

CHAPTER 44

Evolutionary approaches to literature and drama

Joseph Carroll

44.1. The philosophical orientation of adaptationist literary study

Adaptationist literary study has emerged as a distinct movement only in the past 15 years. Contributors include both literary scholars who have assimilated the ideas of evolutionary psychology and also evolutionary social scientists who have taken literary works as a subject of study. Contributors from both disciplinary fields have appeared together in symposia, conference panels, special issues of journals, and edited books, and they have also entered together into collaborative research projects. This blurring and crossing of disciplinary boundaries points to the largest philosophical principle that distinguishes Darwinian literary study—the idea of ‘consilience’. Reintroduced into philosophical parlance by Edward O. Wilson (1998), the term ‘consilience’ denotes that nature forms a unified field of determinate causal relations and that all fields of knowledge are thus integrally connected. Within the consilient world view, physics constrains chemistry; chemistry constrains biology; biology constrains psychology, anthropology, and the other human sciences, and all these sciences constrain the study of human cultural production, including literature, drama, and the other arts.

Adaptationist literary scholars identify evolution as a crucial link in a causal chain that produces literary artefacts. They accept the argument that over evolutionary time the human mind has evolved in an adaptive relationship with its environment, and they affirm that the ‘adapted mind’ has a definite structure—a distinctly configured set of species-typical behavioural dispositions. The common designation for that species-typical configuration—both in literary tradition and in evolutionary psychology—is ‘human nature’. Like most traditional literary theorists, adaptationist literary scholars argue that literary works are produced and consumed to fulfil the needs of human nature, that they depict human nature, and that they are constrained, in their formal organization, by the species-typical dynamics of human social interaction.

In the following three sections I shall describe the historical context of adaptationist literary study, survey the work that has already been published in adaptationist literary studies, and then consider some of the directions further research might take.

44.2. The historical context of adaptationist literary study

Literature did not become the subject of an academic discipline until the last two decades of the

nineteenth century, and until the 1940s, it consisted in two main forms: (i) philological and historical scholarship; and (ii) moralized aesthetic commentary of a very general, impressionistic character (see Graff, 1987; Abrams, 1997). In the 1930s, a new methodology arose, a form of 'close reading' or formal analysis of theme, tone, and style. 'The New Criticism', as this school is still called, dominated academic literary study in England and America until the late 1970s. By focusing on formal analysis, the school provided a methodology admirably suited to classroom study and to the mass production of scholarly publication in the burgeoning industry of higher education.

Between the middle of the 1970s and the middle of the 1980s, a revolution took place in literary studies. 'Poststructuralism' or 'postmodernism', spearheaded by the 'deconstructive' philosophy of Jacques Derrida, swept across the landscape of literature departments and infiltrated all the departments of the humanities. The fundamental tenets of poststructuralism are 'textualism' and 'indeterminacy'. Textualism is the belief that language or 'discourse' is the elemental stuff of existence, that it constitutes or at least fundamentally determines all forms of reality. Indeterminacy is the belief that all meaning contradicts itself and that no determinate meaning is possible. If all meaning is indeterminate, all texts are open to perpetual reinterpretation. In postmodern essays, this particular inference, though it sounds fairly determinate, has itself been explicitly reiterated with the monotonous regularity of a monastic liturgy. Given that literary scholars deal with a finite body of texts, the motivating force that attaches to this industrial academic rationale can hardly be overestimated.

New Criticism was fundamentally conservative in orientation. Its practitioners were often politically or ideologically conservative, and it shared with Victorian humanism a reverential attitude towards the canonical texts of Western culture—and by extension, towards Western culture itself. The ideological impulses that animated the postmodern revolution were, in contrast, radical and subversive. Under the aegis of Michel Foucault, the postmodernists adopted a stance of suspicion and hostility to all established forms of 'power': bourgeois, patriarchal, heterosexist, Western, colonial, white, rational,

and scientific. In the past decade, 'deep ecology' has added one more item to this list of suspect epithets, the anthropocentric emphasis on the specifically 'human' (see Carroll, 2004, Part 1, Chapter 8). Since the middle of the 1980s, the bulk of postmodern criticism has had a political slant, and much of it has been predominantly political. Feminism emerged in the 1970s, independently of postmodernism, as a highly politicized literary movement driven by the transformation of women's social roles and by the changing demographics of the university itself. By the middle of the 1980s, literary feminism had assimilated itself to the larger postmodern creed, and almost all literary feminism now adopts one or another of the postmodern idioms as the medium for its preoccupation with the concerns of women. In the postmodern political arena, textualism and indeterminacy serve as means for deprecating the legitimacy of dominant social, psychological, or sexual norms. Postmodern science theory treats of science itself as merely a political and cultural construct that reflects and supports these dominant norms (Gross and Levitt, 1994; Sokal, 1996; Gross *et al.*, 1997; Koertge, 1998; Sokal and Bricmont, 1998; Parsons, 2003).

Until the advent of postmodernism, academic literary study and standard social science ran on separate but parallel tracks. Darwinian influences on anthropology, psychology and sociology died out in the first two decades of the twentieth century and were replaced by the doctrines of cultural autonomy and behaviourist conditioning (see Brown, 1991, pp. 1–38; Buss, 1999, Part 1; Degler, 1991; Fox, 1989, Chapters 3 and 4; Freeman, 1992, 1999, pp. 17–27; Tooby and Cosmides, 1992, p. 28). From the 1940s to the middle of the 1970s, the New Critical orthodoxy held that literary meaning is itself autonomous and fully intelligible without reference to any contextual influence. The social scientists wished to protect culture from any suspicion of biological influence, and the literary critics wished to protect literature from any suspicion not only of biological influence but also of social influence. Postmodernism expanded the notion of textual autonomy to include not just the isolated literary text but the whole textual universe—the world constituted by 'discourse'. The idea of cultural autonomy brought the postmodernists into

alignment with important aspects of standard social science, and in the 1990s postmodernism began to seep over into anthropology. Much standard social science remains distinct from postmodernism in that standard social scientists, though they reject the idea of human nature and deny that biology influences culture, none the less continue to regard scientific methodology as a medium of objective knowledge about a real world that exists independently of cultural and linguistic constructs.

Adaptationist literary theorists have rejected both the irrationalism of postmodernism and the blank-slate model of human behaviour that informs standard social science. They affirm the ideas of 'truth' and 'reality', and they think that in studying the products of the human imagination, truth and reality can be most adequately served by an adaptationist understanding of human nature.

