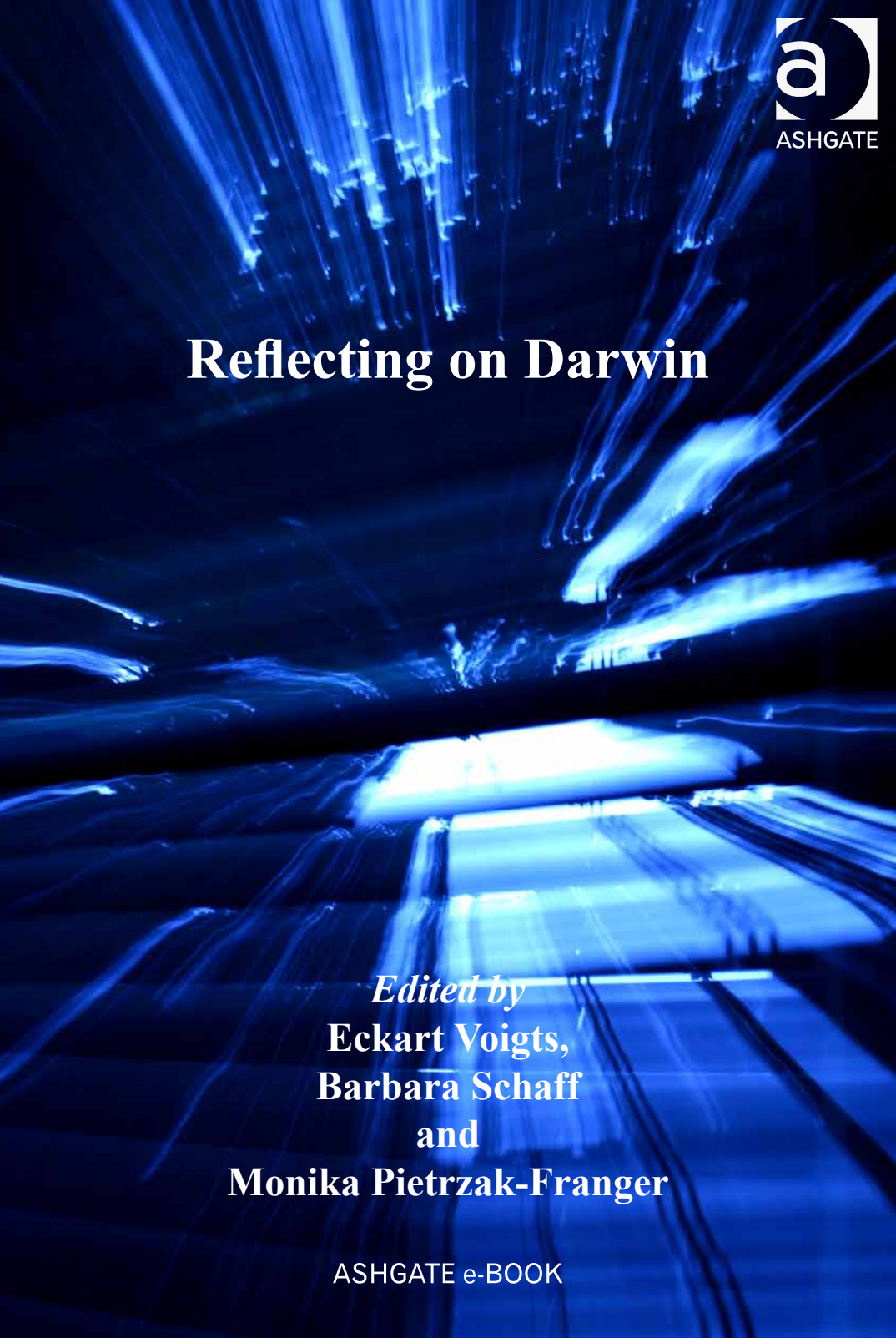

Reflecting on Darwin

Edited by
Eckart Voigts,
Barbara Schaff
and
Monika Pietrzak-Franger

ASHGATE e-BOOK

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Susanne Scholz is Professor of English Literature and Culture at the University of Frankfurt/Main. She has held teaching posts at the Universities of Frankfurt, Siegen and Paderborn. Her main research interests and publications are in the field of early modern, eighteenth- and nineteenth-century English literature, gender studies, medical humanities and visual culture studies. She has recently completed a research project on English literature and the scientific gaze and is currently working on a project on visual practices at the court of Elizabeth I. Her major book publications are: *Body Narratives: Writing the Nation and Fashioning the Subject in Early Modern England,* London: Macmillan 2000, *Objekte und Erzählungen. Subjektivität und kultureller Dinggebrauch im England des frühen 18. Jahrhunderts*, Königstein: Helmer 2004, *Medialisierungen des Unsichtbaren um 1900*, München: Fink 2010 (ed., with Julika Griem), and *Phantasmatic Knowledge: Visions of the Human and the Scientific Gaze in English Literature, 1880–1930*, Heidelberg: Winter 2013.

Angela Schwarz is Professor of Modern History at the University of Siegen. She has studied history and English, at the University of Duisburg and the University of Reading (England), acquired her PhD with a study on British visitors to Nazi Germany in the 1930s (*Die Reise ins Dritte Reich. Britische Augenzeugen im nationalsozialistischen Deutschland*, 1993). Since her postdoctoral study on popular science in the nineteenth and twentieth century (*Der Schlüssel zur modernen Welt. Wissenschaftspopularisierung in Großbritannien und Deutschland im Übergang zur Moderne, ca. 1870–1914* 1999) she has expanded her fields of research beyond Anglo-German relations, British history and the history of science popularization to include aspects of urban history, history of science and technology, media history including world's fairs as media, and local and regional history. All of her work may be subsumed under the concept of the new cultural history with a strong focus on transnational phenomena. At present she is preparing a volume on the debate on evolution in the public since 1859 (*Streitfall Evolution. Eine Kulturgeschichte*), a monograph on science, technology and the birth of the modern world and another on history in computer games (*Computerspiele und historisches Lernen*).

Felix Sprang is Assistant Professor at the University of Hamburg, having studied English, philosophy and biology at the University of Frankfurt and the University of Hamburg. As Aby Warburg Scholar at the Warburg Institute, University of London, he has worked on literary reflections of scientific thought in early modern London (*Londons Fountaine of Arts and Sciences. Bildliche und theatrale Vermittlungsinstanzen naturwissenschaftlichen Denkens im frühneuzeitlichen London*, 2008). His latest monograph, *The Seat of the Sonnet's Soul – Poetic Form and the Unfolding of the* volta *in Literary History*, in which he addresses aesthetic form from the vantage point of intellectual history, is currently under review. His recent publications include: 'The Rise of the "Life Sciences" and the Dismissal of Plant Life in the Late Eighteenth and Early Nineteenth Centuries', (Göttingen: V &R, 2013. 115-136) *Discovering the Human: Life Sciences and the Arts in the*

Eighteenth and Early Nineteenth Centuries (Basingstoke: Palgrave Macmillan (in preparation); '"…so weak is my ability and knowledge in navigation..." Navigating the Stage in Early Modern London', *Shakespeare Jahrbuch* 148 (2012): 31–53.

Momme von Sydow studied philosophy and psychology (with minors in evolutionary biology) at the Universities of Bonn, Durham (UK), and Göttingen. He obtained two PhDs: one in philosophy at the University of Durham, discussing Darwinian metaphysics and its critique, another at the University of Göttingen in psychology on Bayesian hypothesis testing. Fields of empirical and theoretical research include conceptual foundations of Darwinism, optimal information selection, inductive logics, contingency judgments, probability judgments, causal and deontic reasoning, Bayesian reasoning, the rationality of intuition and the psychology of justice. He has criticized the metaphysics of gene-Darwinism and more recently has worked on knowledge-based Bayesian models of hypothesis testing. Since 2006, he has headed his own DFG research projects on the Bayesian logics of knowledge-based hypothesis testing at the University of Göttingen, where he has also been member of the Courant Centre 'Evolution of Social Behaviour'. He has taught at the Universities of Göttingen, TU Berlin, and Heidelberg. Since 2011, he has been continuing his own research in a project on 'Bayes logic and Bayes nets' in cognitive psychology at the University of Heidelberg (associated with CRISP and the Leibniz Prize winner Prof Klaus Fiedler).

Eckart Voigts is Professor of English Literature at TU Braunschweig, Germany. He also taught at the Universities of Siegen and Frankfurt, Germany, at Vienna, Austria, Madison and Milwaukee (Wisconsin, USA) and at Leeds University, UK. He has published articles on Darwin biofiction and neo-Victorianism. His *Introduction to Media Studies* (Klett) was published in 2005. He is also editor of *Dramatized Media / Mediated Drama* (2000), *Janespotting and Beyond. British Heritage Retrovisions since the Mid-1990s* (2004) and co-editor of *The New Documentarism, ZAA* (56.2, 2008) and *Adaptations: Performing across Media and Genres* (2009).

Nils Wilkinson received his BA and MA in Literary, Cultural and Media Studies at the University of Siegen where he has been a research assistant since 2009. He is currently writing his PhD on cultural representations of DNA. His main research interests are in gender and queer studies, science fiction, science studies and the nature/culture debate. He has published essays on contemporary English theater (on Ravenhill, Churchill and Ayckbourn).

Introduction: Cultural Reflections on Darwin and Their Historical Evolution

Monika Pietrzak-Franger and Eckart Voigts, Braunschweig

We live under the rule of a 'biocracy' (Lipp 2001) and we may well be in the middle of a 'Darwinian revolution in the humanities' (Carroll 2010). The life sciences have attained an enormous power of discourse in recent years, particularly since the decoding of the human genome and other advances in the field of genetic engineering. Charles Darwin is the figurehead of this biocracy. Richard Dawkins, the iconic proponent of neo-Darwinism in public discourse, began his 2008 series on *The Genius of Charles Darwin* by declaring that evolution is 'perhaps the most powerful idea ever to occur in a human mind'.[1] A clear indicator of the current interest in Darwin both inside and outside academia is the fact that Darwin – the face on the £10 note – was ranked fourth-influential scientist of all time in *The Scientific 100: A Ranking of the Most Influential Scientists, Past and Present* (Citadel Press 2000). Daniel Dennett goes further:

> If I were to give a prize for the single best idea anybody ever had, I'd give it to Darwin for the idea of natural selection – ahead of Newton, ahead of Einstein. Because his idea unites the two most disparate features of our universe: The world of purposeless, meaningless matter-in-motion, on the one side, and the world of meaning, and purpose, and design on the other.[2]

Ever since the advent of sociobiology in the mid-1970s, notably with Edward O. Wilson's book *Sociobiology: The New Synthesis*, there have been attempts to make biological determinism the major explanatory template for sociocultural fields of human inquiry.[3] More recently, especially with the influential work of Daniel Dennett and Richard Dawkins and the so-called 'Darwin wars' (Brown 1999), these trends towards 'gene centrism' (Dupré 2003), the transfer of Darwinian paradigms into culture as 'memetics' and literature as 'Darwinian

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[1] Richard Dawkins, *The Genius of Charles Darwin*, Part 1 'Life, Darwin and Everything' (Channel 4, 2008).

[2] This quote occurs fairly early in 'Darwin's Dangerous Idea', the first episode in the TV documentary miniseries *Evolution* (PBS 2003).

[3] The initial debate between adaptationist sociobiology (Wilson, Dennett) and its critics within evolutionary biology (Gould, Lewontin), a debate which quickly turned personal and aggressive, is well documented in *The New York Review of Books*.

literary studies', have made the claims of the fervent, neo-positivist science of some neo-Darwinists, sociobiologists, or evolutionary psychologists first more urgent and subsequently more nuanced.[4]

While these interesting 'Darwinian' approaches to culture have a high heuristic potential, they are often served with an unsavoury conservative revisionism that attacks social constructivism with an essentialist agenda.[5] In general, the debates in this field are loaded with high degrees of emotionalized rhetoric that are frequently picked up in mainstream media. When Wilson and Dawkins squabble over the role of 'kin selection' vs. 'group selection' in evolutionary processes (as they are currently doing), this makes the headlines in the popular press (Thorpe 2012). Exploring this biocentrism both in its scientific and popular versions, this collection of essays offers an overview of the historical evolution of Darwin and his theories as well as of the cultural responses they have inspired. The collection pays special attention to the post-millennial trends in the interpretation of Darwin's work and his scientific persona.

Defying the precepts of time, Charles Darwin has grown younger in recent years (Beer xvii). The 'discovery' of the young Darwin has been accompanied by a heightened interest in his emotion and a parallel re-evaluation of centuries-long (mis)conceptions regarding his theories, which continue to have a stronghold in our cultural imagination. In 'The Changing Face of Darwinism' (2003), Michael Ruse outlines these developments with reference to the evolving portrayal of the scientist in three successive Norton editions of his works. While the 1970 'cover and the frontispiece were based on the well-known photograph of Darwin around seventy years old but looking more like ninety' (306), the Darwin of the third edition is young and 'living technicolor, framed in eggshell blue and gold' (309). Indeed, as Janet Browne has pointed out, there is a clear development in cultural responses to Darwin. While the early, nineteenth-century biographical works envisioned him as an industrious patriarch, loving father and a 'scientific hero' (Browne 2010: 359), the First World War brought to the fore his inner turmoil and turned him into a celebrity of modernist writing (365). After the Second World War, Darwin was associated with secular science and began to be regarded as 'an ordinary mortal who experienced ethical dilemmas and pleasures' (369). Finally, today, what is particularly visible is a more ardent preoccupation not as much with his science as 'with the cultural features that create a scientist' (372). Interestingly, though, Suzanne Gapps, as she examines contemporary tendencies in depicting the

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[4] See Ruse 1985, 1989; Dawkins 1989; Dennett 1995; Ridley 1995, 1996; Wilson 2000; Gould 2002; Voland and Grammer 2003; Kitcher 2003; Eibl 2004; Carroll 2004, 2010 and the special issues of *Politics and Literature* (2010) and *Style* (2008). For an appraisal of memetics, see also Distin 2005. For a critique of evolutionary psychology and sociobiology, see Rose, Kamin and Lewontin 1984; Rose and Rose 2000; Buller 2005.

[5] See Voigts-Virchow 2006 who polemically calls this heuristic reductionism 'droso-philology'. For further criticism see the essays by Sprang, Richter, Gutmann and Wilkinson in this volume.

scientist on the Internet (2009), points out his pervasive portrayal as an 'archetypal, heavily bearded Victorian sage' (French 2009: n. pag.); an icon of unattainable grandeur and intellect. To some extent, Darwin's public profile indicates the persistence of C.P. Snow's dichotomy of the 'two cultures', first articulated in his Rede lecture on 7 May 1959 (Snow 1960), in spite of attempts to use passages like this to erase this divide. At the same time, however, academic and popular spaces become increasingly engaged with the affective Darwin (Keynes 2001; Levine 2006; Colp 2008; Padel 2009; Richardson 2013). Yet, Darwin's scientific persona is not the sole, or most important, point of reference for contemporary debates.

Like no other scientific theory, evolution has fundamentally changed our understanding of the world and determined research questions in the sciences as well as the humanities. As the massive media coverage in the Darwin year 2009, which marked the bicentenary of his birthday, shows, disciplines such as psychology, economics, cultural and literary studies have appropriated Darwin's theories as a means of interpretation and considerably extended its relevance. The BBC Darwin Season included a series of special events on radio and TV and Cambridge University hosted one of many Darwin festivals at universities around the globe.[6] *On the Origin of Species* had a notable new '150th anniversary' edition – with a specially commissioned cover by top-selling Brit-artist Damien Hirst. A five-CD audio book was significantly read by Darwin hardliner and popularizer Dawkins, and a 'graphic adaptation' saw Darwin's major work visualized in comic-book format (Darwin 2009a 2009b; Keller 2009). Darwin figured prominently in the popular media – in TV documentaries such as David Attenborough's *Charles Darwin and the Tree of Life* (BBC 1, 2009) or Dawkins's *The Genius of Charles Darwin* (Channel 4, 2008) and especially in Jon Amiel's Hollywood movie *Creation* (2009).[7] This adaptation of *Annie's Box: Charles Darwin, His Daughter and Human Evolution*, the Darwin biography published by his great-great grandson Randal Keynes in 2001, is notable not just for hopping on the 'young and benign Darwin' bandwagon, providing a 'humanized', or, as some might argue, 'sanitized' image of the scientist as caring father, but also for initially failing to find

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[6] Events included 'Dear Darwin', a series of open letters of contemporary 'ancestors' as diverse as geneticist Craig Venter and director Jonathan Miller, Ruth Padel's personal four-part radio series *Darwin: My Ancestor* and *The Essay: Darwin's Children*, on the transdisciplinary impact of Darwin, which includes a programme by Jonathan Gottschall on Darwin and literature.

[7] See the three-part BBC 2 series *Darwin's Dangerous Idea*, narrated by Andrew Marr, which copied its name from Dennett's book. See also the eight-hour series also called *Darwin's Dangerous Idea* (PBS/WGBH 2001), narrated by Liam Neeson, especially the first, two-hour biofictional episode 'Darwin's Dangerous Idea', or the pioneering BBC miniseries *The Voyage of Charles Darwin* (1978). The Melvyn Bragg-hosted four-part documentary *Darwin: In Our Time* (BBC Radio 4, 2009) was also broadcast as part of the bicentennial celebrations and is currently available on the BBC website.

a distributor in the US.[8] Significantly, popular media representations of Darwin often occur in the context of satires on creationism rather than evolutionism.[9] His work is accepted as path-breaking and his personality only mildly satirized in Jenny Diski's *Monkey's Uncle* (1994) and Terry Pratchett's *Darwin's Watch* (2005). He has also inspired a barrage of artworks and exhibitions in the context of the anniversary, from the massive exhibition *Darwin* (American Natural History Museum, 2005–2009), which travelled to the most important natural history museums worldwide, to small-scale projects such as Beauvais Lyons' excellent fake art satire 'The Association of Creative Zoology' or Carol Church-Brown's 'Singing Darwin'. Alongside these a number of gallery exhibitions demonstrated Darwin's influence on the arts of the last two centuries, with *After Darwin: Contemporary Expressions* (Natural History Museum in London, 2009), *Darwin: Art and the Search for Origins* (Schirn Kunsthalle in Frankfurt, 2009) and the Warsaw exhibition *All Creatures Great and Small* (2009–2010) exploring artists' take on Darwin and, in particular, his *The Expression of Emotions in Man and Animals*.[10]

Spanning the reception history of Darwin's ideas, Richter (in this collection) argues that it has always been intertwined with a number of anxieties evoked by three central topoi: the non-benign character of nature, the human-animal contiguity and the a-teleological character of natural selection. These have continuously formed a ground on which to project current sociocultural, political and biological problems. This said, the profoundness and contradictoriness of Darwin's texts accounts for the plethora of interpretations they have received within and outside of academia. A survey of events in honour of the scientist listed on the site of the International Darwin Day Foundation (2009) shows that apart from the general celebrations, two types were of particular consequence: 1) events that attempted to establish contemporary significance of Darwin's legacy across academic disciplines, and especially, his influence in humanities and 2) events that highlighted Darwin's popular cultural resonance today.[11] Current academic preoccupations evince similar trends.

There clearly has been a flood rather than an ebb in the interest in Darwin. The new millennium witnessed a veritable deluge of publications reframing his life and texts: biographies (Browne 2002, 2003; Keynes 2001; Leone 2009; Tort 2001; Colp 2008), compilations of his letters and selections of his diaries (Keynes 2001; Orel 2000; Secord 2008; Burkhardt et al. 2008), companions to his works (Hodge and Radick 2002; Ruse and Richards 2009) and lavishly illustrated coffee-table books

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[8] Producer Jeremy Thomas blamed this on the influence of creationist religion in the US, see Singh 2009. For a discussion of Amiel's adaptation, see Pietrzak-Franger 2012.

[9] See for example his appearance in popular TV animation: Moral Orel, Adult Swim 2005–2008; The Simpsons: 'The Monkey Suit', 14 May 2006.

[10] For a discussion of these exhibitions and their take on Darwin's ideas concerning emotion, see Pietrzak-Franger, 2013.

[11] See Pietrzak-Franger, 2013.

(Eldredge 2005; Kort and Hollein 2009). There has also been a number of popular publications about Darwin and his family, as well as an abundance of literary (neo-Victorian) rewritings of his life (McDonald 1999; Nichols 2003; Drayson 2002; Chase-Riboud 2003; Darnton 2005; Burch 2005; Padel 2009; Chevalier 2009).[12] In fact, Letissier (2010: 74) may be right in claiming that contemporary bioethical shocks and traumata are frequently displaced into discussions of the unsettling effects of Darwinian science in the mid-19th century.

Darwin has also figured prominently in the well-established context of 'science and literature' approaches since the 1980s (Shuttleworth 1998, Schor 2000, Roof 2007, Clayton 2003, Levine 1988, 2006), within which this publication is positioned. The year 2009 also brought a number of re-evaluations of his position within the disciplines of philosophy and theory of science (Gilson et al., Ruse). The major focus of these publications was the impact that Darwin's thought has had on future generations. The present publication can be subsumed under the first category, with the distinction that it clearly focuses on the post-millennial tendencies and can therefore be understood as supplementary to the existing works on the subject.

Reflecting on Darwin is also complementary to the set of recent works which pivot around the historical evolution of the popular and scholarly reception of Darwin and his ideas (Engels 2008, Ruse 2009). Like them, it asks to what extent our culture has managed to discover 'other' sides of the scientist. Referencing contemporary literary and visual culture, it follows the impulse given by Larson and Brauer (2009) and Smith (2006) and inspects the impact of Darwin's ideas across a variety of media. It thus also adds to the discussions introduced by Beer (1983) and continued by Dawson (2007), Glendening (2007) and Schmitt (2009), with the distinction that, in contrast to these publications, it shifts the focus from the early debates on Darwin(ism) to contemporary context, thereby offering an overview of the developments in the critical responses to him and his ideas.

