics faces three possible avenues of response to this stark message. The first is to accept the worldview of evolutionary psychology and to construe its lessons as casting serious—possibly even terminal—constraints on the project of conceiving sustainable development. The second is to accept the worldview of evolutionary psychology but to search within its constraints for ways of influencing human behaviour towards sustainable development. The third is to question (and perhaps reject) the epistemological basis of evolutionary psychology and the metaphysics that supports it.

The first of these avenues is the one chosen, for example, by Morrison (1999) who casts humanity as a ‘plague mammal’, nature’s ‘prattling prodigy’, rejects all notions of social or spiritual purpose, and suggests that the only relevant policy question is how to manage the inevitable collapse of the population curve. A perverse variation on the same theme is pursued by Easterbrook (1996) who argues that evolution is alive and well, and looks forward with something approaching glee to our eventual demise and the rise of the next super-species. Clearly this is a response

whose legitimacy cannot be entirely ruled out, particularly on some readings of the available evidence. Nonetheless, its bleakness invites a potentially paralysing retreat into the philosophy of despair.

The second alternative is the one favoured (of course) by those who broadly accept evolutionary psychology but recognise the need for changes in human behaviour if we are to achieve sustainable development. Those who take this line tend to focus mainly on the evolutionary arguments for altruistic, cooperative and affiliative behaviour patterns. They point in particular to the capacity for cultural learning and the potential for institutional reinforcement of sustainable behaviours (e.g. Wright, 1994; Siebenhüner, 2000b). Perhaps the most promising clue to the potential benefits of this approach is the insight that the success of individual behavioural strategies depends crucially on the social environment. Thus, Wilkinson (2000) argues strongly in favour of reducing income inequality as a means to fostering affiliative, cooperative behaviour strategies, a policy that has clear resonance with the ecological economics agenda (Stymne and Jackson, 2000).

Siebenhüner (2000b) points out, correctly in my view, that the lack of reciprocity between present and future generations limits the extent to which reciprocal altruism can be expected to deliver sustainable development. He suggests instead that hope lies in a revised concept of group selection articulated by Sober and Wilson (1998), in which survival rests on the characteristics and strategies of the group as a whole, rather than the behaviours of its individual members. It is, however, salutary to note Sober and Wilson’s own cautionary reflections on the degree of promise that group selectionism holds on offer. “Group selection does provide a setting in which helping behaviour directed at members of one’s own group can evolve;” they acknowledge. “However, it equally provides a context in which hurting individuals in other groups can be selectively advantageous. Group selection favours within group niceness and between group nastiness” (Sober and Wilson, 1998).

Thus, even group selectionism appears to offer us no more optimistic vision of the prospects for

social evolution than the one espoused by Gumprowicz, and it is difficult to see how much closer it takes us towards sustainable development. Within the evolutionary psychology worldview there appears to be no evolutionary mechanism capable of reliably thwarting the relentless pursuit of our own material interests and those of our social group—processes which lead ultimately to political conflict and environmental degradation.

Some evolutionary psychologists have attempted to argue that religious or spiritual beliefs evolved precisely to provide a balancing mechanism at the super-social or planetary level. Wright (1994), for example, argues that Darwin himself ended up thinking of religion in this way. Others have pointed out, however, that such belief systems have never been successful either in preserving social cohesion or in protecting the environment. Morrison (1999) goes as far as to suggest that religious fervour evolved only to provide anaesthetic benefits to doomed civilisations—paralysing them from taking appropriate action to prevent their demise!

A further variation on this second avenue of response is to argue for a decoupling of status from power, and in particular of status from control over material resources. Wright (1994) argues, somewhat perversely perhaps, that ‘in a monastery, serenity and asceticism can be sources of status’ and insists that ‘there are cultures and subcultures that try to put less emphasis on the material and more emphasis on the spiritual’ (op. cit. p. 61). But evolutionary psychology generally leaves us in no doubt that existing models of human behaviour remain far from this ideal. As a review of Ridley (1994) book trumpets: “animals and plants invented sex to fend off parasitic infection. Now look where it has got us. Men want BMWs, power and money in order to pair-bond with women who are blonde, youthful and narrow-waisted”.