44.3. Contributions to adaptationist literary study

Literary study inspired by adaptationist social science can be grouped into six large, partially overlapping categories: (i) general programmatic expositions, manifestos and prolegomena; (ii) commentaries on the relation of adaptationist literary study to the bordering fields of ecological literary criticism and cognitive rhetoric; (iii) discussions of the adaptive function of literature; (iv) essays on topics of literary theory (genre, evaluation, and point of view); (v) critiques of specific literary works; and (vi) studies that not only assimilate concepts from the social sciences but also incorporate empirical methodology in the study of literature.

Programmatic expositions rehearse the basic logic of an adaptationist understanding of human nature, affirm that literary production falls within the scope of that logic, and suggest ways in which literary scholars can use evolutionary psychology as a theoretical foundation for literary study (Easterlin, 1993, 1999b, 2001b; Storey, 1993, 1996; Barrow, 1995; Carroll, 1995, 2004, Part 2, Chapters 1 and 6; Carroll, 2005; Boyd, 1998, 2005a; Evans, 1998; Cooke, 1999b; Nieves, 2001; Barash and Barash, 2002, 2005; Fromm 2003a,b; Gottschall and Wilson, 2005; Headlam Wells and

McFadden, in press; McEwan, 2005). Some programmatic expositions have focused on the 'consilient' or comprehensively interdisciplinary nature of adaptationist literary study (Carroll, 2004, Part 1, Chapter 7; Gottschall, 2003c; Love, 1999a,b; Nordlund, 2002). Other expositions have used evolutionary psychology as a framework within which to criticize the poststructuralist conceptions that currently dominate academic literary study (Carroll, 1995, 2004, Part 1, Chapters 2 and 3, and in press d; Storey, 1996; D. S. Wilson, 2005). Within the literary poststructuralist paradigm, psychology is still predominantly Freudian, and some adaptationist scholars have used evolutionary psychology—and especially findings on incest avoidance—to criticize Freudian literary theory (Storey, 1996; Easterlin, 2000; Scalise Sugiyama, 2001c; Evans, 2005).

Over the past two decades or so, in roughly the same period that adaptationist literary study has been developing, literary study has also extended itself into the bordering areas of cognitive science and ecology. 'Cognitive rhetoric' and 'ecocriticism' share little in the way of concepts or concerns with one another, but both overlap in some measure, at different points, with adaptationist literary study.

In its broadest reaches, cognitive rhetoric concerns itself with brain functions and with the emotions involved in literary production and response, but as a distinct school of literary theory it affiliates itself primarily with the linguistic theories of Mark Johnson and George Lakoff. Johnson and Lakoff argue that language is based on metaphor and that metaphors often derive from 'the body', but unlike adaptationist critics, cognitive rhetoricians do not attempt to identify a species-typical structure of behavioural dispositions. Cognitive rhetoricians are generally hostile to evolutionary psychology, and some adaptationist critics have criticized cognitive rhetoric for the limitations in its conceptual scope (Carroll, 2004, Part 1, Chapter 5, pp. 57–58; Part 2, Chapter 1, pp. 104–106; Carroll, 2005, p. 938; Gottschall, 2004). Other adaptationist critics have sought to identify common ground between cognitive rhetoric and adaptationist criticism (Boyd, 1999; Easterlin, 2002).

Ecocriticism is not so much a distinct body of theory or method as, rather, a subject matter.

AU:Date
okay?

AU:Correct
date /reference?
cf.list

Ecocritics have for the most part been animated by environmentalist concerns and sympathies. As specifically literary critics, they have concentrated heavily on a distinct tradition of 'nature' writing, most often American writing. In their theoretical orientation, ecocritics range from postmodernism to a strongly naturalistic and Darwinian outlook. Two prominent ecocritics, Glen Love and Harold Fromm, have sought to assimilate the topics and concerns of ecology to an adaptationist framework (Fromm, 1996, 1998, 2001; Love 1999a,b, 2003). Carroll and Easterlin criticize ecocriticism from an adaptationist perspective and argue that a concept of human nature must take the central place in any theory about the relations of human beings to their physical environment (Carroll, 2004, Part 1, Chapter 8; Part 2, Chapter 4; Easterlin, 2004).

Arguments about the adaptive function of literature fall into three main groups: (i) that literature and the other arts are not adaptive but are, rather, non-adaptive side-effects of cognitive capacities that have developed for adaptive reasons; (ii) that literature and the other arts are indirectly adaptive in that they can be made to contribute to one or another adaptively useful activity; and (iii) that literature and the other arts fulfil adaptive functions that are peculiar to themselves and that could be fulfilled by no other means. Pinker (1997, 2002) argues that the arts, like pornography and rich foods, are means for exploiting psychological mechanisms that evolved for other purposes. He also argues that literature can be adaptively useful in presenting models of situations in which its readers might at some point find themselves. Scalise Sugiyama (2001a) argues that literature can convey adaptively useful information about the environment—specific, concrete information about material resources and physical conditions. Coe (2003) argues that in ancestral environments visual art conveyed information about kin relations. Miller (1999, 2000), Power (1999) and Voland (2003) argue that literature and the other arts, like all other forms of mental activity, subserve the purposes of sexual display. From this perspective, art has no intrinsic adaptive functions but is indirectly adaptive in that, like the peacock's tail, it contributes to processes of sexual selection. Dissanayake, Cooke, and Boyd argue that art evolved as a means of focusing

attention on adaptively salient concerns, and Dissanayake, Boyd, and Dunbar emphasize the utility of literature and the other arts in creating and reinforcing social bonds (Boyd, 2005b; Cooke, 1999a; Dissanayake, 1995a,b, 2000, 2001; Dunbar, 2004, 2005). Dissanayake, Cooke, and Boyd emphasize the adaptively relevant content of art. Dunbar concentrates attention on theory of mind or perspective-taking as central mechanisms of human social interaction. E. O. Wilson, Carroll, and Tooby and Cosmides argue that the arts serve a unique adaptive function in that they provide an emotionally saturated cognitive order that mediates between innate dispositions and the complexities of contingent circumstances (Carroll, 2004, Part 1, Chapters 6 and 7; Part 2, Chapter 6, and in press a and c; Tooby and Cosmides, 2001; E. O. Wilson, 1998, pp. 225–26). Tooby and Cosmides converge with Pinker and Scalise Sugiyama in arguing that in listening to stories people rehearse adaptively relevant scenarios. Carroll acknowledges this practical function but also stipulates that the larger adaptive function is not merely practical. Literature and its oral antecedents create models or images of people acting in the world; those models are imbued with emotion and moral value; and they thus provide general psychological maps or guides through which people assess motives and behaviour and evaluate alternatives. In comparison with that of other animals, even other primates, the human cognitive universe is exceptionally complex, and so far as we know humans are unique in creating an imaginative universe and in regulating their behaviour in relation to the imaginative models they construct.