The book thus reflects on the evolution of cultural responses to Darwin from the early circulation of his ideas to the post-millennial debates. This longstanding popularization and commercialization of evolution theory as well as its ever increasing mediatization present an ideal context for diachronic trans-historical and interdisciplinary approaches. Hence, the crucial question we ask in this collection is: what is Darwin's significance today? How far is his importance today premised on and anchored in his early reception? What is his role in contemporary popular discourses, and to what extent can his theories be productive in building contemporary epistemologies? How have particular cross-disciplinary and popular discourses and media apparatuses formed, displaced or stabilized the various concepts of humankind in the framework of evolutionary theory? We ask how naturalism, determinism and Darwinism – the eugenics of the 19th century and

[12] See Voigts, forthcoming, Letisser 2010, Heilmann and Llewellyn 2010, and Ann Heilmann's paper in this volume.

the genetic coding of the 20th century as well as their conceptual clusters – are positioned, embodied and staged in various media configurations and media genres.

These questions and concerns may be part of the recent endeavours of 'neo-Victorianism', which seeks to explore 'a series of metatextual and metahistorical conjunctions as they interact within the fields of exchange and adaptation between the Victorian and the contemporary' (Heilmann and Llewellyn 2010: 4). This collection is not limited to reflections on Darwin within historical fiction or the neo-Victorian trends since the 1970s. All of the essays, however, address a stance towards Victorianism that confirms the neo-Victorian canon as outlined by Heilmann and Lllewellyn (2010: 4): 'To be part of the neo-Victorianism we discuss in this book, texts (literary, filmic, audio/visual) must in some respect be *self-consciously engaged with the act of (re)interpretation, (re)discovery and (re) vision concerning the Victorians*' (emphasis in original). In the case of Darwin, this self-conscious revision asks the key question formulated by Letissier (2010: 73), of 'how the return to Darwin's writings and, more widely, to Darwin's scientific and cultural contexts, relays present occupations amongst contemporary readers.' This includes both the persistent presence of the Darwinian system of thought, whether in biophilosophy and sociobiology, as examined by Gutmann, Richter, von Sydow and Wilkinson, or in contemporary films and novels (Heilmann, Schwarz, Sprang), or in earlier reflections on Darwin in proto-modernism and modernism (Scholz, Griem), from the philosophy of science (Richardson) to popular juvenile periodicals (Petzold).

Reflecting on Darwin is thus a unique collection of papers that outlines the impact of Darwin and his thought across contemporary (popular) media and in academic debates as well as anchoring these developments in the long history of critical and cultural responses to his work. It both mirrors and inspects the complex tendencies in the post-millennial reflection on Darwin and Darwinism, thus offering a valuable source of information for contemporary and future scholars. It distinguishes itself from other works on the market by providing a pan-medial and cross-disciplinary overview of contemporary tendencies rather than inspecting one particular area of Darwin's influence. Through this approach, it hopes to address the plurality of ways in which Darwin has been rewritten and appropriated. This focus also makes it possible to meta-discursively take up the questions of our positioning vis-à-vis Darwin and the Victorian era, that is, questions which have been at the centre of recent debates in Victorian and neo-Victorian studies. For the first time, the volume will discuss Darwin from the vantage point of the post-bicentenary deluge of Darwin publications. It will review the tendency to whitewash and purify Darwin, culminating in the Darwin bicentennial celebrations, often with a clear anti-creationist agenda. It is also an aim of this collection to analyze and deconstruct the reverse tendency to hold Darwin morally culpable for masculinist domineering in science, for rampant laissez-faire capitalism, or for social Darwinism.

Motivated by contemporary ethical and ecological anxieties, the first section offers an overview of historical developments in cultural responses to the topical

issues of Darwin's theory: human nature, affinity between humans and primates and the question of inheritance. In '"I differ widely from you": Darwin, Galton and the Culture of Eugenics', Angelique Richardson concentrates on the issues of scholarly exchange as she provides a detailed analysis of Darwin's response to the ideas developed by Francis Galton. Richardson argues that while the life writings of both scientists evince a high degree of mutual respect and admiration, they also expound the two cousins' differing views on the nature/nurture problem. Richardson's elucidation of these divergences spotlights centuries-long misconceptions and overgeneralizations concerning Darwin's endorsement of eugenics. Tracing a transformation in Darwin's reception of Galton's theories, Richardson sheds new light on his scientific thought, thereby deepening our understanding of mid-Victorian environmentalist and hereditarian approaches to human development. Her reading thus also offers a novel contextual framework for late Victorian fiction that engages with these issues.

Late nineteenth-century literary reception and negotiation of scientific theories of inheritance is the focus of Susanne Scholz's article. Referencing the modes of popularization of evolutionary theory and its social and economic contexts, Scholz argues that the question of biological determinism and personal autonomy were played out on the terrain of human physique: the face became a veritable 'visual signature at the intersection of the biological and the social' at the turn of the century. While scientists like Galton set out to produce visual typologies of the nation, literature offered a viable space where to question this new visibility and the novel methodologies that underlined it. The medium provided an arena for a negotiation of the interrelationship between biological forces and humanity. Taking as her key example Thomas Hardy's work, Scholz shows to what extent such reconfigured notions of individual and collective identity and agency percolated into the literary medium, where they were re-evaluated and their ideological allegiances exposed and questioned.

Jochen Petzold continues this preoccupation with literature's reflection on modern scientific notions. He is specifically concerned with the popular evolution of Darwin's thought into the 'ape theory' and its circulation in the juvenile periodicals. Spanning a broad context of this transformation, Petzold concentrates on the manner in which the medium fashioned the interrelationship between humans and primates only to outline two dominant tendencies of this depiction: an overt denunciation of the common kinship between them and a less straightforward, if equally potent, xenophobic doctrine of the hierarchy of human races.

In 'Gender Trouble as Monkey Business', Julika Griem continues to explore the implications of this affinity in the culture of European modernism. Sensitive to the metamorphoses in cultural depictions of apes, the article traces issues of gender and race implicit in such literary and filmic texts as Leonhard Stein's short story 'Der Gorilla' (1920), Joseph von Sternberg's film *Blonde Venus* (1932) and Isak Dinesen's novella 'The Monkey' (1933). Griem's exhaustive analysis of the representational patterns characteristically used in the texts makes her assert the

inevitable metamorphoses of modernist media practices where 'traditional forms of narrative containment [...] yield[ed] to a textual enactment of the power of simian mimesis'. These four studies historically ground and thematically reference the following chapters, thus providing a necessary context in which to understand contemporary semantics of Darwin's thought.

They are followed by two sections which concentrate on the function of Darwin in contemporary popular culture and theoretical debates concerning his post-millennial influence. As Beer, Levine, Browne and others have made abundantly clear in discussions of the 'literariness' of Darwin, he utilized the literary technique of entwining meticulously detailed storylines that he was familiar with from his readings of George Eliot and other novelists. Our contributions expand the scope of this research into the mutual influence of Darwin and various media technologies by engaging with his contemporary contextualization.

In 'Neo-Victorian Darwin', Ann Heilmann analyses post-millennial literary takes on the (proto-) Darwinian figure of the evolutionary explorer. In her overview of Andrea Barrett's *The Voyage of the Narwhal* (1998), Chase-Riboud's *Hottentot Venus* (2003), Ruth Padel's *Darwin: A Life in Poems* (2009) and Tracy Chevalier's *Remarkable Creatures* (2009), Heilmann explores the intricacies accompanying a gendered construction of Darwin in particular and scientific personae in general. She argues that these texts not only raise concerns about the ethics of scientific endeavours but also (informally) contribute to the history of ideas by celebrating women's involvement in science.

Literature as a site of critique is further explored by Felix Sprang in '(Mis-) Representations of Darwin's *Origin*'. In his survey of cultural (mis)interpretations of Darwin's ideas, Sprang argues that they arose from Darwin's profoundly complex, if purposefully ambiguous, construction of his theories. He regards Darwin's *Origin* as a rich meta-theoretical text, which encourages a rethinking of the notions of human progress, agency and development and sees various misconstruals of evolutionary theory as nested in the problematic, if linguistically viable, merger of the ideas of 'development' and 'progress'. Contemporary literature, so runs his argument, can sensitize its readers to these misconceived equations and challenge the notion of evolution as progress. Novels such as John Banville's *The Sea* (2005) and Sebastian Barry's *The Secret Scripture* (2008) offer a critique of progress and undermine the belief in the teleological character of evolutionary processes thus urging a revalorization of the popular take on Darwin's thought and the outlook on life it has inspired.

The question concerning the dissemination of scientific knowledge, undertaken by Sprang, is also the chief preoccupation of Angela Schwarz's 'Evolution for Better or for Worse? Science Fiction Literature and Film and the Public Debate on the Future of Humanity'. In her overview of two decades of science fiction, Schwarz scrutinizes the propensity to familiarize audiences with new technologies and offer a testing ground for novel theories. Her inspection of filmic and literary conceptualization of perfected human life, chief preoccupations of biotechnology and genetic engineering, allows her to measure their effectiveness in extending

but also intervening into the established scientific discourse. With their specific agendas, the studies compiled in this section further the inquiry into the media transposition and transformation of Darwin(isms).

The final section of this publication examines the impact of Darwin's thought on contemporary theory. Richter's question: 'Why has Darwin become a pop star as well as a key player in current theory formation?' allows her to outline the tendencies in his current reception in humanities. Spanning the range of these preoccupations, which she enriches with a discussion of recent trends in literary theory, Richter sees epistemological potential in a cultural theory that would draw on the a-teleological character of evolution, which centres on 'transformation, difference and unpredictability'. In this, she offers impulse to a development of methodological frameworks that would go beyond the tunnel-vision of some approaches within 'Literary Darwinism'.

In 'Ordering Darwin', Nils Wilkinson offers reflections on Darwin's usefulness for contemporary negotiation of cultural and scientific norms. Referencing Andreas Anter, Philipp Sarasin and Michel Foucault, he sets out to inquire whether 'evolutionary theory can be made fruitful to poststructuralist thought'. Wilkinson's journey across theoretical fields leads him to conclude that rather than gropingly holding to the pre-conceived notions of nature and nurture, we should redirect our attention to the question of ordering regarded as a cognition-based production of categories and our position within them. He sees, in the marriage of evolutionary principles of variation and contemporary epistemological and ethical questions preoccupying the humanities, the potentiality of a new approach, which would shift focus from the long-standing 'monotheistic' grand narratives to the 'polytheistic' celebration of difference.

In 'The Limits of Sociobiology', Mathias Gutmann inspects the premises of contemporary sociobiological approaches and their explanatory frameworks underlying the questioning of 'human nature'. Gutmann argues that in today's climate of theory formation, it is necessary to re-think whether biological descriptions provide a meaningful basis for the explanation of cultural achievements. He concentrates on a family of sociobiological approaches which explicitly claim to have provided an empirically sound and comprehensive basis for the explanation of the cultural self-expression of humans.

Momme von Sydow extends the discussion of the applicability of Darwin's theories to the processes of knowledge acquisition and learning. At the heart of Darwinian metaphysics, he argues, is the assumption that all learning processes are Darwinian. However, whereas defining these as blind-variation-and-external-retention can yield testable definitions, such a non-tautological definition, he believes, may render Darwinian metaphysics false or restrict its domain of applicability. On this background, von Sydow investigates parallels in treating the problem of tautology in two Darwinian processes: biological mutation-and-selection and psychological trial-and-error reinforcement-learning.

Richter, Wilkinson, Gutmann and v. Sydow not only offer a general overview of contemporary cross-disciplinary appropriations of Darwin's theories but also

look into hitherto rarely explored areas of his influence. Overall, in its three sections (historical, popular, scholarly) the collection provides a discussion of contemporary appropriations of Darwin and links them to the interpretative trends long in existence. *Reflecting on Darwin* thus offers the first study of the post-millennial multi-media and cross-disciplinary responses to Darwin and his ideas.

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PART 1
The Cultural Evolution of Darwin's Thought

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Chapter 1
‘I differ widely from you’: Darwin, Galton and the Culture of Eugenics[1]

Angelique Richardson, Exeter

The year after Darwin died, Francis Galton coined the term eugenics. He saw it as an application of Darwinian ideas: ‘I shall treat of man and see what the theory of heredity of variations and the principle of natural selection mean when applied to man’ (Pearson 1914–1930: ii 86). The same year, Darwin’s eldest son William recalled ‘My father was a thorough liberal by his position in politics; he never studied the subjects with attention, but never failed to read the newspaper with care’, adding, ‘He had the deepest respect and admiration for Gladstone’ (W.E. Darwin 1883: 7).[2] Galton and Darwin were half-cousins, sharing Dr Erasmus Darwin as their grandfather. They corresponded and collaborated and it is easy to make the assumption that they shared similar views on inheritance and eugenics. However, this position, which is itself inflected by reductive assumptions about family members, is challenged by closer analysis of Darwin’s work, language and values. Drawing on their scientific writing, manuscript revisions and letters, this chapter traces important divergences between the two, and by elucidating these seeks to shed new light on Darwin’s scientific thought, deepening our understanding of mid-Victorian environmentalist and hereditarian approaches to human development. In doing so, it also aims to provide a new contextual framework for late Victorian fiction that engages with these issues.

Focusing on differences between Darwin and Galton on the question of inheritance and environment, this chapter also traces shifts in Galton’s thinking

[1] I am most grateful to the Wellcome Trust for a Research Leave Award (WT096507AIA) which allowed me to complete this research. Some of the ideas in this chapter were presented at the Darwin our Contemporary Conference in Siegen in 2009, and at the Darwin and Human Nature Conference in Cambridge in 2011, and I would like to thank the conference organizers and audiences on both occasions, and the Deutsche Forschungsgemeinschaft, the Centre for Research in the Arts, Social Sciences and Humanities at the University of Cambridge, and the British Academy, for support. I am also grateful to the editors and the librarians of the Darwin Correspondence Project. I would like to thank the Syndics of Cambridge University Library for permission to quote from the Darwin archive, and University College London for permission to quote from the Galton archive.

[2] On the liberal thought of Darwin see Stack (2012). On Darwin’s anti-racism see Desmond and Moore (2009), and on his political engagement more generally see Browne (2002: 265–6).

towards a more coercive, interventionist, position that would inform eugenic thought in the late nineteenth century. The profoundly brutalizing effects of poverty were becoming abundantly clear, indisputably visible, for the first time in history, in city slums, and eugenics, which held environmental influence to be negligible, was negatively determined by this awareness. Charity and social reform were taking on elements of hereditarian accounts of poverty which challenged support for the poor, casting them instead as victims of their own biology (see Richardson 2003: 59–67). Eugenics in Britain developed in this context, responding to concerns over poverty and urban degeneration, and opposed to indiscriminate almsgiving. A concomitant segregation of the classes prepared the ground for its acceptance and advocacy among sectors of the professional middle classes. A biologistic discourse on class, eugenics aimed at 'racial improvement' by altering the balance of class in society. The growth of the middle classes, and the search of middle-class women for a public role, coincided with increasing anxieties over national efficiency and provided fertile conditions in which it might flourish. While eugenics appealed to certain members of the left, this should not occlude the fact that it really only found support among a particular group of middle-class socialists, most conspicuously the Fabians, a group that was, in the words of the labour historian Eric Hobsbawm, 'overwhelmingly non-proletarian', uninterested in trade union revivals of 1889, opposed to the formation of an independent labour party, and imperialist (Hobsbawm 1964: 253, in MacKenzie 1981: 35). As the sociologist of science Donald MacKenzie points out, the Fabians' objections to capitalism lay not in any objection to its class exploitation, or in the disempowerment of the worker, but in its endorsement of *laissez-faire*; by contrast they demanded the growth of state regulation and intervention. Poverty might be solved by experts. Galton's protégé Karl Pearson, who would become Britain's first National Professor of Eugenics in 1911, exemplifies the peculiarity of the allegiance between eugenics and socialism. Adopting elements of socialist thinking he made no allegiance with the uneducated labouring classes, instead pursing the social interests of the professional middle class to which he belonged (see MacKenzie 1979).

By the end of the nineteenth century eugenics was resisted by a rapidly professionalizing public health service, and increasingly, through liberal opposition to its encroachment of the principle of individual liberty (see Richardson 2003: 215–27). The liberal, and subsequently labour, MP Josiah Wedgwood led an anti-eugenic parliamentary lobby against the 1912 Mental Deficiency Bill, the closest Britain came to passing eugenic legislation, succeeding in securing the defeat of a proposed eugenic clause prohibiting marriage and criminalizing procreation among the feebleminded in 'the interests of the community' before the bill passed into law in 1913.[3] In the differences between Galton and Darwin that form the subject of this chapter we see an early playing out of the diverging social and

[3] Josiah Wedgwood, *The Parliamentary Debates* (House of Commons), 1912: *Official Report*, ser. 5, 38, cols. 1467–78. See Mulvey (2010: 38–9), and Searle (1976: 92–111), for the important role played by Josiah Wedgwood. For discussion of the wider debates around mental deficiency see Thomson (1998) and Jackson (2000).

political commitments that would be thrown into sharp relief in early twentieth-century debates over eugenics and individual liberty.

The Darwin and Galton families had had contact as children, but Darwin initiated a closer relation in his early forties, after reading Galton's *Narrative of an Explorer in Tropical South Africa* (1853). Galton received the Gold Medal of the Royal Geographical Society for this adventurous narrative, which offered, along the way, detailed analysis of diverse tribes.[4] His initial, ethnographical inquiry into the mental peculiarities of different races was to provide him with the idea of investigating hereditary genius (Galton 1869: v). While endorsing ideas of European superiority, which would harden in *Hereditary Genius*, in places an objectifying gaze co-exists with elements of admiration: 'I must say', Galton declared, 'that, in personal appearance, these naked savages were far less ignoble objects than we Europeans in our dirty shirts and trousers' (Galton 1853: 99). Darwin was clearly impressed by the physical endurance of his younger cousin that the work evidenced: 'What labours and dangers you have gone through: I can hardly fancy how you can have survived them, for you did not formerly look very strong, but you must be as tough as one of your own African waggons' (Darwin to Galton, 25 July 1853). The remark suggests warmth and familiarity, but also a degree of surprise at Galton's abilities. The well-travelled Galton now became a possible source of assistance for Darwin's research. He was anxious at this point for any information on other races breeding & crossing their domestic animals (Darwin to Galton, 7 July 1857). Would Galton, for example, exert influence on the Revd Erdhardt for information on domesticated poultry & animals on East Africa (Darwin to Galton, 4 February 1856)?

Two weeks after the publication of the *Origin of Species,* Galton wrote to tell Darwin he found it 'wonderful'; it was to him like reading an adventure story: 'I have laid it down in the full enjoyment of a feeling that one rarely experiences after boyish days, of having been initiated into an entirely new province of knowledge which, nevertheless, connects itself with other things in a thousand ways' (Galton to Darwin, 9 December 1859). Darwin had broached in passing the question of selective breeding, a subject that was already dear to Galton. Remarking on the seed-raisers' pulling up of 'rogues' he observed that this sort of selection was also followed with animals 'for hardly any one is so careless as to allow his worst animals to breed' (1859: 32–3). This phrase made it through the next four editions of the *Origin*, and also into the *Descent of Man*. But by the sixth edition of the *Origin* (1872), aimed at a wider public, Darwin, perhaps by now alert to – and anxious to avoid association with – the implications of such remarks for human application, revised it to 'for hardly any one is so careless as to breed from his worst animals'. The 'allow' that emphasized the potential for control and, if analogies were to be drawn with humans, had overtones with what would come to be known as eugenics, was now removed.

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[4] Darwin recorded this work in his reading notebook on 20 July 1853 and commented: 'good'. See Darwin Correspondence vol. 4, Appendix IV, 128: 5.