The final avenue of response is to reject evolutionary psychology out of hand. In deference to its depth and breadth, the critique of evolutionary psychology (and of evolutionary biology more generally) really deserves a survey paper of its own. Here it is perhaps enough to point the

interested reader towards Hilary and Steven Rose’s (Rose and Rose, 2000) colourful collection of essays. Broadly speaking, the contributors accuse evolutionary psychology of a variety of sins, including: failing to provide a secure epistemological basis for their predictions, indulging in faulty logic and loose reasoning, failing to distinguish appropriately between proximal and distal explanations, drifting into genetic determinism, and committing the ‘naturalistic fallacy’ of inferring ‘ought’ from ‘is’.

The last of these accusations appears to offer some explanation for the ferocity with which evolutionary psychology and its predecessors (sociobiology and social Darwinism) tend to be countered. In a deliciously irreverent contribution to the Rose and Rose volume, Jencks (2000) notes how easily we slip ‘from what is likely, what is programmed by nature into us, what is an epigenetic rule, into believing it is something that cannot, in the long run, be resisted.’ In keeping with its intellectual predecessors, evolutionary psychology parades before it some remnant of the Spencerian notion of ‘the survival of the fittest’, along with the unsettling suggestion that competitive and aggressive behaviours are somehow justifiable on this basis. This, claims Jencks, ‘is the solecism that *Consilience* achieves, despite its author’s disclaimers’ (op. cit. p. 44).

In fact, Wilson does not so much slip into the naturalistic fallacy as revel in refuting its authority. “The posing of the naturalistic fallacy is itself a fallacy,” he insists. “For if *ought* is not *is*, then what is? To translate *is* into *ought* makes sense if we attend to the objective meaning of ethical precepts” (Wilson, 1998, p. 278). This is one of numerous passages in Wilson’s *Consilience* in which we gain insight into his true agenda. “The main thrust of the consilience worldview,” he admits in the final chapter, “is that culture and hence the unique qualities of the human species will make complete sense only when linked in causal explanation to the natural sciences. Biology in particular is the most proximate and hence relevant of the scientific disciplines” (ibid p. 298). Thus, we are left in no doubt by Wilson (as by other proponents of evolutionary psychology) that the term consilience is not to be

confused with the term conciliation. This is not so much about ‘unifying knowledge’ as claiming territorial advantage for a particular branch of knowledge. Ultimately the pluralism on which ecological economics has always prided itself may lead it to reject the kind of consilience that Wilson appears to demand.

In the final analysis, perhaps, we need to take evolutionary psychology with a pinch of salt. Clever theories, according to this clever theory, may be nothing more than elaborate attempts to increase the sexual capital of the theorists (Miller, 2000). Nonetheless, it seems to me that ecological economics must take some position in relation to models of human behaviour. Certainly, it is not a coherent intellectual position both to claim Wilson’s concept of consilience, as Gowdy and Ferrer-i-Carbonell (1999) do, and yet to reject the insights of evolutionary psychology. If one accepts the evolutionary psychology worldview, then there is clearly a difficult task ahead in formulating within it a concept of human and social agency compatible with sustainable development. If one rejects the evolutionary psychology worldview, as I suspect many ecological economists might wish to do, then we are faced with what is perhaps an even greater task: namely, the establishment of an epistemological and metaphysical basis for a more optimistic view of human nature.

Acknowledgements

I am grateful for critical comments and discussions on earlier drafts of this work from a number of people, including: Blake Alcott, Guido Buenstorf, Fritz Hinterberger, Nic Marks, Joan Martinez-Alier, Richard Norgaard, Bernd Siebenhüner, Prashant Vaze, Jo Vogel, two anonymous referees and the participants in a working session at the 3rd European Society of Ecological Economics conference in Vienna in May 2000.