Genre is a composite concept in literary theory, consisting of various proportions of three chief elements: emotional quality, subject matter, and formal organization. The primary emotional component is a polarity between sadness or grief (tragedy) and joy or mirth (comedy). This polarity is compounded by the kind of mirth that involves ridicule or mockery and that produces satire. Storey (1996) and Nettle (2005a,b) have explored the polarity of tragedy and comedy in adaptationist terms, and Storey and Boyd have explored the theory of humour (Boyd, in press b; Storey, 2001, 2003). Storey locates the source of tragedy in struggles over power, and he locates a primate source for comedy in 'the relaxed open

AU:Pls also give reference details forv Ekman.

mouth display'. Nettle associates tragedy with conflicts over status, and he associates comedy with mate selection. Carroll (2004, pp. 127, 158) correlates tragedy, comedy, and satire with the 'basic emotions' of Ekman, who correlates tragedy with sadness, fear, and anger, comedy with joy and surprise, and satire with anger, disgust, and contempt. Cooke (2002) has examined a specific form of satire, that of the dystopian political novel, and he argues that the satire depends crucially on contrasting the social conditions of a totalitarian state with the evolved needs of a universal human nature. Cooke (1994, 1996) has also examined a generic category, science fiction, that is based more on subject matter than on emotional quality, and he locates the central themes of science fiction in the core issues of survival and reproductive success. Evolutionary psychologists have used mate selection theory to explain the generic features of pornography and romance fiction, paired off, respectively, as male and female forms of fantasy (Ellis and Symons, 1990; Whissel, 1996; Salmon and Symons, 2001; Salmon, 2005). The largest formal distinctions are those between drama, narrative fiction, and poetic verse. Turner (1992, pp. 61–108) has examined the biological basis of poetic meter; he argues for a biologically based three-second metric. Scalise Sugiyama (1996, 2001b, 2005) and Steen (2005) both identify the core elements of narrative as those of goal-oriented agents coping with the adaptive problems of resources and social life. Nettle (2005b) creates a typology of drama through the intersection of two central conflicts (status and mating) and two possible outcomes (negative and positive). Three studies have examined the correlation between the sizes of human social groups and the formal organization of dramas (Stiller *et al.*, 2004; Matthews and Barrett, 2005; Stiller and Hudson, 2005). These studies are oriented to a model for the evolution of the human brain that is driven by social group size, and they use anthropological data on social group size to analyse the organization of social groups in the populations of specific plays and genres.

Adaptationist discussions of literary value, like adaptationist critiques of literary depictions, have tended to focus on the issue of human universals. Turner (1992, p. 26) identifies literary merit with

the sheer number of universal themes in any given work. Cooke (1999b, p. 55) associates literary merit with the presence of conflict among biologically based dispositions. Easterlin (1999a, 2005) counters the emphasis on universals by drawing attention to the way elements of literary tradition and other culturally conditioned factors enter into judgements of literary value. Carroll (2004, p. 145) argues that judgements of value typically depend on a combination of factors: elemental motives linked with basic emotions, coherent thematic structures, stylistic felicity, and the quality of mind and heart in the writer. He also invokes a principle of 'integrity' in the conception of a subject and in the formal organization of a literary work (Carroll, 2004, Part 2, Chapter 5).

Point of view is a standard technical term in literary narrative and involves distinctions like those between 'first-person narrator', 'third-person omniscient narrator', 'third-person limited narrator', and so on. In its broader signification, the concept of 'point of view' opens into the anthropological and psychological theory of literature as a social and communicative act. Dunbar, Barrett and Lycett argue that the evolution of specifically human sociality is crucially dependent both on language and on the capacity for empathy or 'theory of mind', that is, the capacity to envision the world from someone else's point of view—to intuit another person's perceptions, thoughts, and beliefs (Barrett *et al.*, 2002, Chapters 11, 12 and 13; Dunbar, 2004, 2005; Dunbar *et al.*, 2005, Chapters 8, 9 and 10). Scalise Sugiyama (1996) examines the way oral narratives are shaped to manipulate audiences in the interest of the narrator. Carroll argues that literary meaning emerges through the negotiation among three distinct sets of point of view: that of the author, of the characters, and of the audience. Since point of view involves individual identity, Carroll argues that literary theory needs to make use of an empirically derived set of categories, including those of personality theory, for analysing individual differences (Carroll, 2004, Part 2, Chapters 3 and 6; 2005, and in press d).

A large portion of the work done in adaptationist literary study has consisted in interpretive commentary on specific literary texts. Most characteristically, these commentaries identify

behaviours in the texts that correspond (or fail to correspond) to species-typical patterns of behaviour. Topics have included all the standard categories in which evolutionary psychologists tend to divide human life—history effort: survival, resource acquisition, mate selection, parenting, childhood development, kin relations, and social life, including status seeking, coalition building, cheater detection, and in-groups and out-groups. The most sophisticated of these interpretive commentaries have analysed the interplay between elemental dispositions and particular social and cultural ecologies, and they have also incorporated the concepts of traditional literary analysis: the analysis of style and tone, symbolism, figures of speech, point of view, narrative and dramatic structure, the interplay with audience expectations, and the problems of literary value.

The curricula of departments of literature are commonly organized by period and genre, and those categories will serve here as a framework for outlining adaptationist contributions to interpretive criticism.