Inheritance

Darwin and Galton continued to correspond amicably on subjects ranging from lighting fires in the bush to doves, Erasmus Darwin and earthworms. There was, though, one subject on which they differed significantly: the question of inheritance. Darwin's civility towards Galton, his generous manner more generally, and their shared interest in the subject, have tended to underplay these differences.[5]

Darwin introduced his 'provisional hypothesis' of pangenesis in *The Variation of Animals and Plants under Domestication* (1868), seeking to relate it to evolution. Meaning 'from the whole body', the hypothesis, Darwin explained, implied 'that the whole organisation, in the sense of every separate atom or unit, reproduces itself. Hence ovules and pollen-grains, – the fertilised seed or egg, as well as buds, – include and consist of a multitude of germs thrown off from each separate atom of the organism' (1868: i. 357–8). While the theory that each cell produces gemmules – microscopic particles which circulate and collect in the reproductive organs to combine with the gemmules of another organism during fertilization – has long since been disproved, its accommodation of environmental influence – the cells from each generation passing on characteristics acquired during the lifetime of an organism in a Lamarckian manner, resonates with a twenty-first century shift from gene-centric models of understanding in biomedical research (see, for example, Spector 2012). Darwin's theory of pangenesis allowed for the effects of the environment which are now understood in epigenetic research to be co-constitutive of inheritance, emphasizing the holistic nature of generation: 'speaking strictly, it is not the reproductive elements, nor the buds, which generate new organisms, but the cells themselves throughout the body' (i. 374). Darwin set out the need to explain how it was possible for the trait of a remote ancestor 'suddenly to reappear in an offspring', moving in his next clause to the Lamarckian question of use-inheritance – 'how the effects of increased or decreased use of a limb can be transmitted to the child' – which he increasingly endorsed (i. 357). Darwin even saw environmental conditions as analogous to sexual intercourse in being capable of introducing novelty into each germ, remarking that 'as a slight change in the conditions of life is beneficial to each creature, so, in an analogous manner, is the change effected in the germ by sexual union with a distinct individual' (i. 362). This emphasis on individuals, even in relation to plants, is significant, resonating with mid-Victorian liberal thought. As noted earlier, the liberal belief in the individual was to form a major obstacle to eugenic currents later in the century and, in the early twentieth

[5] In their study of Darwin's antipathy towards racism Desmond and Moore (2009: 368), for example, see Darwin incorporating the statistical and eugenic work of Galton and Greg in the *Descent*. Paul and Moore offer a helpful analysis of divergences between Darwin and Galton on inheritance. See Fancher (2009) on the personal and scientific relationship between Galton and Darwin. Stack (2012: 550–54) challenges readings that seek to establish a relation between Darwin and eugenics. See also Stack 2000, which offers a detailed analysis of early radical and socialist responses to Darwin and cautions readers against a distorting focus on eugenics.

century, would secure the defeat of a proposed eugenic amendment to the Mental Deficiency Bill. A deep commitment to the ability of individuals to maintain difference, even from their offspring, emerges in the language of the theory: 'for the fertilised embryo and the mother-plant must be looked at as distinct individuals' (i. 365). Darwin even extended this concept to each microscopic particle: 'Many facts support this view of the independent life of each minute element of the body' (i. 369). Drawing on contemporary cell theory, a major point of interest for Darwin seems to have been the idea of a plural corporeal autonomy: 'Whether each of the innumerable autonomous elements of the body is a cell or the modified product of a cell, is a more doubtful question, even if so wide a definition be given to the term, as to include cell-like bodies without walls and without nuclei' (i. 370). His emphasis on the greater significance of changes to an organism during its lifetime remains as strong as it was in the *Origin*. He observed that when an organism underwent a great change of structure during development – he altered this to *changes* of structure for the second edition, introducing further complexity – the cells, which at each stage are 'supposed to be directly derived from previously-existing cells, must likewise be greatly changed in nature', and noting that supporters of the cellular doctrine attributed this change to an inherent power in the cells, rather than to an external agency.[6] While the cellular doctrine, proposed in 1838 by the German botanist M.J. Schleiden, the physiologist Theodor Schwann and the doctor Rudolf Virchow, emphasized internal agency, it was the emphasis on change per se, within a lifetime, that seems to have been of overriding importance for Darwin, and he foregrounded the autonomy of coterminous cells: 'every one appears to admit that the body consists of a multitude of "organic units", each of which possesses its own proper attributes, and is to a certain extent independent of all others' (ii. 370–71).[7]

Pangenesis and Variation

Darwin seems to have been more interested in the process of variation than the mechanism of inheritance, as the title of his 1868 work might suggest. Variability gave greater scope to external conditions, and he defined it as resulting from special causes 'generally from changed conditions acting during successive generations' (Darwin 1868: ii. 371), speaking with a sanguine acceptance, from the *Origin* onwards, of the uncertainty that surrounded the laws of inheritance, and tending often to downplay its significance: 'Inheritance must be looked at as merely a form of growth, like the self-division of a lowly-organised unicellular plant' (1868: ii. 404). He remarked in *Variation* that 'as such changed conditions do not especially affect the reproductive organs, it seems mysterious on any ordinary view why their product, the new organic being, should be similarly affected'

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[6] Here Darwin cites Virchow (1860) and Turner (1863).

[7] Darwin notes that the term 'organic units' is used by Montgomery (1867: 42), who saw cells not as derived from other cells by a process of growth, but as originating through certain chemical changes (1869: 370, n. 28).

(1868: ii. 371). Here, pangenesis had a part to play, enabling Darwin to account for variation through generations, and to accommodate a theory of use-inheritance. Pondering the inherited effects of the use or disuse of particular organs, he moved from the domesticated duck, which flies less and walks more than the wild duck, and whose limb-bones have decreased and increased correspondingly; the horse trained to certain paces, whose colt inherits similar consensual movements; the dog intelligent from associating with man, the retriever taught to fetch and carry - new mental endowments and bodily powers passed on. 'Nothing in the whole circuit of physiology is more wonderful', he concluded (Darwin 1868: ii. 371–2).

In describing his theory of pangenesis Darwin emphasized both complexity and unpredictability, delighting in both. Neither would be useful for eugenists. He thought it not improbable that certain gemmules, under favourable conditions, should be retained and go on multiplying for a longer period than others, and concluded 'we certainly gain some clear insight into the wonderful fact that the child may depart from the type of both its parents, and resemble its grandparents, or ancestors removed by many generations' (1868: ii. 402). In 1875 he changed 'many' to 'many hundreds of' generations (Darwin 1875: ii. 396), intensifying complexity, and introduced a greater confidence, omitting the somewhat tentative 'assuredly' from the following statement: 'The hypothesis of Pangenesis, as applied to the several great classes of facts just discussed, no doubt is extremely complex; but so assuredly are the facts' (ii. 396; Darwin 1868: ii. 402). He continued: 'we cannot fathom the marvellous complexity of an organic being; but on the hypothesis here advanced this complexity is much increased. Each living creature must be looked at as a microcosm - a little universe, formed of a host of self-propagating organisms, inconceivably minute and as numerous as the stars in heaven' (Darwin 1868: ii. 404). By 1875 the tone was more assured. Darwin dropped the simile, roundly declaring that an organic being *is* a microcosm (Darwin 1875: ii. 399). These resilient, autonomous and complex worlds would not be commensurate with eugenics.

Galton's Hereditary Genius

Meanwhile, Galton was writing up his research on hereditary genius. Looking back from the first decade of the twentieth century in *Memories of my Life* (1908) he would claim to have been inspired by the *Origin*, which 'made a marked epoch in my own mental development, as it did in that of human thought generally'; 'the new views' had encouraged him to pursue many inquiries which had long interested him, clustered round 'the central topics of Heredity and the possible improvement of the Human Race' (Galton 1908: 51). Recalling he began his research with what he saw as 'the many obvious cases of heredity among the Cambridge men who were at the University about my own time', he remarked on the 'justness and comprehensiveness' of his early eugenic ideas, pleased to find himself 'still in accord' with them (Galton 1908: 51). *Hereditary Genius*, following on from his two-part article on race improvement, 'Hereditary Talent and Character', in

Macmillan's Magazine in 1865, in which he had suggested tests for selecting the most able men and women to be parents, argued that race improvement was no more than an enlightened working with nature. He acknowledged that his views were 'in contradiction to general opinion' (Galton 1869: 2). Darwin was quick to respond but, aiming always at civility,[8] the profound sense of empathy that characterized his relationships meant his letters were marked more than most with a sense of his reader's feelings. Seemingly minor differences are often more than this. In his letter to Galton, on having read 'about 50 pages of your book (to the Judges)' he exclaims his need to 'exhale myself, else something will go wrong in my inside'. Finely tuned to his environment, something often did go wrong with his inside - as Desmond and Moore (1991) have masterfully detailed - frequently in response to anticipated opposition. How are we to read 'I do not think I ever in all my life read anything more interesting and original'? Is this unequivocal praise? In the light of his later comments, both in this letter and, more emphatically, later, it clearly was not, though Darwin does seem to have been struck regularly by the novelty of Galton's ideas. Was it faint praise to suppose *Hereditary Genius* would prove 'a memorable work'?[9] There is nothing in Darwin's letter on the value of the science, though he evidently found its novelty remarkable, and while he referred positively to it in the *Descent* how much had this to do with a sense of loyalty to a cousin who had widely received a negative response to his first major venture into scientific territory?[10] Besides, Galton was enthusiastic about pangenesis at this point, for it lent itself to his statistical bent: 'the theory of Pangenesis brings all the influences that bear on heredity into a form that is appropriate for the grasp of mathematical analysis' (Galton 1869: 373). Darwin in his response to the work appears to have been advancing a defence of his environmentalist position, though the letter is generally marshalled as evidence of his endorsement of the work: 'You have made a convert of an opponent in one sense, for I have always maintained that, excepting fools, men did not differ much in intellect, only in zeal and hard work; *and I still think this is an eminently important difference*' (Darwin to Galton, 23 December 1867).[11] Likewise, a comment in his *Autobiography* tends to be taken out of context. These recollections, written for his own amusement

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[8] On Darwin's diplomacy towards another cousin, Horace Wedgwood, with whom he differed on the question of the origin of conscience, see White (2013: 118–19).

[9] Cf. Fancher (2009) who sees Darwin's response to *Hereditary Genius* as marking a closer relationship with Galton. For references to Galton (1869) see *Descent* 1871: i, 104 n. 38; 171, 172; ii, 328, and to Galton's Macmillan articles see *Descent*: i, 168, n. 11; 173).

[10] On the poor contemporary response to *Hereditary Genius* see Paul and Moore (2010: 36–7) and Gökyigit (1994).

[11] Emphasis added. See, for example, 'Praises FG's book [*Hereditary genius* (1869)]. Charles Darwin is converted by its argument', http://www.darwinproject.ac.uk/entry-7032 summary. See also Lewens (2007: 191), Kevles 20. Paul and Moore note that Darwin claimed that Galton converted him to the idea that natural ability rather than 'zeal and hard work' was the root of genius but suggest he may have already been convinced of this (Paul and Moore 2010: 32).

and the interest of his family,[12] were published posthumously, edited by his son Francis, in 1887. Darwin's remark 'I am inclined to agree with Francis Galton in believing that education and environment produce only a small effect on the mind of any one, and that most of our qualities are innate' (Darwin 1958: 42–3) is given by Tim Lewens as evidence of Darwin's increasing advocacy of innateness (Lewens 2007: 191), but it forms part of a passage in which Darwin distinguishes himself from his four sisters and his older brother Erasmus, and may be seen more as part of an insistence on individuality, and variation, than on inheritance per se. Erasmus was a great reader who had encouraged Darwin to read, lending him books, but Darwin did not think he owed much to him: 'our minds and tastes were so different' (Darwin 1958: 42).

Darwin was both self-deprecating and generous in citing the work and assistance of others, on occasion even giving more credit than was due. Is this the impulse at work in his response to Galton on *Hereditary Genius* in such remarks as 'it sets me thinking so much that I find it very hard work; but that is wholly the fault of my brain and not of your beautifully clear style'? It has also tended to be overlooked that Darwin was only commenting on the first fifty pages. Galton signalled the practical intent of his research in his introductory chapter 'I conclude that each generation has enormous power over the natural gifts of those that follow, and maintain that it is a duty we owe to humanity to investigate the range of that power, and to exercise it in a way that, without being unwise towards ourselves, shall be most advantageous to future inhabitants of the earth' (Galton 1892: 1), and sought to secure his credentials by citing Darwin's references in *Variation* to his views on inheritance in *Macmillan's Magazine*: 'I feel assured that, inasmuch as what I then wrote was sufficient to earn the acceptance of Mr. Darwin ('Domestication of Plants and Animals', 1868: ii. 7), the increased amount of evidence submitted in the present volume is not likely to be gainsaid' (Galton 1869: 2). He stressed the limits of education, drawing an analogy between education and social influences in developing the active powers of the mind, and the effect of use in developing the muscles of a blacksmith's arm; there was a clear limit 'which he cannot by any education or exertion overpass' (Galton 1869: 14–15).

Galton's more explicit eugenic ideas came later in the work, as he outlined measures for race improvement. These included 'a welcome and a refuge in celibate monasteries or sisterhoods' for what he loosely termed 'the weak', and a welcome to 'the better sort of emigrants and refugees' whose descendants should be naturalized (Galton 1869: 362). In his preface of 1892, he made it clear that ideas about heredity had developed – and hardened – since the first edition, which Darwin had read. Drawing attention to a shift in understanding Galton observed that the human mind had been popularly thought to act 'independently of natural laws, and to be capable of almost any achievement, if compelled to exert itself by a will that had a power of initiation' (Galton 1892: vii). Galton had no such optimism. He added that even those with 'more philosophical habits of thought'

[12] Barlow, Preface to Darwin (1958): 5.

had not seen that the mental faculties of an individual were limited with as much strictness as the physical, and that the hereditary transmission of ability had been even less clearly apprehended, warning that the earlier part of the book in particular should be read in the light of the imperfect knowledge of its time: 'what was true in the above respects for the year 1869 does not continue to be true for 1892' (1869: viii). Darwin's comments relate only to this earlier part. He was at the time hard at work researching for the *Descent of Man*, which, as we shall see, was to contain a strong critique of eugenic ideas. Galton explained that while *Hereditary Genius* was about 'natural ability' he had chosen the word 'genius' precisely because he believed it excluded any environmental effects, such as education. He also emphasized his divergence from Darwin, again for the same reason – for Galton, the environment could be more or less discounted:

> Marvellous as is the power of the theory of pangenesis in bringing large classes of apparently different phenomena under a single law, serious objections have since arisen to its validity, and prevented its general acceptance. It would, for example, almost compel us to believe that the hereditary transmission of accidental mutilations and of acquired aptitudes would be the rule and not the exception. But leaving out of the question all theoretical reasons against this belief, such as those which I put forward myself many years ago, as well as the more cogent ones adduced by Weismann in late years – putting these wholly aside, and appealing to experimental evidence, it is now certain that the tendency of acquired habits to be hereditarily transmitted is at the most extremely small. (Galton 1869: xiv–xv)

The German zoologist August Weismann was more open to external, environmental factors than is generally thought, as Darwin's own preface to Weismann's *Studies in the Theory of Descent*, published in 1880, makes clear (see Richardson 2010). Darwin flagged up uncertainty around questions of variation, but Weismann's theories of heredity have eclipsed a much more nuanced approach in his experimental work.[13] Galton, however, was moving increasingly to the advocacy of social intervention, as he made explicit in his 1892 preface, also delivered as his Presidential Address to the International Congress of Demography in London the same year:

> [A] vast but unused power is vested in each generation over the very *natures* of their successors – that is, over their inborn faculties arid [sic] dispositions. The brute power of doing this by means of appropriate marriages or abstention from marriage undoubtedly exists, however much the circumstances of social life may hamper its employment. (Galton 1892: xix, emphasis in original)

[13] See Müller-Wille and Rheinberger (2012) on ways in which Weisman's theory of heredity towered above his experimental work.

The Descent of Man and Selection in Relation to Sex

Two years after *Hereditary Genius*, the *Descent of Man* was out. Two passages are often cited as evidence that Darwin endorsed eugenics. The first occurs in the fifth chapter, 'On The Development of The Intellectual and Moral Faculties During Primeval and Civilised Times'. In a section on 'Natural Selection as affecting Civilised Nations', Darwin alluded to recent work by W.R. Greg, Alfred Russel Wallace and Galton. Noting that most of his remarks were taken from their work, he wrote:

> With savages, the weak in body or mind are soon eliminated; and those that survive commonly exhibit a vigorous state of health. We civilised men, on the other hand, do our utmost to check the process of elimination; we build asylums for the imbecile, the maimed, and the sick; we institute poor-laws; and our medical men exert their utmost skill to save the life of every one to the last moment. There is reason to believe that vaccination has preserved thousands, who from a weak constitution would formerly have succumbed to small-pox. Thus the weak members of civilised societies propagate their kind. No one who has attended to the breeding of domestic animals will doubt that this must be highly injurious to the race of man. It is surprising how soon a want of care, or care wrongly directed, leads to the degeneration of a domestic race; but excepting in the case of man himself, hardly any one is so ignorant as to allow his worst animals to breed.[14]

While Darwin removed 'allow' from the edition of the *Origin* that appeared the following year, here he retained it, engaging explicitly with the idea of race improvement. But, as the subsequent paragraph would make clear, he was setting out an argument in order to challenge it. He does so by suggesting we barely have a choice not to give aid to the helpless. Having established the extensive and biologically based origins of the social instincts, he argues 'the aid which we feel impelled to give to the helpless is mainly an incidental result of the instinct of sympathy' (Darwin 1871: i. 168). But this sympathy, he emphasizes, has now deepened, becoming 'more tender and more widely diffused'. And, if it can be stemmed, it is only at great cost: 'Nor could we check our sympathy, if so urged

[14] Darwin (1871: 168). Situating these comments within the context of wider debate Stack (2012) argues persuasively that the section, which has no logical or chronological place in Darwin's argument, provides clear evidence of Darwin's liberalism. Reading it as a hastily put-together and highly topical response to Greg, and the even more reactionary Galton, he points out that, unlike Greg and Galton, Darwin did not believe that civilization was destructive to the process of natural selection, and did not see degeneration as a threat to races. Stack (2012: 547–9; 538–40) shows that Darwin was supporting an anonymous article in the *Spectator* which had argued, against Greg, for the importance of sympathy, but that, unlike the *Spectator* piece, Darwin did not see compassion and benevolence as antagonistic to evolution. Stack points out that while Greg outlined harsh measures he stopped short of accepting them. See also Dixon for an insightful exploration of altruism and the Victorians more generally.

by hard reason, without deterioration in the noblest part of our nature' (168–9). The eugenic arguments have now become a foil against which to measure and elucidate what humans have become and are capable of becoming, playing an important part in Darwin's counter-construction of human nature. Darwin returned to the passage for the second edition and made his argument stronger; 'Nor could we check our sympathy, even at the urging of hard reason' (Darwin 1874: 134); not even reason should be able to challenge sympathy on this vital question. What then follows is the example of the surgeon hardening himself 'whilst performing an operation'; the analogy is immediately dismissed, for in this instance 'he is acting for the good of his patient' (Darwin 1871: i. 169); Darwin engages directly with the discourse of kindness in which eugenic ideas were increasingly dressed, only, forcefully, to upturn it. There is, for Darwin, no comparison. 'If we were intentionally to neglect the weak and helpless, it could only be for a contingent benefit, with a certain and great present evil' (169). By the second edition, this is intensified to 'with an overwhelming present evil' (Darwin 1874: 134), and the statement of 1871, 'Hence we must bear without complaining the undoubtedly bad effects of the weak surviving and propagating their kind' becomes by 1874 'we must therefore bear the undoubtedly bad effects of the weak surviving and propagating their kind' (134). The overall emphasis on acceptance is accentuated here, with the possibility of complaint removed. In 1871 Darwin concluded the passage 'but there appears to be at least one check in steady action, namely the weaker and inferior members of society not marrying so freely as the sound; and this check might be indefinitely increased, though this is more to be hoped for than expected, by the weak in body or mind refraining from marriage' (Darwin 1871: i. 169). Returning to it in 1874, he inverted the order of the last words to read 'this check might be indefinitely increased by the weak in body or mind refraining from marriage, though this is more to be hoped for than expected' (Darwin 1874: 134), leaving the emphasis to fall on acceptance. The section develops a sense of civilization and the accumulation of capital as a social good, which David Stack (2012) has aligned with the position of the free-market liberal. It is at odds with Galton, who argued against social mobility. By contrast, for Darwin, it could help the process of civilization. A few pages later he remarks 'With civilised nations, as far as an advanced standard of morality, and an increased number of fairly well-endowed men are concerned, natural selection apparently effects but little; though the fundamental social instincts were originally thus gained' (Darwin 1871: i. 173). In the second edition he changed 'well-endowed' to the looser, moderate and more inclusive term 'fairly good men' (Darwin 1874: 137). He ends on a note of quiet optimism on the causes which lead to the advance of morality, 'namely, the approbation of our fellow-men – the strengthening of our sympathies by habit – example and imitation – reason – experience and even self-interest – instruction during youth, and religious feelings' (Darwin 1871: i. 173).

The second passage that is often quoted in relation to eugenics occurs in the second volume of the *Descent*. Darwin again mooted the possibility of restraining marriages 'All do good service who aid towards this end. When the principles of breeding and of inheritance are better understood, we shall not hear ignorant

members of our legislature rejecting with scorn a plan for ascertaining by an easy method whether or not consanguineous marriages are injurious to man' (Darwin 1871: ii. 403). But he would only contemplate this as a measure of self-discipline, and even then he thought it unlikely. Here, perhaps preoccupied by the health and sickness of the children from his own cousin marriage to Emma Wedgwood, his anxiety was focused on consanguineous marriages. And, as we shall see, Darwin consistently used to term *utopian* to signal both improbability and dismissiveness. He even draws Galton's remarks on the dysgenic effects of the prudent avoiding marriage into his larger argument in favour of open competition, of abundance, not restraint, for any group. With a subordinate sop to the eugenists – 'though leading to many and obvious evils' – he concludes, unequivocally, 'our natural rate of increase must not be greatly diminished by any means' (Darwin 1871: ii. 403; and 1874: 618 [no revisions]).[15]

Rabbit Experiments and Alternative Charity

In the time between the first and second edition of the *Descent*, Darwin became more critical of Galton. This was also the time during which Galton embarked on a series of experiments on rabbits, transfusing small amounts of blood from one breed and colour to another to test Darwin's theory of Pangenesis.[16] 'It was not a cruel operation ... (of course, under the influence of anaesthetics)' (Galton 1871: 395). Darwin followed with enthusiasm, even looking after the rabbits on occasion. Galton injected the blood of the lop-eared into the silver-greys, waiting for the colour of the coats to change in subsequent generations. But the result was that Galton disproved the theory on which Darwin was drawing in his argument for environmental influence. In March 1871, the month after the appearance of the *Descent*, Galton announced to the Royal Society that he had 'arrived at definite results, negativing, in my opinion, beyond all doubt, the truth of the doctrine of Pangenesis' (Galton 1870–1871: 395). The following month, *Nature* published Darwin's defence*;* he had never said that gemmules were diffused through the blood. 'It seems to me' he remarked of Galton, 'that his conclusion is a little hasty', though 'he deserves the highest credit for his ingenuity and perseverance'. From 'presenting so many vulnerable points', he concluded, the life of pangenesis was 'always in jeopardy; and this is my excuse for having said a few words in its defence' (Darwin 1871a: 502–3). Galton backed down in *Nature* the next month, claiming simply to have been misled by ambiguous language: 'I understood Mr.

[15] Again, see Stack (2012): 541 for a nuanced reading of this passage as evidence of Darwin's liberal, *laissez-faire* humanitarianism. Stack argues that Darwin shared the classically liberal belief in civilization as a self-correcting state and gives his permissive attitude to marriage as another example of him trusting in free competition though, as other historians, including Browne (2002): 277, Desmond and Moore (1991): 290 have also noted, he worried about consanguinity.

[16] See Bulmer (2003): 108–12 and Fancher (2009).