References

- Ashworth, J., 1996. An ‘ism’ for our times. Introduction to: matters of life and death—the worldview from evolutionary psychology. *Demos* 10, 3.
- Axelrod, R., 1984. *The Evolution of Cooperation*. Basic Books, New York.
- Boulding, K.E. 1981. *Evolutionary Economics*, Sage Publications, Beverly Hills.
- Brittan, S., 1997. It is the biology, stupid: what economics can learn from Darwinism. In matters of life and death—the worldview from evolutionary psychology. *Demos* 10, 6–8.
- Buss, D., 1991. Evolutionary personality psychology. *Annual Review of Psychology* 42, 459–491.
- Buss, D., Schmitt, D.P., 1993. Sexual strategies theory—an evolutionary perspective on human mating. *Psychological Review* 100, 204–232.
- Costanza, R., 1989. What is ecological economics. *Ecological Economics* 1, 1–7.
- Cronin, H., 1991. *The Ant and the Peacock—Sexual Selection from Darwin to Today*. Cambridge University Press, Cambridge.
- Cronin, H., Curry, O., 1997. 10 big challenges from the evolutionary agenda. In matters of life and death—the worldview from evolutionary psychology. *Demos* 10, 48.
- Daly, M., Wilson, M., 1988. *Homicide*, Aldine de Gruyter, Hawthorne, NY.
- Daly, H., 1991. *Steady-State Economics*, Second edn. Island Press, New York.
- Daly, H., 1996. *Beyond Growth—The Economics of Sustainable Development*. Beacon Press, Boston.
- Daly, H., Cobb, J., 1989. *The Common Good: Redirecting the Economy Toward Community, the Environment and a Sustainable Future*. Beacon Press, Boston.
- Daly, M., Wilson, M., 1983. *Sex, Evolution and Behaviour*. Willard Grant, Boston.
- Damasio, A., 2000. *The Feeling of What Happens—Body, Emotion and the Making of Consciousness*. Vintage Press, New York.
- Darwin, C., 1968 [1859]. *The Origin of Species by Means of Natural Selection*. Reprinted (1985) by Penguin Classics, London.
- Darwin, C., 1871. *The Descent of Man*, reprinted 1997 by Prometheus Books, New York.
- Dawkins, R., 1976. *The Selfish Gene*. Oxford University Press, Oxford and New York.
- Dawkins, R., 2001. Sustainability Does Not Come Naturally—A Darwinian Perspective on Values, The Values Platform for Sustainability Inaugural Lecture at the Royal Institution, 14th November. The Environment Foundation, Fishguard, UK.
- Day, R.H., 1987. The General Theory of Disequilibrium Economics and Economic Evolution, in Batten, D.J., Casti and B Johansson (eds.) *Economic Evolution and Structural Adjustment*, Springer, Berlin, 46–63.
- Douglas, M., Isherwood, B., 1980. *The World of Goods—Towards an Anthropology of Consumption*. Penguin Books, London.
- Easterbrook, G., 1996. *A Moment on the Earth*. Penguin Books, London.
- Fine, B., Leopold, E., 1993. *The World of Consumption*. Routledge, London.
- Fromm, E., 1976. *To Have or To Be*. Jonathon Cape, London.