One distinct generic group consists in studies of folk tales, fairy tales, fantasies, and works of science fiction. Cooke (1995) and Easterlin (2001a) have examined specific fairy tales. Jobling (2001b) gives a generalized account of ogre stories. (Gottschall has compared large numbers of fairy tales from different cultures; these studies will be cited below under the category of empirical literary analysis.) In all of these studies, emphasis is given to the way in which the stories embody universal themes grounded in evolved psychology. Other critics have examined works in which symbols of human universals are lodged within highly specific cultural or ecological conditions. Boyd (2001) gives an extensive critique of a fantasy tale by Dr Seuss and takes it as a critique of American xenophobia. Cooke has delved into futuristic science fiction (1987, 2002) and has also given a book-length critique of a single literary work, Zamyatin's dystopian futuristic fantasy *We* (Cooke, 2002). He locates this novel within the larger contexts of dystopian fiction and Soviet literature and takes evolutionary psychology as an implicit satiric frame for Soviet totalitarianism. Carroll critiques three works of paleo-fiction (2004, Part 2, Chapter 5) in which Neanderthals and Cro-Magnons encounter one another, and he uses the specific

conditions of Palaeolithic life as a touchstone for assessing the imaginative quality of the novels.

Epics have received a good deal of attention. Nesse (1995) examines three poetic versions of the Guinevere myth, assessing differences in the sexual ethos of different cultural moments. Thiessen and Umezawa (1998) give a sociobiological reading of a medieval Japanese novel and see in it an exemplification of universal human mating dispositions. Fox (1995, 2005) has used evolutionary findings on mate selection to examine male mating conflict in a number of epics. Gottschall (2001, 2003a) examines the Homeric poems within their anthropological context, using sociobiology as a conceptual frame for understanding the sexual ecology of the poems. Barash and Barash (2002, 2005) comment on Virgil's *Aeneid* in the light of evolved sexual psychology. [Barash and Barash (2005) give brief commentaries on adaptationist themes in dozens of works in world literature from the time of Homer to the twentieth century.]

Shakespeare has been a frequent subject of adaptationist criticism. Stiller, Hudson, Nettle, and Dunbar have taken Shakespeare as a focal point for analysing the correlation between human social-group size and the organization of characters within drama (Stiller *et al.*, 2004; Stiller and Hudson, 2005). (See the comments above on the form of drama.) Nettle's (2005a) analysis of tragedy and comedy illustrates its theory with commentary on *Richard III* and *Twelfth Night*. Boyd (in press a) uses kin selection as a chief category for the analysis of dramatic conflict in *Titus Andronicus*. Nordlund (2005) and Headlam Wells (in press) integrate concepts of an evolved human nature with knowledge of Shakespeare's specific historical environment. Nordlund argues that the romantic love is grounded in evolved psychology, and he takes romantic love as a basis of comparison between *Troilus and Cressida* and *All's Well That Ends Well*. Headlam Wells concentrates on the humanist moral vision in *Twelfth Night*, *The Merchant of Venice*, *Measure for Measure*, *The Winter's Tale*, *Romeo and Juliet*, *Julius Caesar* and *King Lear*. Boyd (1999, 2005a) and Nettle (2005b) take *Hamlet* as the basis for exploring the psychological foundations of drama. Scalise Sugiyama (2003) examines a native African people's response to *Hamlet* and draws important

conclusions about the relations between human universals and culturally specific values and beliefs.

Lyric poetry has received some attention from adaptationist critics. Jobling (2002) discusses Byron as a figure who exemplifies the 'cad' mating strategy. (This study was extended as an empirical study by Kruger *et al.*, 2003.) Easterlin (2000) examines the pervading theme of mother–infant relations in the poetry of Wordsworth, correlates Wordsworth's insights with those of modern attachment theory, and sets both in contrast with an extensive body of Freudian feminist criticism. Evans (in press) has examined poems about sports in the light of evolutionary psychology.

A number of adaptationist critics have given interpretive accounts of narrative fiction of the nineteenth and twentieth centuries. Cooke (1999c, 2002) has studied Slavic subjects, but most contributors have studied topics in British and American fiction. Boyd and Carroll have interpreted works of Jane Austen (Boyd, 1998; Carroll, 2004, Part 2, Chapters 3 and 6), and Carroll has also critiqued works by Dickens, Charlotte Brontë, Cather, Bennett, Hardy, Wilde, and others (2004, Part 1, Chapters 6 and 8, Part 2, Chapters 1 and 3; in press b). Carroll (2004, Part 2, Chapter 3) uses five novels to exemplify different kinds of relations among human universals, culturally specific contexts, and individual identities in authors, and he also invokes human universals as a touchstone for canonical status. Jobling (2001a) and Kruger *et al.* (2003) have studied the novels of Sir Walter Scott from a specifically adaptationist perspective. Jobling uses sociobiological mating and ethical theory to explain the pattern of dark and light heroes in Scott's novels, and Kruger *et al.* use characters from Scott and Byron to test hypotheses about differences in cad/dad mating strategies. Easterlin (2005) gives an account of meta-fictional reworkings of *Jane Eyre* and *David Copperfield*, examining the way universals are altered by the self-reflexive contexts of a literary tradition. Love (2003) comments on novels by Howells, Cather, and Hemingway, locating all these commentaries in relation to ecological constraints within the physical environment. Saunders (2005, and in press) comments on a novel by Wharton and a story by Anderson, in both cases

assessing the way the narrative is shaped by the underlying, not fully conscious, force of an evolved sexual psychology. Storey (1996) analyses a novel by Iris Murdoch and argues that Murdoch's conscious Freudian psychology is tacitly subverted by her intuitive apprehension of evolved sexual psychology. Perchan (2004) examines a novel by Graham Greene in order to assess the way in which evolved sexual psychology shapes interpersonal relations in exotic conditions. Carroll and Gottschall (in press) have used an evolutionary understanding of motives, mate selection, and personality to produce a content analysis of the motives, mate preferences, and personality characteristics of 170 characters in 44 British novels of the nineteenth century.

All the theoretical and critical works I have cited make use of information derived from evolutionary psychology—information that is itself derived at least in part from empirical research. Another distinct body of work not only makes use of empirically derived information but conducts empirical research into literature. Miall and Dissanayake (2003) perform metric, phonetic, and foregrounding analyses of 'motherese' and situate their analysis within an adaptationist theory of mother–infant interaction. Scalise Sugiyama (2001a) analyses the incidence of adaptively relevant information about resources in the narratives of native peoples. D. S. Wilson *et al.* (1998) conducted an experiment to assess the relation of Machiavellianism to the fictional stories produced by experimental subjects. Kruger *et al.* (2003) use literary texts to assess differences in short and long-term mating strategies in respondents. The studies of pornography and romance fiction, cited above in the paragraph on genre, all make use of quantitative analysis and work with predictions about sex differences in mating psychology (Ellis and Symons, 1990; Whissel, 1996; Salmon and Symons, 2001; Salmon, 2005). The studies that examine the relation between social group size and dramatic structure, also cited above in the paragraph on genre, begin with an empirical analysis of correlations between social group size and the evolution of the brain, and they bring these findings to bear on analyses of group sizes in dramatic representations (Stiller *et al.*, 2004; Matthews and Barrett, 2005; Stiller and

Hudson, 2005). Gottschall and his colleagues have conducted a series of studies analysing the correlation of species-typical behaviours with representations of behaviour in large numbers of folk tales, fairy tales, and literary works (Gottschall, 2003b, 2005; Carroll and Gottschall, in press; Gottschall *et al.*, 2004, 2005, in press a and b).