Darwin to speak of blood when he used the phrases "circulating freely," and "the steady circulation of fluids," especially as the other words "freely" and "diffusion" encouraged the idea. But it now seems that by circulation he meant "dispersion," which is a totally different conception' (Galton 1871a: 5).[17] '*Vive* Pangenesis', he signed off.

In January 1873 the Tory *Fraser's Magazine* ran an article by Galton on 'Hereditary Improvement' in which he declared 'the obvious course of intelligent men – and I venture to say it should be their religious duty – to advance in the direction whither Nature is determined they shall go; that is, towards the improvement of their race' (Galton 1873: 119). In contrast with the emphasis to be found both in Darwin's writings and in mid-Victorian liberalism on the value of the individual, Galton insisted that the individual was dispensable. In this, he drew on Darwinian natural selection: 'myriads of inchoate lives are produced in what, to our best judgement, seems a wasteful and reckless manner, in order that a few selected specimens may survive, and be the parents of the next generation' (Galton 1873: 119). But for Darwin natural selection was only one of several factors in evolution, with environmental conditions and sexual selection gaining increasing recognition in his later work. While both Galton and Darwin were aware of the importance of exceptional individuals, for Darwin all species members had the potential to be exceptional, and, given the unpredictable effects both of environment and heredity, extraordinariness was, potentially, everywhere. It was, in many ways, a Millian position. Development, conceived socially by J.S. Mill, biologically by Darwin, was for both inescapably bound up with freedom. For Galton, the opposite seemed increasingly to be the case:

> It is as though individual lives were of no more consideration than are the senseless chips which fall from the chisel of the artist who is elaborating some ideal form out of a rude block. We are naturally apt to think of ourselves and of those around us that, being not senseless chips, but living and suffering beings, we should be of primary importance, whereas it seems perfectly clear that our individual lives are little more than agents towards attaining some great and common end of evolution. (1873: 119)

The article represents a shift in his thinking to a more coercive, interventionist, position. He advocated the 'the elevation of our race' through 'the sweeping away of a legion of ineffectives' (Galton 1873: 121), and set out as his object building

[17] See Renwick (2011) for an excellent discussion and contextualization of this very public disagreement. Renwick shows that, as a result, Galton left biological questions alone from this point, seeking instead to demonstrate through the accumulation of extensive data instances of heredity, and thus advance his advocacy of eugenics, and it was biologists who then turned to him. Renwick resituates Galton's work in a social-science context, emphasizing that when biologists turned to Galton in the 1890s it was because biological practice was changing. See also, on Galton's turn from biology at this point, Bowler (1989: 64–73). For further analysis of the pangenesis dispute see Gillham (2001) Ch. 13; Pearson (1914–1930), II, Ch. 10B; Cowan (1977); and Gayon (1998: 105–15).

up, by ‚extensive enquiry and publication of results, a sentiment of caste among those who are naturally gifted' (123), and procuring for them 'moderate social favour and preference'. He concluded that 'the natural result of these measures would be to bind them together by a variety of material and social interests, and to teach them faith in their future' (123); he envisaged the castes being formed within the existing class system, and was confident their members would 'intermarry among themselves about as strictly as is the custom of the nobility in Germany' (Galton 1873: 123), and that their offspring would have 'some moderate claim to purity of blood', on account of having a lineage 'gifted above the average' (125). This he saw as the foundation of 'a future "golden book" of natural nobility' (125). Critical of an aristocracy based on social privilege, Galton advocated substituting social advantage for biological inheritance. He conceded that there wouldn't be 'coercion as to whom any given person should marry' (124), an assurance which served to raise the possibility of coercion in the first place. The plan was for a community to undertake three 'scientific services'; the first, to institute *continuous* enquiries into the facts of human heredity; the second to be a centre of information on heredity for breeders of animals and plants; and the third to discuss and classify the collected facts. The scheme would be assisted by the compilation of 'short biographies and pedigrees, illustrated by measurements and photographs' (Galton 1873: 125, emphasis in original). Galton looked forward to a time when schools would take responsibility not only for examining and classifying boys according to their intellectual acquirements, but also for weighing, measuring and appraising them 'in respect of their natural gifts' (125). The most promising individuals would be registered at a local centre. Galton anticipated that the scheme would come to be seen as 'very reasonable' (126). Writing the year following the *Descent*, a dialogue with Darwin seems explicit in all but name. Darwin's advocacy of charity is dismissed out of hand, and Galton outlines what he terms an 'alternative charity' whereby the registered privileged 'would be accustomed to be treated with more respect and consideration than others whose parents were originally of the same social rank'; it would be easier for them to obtain 'a settled home and employment in early manhood' (1873: 126). He expected charity of this kind to 'become exceedingly popular, and to occupy a large part of the leisure of many people.' It was, he argued, 'quite another thing to patronising paupers and doing what are commonly spoken of as "charitable" actions' which had a 'notorious tendency' to worsen the ills they were intended to cure (126). Galton expressed his concerns over the growth of 'democratic feeling' which, he argued, would be 'directly adverse to the establishment of such a favoured and exceptional class' (127). By contrast, Darwin embraced democracy, believing that the success of the *Descent* was itself 'proof of the increasing liberality of England'.[18] Galton nonetheless believed that, 'democracy notwithstanding', the superiority of this class would be recognized, imagining a time when the most valuable boys and

[18] C. Darwin to J.V. Carus, 25 April 1871, Darwin Correspondence Project, Letter 7715 cited in Stack (2012: 535; Desmond and Moore (1991: 579); Browne (2002: 351).

girls might be given a diploma (127). Galton's article comes close to the utopian fiction that he would later turn to in his quest to promote eugenics, though he framed the scenario as 'not improbable' (128). Fuelled by a fear of working-class combination, he imagines his favoured race driven from trade union workshops and directed into cooperative arrangements in 'healthy rural districts' (128), which would eventually become exclusive colonies, intermarrying and infused by high levels of happiness. He envisages the legislature of the gifted 'enforcing limitation in inheritance where heirs were deficient in natural gifts' (129); the non-gifted would begin to decay, and he believed its disappearance could be effected 'with little severity' (129). If the 'ungifted' continued to procreate children, inferior in moral, intellectual and physical qualities, he declared 'it is easy to believe the time may come when such persons would be considered as enemies to the State, and to have forfeited all claims to kindness' (129).

Galton immediately sent Darwin a copy of the article. Darwin wrote Galton a detailed response, thanking him, with characteristic kindness, and expressing his interest, before proceeding to detail his objections (Darwin to Galton, 4 January 1873). Remarking that he found the caste system 'quite new' and imagined others would too, he added, 'I am not, however, so hopeful as you'. A lack of hope seems to have been the most civil way he could communicate to Galton his incredulity and disapproval. He believed Galton's proposed society 'would have awfully laborious work, and I doubt whether you could ever get efficient workers'. He thought the register simply wouldn't work on a practical level because it would lead families to even greater concealment. But his main objection was the difficulty of deciding who belonged on the register. Darwin was aware of the arbitrariness of the categories and their remoteness from the complexities of real life in ways Galton seems to have been simply unable to see:

> But the greatest difficulty, I think, would be in deciding who deserved to be on the register. How few are above mediocrity in health, strength, morals and intellect; and how difficult to judge on these latter heads. As far as I see, within the same large superior family, only a few of the children would deserve to be on the register; and these would naturally stick to their own families, so that the superior children of distinct families would have no good chance of associating much and forming a caste. (Darwin to Galton, 4 January 1873)

Concluding that he saw 'so much difficulty' with the scheme, he conceded that 'the object seems a grand one', though grand seems to have carried a sense of improbable (he later referred disparagingly to Greg's eugenic plans as grand poetry); he went on to clarify that he feared 'utopian' this 'plan of procedure in improving the human race'. Darwin's serious reservations do not seem to have presented Galton with any difficulty. Galton had already begun to embrace the utopian genre as a way of promulgating his scheme, conceiving a eugenic novel, 'Kantsaywhere', in 1864. Darwin advised 'I should be inclined to trust more (and this is part of your plan) to disseminating and insisting on the importance of the all-important principle of inheritance'. What could Darwin, who saw so much

uncertainty around inheritance, have meant by this? He proceeded in the next sentence to privilege environmental effect over the structure of an organism, in ways that undermined any hard, strictly hereditarian, understanding of inheritance: 'Is it not possible that the inhabitants of malarious countries owe their degraded and miserable appearance to the bad atmosphere, though this does not kill them, rather than to "economy of structure"?' Darwin appears here to have been using the term inheritance in its widest sense. He also objected in the letter to Galton's idea that the race was of supreme importance: 'surely Nature does not more carefully regard races than individuals, as (I believe I have misunderstood what you mean) evidenced by the multitude of races and species which have become extinct.' In pointing out that the races themselves could become extinct, Darwin put the emphasis back on the individual, deftly re-asserting Victorian liberalism within a biological context. 'Would it not be truer to say that Nature cares only for the superior individuals and then makes her new and better races?' The language used here by Darwin needs to be understood in the context of his dialogue with Galton who, as Darwin knew, was committed to a rigidly hierarchical understanding of society. But, as Darwin had made clear at the outset of his writing, a superior individual in evolutionary terms was simply one who showed difference enough to lead to the slightest variation. He also warned Galton against too readily co-opting nature, a word which eugenists would exploit as a licence for their schemes: 'we ought both to shudder in using so freely the word 'Nature' after what De Candolle has said'. Darwin had just read a prepublication copy of Alphonse de Candolle's *Histoire des sciences des savants depuis deux siècles*, in which the Swiss Botanist, who had collaborated with Darwin as he wrote the *Origin*, emphasized environmental influences and cautioned against misuses of the term nature (Darwin to Candolle, 11 December 1872).

Repeating thanks to Galton that were uncharacteristically lukewarm and formal – 'Again let me thank you for the interest received in reading your essay' - Darwin raised, after he had signed off, another and final objection, perhaps the most telling, for he could not have thought that the question had an answer: 'I doubt whether you have made clear how the families on the Register are to be kept pure or superior, and how they are to be in course of time still further improved'. Darwin's hypothesis of pangenesis, to which he remained temperamentally as much as scientifically wedded, was a theory of blending, not purity. It was fundamentally incompatible with eugenics. And what could Darwin have meant by 'This letter will not be worth your deciphering'? Was this more than a throwaway expression of self-deprecation? Certainly, if Galton had managed to decipher the letter correctly, he would have found neither support nor approval from Darwin.

It was in this letter, too, that Darwin remarked that he had almost finished W.R. Greg's *Enigmas of Life* (1872), and asked Galton what he thought of it. Again, Darwin raised the criticism of utopianism, outlining his objections to Greg in a remarkably similar language: 'It is grand poetry – but too Utopian and too full of faith for me'. Greg, who held racist views, appears to have independently developed similar ideas to Galton, remarking in this work that Galton 'had

followed the same line of thought as myself, though both, till after the publication of our respective speculations, were unacquainted with the other's writings' (1872: 115), but noting also that Galton went further than him in his estimation of the 'mischief and menace' of the tendency of civilized nations to multiply from their 'lower specimens' (115). Greg quoted in full from the passage in the *Descent* on tendencies tending to the degeneration of a domestic race, but included none of Darwin's objections to the withholding of sympathy, and ultimately misrepresented his views, remarking 'though he mentions a number of compensating influences, he evidently does not consider them as at all adequate or effective' (1872: 118). Seeing differential class fertility as 'one of the most formidable dangers with which that civilization is threatened' (118), Greg eagerly anticipated a time when, as 'political wisdom improves', 'the pauperism — and with it the propagation of paupers — will be nearly extinguished by the control and organization of charity, and the ultimate abolition of compulsory poor-rates'. 'Even now', he added, 'we are beginning, at least, to *look* in that direction' (1872: 119, emphasis in original). Galton may have gone further than Greg, but Darwin was equally critical of Greg. Unlike these early eugenists, he also believed, as Stack (2012) shows, that a complexity of factors, including environmental influence, would safeguard against any significant degeneration.

Following the reflections of a day, Darwin wrote to his close friend J.D. Hooker repeating his objections. 'Have you read Galton's Essay in Fraser? The idea of castes forming spontaneously & the members intermarrying seems quite new; but the more I think of the subject the less possible does it appear to me that the plan could ever be carried out' (5 January 1873). He added, 'I shd also much like to hear, but only if you have leisure, what you think of Greg's enigmas. It seems to me grand poetry; but he is too Utopian & too full of faith for me to sympathise thoroughly with him. Altogether I have been rather disappointed in the book'. A few months later, writing to Galton in response to his questionnaire for *English Men of Science*, he described his politics as 'Liberal or radical' (Darwin to Galton, 28 May 1873). This would probably not have come as a surprise to Galton.

In 1876 Galton published 'A Theory of Heredity' in *Journal of the Anthropological Institute*. This institute, formed in 1871, sought a coalition of sorts between the polygenists of the Anthropological Society of London, which had been led by the racialist James Hunt, and the Darwinian monogenists, led by T.H. Huxley, Darwin's champion of evolution.[19] Hunt argued for the fixity and persistence of racial characteristics, and had earlier attacked an 'illogical Darwinism' for promulgating the original unity of the human species.[20] Galton's article explicitly downplayed the significance of pangenesis, discounting the

[19] See Hunt (1863 and 1866). On Hunt's response to Huxley and Darwin see Moore and Desmond (2009: 352). For a recent evaluation of the rise in popularity of the idea of race in the nineteenth century, see Beasley (2010). See also Stepan (1982) and Biddis (1979).

[20] *The Times*, 1866, cited in Desmond and Moore (2009: 352).

effects of the environment. Using the term 'stirp' from the Latin *stirpes*, root, to express 'the sum-total of the germs, gemmules, or whatever they may be called, which are to be found, according to every theory of organic units, in the newly fertilised ovum', he argued that the stirp was impervious to environmental influence (Galton 1876: 332), and that 'acquired modifications are barely, if at all, *inherited*, in the correct sense of that word' (346, emphasis in original).[21] In advance of a version being read before the Anthropological Institute in November 1875, Galton wrote to Darwin, emphasizing 'the extremely small transmissibility of acquired modifications', and 'so far as the limits of a letter admit', making 'a clean breast of my audacity in theoretically differing from Pangenesis' (Galton to Darwin, 3 November 1875, in Pearson 1914–1930: ii. 183).

Darwin opened his response 'you probably have no idea how excessively difficult it is to understand'. Even his characteristic self-deprecation was muted: 'I cannot fully grasp, only here and there conjecture, what are the points on which we differ. I daresay this is chiefly due to muddy-headedness on my part, but I do not think wholly so'. Darwin went carefully through his objections and points of difference or obscurity. He challenged Galton's explanation of sexuality – for Darwin, parents were representative not of different sexes but of different conditions of life (see Darwin 1876). On dissimilar twins, Galton had come up with a hereditarian explanation to account for their differences, whereby they inherited complementary material. Twins would increasingly be marshalled by eugenists as evidence of hard hereditarianism. For Darwin, characteristically, they evidenced a complexity much less easy to account for simply through heredity: 'Nothing seems to me more curious than the similarity and dissimilarity of twins'.[22] But it was on the question of environmental difference that Darwin was most anxious to assert his difference. He declared that if Galton rejected the Lamarckian idea of modification by use and disuse during the life of the individual then 'I differ widely from you, as every year I come to attribute more and more to such

[21] G.J. Wilson continued to support Pangenesis against Galton's objections: see Wilson to Darwin 19 March 1877. On Galton on acquired characteristics, see Renwick (2011) and Cowan (1968 and 1977).

[22] Darwin to Galton, 6 November 1875. In 1875, Galton argued for the predominance of nature over nurture (*Journal of Anthropological Institute* 1875: 391–406); see also *Fraser's Magazine* (1875: 556–76) and Galton Papers, GALTON/2/4/3/13 and GALTON/2/4/3/14. See Burbridge (2001), and for later explorations of heredity and twins see Hirsch (1930) and, more recently, Wright (1997). On the latest research on twins, which challenges hereditarian ideas through epigenetics, see Spector (2012). Galton also discusses twins in 'The Anthropometric Laboratory' (1882: 332–3). See Galton Papers, GALTON/2/4/3 on Galton's data and notes on the effects of nature and nurture on the physical and mental characteristics of twins, assembled between 1874 and 1876. Letters provide responses to his circular, nineteen compare boys and girls (GALTON/2/4/3/2). Galton has working papers and a notebook on heredity in fingerprints, dated 1892, which includes work on twins (GALTON/2/9/6/4). See also *Inquiries into Human Faculty and its Development in Nature* (1883).

agency'.[23] He concluded his letter 'I am very sorry to differ so much from you, but I have thought that you would desire my open opinion'. He added at the close of the letter, moderating the tone, that he had a good stock of sweet peas. Galton was by now distributing sweet pea seeds to a network of collaborators, which included Darwin, collecting data on the weight of produce from a single family.[24]

'Alas! alas!---- and I had taken such pains to express myself clearly, and I see what I mean, so clearly!' Galton replied. Darwin's letter represents the culmination of his frustration, and disagreement, with Galton. Their correspondence continued but shifted to the altogether easier topics of their grandfather, and earthworms. Darwin added a reference to Galton's rabbit experiments to the second edition of *Variation*, but remained resistant to Galton's findings, noting that while he would have expected that gemmules would have been present in the blood, this was not a necessary part of the hypothesis, which manifestly applied to plants and the lowest animals (Darwin 1875: ii. 350). Karl Pearson would observe in his biography of Galton: 'We must remember that Galton had set before himself in the last years of his life a definite plan of eugenics propagandism'; for those 'who read novels and only look at the picture pages of newspapers, he wrote what they needed, a tale, his "Kantsaywhere"' (Pearson 1914–1930: iii. 412). He completed this story in 1910. But from the beginning Darwin saw, and rejected, Galton's eugenic ideas as utopian, or, perhaps more accurately, dystopian, leading to the loss of what was most noble about human nature.

Galton wanted novels to put racial theories to the test. He wrote in his notebook of 1888 that no theme was 'more trite than that of the sexual instinct', forming 'the principal subject of each of the many hundreds, four hundred, I believe, of novels, and of ~~most of the~~ the still more numerous poems that are annually written in England alone'. He lamented that 'one of its main peculiarities, has never, so far as I know, been even yet clearly set forth. It is the relation that exists between different degrees of contrast and different degrees of sexual attractiveness'.[25] A number of late Victorian novelists did go on to explore, and advocate, eugenic ideas of race improvement, seeing fiction as the most efficient means of promoting the self-conscious control of breeding among humans (see Richardson 2003). Several New Woman writers at the end of the century made it their aim to replace passion with the rational choice of a partner. In the bestselling *The Heavenly Twins* (1893), its title resonant with Galton's nature-nurture studies, Sarah Grand, who was responsible for the term 'New Woman' (Forbes 1900: 883), has her

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[23] Darwin later told Galton (18 December 1875) that he had admitted in the second edition of *Variation* (1875), before seeing Galton's *A Theory of Heredity* that 'perhaps the gemmules are largely multiplied in the reproductive organs; but this does not make me doubt that each unit of the whole system also sends forth its gemmules.

[24] Galton (1877). See Renwick (2011: 359–60) for contextualization of these experiments.

[25] Galton Papers University College London Library, GALTON/2/4/19/3, deletions in manuscript.

heroine read the works of Galton. But there was something about the bulkiness of novels, their complex and unpredictable abundance, that ill fitted them for the eugenic project. And other writers, implicitly or explicitly against these schemes of control, and committed to the self-governances of everyday life, took the form away from deterministic agendas. Mona Caird, who sparked the most famous newspaper controversy of the century 'Is Marriage a Failure?' in 1888, emphasized the complexity and unpredictability of the laws of inheritance; in her final novel, *The Great Wave,* the sage Dr de Mollyns declares 'people talk a lot of nonsense about heredity' (Caird 1931: 43); and Hardy, with whom she was friends, explored these questions in his novels and poetry (see Richardson, forthcoming). Darwin delighted in novels all his life. These 'works of the imagination' had been for him for years 'a wonderful relief and pleasure'. 'I often bless all novelists', he remarked. For Darwin a first-class novel contained someone 'whom one can thoroughly love'. If it was a pretty woman, he added, 'all the better'. His one proviso was that they did not end unhappily, against which he declared, with mock censure, 'a law ought to be passed' (Darwin 1958: 138). He saw no role for the novel in educating Britain in his ideas, or, indeed, in race improvement, just as he had no plans for the social application of his research.

Galton never accepted Darwin's view that the race was not more important than the individual; indeed he made the idea of race central to the Eugenic College in Kantsaywhere: 'they think much more of the race than of the individual' the narrator reported enthusiastically (Pearson 1914–1930: iiia. 415). Reason and racial feeling are held as the highest virtues in Kantsaywhere. By contrast, for Darwin, sympathy, and the potential of each individual to vary, however slightly, were of far greater value to human development. He had little time for utopias. The world was a happy enough place, its struggles and sorrows notwithstanding.

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Chapter 2
Evolution, Heredity and Visuality: Reading Faces with Thomas Hardy

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Reading Faces

In an article in *Photographic News* of 15 July 1881, Francis Galton described the uses of his new technique of composite photography for the proud documentation of family likeness:

> The result is sure to be artistic in expression and flatteringly handsome, and would be very interesting to the members of the family. Young and old, and persons of both sexes, can be combined into one ideal face. I can well imagine a fashion setting in to have these pictures. (Galton 1881: 333)

In a later article on the same topic, he suggests to collect photographic portraits of family members in a systematic fashion, because:

> The world is beginning to perceive that the life of each individual is in some real sense a prolongation of those of his ancestry. His character, his vigour, and his disease are principally theirs; sometimes his faculties are blends of ancestral qualities, more frequently they are aggregates, veins of resemblance to one or other of them showing now here and now there. (Galton 1882: 31)

Although he does not explicitly discuss heredity in these articles, Galton's preoccupation with biological inheritance, of intelligence, abilities and looks, (as manifested in his earlier work *Hereditary Genius*, 1869) also structured his experiments with a technique which, in his eyes, could document the imprint of ancestry on human faces, composite photography. As early as 1879, Galton, a cousin of Charles Darwin's and founder of eugenics, had experimented with the new media technology of photography in order to develop a tool for the detection of congenital deviations in human faces (Galton 1879, 1883; Pearson 1924: 294). His use of diagnostic physiognomy targeted characteristic facial features, for example, of phtisical patients, which he read as typical signs of the illness; a biological code written in the patient's face.