- Georgescu-Roegen, N., 1971. *The Entropy Law and the Economic Process*. Harvard University Press, Cambridge, Mass.
- Goodwin, N.R., Ackerman, F., Kiron, D. (Eds.), 1997. *The Consumer Society*. Island Press, Washington, DC.
- Gowdy, J.M., Ferrer-i-Carbonell, A., 1999. Toward concision between biology and economics: the contribution of Ecological Economics, 10th Anniversary Invited Paper. *Ecological Economics* 29, 337–348.
- Gowdy, J.M., 1994. *Coevolutionary Economics*. Kluwer, Boston.
- Gumpłowicz, L., 1898. *Sociologie et Politique* [Sociology and Politics]. Giard et Brière, Paris, cited in Hawkins 1995.
- Gumpłowicz, L., 1963 [1885]. *Outlines of Sociology*. Paine-Whitman, New York.
- Hamilton, W., 1963. The evolution of altruistic behaviour. *American Naturalist* 97, 354–356.
- Hamilton, W., 1964. The genetical evolution of social behaviour. *Journal of Theoretical Biology* 7, 1–52.
- Hamilton, W., 1972. Altruism and related phenomena, mainly in social insects. *Annual Review of Ecology and Systematics*, 3, 193–232.
- Hawkins, M.J., 1995. The struggle for existence in 19th century social theory: three case studies. *History of Human Science* 8 (3), 47–67.
- Herber, L., 1963. *Our Synthetic Environment*. Jonathon Cape, London.
- Hirsch, F., 1977. *Social Limits to Growth*. Revised edition 1995. Routledge, London.
- Hodgson, G., 1994. *Economics and Evolution—bringing life back into economics*, Polity Press, Cambridge.
- Inglehart, R., Abramson, P.R., 1994. Economic security and value change. *American Political Science Review* 88 (3), 336–354.
- Jackson, T., 2000. Why Is Ecological Economics Not an Evolutionary Science? Paper presented to the European Society for Ecological Economics 3rd Biennial Conference, Vienna, May.
- Jackson, T., Marks, N., 1999. Consumption, sustainable welfare and human needs—with reference to UK expenditure patterns 1954–1994. *Ecological Economics* 28 (3), 421–442.
- Jacobs, M., 1991. *The Green Economy*. Pluto Press, London.
- Jacobs, M., Røpke, I., 1999. Special Issue on Consumption. *Ecological Economics* 28 (3).
- Jencks, C., 2000. EP—Phone Home, Chapter 3, in Rose and Rose (2000).
- Jennings, A., Waller, W., 1998. *History of Political Economy*, 30(2), 189–217.
- Kaldor, N., 1972. The irrelevance of equilibrium economics. *Economic Journal* 82 (4), 1237–1255.
- Kapp, K.W., 1976. The nature and significance of institutional economics. *Kyklos* 29, 209–232.
- Max Neef, M., 1991. *Human-Scale Development—Conception, Application and Further Reflection*. Apex Press, London.
- Max Neef, M., 1995. Economic growth and quality of life—a threshold hypothesis. *Ecological Economics* 15, 115–118.
- Maslow, A., 1954. *Motivation and Personality*. Harper & Row, New York.
- Miller, G., 1997. Political peacocks. In *matters of life and death—the worldview from evolutionary psychology*. *Demos* 10, 9–11.
- Miller, G., 2000. *The Mating Mind—How Sexual Choice Shaped the Evolution of Human Nature*. William Heinemann, London.
- Moore, J., 1986. Socializing Darwinism: historiography and the fortunes of a phrase. In: Levidow, L. (Ed.), *Science and Politics*. Free Association Books, London.
- Morrison, R., 1999. *The Spirit in the Gene—Humanity's Proud Illusion and the Laws of Nature*. Cornell University Press, Ithaca and London.
- Myers, N., 1997. Consumption: Challenge to Sustainable Development, *Science*, 276, 53–57.
- Myrdal, G., 1978. Institutional economics. *Journal of Economic Issues* 12 (4), 771–784.
- Nesse, R., Williams, G., 1997. Is there an evolutionist in the house? In *matters of life and death—the worldview from evolutionary psychology*. *Demos* 10, 25–27.
- Norgaard, R., 1994. *Development Betrayed—The End of Progress and a Coevolutionary Revisioning of the Future*. Routledge, London.
- Norton, B., Costanza, R., Bishop, R.C., 1998. The evolution of preferences: why 'sovereign' preferences may not lead to sustainable policies and what to do about it. *Ecological Economics* 24, 193–211.
- Redclift, M., 1996. *Wasted—Counting the Costs of Global Consumption*. Routledge, London.
- Ridley, M., 1996. *The Origins of Virtue*. Penguin Books, London.
- Ridley, M., 1994. *The Red Queen—Sex and the Evolution of Human Nature*. Penguin Books, London.
- Rose, R., 1995. Genes and Human Behaviour. *Annual Review of Psychology* 46, 625–654.
- Rose, H., Rose, S., 2000. *Alas, Poor Darwin—Arguments Against Evolutionary Psychology*. Jonathon Cape, London.
- Rosenblatt, R. (Ed.), 1999. *Consuming Desires: Consumption, Culture and the Pursuit of Happiness*. Island Press, New York.
- Schumpeter, J.A., 1939. *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process*. McGraw Hill, New York.
- Scitovsky, T., 1976. *The Joyless Economy*, reprinted May 1992, Oxford University Press, Oxford.
- Siebenhüner, B., 2000a. *Homo sustinens*—towards a new conception of humans for the science of sustainability. *Ecological Economics* 32 (1), 15–25.
- Siebenhüner, B., 2000b. *Evolutionary Psychology in Ecological Economics*, paper submitted to Ecological Economics, based on a paper presented to the European Society for Ecological Economics 3rd Biennial Conference, Vienna, May.