44.4. Directions for further research

Most of the research areas outlined above have been explored in only a preliminary fashion. Up to the present time, the only area that has been fully developed is that of programmatic expositions. As both evolutionary psychology and adaptationist literary study develop further, and as the institutional context of literary study changes, it will be necessary periodically to reassess the whole field. For the time being, the most productive efforts could probably be devoted to the other areas under review.

Theories about the adaptive function of literature and the other arts remain in a highly speculative state. The background knowledge for this area—knowledge about the last few hundred thousand years of human evolution, the development of language, the evolution of social life, and the emergence of symbolic culture within the past 100 000 years or so—is itself still speculative and controversial (see Carroll, in press c). Further understanding of this issue will depend in part on developments in the primary field of anthropological research into human evolution and in part on psychological studies of the actual functions that are currently fulfilled by the production and consumption of imaginative artefacts.

Major topics in literary theory have been broached but by no means fully explored by adaptationist scholars. A better understanding of tone and genre will depend in part on a more precise and adequate knowledge of the nature of emotion. Research into 'basic emotions' and affective neuroscience provide chief points of departure for this research. Knowledge of the way 'point of view' enters into literary meaning can be advanced by new findings in theory of mind, in the evolution and nature of human

sociality, and in personality. Literary value, like all value, is subjective, but subjective mental events are themselves susceptible to empirical research, and the same kinds of research that illuminate an understanding of emotion, point of view, and social dynamics will further illuminate our understanding of literary values.

The interpretive critique of individual literary works, and of works grouped by author, genre and period, provide a main field for further development in adaptationist literary study. Current studies have made only an occasional lodgement on the coast of a continent in which the interior remains largely unexplored. Vast tracts of world literature, and whole phases even of English and American literature, remain virgin forest. The medieval period has barely been touched, and virtually nothing has been written about seventeenth- and eighteenth-century literature. Scarcely more has been written about modern literature. Most poetry remains to be explored. Apart from the works of Shakespeare, most drama has not yet been brought under scrutiny.

The social sciences are in general not strongly oriented to the study of cultural history. Evolutionary psychology grounds itself in deep history—in evolutionary history—and it is preoccupied with the human universals that emerge from that history, but it has made only rudimentary progress in understanding how universal human dispositions vary in the varying cultural ecologies of the past 10 000 years—the period for the emergence of agriculture, mass societies, and literacy. One of the chief challenges to adaptationist scholars, and one of the chief ways in which they can contribute to the larger project of an adaptationist understanding of human nature, is to integrate a knowledge of species-typical behavioural dispositions with a scholarly knowledge of specific cultural ecologies.

Most literary scholars have not been trained in empirical methodology, and few social scientists have taken literature as a source for data. That disciplinary barrier is now being surmounted, and the new methodologies that are being developed should fundamentally influence every area of literary study. New knowledge produces new concepts, and new concepts alter the terms in which we formulate literary theories and analyse individual texts. By developing

quantitative methods of analysis and by using data to test specific hypotheses, literary scholars can produce knowledge that is both falsifiable and genuinely progressive. They can link their own work ever more closely with the continuously developing knowledge in the empirical sciences, and they can produce new knowledge.

A truly adequate form of adaptationist literary study would combine at least four areas of expertise: (i) a thorough knowledge of evolutionary psychology—including a knowledge of its current limitations and its chief topics of controversy; (ii) a deep and broad humanistic training, with specialized knowledge of one or more historical periods, including the demographics, economics, politics, cultural forms, and literary traditions of those periods; (iii) expertise in the methods of ‘close reading’—a knowledge of the inner workings of tone, imagery, style, figures of speech, and the formal organization of narrative, drama, and verse; and (iv) a practical acquaintance with empirical methodology and a readiness to incorporate empirical analysis into literary research. Literary scholars will need both to develop new forms of expertise and also to imitate the sciences in the practice of working collaboratively, in research teams, so as to pool different forms of expertise. The demands are heavy, but the rewards great. We have opportunities of discovery that are, in the humanities, unprecedented.