Physiognomy in its scientific uses relied on a way of seeing which derived its evidentiary power from the symbolic capital of photography, that is, its claim to document the 'real'. This photographic gaze, which entered the scientific 'tool kit' in the second half of the nineteenth century, is at the heart of many late Victorian

attempts to create order in a wealth of (scientific) data, to differentiate and typify along visual lines and thus to provide orientation in an increasingly confusing world of faceless crowds and racially (and facially) different people (Pearl 2010). As a semiotic technique, physiognomic 'knowledge' – the capacity to decipher the code of human faces – had long been naturalized as a kind of common sense knowledge (Pearl 2010: 6–8 and passim, Hartley 2001). Its media of dissemination were (and are) not only scientific treatises and the manuals of popular science, but also literature and – from the twentieth century on – film. Victorian literature abounds with physiognomic detail, introducing characters via their facial features and in some cases also their cranial measures.[1] Family physiognomies in particular establish a moment of visual continuity over generations and it is especially this aspect of bridging chasms in time that seems to trigger the literary imagination. Yet while in the eighteenth-century gothic, family likenesses often signified the return of a past that refuses to pass, a family curse or unresolved secret, these threats from the past are, in the late Victorian gothic, frequently biologized by inclusion, for example, into a discourse of atavism, or more generally speaking, heredity.

Scientific efforts to detect anthropological constants in biological features speak of a predicament which we still share with the Victorians, although the scientific terminology may have changed: it concerns the precarious relation, in the human frame, of individual consciousness and moral agency on the one hand, and the determining factors (such as, e.g., race, heredity and gender) perceived to be inscribed into the physiological make-up of man on the other. We may call the discourse of biological determinism by the name of genetics today, but we still (or again) labour under the same fundamental questions: where is human agency to be located? Is there such a thing as free will? To what degree are our decisions determined by our genetic heritage?

Thomas Hardy's involvement with the philosophy and science of his day is well-known and especially his engagement with evolutionary thought has been the focus of scholarly attention (Richardson 1998; Gilmartin 1998; Armstrong 2003a+b). For Hardy, ancestral agencies work as determining forces behind the subject's back, but they can be written on his or her body. For this reason, issues of vision play an important role in his texts, not only in the sense of making visible what has been hidden before, but also in their inherent danger of misrecognition through change of perspective. Hardy's sceptical use of visual metaphors, especially those from the semantic field of photography, underlines his rather disillusioned notions of the position of man in an inhospitable world. It is in the interaction of photography, progress and poetry that Hardy captures most intimately the precarious status of the new post-Darwinian subject. Hardy's contribution to poetry in the transitional period from late Victorianism to Modernism, it seems, consists of an awareness of a loss of agency and control that

[1] The most well-known example is probably Sherlock Holmes' first meeting with Professor Moriarty in 'The Final Problem' (1893), where the latter claims that Holmes has 'less frontal development' than he had expected (Conan Doyle 2001: 493).

comes with the acceptance of ancestral agencies. This crisis of subjectivity is often rendered as a crisis of referentiality, that is, as a loss of control of the visual field or an awareness of the deceptive power of images.

Hardy's poem 'Heredity', which was probably drafted around the time when he was writing his final novels,[2] all of which deal heavily in questions of genealogy and family likeness, sums up most of the concerns late Victorians could have had with the visual signs of heredity on human bodies, especially faces:

> I am the family face;
> Flesh perishes, I live on,
> Projecting trait and trace
> Through time to times anon,
> And leaping from place to place
> Over oblivion.
>
> The years-heired feature that can
> In curve and voice and eye
> Despise the human span
> Of durance – that is I;
> The eternal thing in man,
> That heeds no call to die. (Hardy 2001a: 434)

The special relation of 'I', the subject, the centre of agency and autonomy, and the visually recognizable sign of the 'family face' take centre stage here. Defying the passing of time, the 'family face' fashions itself as the subject ('I') of the discourse of humanness. It is not a material and mortal characteristic of the body but rather an idea or a phantasm. Neither is it a signature of its bearer's individuality. The discrepancy between what we traditionally call by the name of 'I' – an individual human subject – and the phenomenon that now assumes this position, that is, hereditary traces and traits, is crucial to the poem's vision of the human. The 'family face' represents precisely *not* that which is individual in a human subject but that (visually recognizable) quality beyond his or her control which is 'projected on' from sire to son and from mother to daughter. Contrary to the promise of individuality that usually comes with the discourse of face, this face appears as the differentiating marker of the social (and biological) unit of the family, but not of the single subject. Thus by paradoxically calling 'I' that which is beyond the individual's control, the poem stages the conflicting positions of

[2] It is difficult to date the poem, which first appeared in print in Hardy's collection *Moments of Vision* of 1917. J. Hillis Miller sees *Tess of the d'Urbervilles*, *Jude the Obscure* and *The Well-Beloved* as a tripartite structure dealing with the topic of heredity, resulting from Hardy's reading of August Weismann's *Essays on Heredity*. He quotes a journal entry for 19 February 1889, drafting both the outline of *The Well-Beloved* and the topic of the poem 'Heredity' (Hillis Miller 1982: 148). On heredity and visuality in *The Well-Beloved* see also my *Phantasmatic Knowledge. Visions of the Human and the Scientific Gaze in English Literature 1880–1930* (2013: 121–38).

biological determinants and individual uniqueness. In claiming to be the agent behind human actions, the poem's 'I' declares human autonomy to be illusory. Speaking of itself as 'the eternal thing in man', it also assumes the position of metaphysical agent in the makeup of the human. So if the transcendental agent that differentiates the human from the beast is in fact a biological phenomenon, this presents another instance of de-privileging man as the apex of creation. Yet why should this core of the subject be represented as a visual thing?

Family likeness suggests, as Thomas Hardy elaborates in detail in his novel *The Well-Beloved*, that the lineaments of the face provide 'a true index of the spirit within' (Hardy 1997: 242), meaning that a likeness of face speaks of a similar character which is handed down from generation to generation. (The protagonist later learns to his dismay that this is not the case.) This implies that 'character' leaves a visual imprint, which an inner disposition translates into an external manifestation that can be read as its sign: the central tenet of physiognomy. Turning the body into a medium of 'inner' dispositions also implies that both inner and outer qualities have a biological basis. This in turn connects the recognizable similarity of bodies and faces to the discourse of heredity. Family likeness thus emerges as the visual side and also the 'empirical' proof of the workings of ancestral agencies.

Creating Evidence

The nineteenth-century discourse of heredity emerges as a knowledge regime when the two 'scientific revolutions' of the nineteenth century, photography and evolution theory, intersect. As Staffan Müller-Wille and Hans-Jörg Rheinberger (2007) have recently pointed out, heredity had developed as an epistemic space since the late eighteenth century. Originating from legal discourse, where it signified the passing on of properties and positions (inheritance), the concept was transferred to the realm of biological reproduction, where it clearly followed an evolutionary logic (Müller-Wille and Rheinberger 2007: 5).

Sciences, however, need empirical proof. In the case of heredity, scientists speculated about how 'characteristics' (in Darwin's terminology) were handed down the generations, whether as idealist 'imprint' or in the form of material units, which Galton called 'stirps', which migrate between bodies.[3] Their most obvious evidence, however, was likenesses on the faces of people who were biologically related. In the course of the nineteenth century, with the pressure for positivist proof increasing, visualization started to play an important role in the scientific investigation of heredity, and it is here that the new media technique of photography assumed one of its specific Victorian uses (Scholz 2008; Pearl 2010). Francis Galton, for example, invested considerable time and energy into the investigation of hereditary transmission of 'characteristics' or 'stirps', making

[3] Galton 1875. On the notion of 'stirps', see also Angelique Richardson's paper in this volume.

use of the new medium of photography to support his initial statistical tables of the dissemination of intelligence in the English upper classes (as, e.g., in *Hereditary Genius*, 1869) with visual evidence. Galton used the new medium not only as a means of documentation but as an experimental procedure, a research technology. He tried to visualize the characteristic physiognomies from a specific group or 'class' of people: criminals, Westminster school boys, soldiers, Jews, types prone to certain diseases and families (Galton 1882: 26–31). This link of physiognomic discourse and photography was clearly meant as a tool for collective diagnosis: what he wanted to isolate was the imprint of shared biological agencies on the outside, especially the face, of the single specimen of that group: a type. A type is thus the visual representation of the hereditary characteristics of a family or other biological unit such as 'race'. In Galton's research, it was produced by a mixture of optical and statistical methods (Galton speaks of 'pictorial statistics'[4]) and the result was purely fictional (Schmidt 1991; Novak 2008).

Producing these family composites, Galton had the idea that families should put them into the flyleaf of their family bibles, where they used to register dates of birth, marriage and death, in order to document the family stock by visual means, maybe even with an eye on its improvement (Galton 1882: 26; cf. also 1881: 333). In terms of their 'diagnostic' value, however, family composites differ conceptually from the composites of criminals or phtisical patients. Criminal, social or pathological physiognomies – the face of criminality or a specific illness, or, as in Weimar Germany, the face of the clerk or typewriter girl – primarily establish a synchronic notion of types, often said to be produced by milieus or social circumstances. They can acquire a diachronic aspect when included in a discourse of atavism, but basically, they are 'the face of a time'. By contrast, the notion of the family face speaks of generational, that is, diachronic continuity, implying a 'biologization' of the concept of type. Thus family composites, more than any other composites Galton made (with the exception, perhaps, of the Jewish boys he composed for Joseph Jacob), lend themselves to be exploited as scientific data for a diagnostic physiognomy of heredity.

Hidden Agencies

Family likeness thus emerges as the visual side of a discourse that links biological heredity with social inheritance; it adds a face to a name. Being at the same time a social and a biological unit, the family is positioned between the subject, society and the species. It is thus a privileged arena of a discourse of heredity that is also, as an epistemic space, positioned at the interface of the individual and the

[4] Galton is quite aware that his life-like images of faces have no single referent in the real world, pointing out that he intends to produce a generalized picture, the 'portrait of a type', 'one that represents no man in particular, but portrays an imaginary figure, possessing the average features of any given group of men' (Galton 1888: 222).

species (Müller-Wille and Rheinberger 2007: 21).[5] Now, if heredity is, as William Newton claims in his review of Galton's *Hereditary Genius*, 'the application of Darwinism to History' (Newton and Lloyd 1876: iv), its emergence must be seen in the greater context of a reconfiguration of individual and collective identities. Both scientific and social discourse increasingly focused on the relation of the single individual to the total of the population, and the emerging mass culture of Victorian London provided an ample field of investigation for their reasonings. This reconfiguration of the anthropological frame of investigation displaces personal agency onto the moving force of ancestors, as Maudsley had put it almost poetically in his *Pathology of Mind*: 'Beneath every face are the latent faces of ancestors, beneath every character their characters' (Maudsley 1895: 49). In this context, the family face functions as the visual representation of a generational trait or characteristic that individualizes the family unit, but 'collectivises' the individual. As a biological unit, this force (the 'deep silent stream' in Maudsley's words; Maudsley 1895: 49) behind the family or 'race' seems to deny agency and free will to the single manifestation of the family 'stock' while empowering the social unit of which it is a part.

This predicament of personal autonomy versus hereditary determinism is given voice in another poem by Hardy, 'The Pedigree' from 1916, and again the visual plays a double role here:

> I bent in the deep of night
> Over a pedigree the chronicler gave
> As mine; and as I bent there, half-unrobed,
> The uncurtained panes of my window-square let in the watery light
> Of the moon in its old age:
> And green-rheumed clouds were hurrying past where mute and cold
> it globed
> Like a drifting dolphin's eye seen through a lapping wave.
>
> So, scanning my sire-sown tree,
> And the hieroglyphs of this spouse tied to that,

[5] Müller-Wille and Rheinberger also discuss the impact of the epistemic space of heredity on the emerging concept of race: 'Race, like the concept of caste, its correlate in cultural history, became a biopolitical notion that resorted to physiological reproduction in order to explain the uneven reproduction of power, wealth, and opportunities. The same strategy can be observed in the conflict between nature and nurture that began to revolve around cases of 'savage children' in the early nineteenth century, in the Victorian ideology of the 'self-made man', and, finally, in the discussion on the origin and (self-) reproduction of 'genius' that became prominent around 1800, long before Galton published his *Hereditary Genius* (1869). In all of these disparate arenas of literary as well as scientific culture, the specific [i.e. relating to species] and the individual were conflated in elementary dispositions. While manifesting themselves in select individuals, hereditary dispositions were omnipresent within the species, and accounted for what appeared as an oxymoron: the reproduction of difference' (Müller-Wille and Rheinberger 2007: 23).

With offspring mapped below in lineage,
Till the tangles troubled me,
The branches seemed to twist into a seared and cynic face
Which winked and tokened towards the window like a Mage
Enchanting me to gaze again thereat.

It was a mirror now,
And in it a long perspective I could trace
Of my begetters, dwindling backward each past each
All with the kindred look,
Whose names had since been inked down in their place
On the recorder's book,
Generation and generation of my mien, and build, and brow.

And then did I divine
That every heave and coil and move I made
Within my brain, and in my mood and speech,
Was in the glass portrayed
As long forestalled by their so making it;
The first of them, the primest fuglemen of my line,
Being fogged in far antiqueness past surmise and reason's reach.

Said I then, sunk in tone,
'I am merest mimicker and counterfeit! –
Though thinking, *I am I,*
And what I do I do myself alone.'
– The cynic twist of the page thereat unknit
Back to its normal figure, having wrought its purport wry,
The Mage's mirror left the window-square,
And the stained moon and drift retook their places there. (Hardy 2001b: 460–61)

The speaker's midnight vision speaks of a pedigree come to life, brought into being, as it were, by his own gaze. Framed in the mirror of the nightly window, he sees himself 'in perspective', as he puts it, that is, as part of a social 'organism' that moves through time. Envisioning a generational line of (male) ancestors back to prehistoric times, all similar in face and stature, he realizes the moving force of heredity, which for him, at that particular moment, annihilates all personal agency. As in the poem 'Heredity', 'I' is not what it seems to be, the seat of conscious decisions and personal agency. The subject feels 'unreal' in this scene, a mimicker of his own decisions and counterfeit of his own personality. But if seen 'in perspective', the reader of these lines must acknowledge that this might be a nightmare, but not a vision of an 'eternal truth'. The mere reference to perspective, the framing of the vision in a reflecting window that becomes a mirror, the fantastic image of the moon as a dolphin's eye, the misrecognition of a face in the twisted page – all these instances point to the unreliability of the speaker's vision. A window is not a mirror, what he sees there might not be himself but something that is external to him, a momentary hallucination triggered by his

semi-rational state. In addition, in this state of heightened excitability, the speaker's powers of interpretation run wild. The time of the night and the fact that he is half-unrobed also point to his proneness for fantastic suggestions, emphasizing his vulnerability, but also a kind of suspension in an in-between state, between body and consciousness, nature and culture. What he sees are the figments of his own brain, all visions exist in the eye of the beholder only. The question raised by the poem, whether the dreamlike image conjured up as if by magic or the rational path of 'reason's reach' tell the truth about the forces which move the individual human being, remains unsolved. The momentary, dreamlike vision gives an unstable, merely temporary shape to an idea that might not hold true in broad daylight (or the light of reason). Just as the tenets of hereditarian or degenerationist discourse in Hardy's novels are undermined by the unreliability of his narrators or focalizers, so here the nightmare of a remote controlled subject is at the same time put forward as a possibility and deconstructed as an optical illusion. And not only the speaker's powers of sense perception come under scrutiny, but also his semiotic capacities. Apparently, he construes all kinds of chimaeras out of the visual perceptions he experiences; if such are the powers of human vision, this seems to imply, this is no suitable basis for scientific evidence production.

Evolutionist Aesthetics

In Thomas Hardy's last novel, *The Well-Beloved* from 1897, likeness is not visualized through pictures but narrated through the protagonist's eye, who is, by dint of his vocation as an artist, a connoisseur of female beauty, but, due to his biased gaze, an unreliable focalizer. In tune with the two poems, *The Well-Beloved* deals with the conflict between the notion that a person's face can be 'read' as a signature of character, to be deduced from physiognomic signs, and the notion that behind every face are the faces, and thus the agency, of ancestors: a face made by character and experience versus a face made by family history. The novel negotiates this conflict partly by making the women bear, in their bodies, the burden of the ancestral heritage, while the male protagonist tries to uphold the illusion that he walks free of deterministic influences. It turns out, however, that even the artist's imagination is dominated by agencies beyond his control, agencies which seem rooted in archaic times and which merely mask as artistic individuality. What is particularly interesting here is the fact that the artist's muse or capacity of imagining perfect forms, the eponymous 'Well-Beloved', also follows the dictates of evolution. Vision, this implies, is never innocent, nor is it objective. Both the powers to recognize likeness and the production of beauty ideals are pre-formed by agencies beyond their protagonists' control.

Hardy's version of hereditary likeness seems intentionally displaced into surroundings that defy modernization. The greater part of the story takes place on the Isle of Portland, known among its natives as the Isle of Slingers at the southern coast of England, a place that is represented in almost archaic terms. Angelique Richardson even compares it to Darwin's Galápagos Archipelago, claiming that

'the theory Darwin wrung from the Galápagos is tried and tested, here and now in Wessex' (Richardson 1998: 324). The male protagonist, Jocelyn Pierston, son of a local quarrier, has turned his father's occupation with the local stone (and the heaps of money the elder Pierston has made from it) to more refined uses by becoming a sculptor. He falls in love, in generational succession, with three women of the same family, his cousin Avice Caro, her daughter and her granddaughter, who not only bear the same name but are described as almost identical in body and face. They are island women, knit to his own family by centuries of intermarriage, by sharing bonds of blood, ancient customs and only a handful of names.

Read with an evolutionist framework in mind, *The Well-Beloved* can be understood as a representation of the workings of environment on the development of species. The Isle of Slingers, separated from the mainland for centuries, appears as a biotope that 'breeds' a certain type of people who are, in the eyes of Jocelyn Pierston (who is one of them) clearly different from the inhabitants of the rest of Britain. This 'ecosystem' of the peninsula comes under stress with the advent of the railway which opens the Isle to inhabitants from the greater island and lays it open to invasion by outsiders, 'kimberlin' in the diction of the islanders, allowing for a mixture of 'races'. Under these circumstances, the old race of the Isle is bound to die out. Its specific features, so perfectly preserved in the faces of the three Avices, will mix with the British type of which Pierston's colleague Somers has complained that it is boring and shallow (Hardy 1997: 262).[6] It is this almost primeval 'purity' that Pierston sees in the Avices' features:

> The three Avices, the second something like the first, the third a glorification of the first, at all events externally, were the outcome of the immemorial island custom of intermarriage and prenuptial union, under which condition the type of feature was almost uniform from parent to child through generations. (Hardy 1997: 294)

Evolutionism plays a twofold role in *The Well-Beloved*. On the one hand, it appears as a foil against which to contextualize the family likeness that is central to the narrative. On the other hand, given the emphatic link between Jocelyn Pierston's island origins and his aesthetic phantasm, evolutionary agencies also seem to shape his artistic ideals. Darwin has, in both *The Origin of Species* and *The Descent of Man*, pointed to the fact that beauty ideals frequently follow evolutionary dictates. Despite the fact that he minimizes the allure of beauty in the sexual selection of 'civilized' humans (which is, in his eyes, counterbalanced by the charms of money

[6] It should be noted, however, that in the novel, the 'genetic pool' of the island is drained because, as the narrative shows, the young people desert this rough habitat for the more modern comforts of London: the two descendants of the two successful quarrier families, Jocelyn Pierston and Marcia Bencomb, quit the island, leaving behind Avice Caro, the descendant of the third grand family of the island, now impoverished, as the last representative of island ways.

and upbringing),[7] other evolutionary thinkers of the nineteenth century have taken up the idea with more enthusiasm. Grant Allen, for example, being both a biologist and a popular novelist, suggested a more or less direct link between biological impulses and artistic choices. In his essay 'Aesthetic Evolution in Man' which appeared in the journal *Mind* in October 1880 he states that:

> [t]he beautiful for every kind must […] be (in the main) the healthy, the normal, the strong, the perfect, and the parentally sound. Were it ever otherwise – did any race or kind ever habitually prefer the morbid to the sound, that race or kind must be on the highroad to extinction. (Allen 1880: 449)

Allen's argument derives from Herbert Spencer's earlier 'Personal Beauty' and claims that aesthetic sensibility is determined by evolutionist principles. This notion of an ideal type articulates a quasi-platonic ideal of beauty. The ideal type can only be visualized by specific means or as part of a specific way of seeing; technical ones such as Galton's composites, or a specific form of artistic imagination as in Hardy's novel. For both, however, the ideal is subject to the dictates of sexual selection, resulting in a 'type', an ideal of racial purity or its reversal, racial degeneration. In the case of Jocelyn Pierston this entails a permanent hankering after an ideal that he seems unable to grasp in the 'real' world. He eventually encounters its embodiment, after years of wandering the world, in his own place of origin, the archaic Isle of Slingers. For Pierston, sexual selection drives aesthetic choice, and his ideal beauty is brought forward by an anthropomorphized principle of artistic imagination, the so-called 'Well-Beloved'. Pierston sees the Well-Beloved as a kind of idealist Muse or 'goddess' who guides his love life as well as his artistic production. She, or, to be more precise, her respective embodiment is, in his words, 'of no tangible substance; a spirit, a dream, a frenzy, a conception, an aroma, an epitomized sex, a light of the eye, a parting of the lips' (Hardy 1997: 184). 'She' is also clearly a part of himself, which he associates with his island upbringing. In Pierston's engagement with his artistic principle, we are confronted with a collapse of the distinction between the biological and the aesthetic; his Well-Beloved is ruled, consciously or unconsciously, by evolutionary motivations, maybe even functionally dependent on a kind of racial determinism. His way of seeing and, as a consequence of this, his artistic output, is thus complicit with the discourses of biological determinism and with the knowledge regime of heredity that is prevalent at his time. To his artistic vision, a 'kimberlin' cannot suffice; thus Pierston must go back to his origins to find a 'mate' there, as only the island beauty is the beauty he finds 'aesthetically' satisfactory. Remarkably, however, he is certain that he will

[7] 'Civilised men are largely attracted by the mental charms of women, by their wealth, and especially their social position; for they rarely marry into a much lower rank. The men who succeed in obtaining the more beautiful women will not have a better chance of leaving a long line of descendants than other men with plainer wives' (Darwin 2003: 585–6).

not find an intellectual peer there; his relation to the island women must always imply a hierarchy, of genders, of generations, of artistic superiority.