- Sober, E., Wilson, D.S., 1998. *Unto Others—The Evolution and Psychology of Unselfish Behaviour*. Harvard University Press, Cambridge, MA.
- Spencer, H., 1969 [1876–1896]. *The Principles of Sociology*, abridged edition. Macmillan, London.
- Spencer, H., 1878. *The Study of Sociology*, Seventh Edn. Kegan Paul, London.
- Stymne, S., Jackson, T., 2000. Intragenerational equity and sustainable welfare. *Ecological Economics* 33, 219–236.
- Tooby, J., 1987. The emergence of evolutionary psychology. In: Pines, D. (Ed.), *Emerging Syntheses in Science*. Santa Fe Institute, Santa Fe.
- Tooby, J., Cosmides, L., 1990. The past explains the present: emotional adaptations and the structure of ancestral environments. *Ethology and Sociobiology* 11, 375–421.
- Trivers, R., 1971. The evolution of reciprocal altruism. *Quarterly Review of Biology* 46, 35–56.
- Trivers, R., 1972. Parental investment and sexual selection. In: Campbell, B. (Ed.), *Sexual Selection and the Descent of Man*. Aldine de Gruyter, Chicago.
- van den Bergh, J.C.J.M., Ferrer-i-Carbonell, A., Munda, G., 2000. Alternative models of individual behaviour and implications for environmental policy. *Ecological Economics* 32 (1), 43–61.
- van Valen, L., 1973. A new evolutionary law. *Evolutionary Theory* 1, 1–30.
- Veblen, T., 1898. Why is Economics not an Evolutionary science? Reprinted in Veblen, T., 1919. *The Place of Science in Modern Civilization*, B W Huebsch, New York.
- Veblen, T., 1899. *The Theory of the Leisure Class*. 1998 edition, Great Minds Series, Prometheus Books, London.
- Veblen, T., 1919. *The Place of Science in Modern Civilization*, B.W., Huebsch, New York.
- Wachtel, P., 1989. *The Poverty of Affluence*. New Society Publishers, Philadelphia.
- Whewell, W., 1840. *The Philosophy of the Inductive Sciences*, reprinted May 1999, Thoemmes Press, Bristol.
- Wilkinson, R., 2000. *Mind the Gap—Hierarchies, Health, and Human Evolution*. Wiedenfeld and Nicholson, London.
- Williams, G., 1966. *Adaptation and Natural Selection*, Princeton University Press, Princeton, NJ.
- Wilson, E.O., 1998. *Consilience*. Alfred Knopf, New York.
- Wilson, E.O., 1975. *Sociobiology—The New Synthesis*. Harvard University Press, Cambridge.
- Witt, U. 1992. *Explaining Process and Change—Approaches to Evolutionary Economics*, Michigan University Press, Ann Arbor.
- Wright, R., 1994. *The Moral Animal—Why We are the Way We Are: The New Science of Evolutionary Psychology*. Abacus, London.
- Wright, R., 1995. The Evolution of Despair, *Time*, August 28, 50–57.
- Wright, R., 1997. The dissent of women in matters of life and death: the worldview from evolutionary psychology. *Demos* 10, 18–24.
- Young, R.M., 1969. Malthus and the Evolutionists: the Common Context of Biological and Social Theory, Past and Present, 43, 109–145.
- Young, R.M., 1985. Darwinism is social. In: Kohn, D. (Ed.), *The Darwinian Heritage*. Princeton and Nova Pacifica. Princeton, pp. 609–638.