References

- Abrams, M. H. (1997) The transformation of English studies: 1930–1995. *Daedalus*, 126: 105–132.
- Barash, D. and Barash, N. (2002, October 18) Biology as a lens: evolution and literary criticism. *Chronicle of Higher Education*, 49, B7–B9.
- Barash, D. and Barash, N. (2005) *Madame Bovary's Ovaries: A Darwinian Look at Literature*. Delacorte, New York.
- Barrett, L., Dunbar, R. I. M. and Lycett, J. (2002) *Human Evolutionary Psychology*. Princeton University Press, Princeton.
- Barrow, J. D. (1995) *The Artful Universe*. Oxford: Clarendon Press.
- Boyd, B. (1998) “Jane, meet Charles”: literature, evolution, and human nature. *Philosophy and Literature*, 22: 1–30.
- Boyd, B. (1999) Literature and discovery. *Philosophy and Literature*, 23: 313–333.
- Boyd, B. (2001) The origin of stories: *Horton Hears a Who*. *Philosophy and Literature*, 25: 197–214.
- Boyd, B. (2005a) Literature and evolution: a bio-cultural approach. *Philosophy and Literature*, 29: 1–23.
- Boyd, B. (2005b) Evolutionary theories of art. In J. Gottschall and D. S. Wilson (eds) *Literature and the human animal*, pp. 147–176. Northwestern University Press, Evanston, IL.
- Boyd, B. (in press a) Kind and unkindness: Aaron in *Titus Andronicus*. In B. Boyd (ed.) *Words that Count: Essays on Early Modern Authorship in Honor of MacDonald P. Jackson*. University of Delaware Press, Newark, NJ.
- Boyd, B. (in press b) Laughter and literature: a play theory of humor. *Philosophy and Literature*.
- Carroll, J. (1995) *Evolution and Literary Theory*. University of Missouri Press, Columbia.
- Carroll, J. (2004) *Literary Darwinism: Evolution, Human Nature, and Literature*. Routledge, New York.
- Carroll, J. (2005) Literature and evolutionary psychology. In D. Buss (ed.) *The Handbook of Evolutionary Psychology*, pp. 931–952. Wiley, Hoboken, NJ.
- Carroll, J. (in press a) The adaptive function of literature. In C. Martindale, P. Locher and V. Petrov (eds) *Evolutionary and Neurocognitive Approaches to Creativity and the Arts*. Baywood, Amityville, NY.
- Carroll, J. (in press b) Aestheticism, homoeroticism, and Christian guilt in *The Picture of Dorian Gray*: a Darwinian critique. *Philosophy and Literature*.
- Carroll, J. (in press c) The human revolution and the adaptive function of literature. *Philosophy and Literature*.
- Carroll, J. (in press d) Literature and evolution. In R. Headlam Wells and J. McFadden (eds) *Human Nature: Fact and fiction*. Continuum, London.
- Carroll, J. and Gottschall, J. (in press) Human nature and agonistic structure in canonical British novels of the nineteenth and early twentieth centuries: a content analysis. In U. Klein, K. Mellmann and S. Metzger (eds) *Anthropologie und Sozialgeschichte der Literatur Heuristiken der Literaturwissenschaft*. Mentis, Paderborn, Germany.
- Coe, K. (2003) *The Ancestress Hypothesis: Visual Art as Adaptation*. Rutgers University Press, New Brunswick.
- Cooke, B. (1987) The human alien: in-groups and out-breeding in *Enemy Mine*. In G. Slusser and E. Rabkin (eds) *Aliens: The Anthropology of Science Fiction*, pp. 179–198. Southern Illinois University Press, Carbondale.
- Cooke, B. (1994) Sociobiology, science fiction and the future. *Foundation: The Review of Science Fiction*, 60: 42–51.
- Cooke, B. (1995) Microplots: the case of *Swan Lake*. *Human Nature*, 2: 183–196.
- Cooke, B. (1996) The biology of immortality: a Darwinist perspective on science fiction. In G. Slusser, G. Westfahl and E. Rabkin (eds) *Immortal engines: Immortality and Life Extension in Science Fiction*, pp. 90–101. University of Georgia Press, Athens, GA.
- Cooke, B. (1999a) On the evolution of interest: cases in serpent art. In D. H. Rosen and M. Luebbert (eds) *Evolution of the Psyche*, pp. 150–168. Praeger, Westport, CT.

646 · CHAPTER 44 Evolutionary approaches of literature and drama

- Cooke, B. (1999b) The promise of a bioethematics. In J. B. Bedaux and B. Cooke (eds) *Sociobiology and the Arts*, pp. 43–62. Editions Rodopi, Amsterdam.
- Cooke, B. (1999c) Sexual property in Pushkin's "The Snowstorm": a Darwinist perspective. In B. Cooke and F. Turner (eds) *Biopoetics: Evolutionary Explorations in the Arts*, pp. 175–204. ICUS, Lexington, KY.
- Cooke, B. (2002) *Human Nature in Utopia: Zamyatin's We*. Northwestern University Press, Evanston, IL.
- Degler, C. (1991) *In Search of Human Nature: The Decline and Revival of Darwinism in American Social Thought*. Oxford University Press, Oxford.
- Dissanayake, E. (1995a) Chimera, spandrel, or adaptation: conceptualizing art in human evolution. *Human Nature*, 6: 99–117.
- Dissanayake, E. (1995b, first published 1992) *Homo Aestheticus: Where Art Comes From and Why*. University of Washington Press, Seattle.
- Dissanayake, E. (2000) *Art and Intimacy: How the Arts Began*. University of Washington Press, Seattle.
- Dissanayake, E. (2001) Aesthetic incunabula. *Philosophy and Literature*, 25: 335–346.
- Dunbar, R. I. M. (2004) *The Human Story: A Brief History of Mankind's Evolution*. Faber & Faber, London.
- Dunbar, R. I. M. (2005) Why are good writers so rare? An evolutionary perspective on literature. *Journal of Cultural and Evolutionary Psychology*, 3: 7–22.
- Dunbar, R. I. M., Barrett, L. and Lycett, J. (2005) *Evolutionary Psychology: A Beginner's Guide*. One World, Oxford.
- Easterlin, N. (1993) Play, mutation, and reality acceptance: toward a theory of literary experience. In N. Easterlin and B. Riebling (eds) *After Poststructuralism: Interdisciplinarity and Literary Theory*, pp. 105–125. Northwestern University Press, Evanston, IL.
- Easterlin, N. (1999a) Do cognitive predispositions predict or determine literary value judgments? Narrativity, plot, and aesthetics. In B. Cooke and F. Turner (eds) *Biopoetics: Evolutionary Explorations in the Arts*, pp. 241–262. ICUS, Lexington, KY.
- Easterlin, N. (1999b) Making knowledge: bioepistemology and the foundations of literary theory. *Mosaic*, 32: 131–147.
- Easterlin, N. (2000) Psychoanalysis and the "discipline of love". *Philosophy and Literature*, 24: 261–279.
- Easterlin, N. (2001a) Hans Christian Andersen's fish out of water. *Philosophy and Literature*, 25: 251–277.
- Easterlin, N. (2001b) Voyages in the verbal universe: the role of speculation in Darwinian literary criticism. *Interdisciplinary Literary Studies*, 2: 59–73.
- Easterlin, N. (2002) Romanticism's gray matter. *Philosophy and Literature*, 443–455.
- Easterlin, N. (2004) "Loving ourselves best of all": ecocriticism and the adapted mind. *Mosaic*, 37: 1–18.
- Easterlin, N. (2005) How to write the great Darwinian novel: cognitive predispositions, cultural complexity, and aesthetic evaluation. *Journal of Cultural and Evolutionary Psychology*, 3: 23–38.
- Ellis, B. and Symons, D. (1990) Sex differences in sexual fantasy: an evolutionary psychological approach. *The Journal of Sex Research*, 27: 527–555.
- Evans, D. (1998) Evolution and literature. *South Dakota Review*, 36: 33–45.
- Evans, D. (in press) The flash and dazzle of sports poetry. *Aethlon: The Journal of Sports Literature*.
- Evans, D. (2005) From Lacan to Darwin. In J. Gottschall and D. S. Wilson (eds) *Literature and the human animal*, pp. 38–55. Northwestern University Press, Evanston, IL.
- Fox, R. (1989) *The Search for Society: Quest for a Biosocial Science and Morality*. Rutgers University Press, New Brunswick.
- Fox, R. (1995) Sexual conflict in the epics. *Human Nature*, 6: 135–144.
- Fox, R. (2005) Male bonding in the epics and romances. In J. Gottschall and D. S. Wilson (eds) *Literature and the human animal*, pp. 126–144. Northwestern University Press, Evanston, IL.
- Freeman, D. (1992) Paradigms in collision. *Academic Questions*, 5: 23–33.
- Freeman, D. (1999) *The fateful hoaxing of Margaret Mead: A Historical Analysis of her Samoan Research*. Westview, Boulder, CO.
- Fromm, H. (1996) From transcendence to obsolescence: a route map. In C. Glotfelty and H. Fromm (eds) *The Ecocriticism Reader: Landmarks in Literary Ecology*, pp. 30–39. University of Georgia Press, Athens.
- Fromm, H. (1998) Ecology and ecstasy on Interstate 80. *Hudson Review*, 51: 65–78.
- Fromm, H. (2001) A crucifix for Dracula: Wendell Berry meets Edward O. Wilson. *Hudson Review*, 53: 657–664.
- Fromm, H. (2003a) The new Darwinism in the humanities: from Plato to Pinker. *Hudson Review*, 56: 89–99.
- Fromm, H. (2003b) The new Darwinism in the humanities, part two: back to nature again. *Hudson Review*, 56: 315–327.
- Gottschall, J. (2001) Homer's human animal: ritual combat in the *Iliad*. *Philosophy and Literature*, 25: 278–294.
- Gottschall, J. (2003a) An evolutionary perspective on Homer's invisible daughters. *Interdisciplinary Literary Studies*, 4: 36–55.
- Gottschall, J. (2003b) Patterns of characterization in folk tales across geographic regions and levels of cultural complexity: literature as a neglected source of quantitative data. *Human Nature*, 14: 365–382.
- Gottschall, J. (2003c) The tree of knowledge and Darwinian literary study. *Philosophy and Literature*, 27: 255–268.
- Gottschall, J. (2004) Literary universals and the sciences of the mind. *Philosophy and Literature*, 28: 202–217.
- Gottschall, J. (2005) Quantitative literary study: a modest manifesto and testing the hypotheses of feminist fairy tale studies. In J. Gottschall and D. S. Wilson (eds) *Literature and the Human Animal*, pp. 199–224. Northwestern University Press, Evanston, IL.