Only in part two of the novel, called 'A Young Man of Forty', does the phantasm find its local habitation and its name, and the name is Avice Caro. When Jocelyn realizes that his former fiancée, whom he left without explanation twenty years ago, is the woman he has always 'loved', she is already dead. Having reflected, on his way from London to Portland, on his relationship to Avice, Pierston comes to the conclusion that he now loves her as he never loved her in life: 'He loved the woman dead and inaccessible as he had never loved her in life. […] The flesh was absent altogether; it was love rarefied and refined to its highest altar. He had felt nothing like it before' (Hardy 1997: 231). Apparently, her death lifts the original Avice onto another plane on which her (now dematerialized) beauty becomes a model for his art. Interestingly, this contemplation is instigated by Pierston's rediscovery of a photograph of Avice, a visual token which operates as a *lieu de memoire* and at the same time structures his first vision of the second Avice: 'From the melancholy mass of papers, faded photographs, seals, diaries, withered flowers, and such like, Jocelyn drew a little portrait, one taken on glass in the primitive days of photography, and framed with tinsel in the commonest way' (Hardy 1997: 230). The photograph freezes the 'original' Avice Caro at a specific point in time, and by arresting her in time and space, it turns her face into an eternal icon. Pierston's 'actualizing' gaze, which lights on the photo when he realizes that the 'real' Avice is dead, transforms it into a type, determining, once and for all, the outward form of his Well-Beloved. The well-known conjunction of photography and death is evoked here, which lifts this slice of a bygone reality onto the plane of an ideal, just like a composite photograph.

When he visits Avice's graveyard in the evening, he has a vision: 'during some minutes or so he seemed to see Avice Caro herself, bending over and withdrawing from her grave in the light of the moon. … She seemed not a year older, not a digit less slender, not a line more angular than when he had parted from her twenty years earlier' (Hardy 1997: 235). It turns out that he has seen Avice's daughter, Ann Avice Caro. Many years later, he will propose to Ann Avice's daughter, also called Avice, in the desperate wish to eventually capture the island 'face'. Yet while Jocelyn's focalization suggests both that he himself never changes and that the face he pursues is always the same, this likeness is by no means confirmed by the text. On the contrary: given the unreliability of Jocelyn's focalization and the unreliability of the third-person narrator, there is a strong suggestion that the likeness of the three Avices only exists in the eye of the beholder, or more precisely, that it is produced by Jocelyn's gaze under the influence of the evolutionist powers embodied in the Well-Beloved.

In *The Well-Beloved*, the discourse of photography and the discourse of heredity meet in the shared belief in the reproducibility of the human face. By speaking of originals and copies, calling the third Avice a 'more modernized, up-to-date edition' (Hardy 1997: 289) or an 'extraordinary reproduction' (Hardy 1997: 292) of the other Avices, the narrative also partakes in a discourse on mediality that

is concerned with the reproduction of information or data. In a hereditarian (or, in today's diction: genetic) sense, the two later Avices appear as exact replicas of the first Avice's 'genetic' data, explicable by evolutionist factors such as the constant intermarriage of the islanders. By linking the discourse of heredity and the discourse of photography, the novel here, through Pierston's eyes, conflates all three Avices as a materialization of the ideal that is visualized in the photograph of Avice the first.

Interestingly, photography as an art in the age of technical reproduction does not play a role here. Pierston is a sculptor, and while he is hindered, by Avice's early death, from begetting another Avice in the flesh, he apparently produces great numbers of Avices of stone. These petrified versions of the island woman, made of the island stone, seem to translate the arrested and idealized body of the photographed Avice into a different medium, where she is also at the same time singularly specific and infinitely reproducible. The seriality of the statues he sculpts again foregrounds how sexual and artistic reproductions are mapped onto each other throughout the novel. While sexual and artistic reproductions come together in the alleged drivenness of both by principles of sexual selection and thus evolution, they part company when it comes to generational reproduction. The medialization has in both cases effected a sublimation of the flesh, implying – especially if seen under the imperatives of sexual selection and the continuance of the race – that pure beauty is a sterile phantom, and that racial purity is a phantasm.

The insinuation that vision may easily be led astray and that seeing may not be the direct way to knowing the 'truth' about a person reflects back on the topic of heredity and its visualization in the bodies of the three generations of Avices. If read against Pierston's focalization, it appears that the Avices are not at all alike; all three have their distinct personalities – which are invisible to a gaze driven by sexual selection turned artistic. Indeed, the text of the novel discredits this belief several times, so much so that from a certain angle, the likeness of the three Avices is nothing more than an optical illusion. It is here that the narrative stresses most vehemently that Pierston cannot help following the dictates of his 'constructive' gaze: 'He could not help seeing in her all that he knew of another, and veiling in her all that did not harmonize with his sense of metempsychosis' (Hardy 1997: 244). Artistic imagination is here cast as a force beyond the subject, who is as 'remote controlled' by his artistic obsession or sexual infatuation as the women are by their 'racial' determination. So even if they are alike in body, likeness in external aspect is not likeness in character, as Pierston repeatedly points out:

> When he glanced up, her [the second Avice's] lineaments seemed to have all the soul and heart that had characterized her mother's, and had been, with her, a true index of the spirit within. Could it be possible that in this case the manifestation was fictitious? He had met with many such examples of hereditary persistence without the qualities signified by the traits. (Hardy 1997: 242)

Pierston here unconsciously undermines the basis of the scientific belief in the laws of heredity. The conviction that like begets like does not stop at the surface of

the body, for in the knowledge regime of heredity, from external likeness follows a similarity of character. Physiognomic readings of the body are based on the belief that outward signs are – as Pierston terms it – 'indices' of inward 'spirit'. The obvious difference in character between all three Avices thus undermines the belief in visual evidence. It also, by using the signifier 'index' which tropes the promise of photography, that is, its alleged capacity to provide an emanation of the 'real thing', subverts the certainties of the scientific way of seeing. The scientifically 'proven' signifying relation between body and character is here disrupted, just like the epistemic basis of Pierston's focalization, which is grounded in the belief that external beauty represents internal spirit. But the text goes even further than that: by calling the perceived mismatch between outward appearance and internal character 'fictitious', it self-reflexively exposes the contingencies behind all representations.

In all three texts, the family face functions as a visual signature at the intersection of the biological and the social, the individual and the species. It seems to confirm the evolutionist tenet of the generational passing on of traces and traits by making them apparent on the surface of the body. But the family face not only tropes the predicaments of visual typification, it also speaks of ancestral agencies beyond the individual's control. In many late-Victorian texts, the pressing problem of individual agency vis-à-vis forces beyond the subject's control is tackled by recourse to well-worn strategies of cultural stress management. In most of Hardy's texts, especially in the novels, the female protagonists bear the burden of biological determinism. Splitting the inherent problem of agency along gender lines allows the men to fashion themselves as exempt from the problematic determinism that comes with the 'family face'. In their accounts, only the women are bearers of hereditary likeness while the men seem to have no part in this passing on of traits at all, neither as physiognomic bearers of the family face nor as formative agents in the making of the next generation's face: in *The Well-Beloved*, the family face is projected from mother to daughter without the slightest hint of male agency.

However, the staging of the family face in these texts not only points to a specific evolutionary configuration of agency in which the past dominates the present, it also draws attention to the reading process that is necessary to make sense of this sign. To draw indexical conclusions from the outside of the body/face, and to read the outside as a direct representation of the inside might be just as fantastical as the lyrical I's nightly visions in 'The Pedigree', or Pierston's phantasmatic visions in *The Well-Beloved*, and it might produce similarly nightmarish results. In subtly deconstructing their protagonists' visions, Hardy's texts thus point to the shortcomings of scientific notions of positivist proof gained through physiognomic readings. So, through the sceptical use of visual concepts and metaphors, Hardy highlights the unreliability of human vision – and thus also of scientific findings based on visual evidence. In doing so, the texts ultimately undercut both the belief in ancestral agencies and the hope of salvation through female sacrifice.

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Chapter 3
‘How like us is that ugly brute, the ape!’: Darwin’s ‘Ape Theory’ and Its Traces in Victorian Children’s Magazines[1]

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The Argument

In *On the Origin of Species*, Charles Darwin does not explain to what extent his theory of the evolution of species by means of natural selection is applicable to mankind; he only hints that in ‘the distant future ... light will be thrown on the origin of man and his history’ (1985: 458). Nonetheless, according to Alvar Ellegård, the ‘lowbrow press’ quickly focused on the question of the descent of man and Darwin’s theory became popularly known as the ‘ape theory’ (1958: 24).[2] The very term was a form of criticism: ‘the bare mention of the ape theory was an effective method for anti-Darwinians to arouse popular feelings against the new views’ (Ellegård 1958: 24), since the general public was scandalized by the idea of a close link between humans and animals. In this paper, I want to examine the cultural context that made it possible to reduce Darwin’s theory to the ‘monkey-question’, namely the widespread interest in primates that gripped the popular imagination in the late 1850s and early 1860s. The main focus will then be to trace both this interest and references to Darwin’s alleged claim of a direct descent of man from the monkey in children’s literature – particularly in periodicals – published in the last four decades of the nineteenth century. I will argue that while the majority of references are overtly critical of evolution theory, there are also some cases in which the connection between man and ape prevails as a racist subtext.[3]

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[2] As Ellegård points out, in absolute numbers the popular press did not pay Darwin’s book very much attention, since its price would have placed it outside the reach of working class readers (cf. 1958: 27). However, when they did report on it, ‘Man’s descent did feature prominently’ since ‘little else of Darwinian theory was treated at all’ (1958: 24).

[3] Some of the terrain covered in the first section of this article is also treated in John Miller’s *Empire and the Animal Body*, which appeared in October 2012. While Miller discusses children’s literature (particularly Ballantyne’s *Gorilla Hunters*), he only mentions juvenile magazines in passing.

The Context: 'Brain Controversy' and 'Gorilla-Mania'

It is significant for the reception of Darwin's theory that the 1850s saw a growing interest in monkeys. This interest was particularly strong amongst naturalists, but their debates also reached the pages of high-brow magazines like *The Athenaeum* or newspapers like *The Times*. The superficial likeness of man and ape had, of course, been noted much earlier. For example, Cicero credits Quintus Ennius, a Roman poet from the second century BC, with the exclamation 'simia quam similis turpissuma bestia nobis' (1967: 94) quoted in my title ('How like us is that ugly brute, the ape!'), and numerous authors had made comparisons between men and monkeys. By the second half of the eighteenth century, Jean-Jacques Rousseau in his *Discourse sur l'origine et les fondements de l'inegalité parmi les hommes* (1754) and James Burnett, Lord Monboddo, in *Origin and Progress of Language* (1773) suggested that 'man and the 'orang-outang' are the same species' (Lovejoy 1933: 278), and during the first half of the nineteenth century, anatomical evidence rapidly accumulated on the physiological links between man and the primates, which reinforced questions concerning the categorial distinction between humans and animals. In 1857, Richard Owen (later to become one of Darwin's fiercest critics) delivered a paper at a meeting of the Linnaean Society entitled 'On the Characters, Principles of Division and Primary Groups of the Class of Mammalia', that is, on the systematic subdivision of mammals. In this paper, Owen claimed that the brain was the most distinctive feature of humans and he identified three physiological structures supposedly unique to the human brain: a third posterior lobe of the cerebrum, the posterior horn of the lateral ventricle and the *hippocampus minor* (1858: 19–20). Consequently, he regarded 'the genus *Homo*, as not merely a representative of a distinct order, but of a distinct subclass of the Mammalia', a subclass for which he suggested the name 'Archencephala', to emphasize man's mental capacity (1858: 20). This assertion remained unchallenged until Owen repeated it in June 1860, at a meeting of the British Association for the Advancement of Science in Oxford (cf. L. Huxley 1900: 180). Owen clearly intended his remark on brain structures as a refutation of Darwin's theory on the evolution of species – *On the Origin of Species* had appeared a few months earlier and the paper under discussion had made specific reference to it (cf. Wilson 1996: 196). Thomas Henry Huxley – who later became known as 'Darwin's bulldog' for his vociferous defence of evolution theory – was also present at this meeting, and in his own recollection of the event (published in 1863 in his *Man's Place in Nature*), he gave Owen's assertions 'a direct and unqualified contradiction, pledging [himself] to justify that unusual procedure elsewhere' (1858: 116). Two days later, at an extremely crowded meeting, his indirect defence of Darwin's theory made Huxley the target for ridicule, when Samuel Wilberforce, Bishop of Oxford, famously asked him if it was 'on his grandfather's or his grandmother's side that the ape ancestry' came in (F. Darwin 1892: 238); Huxley responded in kind by insinuating that the Bishop had 'prostituted the gifts of culture and eloquence to the service of prejudice and of falsehood' (F.

Darwin 1892: 239).[4] The incidents caused considerable public debate and as *The Athenaeum* commented in its summary of the proceedings, '[t]he dispute has at least made Oxford uncommonly lively during the week' ('Science' 1860: 19).

In early 1861, Huxley provided the justification he had promised for his contradiction of Owen, in an article in the *Natural History Review* (cf. T.H. Huxley 2001: 116). However, Owen proved extremely unwilling to admit his error and the 'brain controversy' continued for several years, involving various scientists and utilizing a number of journals, some, like the *Natural History Review*, aimed at specialists, but others, like *The Athenaeum*, aimed at a general (educated) readership. Somewhat later, the controversy also found its way into children's literature. In Charles Kingsley's *Water-Babies*, first serialized in *Macmillan's Magazine* in 1862/63, the debate about the *hippocampus minor*, which Owen declared was unique to the human brain, is turned into the 'hippopotamus test':

> If you have a hippopotamus major in your brain, you are no ape, though you had four hands, no feet, and were more apish than the apes of all aperies. But if a hippopotamus major is ever discovered in one single ape's brain, nothing will save your great-great-great-great-great-great-great-great-great-great-great-greater-greatest-grandmother from having been an ape too. (1976: 172–3)

The quote indicates that by 1862 the 'brain controversy' was clearly linked to the question of man's possible connection to the animals, or his supposed 'descent' from the apes.

Despite its prominence in magazines (and the literary monument erected to it in the *Water-Babies*), it seems questionable if this brain controversy (the details of which would only have been accessible to a small section of the public) would have gained much cultural significance in itself. However, it coincided not only with the discussion of Darwin's theory, but also with the gorilla-mania that gripped Britain in the early 1860s. In February 1861, the Franco-American explorer Paul du Chaillu came to London on the invitation of the Royal Geographic Society, bringing along a large collection of gorilla bones and skins (cf. Vaucaire 1930: 131). The term 'gorilla' had only been introduced to scientific nomenclature in 1847, by the Americans Thomas Savage and Jeffries Wyman (cf. Wilson 1996: 184–5), and the novelty of this giant ape and the stories of its incredible strength and ferocity ensured that the public interest in du Chaillu and his specimens was immense.[5] When he delivered his paper at the annual meeting of the Geographical Society on 25 February 1861, *The London Review* declared that the meeting had been 'an unprecedentedly brilliant one', that the 'large room at Burlington House was crowded to excess' and that the account had been 'most highly entertaining' ('Learned Societies' 1861: 232).

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[4] Francis Darwin quotes from the notes of the Hon and Revd W.H. Fremantle, who had been present at the meeting.

[5] Ellegård points to 'the extraordinary amount of notice ... the popular press took of the African traveller du Chaillu and his Gorillas' (1958: 27).

In May of 1861, du Chaillu published the account of his *Explorations and Adventures in Equatorial Africa* – to great success: during the first two years, more than 10,000 copies were sold, at the substantial price of one guinea (cf. Vaucaire 1930: 135). However, the popularity of the book was soon turned into a certain notoriety when yet another controversy arose, this time focusing on the credibility of du Chaillu, who had no formal education in biology or geology, whose style of writing was somewhat colourful, and who displayed a marked 'disregard for precise dates' (Edmonds 1998: 119). This controversy was conducted even more publicly than the debate about monkeys' brains – letters to the editors of various magazines and papers abound – and its subject matter was much more accessible to the general public. Furthermore, it clearly crossed the line to scandal when, after a meeting of the Ethnological Society held on 2 July 1861, du Chaillu responded to severe criticism by spitting his opponent, T.A. Malone, in the face, calling him a 'coward' and challenging him to a duel (cf. 'Fracas' 1961: 3). Du Chaillu had immediately apologized for his behaviour in a letter to *The Times* (cf. du Chaillu 1861: 6), but his behaviour was clearly shocking for Victorian society. For example, the magazine *Punch* suggested, tongue in cheek, that 'such a way of arguing may be tolerated possibly at a meeting of Gorillas, but, happily, among Englishmen it has not yet been sanctioned' ('Latest' 1861: 19).

Not surprisingly, however, the scandal only helped to fuel an already substantial excitement about du Chaillu's book and about gorillas. By mid-1861, a veritable gorilla-mania had gripped the British public. It comprised the ongoing brain controversy between Owen and Huxley (and others), the interest in the adventurer-explorer du Chaillu and his popular book, and the growing debate about the implications of Darwin's theory for humans. That these three factors were seen in conjunction by contemporary observers is documented, for example, in two humorous poems attributed to gorillas. In May 1861, shortly after the publication of du Chaillu's *Explorations and Adventures*, the magazine *Punch* printed the poem 'Monkeyana', in which a gorilla (wearing a billboard entitled 'Am I a Man and a Brother?') asks the readers, 'Am I satyr or man? / Pray tell me who can, / And settle my place in the scale. / A man in ape's shape, / An anthropoid ape, / Or a monkey deprived of his tail?' ('Monkeyana' 1861: 206), and hence emphasizes the issue of the connection between man and the apes. In the following twelve stanzas, the gorilla neatly summarizes the scholarly and popular debate, explicitly referring to Darwin's theory of change through 'Nature's [*sic*] selection', to the 'rivalry' between Huxley and Owen, and to du Chaillu, 'that chivalrous knight', who had fought with gorillas and brought back the specimens to prove it. A comparable poem, 'The Gorilla's Petition', appeared roughly eighteen months later in *The Penny Illustrated Paper*. It also names Darwin, Owen, Huxley and du Chaillu, and closes with a plea for pity: 'Pity the sorrows of a poor old ape, / ... / Whose near affinity to human shape / Deserves your sympathy, if nothing more' ('Gorilla's Petition' 1863: 391).

Although evolution theory, the brain controversy and interest in the newly discovered ape clearly form a complex whole, the public excitement focused

primarily on the gorilla. Due to the sensational lectures given by du Chaillu, accompanied by displays of specimens, the ape became the 'talk of the town', as *The Morning Chronicle* noted in May 1861 ('London' 1861: 4). This popular interest in gorillas is well documented in the newspapers and magazines – *the* mass-media of the nineteenth century: The online database 'Nineteenth Century British Library Newspapers' includes 48 different publications and a search in this database reveals that in 1859 and 1860, the term 'gorilla' was still a rare occurrence (43 and 21 articles, respectively). But in 1861, the count jumps to 531 entries, and in 1862, the word 'gorilla' appears in 617 articles or notices. By 1863, the excitement is dying down (1863, 339 hits; 1864, 208; 1865, 108), but the statistical data indicates that in 1861, *Punch* was clearly justified in calling the gorilla 'The Lion of the Season' ('Lion' 1861: 211).

Gorillas and Darwinian Thought in Children's Literature

If gorillas were the talk of the town in the early 1860s, it is not surprising that they should also feature prominently in the literature for young readers, particularly in periodicals.[6] In mid-century, the market for such publications had started to expand dramatically – according to Richard Altick, 'from the middle fifties onward, new juvenile papers came out almost every year' (1963: 362). Sheila Egoff underscores the cultural importance of these magazines, suggesting that 'children's magazines of the nineteenth century were institutions as those of today can never hope [...] to be' (1951: 26). Characteristically, these magazines offered a mixture of entertainment and instruction, and many of them – particularly but not exclusively those aimed at boys – regularly included scientific topics.[7] As Diana Dixon points out, '[c]hildren's magazines became an important vehicle for the popularisation of science in England from the 1850s onwards' (2001: 228).

In 'A Word About the Gorilla', an article published in *Every Boy's Magazine* in 1962, the unnamed author pointed to the popularity of gorillas: 'During the

[6] I have only found one article on gorillas in a children's magazine that predates the publication of du Chaillu's *Explorations and Adventures*. On 1 December 1859, *The Children's Friend*, a magazine for younger children, published a short illustrated piece on 'The Gorilla', in which the primate is described as 'a kind of ape ... only lately discovered' (273). Interestingly, it ends with the question of the relationship between man and ape – which is clearly negated: 'The natives believe that the Gorillas are really men like themselves. But we know that they are only apes, and are formed like beasts, and not like men' (275).

[7] A prime example of a Victorian magazine for girls that regularly printed articles on scientific topics is *The Girl's Own Paper* (*GOP*), which started publication in 1880. However, a comparison with its 'brother' publication, *The Boy's Own Paper* (founded in 1879), reveals a marked difference: In the *GOP* scientific topics are much less frequent and they are much less 'spectacular'; particularly practical experiments in chemistry and physics are completely absent from the pages of the *GOP*.

whole of last year the most frequent topic of conversation was the gorilla and M. du Chaillu' (1862: 54). As the article suggests, du Chaillu's *Explorations and Adventures*, although not written for a juvenile audience, would certainly have been of interest to them, and its style of writing made it comparatively accessible.[8] However, while the style was accessible, the price of the book would have placed it well out of reach for most children – but it still proved an important factor with regard to the spread of the 'gorilla-mania' to the pages of children's literature. Only a few weeks after its publication, *The Boy's Own Magazine* printed excerpts, including du Chaillu's account of his first encounter with a gorilla:

> He had gone through the jungle on his all-fours, but when he saw our party he erected himself, and looked us boldly in the face. He stood about a dozen yards from us, and was a sight I think I shall never forget. Nearly six feet high ... with immense body, huge chest, and great muscular arms, with fiercely-glaring large deep gray eyes, and a hellish expression of face, which seemed to me like some nightmare vision, – thus stood before us this king of the African forest. ... And now truly he reminded me of nothing but some hellish dream creature – a being of that hideous order, half-man, half-beast, which we find pictured by old artists in some representations of the infernal regions. ... With a groan which had something terribly human in it, and yet was full of brutishness, he fell forward on his face. ('Mr du Chaillu' 1861: 251)

This passage is interesting in our present context for the ambiguity it displays and the uneasiness it causes. Clearly, du Chaillu is strongly aware not only of physical similarities between man and ape, he even hears 'something terribly human' in the animal's death-groan; at the same time, its 'brutishness' underscores the animal nature of the sound and its producer. Interestingly, *The Boy's Own Magazine* only reprints the passage, it does not comment on it – but the fact that it does reprint excerpts is an indication of the popularity of the topic among young readers. More importantly, however, du Chaillu's *Explorations and Adventures* clearly inspired and/or influenced a number of texts for children that dealt with gorillas, and I would like to examine four examples that appeared between 1861 and 1889.

The immediate success of du Chaillu's book had prompted the publisher T. Nelson and Sons to ask Robert Michael Ballantyne – a well-known author of adventure stories for boys – to write a book on the subject; he was promised £80 should the book be completed in time for the Christmas sales – that is, in less than six months (cf. Quayle 146). Ballantyne met the deadline and according to his biographer, 'the publicity given to du Chaillu's work ensured *The Gorilla Hunters* a wide sale' (Quayle 1967: 146), and it 'passed through numerous editions during the succeeding years' (1967: 155).

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[8] A few years later, after his return to America in 1867, du Chaillu himself was to produce a children's book based on his explorations: *Stories of the Gorilla Country: Narrated for Young People* (1867) (cf. Edmonds 1998: 119).

In order to write a book on a subject of which he knew little, Ballantyne relied heavily on du Chaillu's *Explorations and Adventures*, particularly when describing the gorilla. This is how Ballantyne's first person narrator, Ralph, describes his first sighting of a gorilla:

> Of all the hideous creatures I had ever seen or heard of, none came up in the least degree to this. Apart altogether from its gigantic size, this monster was calculated to strike terror into the hearts of beholders simply by the expression of its visage, which was quite satanic. I could scarcely persuade myself that I was awake. It seemed as if I were gazing on one of those hideous creatures one beholds when oppressed with nightmare. (1987: 136)

The parallels to du Chaillu's description, quoted above, are striking (although Ballantyne goes further to sensationalize the account): Both du Chaillu and Ballantyne emphasize the monstrosity of the gorillas depicted, they are described as 'creations' which seem to combine features of the human and the animal. Thus, both writers create nightmare visions of monsters that are not only frightening in their ferocity, but disturbing in their near-humanity.

In another passage of *Explorations and Adventures* (not reprinted in *The Boy's Own Magazine*) du Chaillu describes his emotions after killing a gorilla:

> There is enough likeness to humanity in this beast to make a dead one an awful sight .... It was as though I had killed some monstrous creation, which yet had something of humanity in it. Well as I know that this was an error, I could not help the feeling. (1987: 434)

In this passage, the feeling of kinship to the animal is both rejected and upheld, and its implications are clearly unsettling to the writer. Du Chaillu says he knows that linking the gorilla closely to man is 'an error', yet he does so at various points in his narrative. Significantly, Ralph shares du Chaillu's uneasy recognition of a likeness in the dead gorilla: 'I shuddered as I looked upon it, for there was something terribly human-like about it, despite the brutishness of its aspect', and he confides that he felt 'like the accomplice to a murder' when his friend shoots a gorilla (1987: 137). A short time later, a female gorilla 'with a baby gorilla in her arms' is described in very human terms: 'Fierce and hairy though she was, there was a certain air of tenderness about this mother, as she stroked and pawed her little one, that went straight to my heart' (1987: 143). This implicit recognition of the connection between man and ape lets Ralph strike Makarooroo's gun in order to prevent him 'from committing murder' (1987: 143). Again, the scene is based on du Chaillu, who also narrates such a meeting: 'The mother was stroking the little one, and looking fondly down at it; and the scene was so pretty and touching that I held my fire, and considered – like a soft-hearted fellow – whether I had better not leave them in peace' (1987: 287). Interestingly, du Chaillu reports that while he held his fire, his African 'hunter' had no such inhibitions and 'killed the mother, who fell without a struggle' (287).

Similar feelings of kinship with the apes are also expressed in a much later publication, 'Through the Dark Country; or, the Adventures of Frank Berresford', an adventure story that was serialized, anonymously, in *Boys of England* from August to November 1889. It is a long story of countless adventures, impossible escapes, dangerous rescues, love and heroism, and natural history does not play a large role (as it does in Ballantyne's *Gorilla Hunters*). However, the adventurers do get into 'gorilla country', and their first encounter with a gorilla is again fashioned after du Chaillu:

> Great Heavens! What was it – man or beast? It stood upon its hind feet, with its arms stretched outward, breaking the branches with its hands; its body was covered with hair, excepting on the chest, which was covered with blue wrinkled skin; its face was hairless and quite black. It stood fully six feet high, with arms which could have reached almost as far again; its eyes gleamed with intelligence and rage; it had fingers and toes. (1889: 196)

As in du Chaillu's and Ballantyne's texts, the first encounter is with a giant male, standing up on its hind legs and impressing the onlookers with its size and strength – and the question is raised, if this creature is 'man or beast'. Echoing both earlier texts, the gorilla is shot and dies 'with an appalling yell', which 'sounded as though all the demons in hades had been let loose' (1889: 196). Immediately afterwards, the following dialogue takes place:

> 'I feel almost like a murderer,' Frank said; 'it is so like a man. From this day and for evermore, I believe in Darwin's theory: we are descended doubtless from gorillas.'
>
> 'Doubtless,' Dick assented. 'I feel ashamed of myself for being so like a brute.'
>
> 'Shall Sambo cut it up?' the black asked, dancing about in great joy. ... 'Part ob gorilla berry good eat.'
>
> 'But,' Frank said, 'I should feel like a cannibal. No, let it lie there. ....' (1889: 196)

Again, a biological link between ape and man is presented as an uncanny possibility – shortly afterwards, Frank will call monkeys his 'half-brothers' (1889: 196). But this possibility is simultaneously undercut in both texts. Frank's ostensible horror at the 'cannibalistic' idea of eating gorilla is clearly exaggerated, just as his 'conversion' to Darwinian thought is laughed at by Dick's assertion of shame for his own 'brute-ness'. In Ballantyne's *Gorilla Hunters*, the possibility of relatedness is also presented as ludicrous by claiming similarity, when one of the three heroes, Peterkin, repeatedly refers to his friend Jack as a gorilla (cf. 1861: 18, 103, 113), and even suggests that the 'gorillas will be sure to mistake [him] for a relative until [he] get[s] quite close' (1861: 20). Identity of man and ape is, of course, an exaggeration of the stipulated link that renders it ridiculous – a strategy that was frequently employed in caricatures depicting Darwin as a monkey.

The third example provides the most consistently humorous treatment of the relationship between man and ape. It is Thomas Miller's adventure story 'The Gaboon; or: Adventures in Gorillaland', which was serialized in *Routledge's Magazine for Boys* from January through October 1868. The text is explicitly inspired by du Chaillu's *Explorations and Adventures*: One of the protagonists justifies his decision to go to Africa with reference to his sons who 'have done nothing but talk about the gorillas and the Fan cannibals since they first read Du Chaillu's book' (January 1868: 12). And while Ballantyne copied without acknowledging his source, Miller refers to his source text at various points. For example, one of the travellers declares that he can 'imagine the feeling of Du Chaillu when he shot the first gorilla, and thought how much its dying moans resembled those of a Christian' (February 1868: 79).

Of the three stories discussed, 'The Gaboon' goes furthest in consistently describing gorillas as quasi-human. In the embedded narrative of an African who had been abducted by gorillas, they are said to have a language and even a kind of civilization, in which a gorilla 'doctor' is sent for by ailing apes. In another scene, a female gorilla is said to have put black leaves on her head as a sign of mourning; as the native guide explains: 'All de old gorilla-wives do when dey losee old man, so dat no udder gorilla makee lub to dem till dey take it off' (March 1868: 18). However, this likeness of man and ape is clearly not meant seriously, the whole text is farcical. Thus, when the captain of the ship is confronted with a captured animal, he wonders:

> ... how to rate him on the ships books ... for there is no knowing what he is until some of these learned gentlemen have decided how to classify him. If he's an aborigine, I should like him to be treated as a Christian. ... I suppose we must rig him out in a sailor's outfit, for it would hardly do to mast-head him, when in port, without having some kind of a decent suit thrown over him. .... (February 1868: 76)

Not surprisingly, the gorilla is later dressed up in human clothes as a 'war god' and used to impress the 'natives' and to cure them of their cannibalistic desires (cf. April 1868: 243), and the ship's doctor even reverses the idea of human superiority, saying that:

> ... it is difficult to prove that this hairy fellow is not related to us all. If so, he must look upon us as a degenerate race, and he himself the only real gentleman who neither toils nor spins, but only takes his walks abroad for his pleasure, and eats what nature provided for him. .... (February 1868: 79)

Thus, all three narratives openly play with the idea of a close link between humans and apes, particularly gorillas, picking up on the contemporary debate surrounding the theories of Darwin, Huxley and others. At the same time, they ridicule the idea of such a link by exaggerating close structural resemblance into similarity or identity – or even suggest animal superiority.

The fourth example is not a fictional account of gorillas, but the non-fictional piece already referred to, 'A Word About the Gorilla', that appeared in *Every Boy's Magazine* in February 1862, not quite a year after du Chaillu's book. The article is supposed to give 'a short account of the formidable and singular beast', 'in a few simple words' (55), and is primarily based on du Chaillu. On ten pages the author summarizes early references to gorillas, gives a physical description of the animal and reprints the same excerpt from *Explorations and Adventures* that had already appeared in *The Boy's Own Magazine* and which includes the reference to the quasi-human groan. However, while the author in *The Boy's Own Magazine* had not commented on the excerpt, the author in *Every Boy's Magazine* quickly distances himself from the idea of kinship:

> And now, as our readers probably imagine that man and the gorilla are similar in many respects, let us proceed to show what a vast difference there is in reality between them. In order to make this more apparent, we have introduced a drawing of the two skeletons placed side by side. What grace and dignity there is in the one compared with the awkward slouching position of the other. (1862: 62)

However, the author obviously did not trust the drawing of the skeletons to be sufficiently clear and hence he summarizes the main points of anatomical difference, praising man as 'perfectly balanced on the small and delicate feet; slender arms with hands ... ; a skull, smooth and round; jawbones small and symmetrical, and teeth white and regular' – while denigrating the gorilla: 'its head sunk upon its shoulders; its long arms, with paws ... ; its short, ill-shaped legs, unable to support its huge body without the help of the arms; its massive jawbones and protruding face' (1862: 63). To further emphasize the point of vast difference, the article is also illustrated with a picture of a gorilla on all fours – an illustration that clearly exaggerates the length of its arms and the size of its 'paws' and hence over-emphasizes the anatomical difference between man and animal. Finally, 'the youthful student who would still be better informed on this interesting subject' is referred to Richard Owen and Waterhouse Hawkins – who were both known opponents of Darwin's theory.

All four texts either explicitly refer to du Chaillu's book or use the same imagery in describing gorillas as disturbingly human, yet all four ultimately denounce the idea of distant kinship as implied in the idea of common ancestors. In this respect, they are typical of most other references to Darwinian thought in juvenile magazines, which tend to use it only jokingly, or to explicitly condemn Darwin's theory as wrong – particularly after the publication of *The Descent of Man*.

Thus, in 1873 the *Sunday School Hive* comments on the relationship of man and monkey (*à propos* the orangutan):

> God made man in his own image. The monkeys are God's creatures, but we are God's children. We are made to know God and love God, and love that which is holy, and to do that which is right. But while man is God's child, he is Lord and Master of the world. ... And to-day we see that it is even so. Neither monkeys, nor lions, nor elephants rule the world. ('Ourang-Outang'1873: 3)

Despite these insistences, evolution theory and 'the monkey-question' obviously continued to interest young readers, as is witnessed by two answers to correspondents in *The Girl's Own Paper*, given in 1881 and 1885.[9] In the first, the editor starts by giving a succinct summary of the theory of evolution:

> In general, we may say that Mr. Darwin denies the existence of species, as so made by a Creator, but thinks that all kinds of plants and animals develop themselves, through force of natural influences ... during countless ages of time, till they assume their existing appearance; so that man, by the Darwinian theory, is only a developed ape, and the ape is developed from something less organised, till we get back to the earliest living monad. When the first stone got its life Darwinism leaves to conjecture. ('Darwin' 1881: 654)

Interestingly, the editor tries to refute Darwin's theory with an appeal to reason rather than faith. While the question how life first started is beyond the scope of evolution theory, the implication of the answer is, of course, that life could only have started by divine intervention. Nonetheless, the editor concedes that evolution theory is 'not necessarily atheistic' – however, he continues that 'it is all sheer nonsense' ('Darwin' 1881: 654). Four years later, in 1885, a similar question must have been asked, and this time the answer is based on religious belief, not reason:

> The notion of evolution, as, for example, that man, who 'God made in His own image,' merely owed his origin to some low order of animal life, and developed into a being with a responsible soul through a monkey, is, of course, an infidel idea. No one accepting the Divine inspiration of the Holy Scriptures could admit such a dogma. ('Beatrice' 1885: 431)

This short response insists on the literal truth of the Bible and hence in man's origin in a special act of divine creation or intervention. Labelling Darwin's theory as 'infidel' places it out of bounds of all rational discussion.

Seven years later, in 1892, a further reference to Darwin is made in an answer to a question that clearly has nothing to do with evolution theory: an 'English Lassie' obviously inquired if it was acceptable for an English girl 'to marry a Scotchman'. The editors answered that the Scot is 'not a savage, nor a heathen, nor is he still keeping up the peculiar characteristics of his monkey origin any more than yourself (according to Darwin's unorthodox ideas)' ('English Lassie' 239). While 'infidel' is extremely negative, 'unorthodox' is arguably less pejorative, as it can signify the deviation from an accepted standard that does not deny the existence of a common ground between 'orthodox' and 'unorthodox' views. This is hardly enough evidence to speculate on a change in editorial policy towards

[9] As was usual at the time, *The Girl's Own Paper* regularly included a section entitled 'Answer to Correspondents'. In this section, only the answers were printed so that the question can only be guessed at. In this case both questions obviously concerned 'Darwinism' or 'evolution theory'.

Darwinian thought, but the fact that the reference is used at all indicates that the topic was still in the public's mind, and was deemed acceptable to use for a joke in a magazine aimed at girls and young women.

Racial Prejudice – Evolution Theory through the Back Door?

The open rejection of a link between man and animal displayed in virtually all texts examined is only part of the story.[10] We have already seen that in the fictional representations of gorillas they are described as alarmingly 'human', particularly in death. And while the three adventure stories for boys ridicule the idea of kinship by stipulating identity, they also endorse a different kind of theory that held extremely wide currency at the time: the idea that humanity consisted of different 'races' that constituted 'higher' or 'lower' forms of mankind. For example, Darwin narrates that arriving at Tierra del Fuego on the *Beagle* he was struck by the vast 'difference between savage and civilized man' (1965: 195). It is this racist and hierarchical mindset that declares Europeans superior to Africans and suggests that the latter may be much closer to the animal kingdom. And this idea clearly represents the general consensus, both of the general public and among scientists. For example, despite their fundamental differences with regard to evolution theory, both Huxley and Owen clearly believe in a hierarchy of human races: In *Man's Place in Nature*, the former declares that 'the difference in the volume of the cranial cavity of different races of mankind is far greater, absolutely, than between the lowest Man and the highest Ape' (2001: 80), in order to suggest a link between man and animals, while the latter compares the gorilla to 'the Negro (or lowest variety of Human Race)' in order to refute suggestions of 'man's origin from a transmuted ape' ('The Gorilla' 1859: 395).

This racist doctrine is always also present in discussions of the 'monkey question', either explicitly or implicitly. For example, the illustration from *Punch* for the poem *Monkeyana* – a gorilla wearing a billboard asking 'Am I a Man and a Brother?' – alludes to a famous medallion of the abolitionist movement which depicts a black man in chains, raising his hands in supplication, and which bears the inscription 'Am I Not a Man and a Brother?' Hence, the illustration suggests that if the black slaves could claim kinship, they might be a connecting link to gorillas. A 'Prize Paper' (i.e., the winning paper in an essay competition) on 'The Monkey Tribe', published in *The Boy's Own Magazine* in early 1862, closes with exactly the same suggestion. First, the young author, one James R. Lane, reassures

[10] I have come across only two texts in children's magazines that do not ridicule or denounce evolution theory: In 1883, the magazine *Young Folks* published an obituary to Charles Darwin (who had died the previous April), in which the origins of evolution theory are briefly explained and in which he is honoured as a peer of 'Plato, Isaiah, Shakespeare, [and] Newton' (Parton); ten years later, *The Boy's Own Paper* published a short piece entitled 'Boyhood of Charles Darwin', which calls him 'famous' but does not refer to evolution theory at all (Vaughan 1893).

his readers that the 'talent of an Owen, a Savage, and a du Chaillu has proved, most unquestionably' that neither their 'great-great-grandpapa [nor] great-great-grandmamma ... were gorillas' (78). But then he suggests a different kind of link between man and animal: 'Yet, contrast the monkey with the negro, and, in many points, the similitude is exceedingly clear – so exact, indeed, that many learned men have declared these animals to be nothing less than human beings degenerated by living in a wild state' (78).

Not surprisingly, all three adventure stories discussed above portray the Africans as intellectually, morally and culturally inferior to Europeans. The short dialogue from 'Through the Dark Country', quoted above, is a case in point: '"Shall Sambo cut it up?" the black asked, dancing about in great joy. ... "Part ob gorilla berry good eat"'. The black Sambo – the name had become prototypical for a black servant through Thackeray's *Vanity Fair* – is depicted as childishly over-emotional, and his broken English indicates his lack of intellectual capacity. The same lack of restraint is displayed by the natives in Ballantyne's *Gorilla Hunters*, when during a hunt the blacks are 'perfectly wild with excitement', but here the childishness is changed into a more sinister representation: 'Their black faces worked convulsively, and their white eyes and teeth glittered as they leaped and darted about in a state of almost perfect nudity, so that their aspect was quite demoniacal' (1861: 60).[11] And like Sambo, the native guide in *Gorilla Hunters* is ridiculed for his incorrect use of English, which marks his direct speech. In a particularly telling passage, Makarooroo uses 'canibobbles' instead of 'cannibals', which lets Peterkin declare 'I must get you to write a new dictionary. I think it would pay!' (1861: 138). Although Makarooroo is repeatedly referred to as 'intelligent' (e.g., 1861: 49, 50), he is clearly also depicted as the 'funny dog' Peterkin sees in him (cf. 1861: 50). In 'The Gaboon', black characters are also always quoted using a funny, non-standard English, and sometimes their 'jabbering' is even compared to that of 'a colony of agitated monkeys' (February 1868: 16), underscoring the negro-gorilla link. Such passages appear with great frequency in all three adventure stories. Thus, while these texts ridicule the idea of a link between man and ape, they simultaneously lend support to a race-theory that reintroduces the 'monkey question', only to answer it by stipulating Africans as a possible link between 'man' and 'animal'.

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[11] A few decades later, in 1897, Rudyard Kipling would neatly sum up this 'double nature' of 'natives' in his famous poem 'The White Man's Burden', calling them 'half-devil and half-child' (1821).

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Chapter 4
Gender Trouble as Monkey Business: Changing Roles of Simian Characters in Literature and Film between 1870 and 1930

Julika Griem, Frankfurt

Victorian Choices: Ape Figures in Late Nineteenth-century Texts

The literary fascination with ape and monkey figures can be traced back to a long and complex pre-Darwinian history. We might, for instance, look at Greek and Roman sources, search for the ape in medieval texts and have a look at the bestiaries and travelogues of Renaissance authors to discover how our closest relative in the animal kingdom has been employed as a foil of manifold projection.[1] A particularly rich chapter of this history unfolds around 1800, when an increasing number of living animals arrived in Europe to be displayed in front of an audience keenly interested in anthropological speculation and in teasing out the satirical and utopian potential of provokingly humanized ape figures.[2]

In the context of late nineteenth-century literature we find a situation again differing from the Enlightenment and Romantic encounters with apes and monkeys. Due to the controversial climate of the evolutionary debates of the Victorian era, literary representations of apes and monkeys at this time negotiate different cultural and political tensions: in many of the texts featuring apes or ape-like characters simian traits function as stigmata announcing the threat of regression and degeneration. Quite frequently, encounters between civilized Europeans and animal or animalized others culminate in constellations of a problematic 'going native', staging the revealing late-colonial moment of a confrontation with an uncannily similar simian double as a return of energies that have to be repressed.

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[1] Janson's 1952 study *Apes and Ape Lore in the Middle Ages and the Renaissance* is an indispensable source and historical guide to the pre-Darwinian history of man's relationships to apes. A collection offering further overviews and historical case studies was provided by Corbey and Theunissen in *Ape, Man, Apeman: Changing Views Since 1600* in 1995.