AU:Pls give
first three
Authors

- Gottschall, J. and Wilson, D. S. (2005) Introduction: Literature—a last frontier in human evolutionary studies. In J. Gottschall and D. S. Wilson (eds) *Literature and the human animal*, pp. xvii–xxvi. Northwestern University Press, Evanston, IL.
- Gottschall, J., Martin, J., Quish, H. and Rea, J. (2004) Sex differences in mate choice criteria are reflected in folktales from around the world and in historical European literature. *Evolution and Human Behavior*, 25: 102–112.
- Gottschall, J. et al. (2005) The heroine with a thousand faces: universal trends in the characterization of female folk tale protagonists. *Evolutionary Psychology*, 3: 85–103.
- Gottschall, J., Allison, E., De Rosa, J. and Klockeman, K. (in press a) Can literary study be scientific? Results of an empirical search for the virgin/whore dichotomy. *Interdisciplinary Literary Studies*.
- Gottschall, J. et al. (in press b) A census of the Western canon: literary studies and quantification. *Interdisciplinary Literary Studies*.
- Graff, G. (1987) *Professing Literature: An Institutional History*. University of Chicago Press, Chicago.
- Gross, P. R. and Levitt, N. (1994) *Higher Superstition: The Academic Left and its Quarrels with Science*. Johns Hopkins University Press, Baltimore.
- Gross, P. R., Levitt, N. and Lewis, M. W. (eds) (1997) *The Flight from Science and Reason*. Johns Hopkins University Press, Baltimore.
- Headlam Wells, R. (in press) *Shakespeare's Humanism*. Cambridge University Press, Cambridge.
- Headlam Wells, R. and McFadden, J. (in press) Introduction. In R. Headlam Wells and J. McFadden (eds) *Human Nature: Fact and Fiction*. Continuum, London.
- Jobling, I. (2001a) Personal justice and homicide in Scott's *Ivanhoe*: an evolutionary psychological perspective. *Interdisciplinary Literary Studies*, 2: 29–43.
- Jobling, I. (2001b) The psychological foundations of the hero-ogre story: a cross-cultural study. *Human Nature*, 12: 247–272.
- Jobling, I. (2002) Byron as cad. *Philosophy and Literature*, 26: 296–311.
- Kruger, D., Fisher, M. and Jobling, I. (2003) Proper and dark heroes as dads and cads: alternative mating strategies in British and romantic literature. *Human Nature*, 14: 305–317.
- Love, G. A. (1999a) Ecocriticism and science: toward consilience? *New Literary History*, 30: 561–576.
- Love, G. A. (1999b) Science, anti-science, and ecocriticism. *Interdisciplinary Studies in Literature and the Environment*, 6: 65–81.
- Love, G. A. (2003) *Practical Ecocriticism: Literature, Biology, and the Environment*. University of Virginia Press, Charlottesville.
- McEwan, I. (2005) Literature, science, and human nature. In J. Gottschall and D. S. Wilson (eds) *Literature and the Human Animal*, pp. 5–19. Northwestern University Press, Evanston, IL.
- Matthews, P. and Barrett, L. (2005) Small-screen social groups: soap operas and social networks. *Journal of Cultural and Evolutionary Psychology*, 3: 75–86.
- Miall, D. and Dissanayake, E. (2003) The poetics of babytalk. *Human Nature*, 14: 337–364.
- Miller, G. (1999) Sexual selection for cultural displays. In R. Dunbar, C. Knight and C. Power (eds) *The Evolution of Culture*, pp. 71–91. Rutgers University Press, New Brunswick.
- Miller, G. (2000) *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature*. Doubleday, New York.
- Nesse, M. (1995) Guinevere's choice. *Human Nature*, 6: 145–163.
- Nettle, D. (2005a) The wheel of fire and the mating game: explaining the origins of tragedy and comedy. *Journal of Cultural and Evolutionary Psychology*, 3: 39–56.
- Nettle, D. (2005b) What happens in *Hamlet*? Exploring the psychological foundations of drama. In J. Gottschall and D. S. Wilson (eds) *Literature and the Human Animal*, pp. 56–75. Northwestern University Press, Evanston, IL.
- Nieves, E. (2001) The new (r)evolutionary criticism and the American literary academy: interdisciplinary insurrections 2000. In J.-P. Barbiche (ed.) *Devolutions et federalismes: Des faits et des idées*, pp. 111–119. Lharmattan, Paris.
- Nordlund, M. (2002) Consilient literary interpretation. *Philosophy and Literature*, 26: 312–333.
- Nordlund, M. (2005) The problem of romantic love: Shakespeare and evolutionary psychology. In J. Gottschall and D. S. Wilson (eds) *Literature and the Human Animal*, pp. 107–125. Northwestern University Press, Evanston, IL.
- Perchan, R. (2004) The Darwinian world of Graham Greene's *The Quiet American*. *New Korean Journal of English Language and Literature*, 46: 155–172.
- Pinker, S. (1997) *How the Mind Works*. W. W. Norton, New York.
- Pinker, S. (2002) *The Blank Slate: The Modern Denial of Human Nature*. Viking, New York.
- Power, C. (1999) "Beauty Magic": The origins of art. In R. Dunbar, C. Knight and C. Power (eds) *The Evolution of Culture*, pp. 92–112. Rutgers University Press, New Brunswick.
- Salmon, C. (2005) Crossing the abyss: erotica and the intersection of evolutionary psychology and literary studies. In J. Gottschall and D. S. Wilson (eds) *Literature and the human animal*, pp. 244–257. Northwestern University Press, Evanston, IL.
- Salmon, C. and Symons, D. (2001) *Warrior Lovers: Erotic Fiction, Evolution, and Female Sexuality*. Weidenfeld & Nicolson, London.
- Saunders, J. (2005) Evolutionary biological issues in Edith Wharton's *The Children*. *College Literature*, 32: 83–102.
- Saunders, J. (in press) Male reproductive strategies in Sherwood Anderson's "The Untold Lie." *Philosophy and Literature*.
- Scalise Sugiyama, M. (1996) On the origins of narrative: storyteller bias as a fitness enhancing strategy. *Human Nature*, 7: 403–425.
- Scalise Sugiyama, M. (2001a) Food, foragers, and folklore: the role of narrative in human subsistence. *Evolution and Human Behavior*, 22: 221–240.

648 · CHAPTER 44 Evolutionary approaches of literature and drama

- Scalise Sugiyama, M. (2001b) Narrative theory and function: why evolution matters. *Philosophy and Literature*, 25: 233–250.
- Scalise Sugiyama, M. (2001c) New science, old myth: an evolutionary critique of the Oedipal paradigm. *Mosaic*, 34: 121–136.
- Scalise Sugiyama, M. (2003) Cultural relativism in the bush: toward a theory of narrative universals. *Human Nature*, 14: 383–396.
- Scalise Sugiyama, M. (2005) Reverse-engineering narrative: evidence of special design. In J. Gottschall and D. S. Wilson (eds) *Literature and the Human Animal*, pp. 177–196. Northwestern University Press, Evanston, IL.
- Sokal, A. D. (1996) Transgressing the boundaries: toward a transformative hermeneutics of quantum gravity. *Social Text*, 14: 217–252.
- Sokal, A. D. and Bricmont, J. (1998) *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science*. Picador, New York.
- Steen, F. (2005) The paradox of narrative thinking. *Journal of Cultural and Evolutionary Psychology*, 3: 87–105.
- Stiller, J. and Hudson, M. (2005) Weak links and scene cliques within the small world of Shakespeare. *Journal of Cultural and Evolutionary Psychology*, 3: 57–73.
- Stiller, J., Nettle, D. and Dunbar, R. I. M. (2004) The small world of Shakespeare's plays. *Human Nature* 14: 397–408.
- Storey, R. (1993) "I am I because my little dog knows me": prolegomenon to a theory of mimesis. In N. Easterlin and B. Riebling (eds) *After Poststructuralism: Interdisciplinarity and Literary Theory*, pp. 45–70. Northwestern University Press, Evanston, IL.
- Storey, R. (1996) *Mimesis and the Human Animal: on the Biogenetic Foundations of Literary Representation*. Northwestern University Press, Evanston, IL.
- Storey, R. (2001) A critique of recent theories of laughter and humor, with special reference to the comedy of *Seinfeld*. *Interdisciplinary Literary Studies*, 2: 75–92.
- Storey, R. (2003) Humor and sexual selection. *Human Nature*, 14: 319–336.
- Thiessen, D. and Umezawa, Y. (1998) The sociobiology of everyday life: a new look at a very old novel. *Human Nature*, 9: 293–320.
- Tooby, J. and Cosmides, L. (1992) The psychological foundations of culture. In J. H. Barkow, L. Cosmides and J. Tooby (eds) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, pp. 19–136. Oxford University Press, New York.
- Tooby, J. and Cosmides, L. (2001) Does beauty build adapted minds? Toward an evolutionary theory of aesthetics, fiction, and the arts. *SubStance* 30: 6–27.
- Turner, F. (1992, first published 1985) *Natural classicism: Essays on literature and science*. University of Virginia Press, Charlottesville.
- Voland, E. (2003) Aesthetic preferences in the world of artifacts—adaptations for the evaluation of honest signals? In E. Voland and K. Grammer (eds) *Evolutionary Aesthetics*, pp. 239–260. Springer, Berlin.
- Whissel, C. (1996) Mate selection in popular women's fiction. *Human Nature*, 7: 427–447.
- Wilson, D. S. (2005) Evolutionary social constructivism. In J. Gottschall and D. S. Wilson (eds) *Literature and the Human Animal*, pp. 20–37. Northwestern University Press, Evanston, IL.
- Wilson, D. S., Near, D. and Miller, R. (1998) Individual differences in Machiavellianism as a mix of cooperative and exploitative strategies. *Evolution and Human Behavior*, 19: 203–211.
- Wilson, E. O. (1998) *Consilience: The Unity of Knowledge*. Alfred A. Knopf, New York

ED: pls check spelling