[2] Among the literary texts to be considered in this context are Rétif de la Bretonne's *La Découverte Australe par un Homme-volant ou Le Dédale francais*, including the 'Lettre d'un Singe aux Etres de son Espèce' (1871), E.T.A. Hoffmann's, 'Nachricht von einem gebildeten jungen Mann' (1815), Thomas Love Peacock's *Melincourt* (1817), and Wilhelm Hauff's 'Der Affe als Mensch' (1827). For a more extended discussion of those texts cf. Griem 2005: 56–69.

As a consequence, the narrative emplotments of many of the most symptomatic Victorian monkey stories are driven by a strong impulse to contain the power of ape-like doubles and others while simultaneously registering the futility of this project. In Sheridan Le Fanu's story 'Green Tea' (1872), published a year after Darwin's *The Descent of Man*, a Victorian vicar does not manage to fight off the hallucination of a small black monkey embodying the man's repressed sexual desire, while in Stevenson's *Strange Case of Dr. Jekyll and Mr Hyde* (1897), the sanity and self-respect of the Victorian gentleman hinges on the very possibility to pacify the destructive activities of his clearly simian *alter ego* (Stevenson 1911). In Kipling's short story 'The Mark of the Beast' (1891) the gruesome consequences of an English colonial officer's confrontation with the Indian monkey god Hanuman can only be made up for by a compromising act of torture (Kipling 1911). Finally, Arthur Conan Doyle presents us with more self-affirmed and even humorous possibilities of coping with the disturbing energies represented by simian others figuring as doubles and shadows. In the novel *The Lost World* (1912), Professor Challenger, leader of an expedition into a prehistoric world, is temporarily mirrored by his 'absurd parody' of 'the king of the ape-men' before the 'sharp contrast' between 'the sloping forehead and low, curved skull of the ape-man' and 'the broad brow and magnificent cranium of the European' is reinstalled (Doyle 1998 [1912]: 144). In the later story 'The Creeping Man' (1923) another celebrated professor temporarily reverts into a simian killer having consumed a potion promising to rejuvenate his sexual performance. Here, it takes the intervention of the master detective to not only invert the professor's fatal regression, but also to disentangle a threatening confusion of human and animal elements: relying on the detective story's generic power to restitute law and order, Dr. Watson can finally inform the reader that 'it was the monkey, not the professor' (Conan Doyle 1993: 71).

At a first glance, female characters are conspicuously absent in the late Victorian stories just mentioned. Despite this absence, however, we cannot fail to realize that the Victorian *mise-en-scène* of the simian paradigm is as heavily racialized as it is sexualized, continuing a tradition that can already be observed in earlier texts such as Edward Long's *History of Jamaica* of 1774:

> (The Negro's) faculties of smell are truly bestial, nor less their commerce with the other sexes; in these acts they are libidinous and shameless as monkeys, or baboons. The equally hot temperament of their women has given probability to the charge of their admitting these animals frequently to their embrace. An example of this intercourse once happened, I think, in England. Ludicrous as it may seem I do not think that an oran-outang husband would be any dishonour to an Hottentot female.[3]

[3] Quoted after Pieterse (1992: 41), who explores the long tradition of simian stereotypes in colonial, racist and imperialist discourses.

Whereas in the texts of Le Fanu, Stevenson, Kipling and Conan Doyle the encounters with animalized doubles and others have a clearly libidinous quality, earlier Victorian texts such as, for instance, Poe's 'The Murders in the Rue Morgue' (1841) and Flaubert's less known 'Quidquid volueris' (1837), blatantly exploit the titillation to be gained from imagining sexual encounters between male apes and human women.

In Poe's much-discussed detective story, Mr Dupin has to solve the heavily overdetermined case of an orangutan violently killing two ladies.[4] In Flaubert's tale, the sexual implications of Poe's fantasy resonating with the anxieties and voyeuristic fascination of a society divided over the issue of slavery are spelled out and reformulated in a European context: Here, the hybrid offspring of a black slave and an orangutan falls in love with his guardian's wife and out of unrequited love rapes his beloved and eventually kills her and her child as well as himself.[5] In a similar vein, Charles Baudelaire, a great admirer of Poe, quite frankly expressed his voyeuristic interest in trans-species fantasies of miscegenation when he, in one of his comments on the exhibition of 'Le Salon' in 1859, turned a controversial female gorilla sculpture created by Emile Frémiet into a simian rapist carrying away his human burden:

> Pourquoi pas un crocodile, un tigre, ou toute autre bête susceptible de manger une femme? Non pas! songez bien qu'il ne s'agit pas de manger, mais de violer. Or le singe seul, le singe gigantesque, à la fois plus et moins qu'un homme, a manifesté quelquefois un appétit humain pour la femme. Voilà donc le moyen d'étonnement trouvé! "Il l'entraîne; saura-t-elle résister?" telle est la question que se fera tout le public féminin. Un sentiment bizarre, compliqué, fait en partie de terreur et en partie de curiosité priapique, enlèvera le succès. Cependant, comme M. Frémiet est un excellent ouvrier, l'animal et la femme seront également bien imités et modelés. En vérité, de tels sujets ne sont pas dignes d'un talent aussi mûr, et le jury s'est bien conduit en repoussant ce vilain drame. (Baudelaire 1923: 355)[6]

Towards the end of the nineteenth century an interesting shift within the gendered economy of literary representations of apes and ape-like characters can be observed. In Henry Rider Haggard's 1887 novel *She* the adventure plot is not just employed to create moments of going native confronting the Victorian explorers with animalized male others. What the novel also offers is a clearly functionalized configuration of gendered simian characters. Hence one of the protagonists, the

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[4] Kennedy and Weissberg 2001 present an excellent collection of essays exploring the textual strategies and political contexts of Poe's story.

[5] Many Flaubert scholars have neglected this early work due to its allegedly juvenile and sensationalist character. For an examination of its political implications cf. Diamond 1998.

[6] For a thorough reconstruction of the scandal caused by Frémiet's orangutan sculpture cf. Weissberg 1991.

ugly but highly intelligent and sympathetic Victorian bachelor Horace Holly, is invested with primate features right at the beginning of the text:

> He appeared to be about forty years of age, and I think just as ugly as his companion was handsome. To begin with he was short, rather bow-legged, very deep chested, and with unusually long arms. He had dark hair and small eyes, and the hair grew down on his forehead, and his whiskers grew quite up to his hair, so that there was uncommonly little of his countenance to be seen. Altogether he reminded me forcibly of a gorilla, and yet there was something very pleasing and genial about the man's eye. (Haggard 1994: 10)

In addition to casting one of the Victorian heroes as a gorilla-like creature, Haggard also gives us a climactic scene in which the fabulously beautiful *She*, a mysterious *femme fatale* of unfathomable age, is undergoing a significant transformation. After she has bewitched the English adventurers, they have to witness how, at the end of their journey, she is quite literally 'turning into a monkey':

> Smaller she grew, and smaller yet, till she was no larger than a monkey. Now the skin was puckered into a million wrinkles, and on the shapeless face was the stamp of unutterable age. … She, who but two minutes before had gazed upon us the loveliest, noblest, most splendid woman the world has ever seen, she lay still before us, near the masses of her own dark hair, no larger than a big monkey, and hideous – ah, too hideous for words! … There, too, lay the hideous little monkey frame, covered with crinkled yellow parchment, that once had been the glorious *She*. (Haggard 1994: 280–81)

If we compare these two scenes, an obvious distribution of the gendered roles of late Victorian simian characters comes to the fore. In the case of Haggard's male protagonist, his ape-like appearance marks the beginning of a development suggesting arguably positive connotations. Holly's bachelorhood is shown as a façade of sublimation, hiding a sexual activity expressed in his apish features. Whereas this covert aspect of his personality had to be repressed in the English context, the adventurous trip to Africa grants the bachelor the possibility to rediscover his potentially animalistic sexuality without – this is important – interfering with the 'pleasing and genial' side of his character. In the case of the female protagonist of the novel, her regressive potential is clearly presented as a negative development culminating in an offensive form of degeneration. For the woman, the monkey within cannot at all be associated with a possibility of liberation, but rather functions as a disempowering stigma: whereas gorilla-like Holly is regenerated through his African experiences, *She* ends up as an abject creature whose human status is practically obliterated.[7]

As a crucially transitional text, Edgar Rice Burroughs's *Tarzan of the Apes* (1912) both adopts and modifies the double standard according to which the simian characters in Haggard's novel are constructed. Hence, the Tarzan story on the one hand relies on a female protagonist – Jane Porter – who can be read as an American

[7] On the abject status of *She* cf. also Richter 2011.

angel in the house. Tarzan himself, on the other hand, is given the opportunity to retrieve his animal instincts in a much more obvious way than Haggard's Victorian bachelor: while the latter, whom his African servants call 'baboon', performs a tentative revitalization, Tarzan's unrestrained vitality is foregrounded through his jungle education and his many allies in the animal kingdom. In comparison with his effeminate cousin, the second Lord Greystoke, Tarzan clearly succeeds as the natural gentleman whose simian acculturation gave him the chance to achieve a reinvigorated form of manhood.[8] Burroughs's noble apeman thus serves as a good example for what Anthony Rotundo has identified as the 'masculine primitive': in a historical situation characterized by an increasing pressure to open the bourgeois spheres of work and education to women, the celebration of an unfettered, physically active vitality in touch with man's animalistic roots opened up a way to recode Victorian norms of masculinity (Rotundo 1993). Replacing the fear of degeneration with a new ideal of regeneration, the complicated legacy of such a 'masculine primitive' informs the simian characters of modernist texts such as Eugene O'Neill's *The Hairy Ape* or Richard Wright's *Native Son*.[9] Instead of returning to these heavily commented texts I will, in the remaining main part of this paper, focus on the much less known expressionist story 'The Gorilla', on Joseph von Sternberg's *Blonde Venus* and on Isak Dinesen's novella *The Monkey*, to explore how the late Victorian functionalization of simian characters is transformed into a very different modernist scenario.

Modernist Transformations: King Kong's Tragedy – Rotpeter's Ruse

Even though the modernist ape figures I will discuss now differ from their Victorian ancestors, they still operate along gendered lines. These lines can be traced back to two modernist texts I consider crucial for the cultural history of apes and monkeys in the early twentieth century. It might appear slightly daring to compare the great ape in Cooper and Schoedsack's 1933 film *The Son of Kong* with Kafka's simian first-person narrator in his 1917 *Report to an Academy* (Kafka 2001 [1917]). With regard to an emerging interest in the didactic and economic exploitation of great apes in the early twentieth century, however, a number of surprising parallels can be detected. Firstly, both protagonists can be situated in the modernist context of the popular fascination with an increasingly commercialized trade in and display of exotic animals in circuses, zoos and scientific institutions: while Kong is kidnapped by film-makers looking for a Broadway attraction, Rotpeter was captured by the Hagenbeck Company. Secondly, both stories provide their male

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[8] Cf. Ruth Mayer 2008; on changing notions of masculinity in late Victorian culture cf. Adams 1995 and McDevitt 2004.

[9] Cf., among many other studies, Robinson 1995 and Nickel 1998 on the 'masculine primitive' in *The Hairy Ape*; on Richard Wright's possible uses of both *The Hairy Ape* and *King Kong* as negotiations of the masculine primitive cf. Fabre 1971 and Hellenbrand 1983. For a more extensive discussion of these texts cf. Griem 2005: 175–94.

simian protagonists with a female companion whose role is quite similar in both narratives. Accordingly, Kong's 'white woman', Ann Darrow, was described by one of the film's directors as a woman who has 'retained, fortunately, the fighting, dominant blood of the savage … This quality can be found in the most fragile of women' (Berenstein 1996: 183). In a similar vein, Kafka's Rotpeter characterizes his female chimp at the end of his report:

> When I come home late at night from banquets, from scientific societies, or from social gatherings in someone's home, a small half-trained female chimpanzee is waiting for me, and I take my pleasure with her the way apes do. During the day I don't want to see her. For she has in her gaze the madness of a bewildered trained animal. I'm the only one who recognizes that, and I cannot bear it. (Kafka 2009: n. pag.)

In the following considerations, I will argue that King Kong and Rotpeter, even though they seem to be treating their 'leading ladies' in similar ways, still represent different versions of a modernist simian paradigm exploiting the fascination with an exoticized primitive. King Kong, on the one hand, can be read not only as the allegory of a black rapist,[10] but also as a surprisingly gentle potential lover still in touch with his instincts. Despite his courteous behaviour in the scenes with Ann Darrow, he cannot escape his tragic fate, however: in the climactic scene showing how the movie producers hunt him down from the top of the Chrysler building, he is effectively sacrificed as a victim of a modern entertainment industry. Kafka's much more subtly anthropomorphized Rotpeter, on the other hand, tells the story of a surprising ruse. Having been captured for similar purposes as the great ape Kong, Hagenbeck's clever performer has managed a mimetic transformation that at least possibly turns the animal victim into a master of human ceremonies. As my following examples are meant to demonstrate, it is these two possibilities that anticipate the gendered variants of modernist representations and spectacles of apes and monkeys. Whereas the male simian characters predominantly tend to get caught in self-destructive tragedies, the female ones are at least granted the alternative of a subversive appropriation.

Leonhard Stein's 'Der Gorilla': Simian Entrapment

Stein's 1920 story can be briefly summarized: a decadent bonvivant called Pangesius has fallen in love with proud Statira. This lady is a zoologist who illustrates her scientific hypotheses by parading a trained gorilla to learned audiences. When Statira refuses to respond to Pangesius's passionate courtship, the lover reverts to an extreme ploy. He kills the gorilla and skins him. After having deposited the animal's flesh in Statira's chamber of dissected animals, Pangesius undresses and climbs into the still warm fur of the skinned ape, eagerly awaiting his beloved's return in the naturalistic costume of her favourite pet who

[10] The canonicity and cultural endurance of *King Kong* is based on the great ape's clever overdetermination and was most comprehensively demonstrated in Erb 1998.

had always been allowed to spend his nights in her bedroom. The ingenious plan initially seems to be successful – Pangesius, whom Statira still seems to be taking as her gorilla, is granted access to the lady's bed. Soon things take an unexpected and fatal turn, however: when Statira approaches her hidden lover to reveal that she has been seeing through his trick, Pangesius realizes that he has literally grown into the ape's skin. As he now can no longer escape his furry costume, he attacks his mistress and pushes both of them from the roof of a skyscraper.

Stein's story at a first glance reminds one of Kafka's metamorphoses. At a second glance, however, the text rather foreshadows elements of *King Kong*: Statira, always clad in white and surrounded by white lilies, represents the *femme fatale* version of the great ape's white woman, and just like the film, the story also plays on the phantasma of an act of miscegenation crossing the species boundary. Furthermore, the highly sexualized encounter between a powerful primate and his human lady is equally cast along the lines of a 'beauty and the beast' plot. To increase the tragic determinism we again find in King Kong's story, Stein also employs mythological subtexts and a naturalistic discourse tipping over into a biologistic sensationalism. This tendency surfaces in the passages illustrating the transformation of man into ape. Here, the strategy of pseudo-scientific rationalization most drastically relies on a fantasy of physiological particles engaged in a bloody struggle for survival:

> Die Veränderung. Woher stammte sie? Von dem eigentümlich riechenden Fleisch der wilden Tiere, das ihm nun schon eine Woche als einzige Nahrung vorgeworfen wurde, oder von dem Fell des Gorillas? Von dem Fell des Gorillas. Es hatte sich eng an Pangesius' nackte Haut gepresst, schien bereits durch Adernstränge mit ihr verbunden, sicher waren in dem Gewebe viele der mächtigen roten Blutkörper des Gorillas übrig geblieben, die nun die menschlichen rächend bekriegten. Und die Blutkörperchen der Affen sind zäher und mächtiger denn die der Menschen. Doch konnte Pangesius diesen Gedanken, dessen Vorstellung ihm körperlichen Schmerz verursachte, nicht länger verfolgen; knurrend warft er sich ins Zottige des Fells, langsam der tödlich süssen Versunkenheit in das neue bewusstlose Reich hingegeben. (Stein 1999: 49)

In such pseudo-Darwinian passages, Stein's predominantly expressionist text reverts to a naturalist repertoire. And yet, due to the orgiastic quality underlying many of the physiological descriptions, the story comes close to a modernist notion of ecstatic dissolution Marianna Torgovnick has characterized as 'oceanic' (Torgovnick 1997: 5ff.). At a first glance, there is indeed something Dionysian in the struggle taking place between the man's and the ape's organism. The possibility of a revitalising effect of the grotesque osmosis of human and animal skin is soon undermined, however. We might still be tempted to construe even the lovers' final fall, happening in 'raging entanglement', as a last moment of an expressionistically celebrated transgression. At the same time, though, the protagonist's development clearly heads towards an experience of disempowering containment. This shows more concretely when Statira locks the animal containing her lover into a cage during a journey to Latin America. Later on, the lovesick man's clever device

even more radically turns into a trap: as the prop of his simian masquerade does not just function as a costume, but turns into a living second skin, Pangesius's performance has become a fatal essence. Locked into his taxidermic cage, this modernist simian character no longer has the chance to discover the proverbial ape within as he quite literally has been turned into a gruesomely realistic gorilla foreshadowing the fate of his much more famous American follower King Kong.

Josephine Baker, The Blonde Venus and Dinesen's 'The Monkey': Simian Subversion

Considering Stein's short story, but also the earlier mentioned examples of O'Neill's *Hairy Ape* and Richard Wright's *Native Son*, the melodramatic staging of the encounter of white ladies and black beasts combines gendered and racial projections. Quite often, such trans-species modernist romances are based on a rhetorical constellation also underlying Freud's trope of the 'dark continent': in this trope, as Mary Anne Doane put it,

> there is an extraordinary condensation of motives linking the white woman and the colonialist's notion of 'blackness'. Just as Africa was considered to be the continent without a history, European femininity represented a pure presence and timelessness (whose psychical history was held, by Freud, to be largely inaccessible). (Doane 1991: 212)

It cannot be overlooked that many modernist versions of the story of the fair woman and her dark primate still capitalize on an ambivalent juxtaposition of repulsion and attraction. The examples I want to look at in the remaining part of this paper still add a specifically subversive twist to this ambivalence. The subversive moment I am particularly interested in comes to the fore if we return to the notion of a simian mask already employed in Stein's story: Pangesius's wish to replace the suspected animal – and more potent – lover culminates in his idea to use the gorilla's fur as a strategic costume or mask. As I have tried to show, this performative *mise-en-scène* of a masculine primitive fails dramatically in Stein's story. If we leave the context of a predominantly white European culture, however, different appropriations of the motif of simian masks come into play. There is, for instance, the 'minstrel mask' – which, according to Houston Baker, inspires the art of the Harlem Renaissance where it no longer functions as a racist cliché, but as a double-edged symbol of African American creativity: 'That mask is a space of habitation not only for repressed spirits of sexuality, ludic play, id satisfaction, castration anxiety, and a mirror stage of development, but also for that deep-seated denial of the indisputable humanity of inhabitants of and descendants from the continent of Africa' (Baker 1987: 17).

In her notorious 'Dance of the Savages' Josephine Baker presented a particularly expressive and controversial application of a masquerade fearlessly engaging with racist stereotypes. Baker did not shy away from driving her French audiences into highly ambivalent reactions triggered not only by her nudity, but

also by the famous banana skirt, her animal poses and her boyish haircut. 'She's horrible, she's wonderful … Is she black? Is she white? Is that her hair I see or is her skull painted black?' were some of the anxious questions, while another critic condemned a 'lamentable transatlantic exhibition that brings us back to the monkey much quicker than we descended from the monkey' (Petro 2002: 140).

Baker's provokingly regressive performances represent an interesting version of a 'feminine primitive'. The dancer succeeded as the first African American international celebrity, but she also turned herself into the object of a spectacle advocating the modernist programmes of a 'New Woman' and a 'New Negro'. In a characteristically contradictory manner, Baker's 'ultramodern primitivism' expanded the repertoire of female vaudeville art as her poses were based on a 'self-mockery' oscillating between masculinity and femininity, human and animal, regeneration and degeneration. Her success has thus to be seen as the balancing act of a multiple appropriation: employing minstrel clichés already used by white artists, her scope of action has been described as both 'demeaning and empowering', as caught in a creative dilemma Eric Sundquist has described as a 'painful entanglement between cultural self-determination and racist domination' (Gubar 1997: 119).

It is no coincidence that Josephine Baker celebrated her first triumphs not on Broadway, but in Paris. The American public of the mid-1920s was busy watching a slightly different kind of simian spectacle. In the summer of 1925 enormous media coverage was mobilized to follow the so-called 'Monkey Trial' against a teacher from Tennessee who had dared to introduce his pupils to Darwin's theories. In the US, the trial resulted in a public craze inviting spectators to spot 'missing links', while the opponents were exchanging postcards with monkey motives. On the other side of the Atlantic, French commentators reported on the events from a perspective of amused detachment:

> On this side of the ocean it is difficult to understand the susceptibility of American citizens on the subject and precisely why they should so stubbornly cling to the biblical version. It is said in Genesis the first man came from mud and mud is not anything very clean. In any case if the Darwinian hypothesis should irritate any one it should only be the monkey. The monkey is an innocent animal – a vegetarian by birth. He has never placed God on a cross, knows nothing of the art of war, does not practice the lynch law and never dreams of assassinating his fellow beings. The day when science definitely recognizes him as the father of the human race the monkey will have no occasion to be proud of his descendants. That is why it must be concluded that the American Association which is prosecuting the teacher of evolution can be no other than the Society for Prevention of Cruelty to Animals. (Russell 2008: 119)

The 'Monkey Trial' again mobilized a Victorian and naturalist rhetoric of degeneration relying on images of simian regression. Seven years later, however, Joseph von Sternberg cast Marlene Dietrich as the protagonist of a simian masquerade that rather offered a modernist mirror image of Josephine Baker's Parisian shows. The 'maternal melodrama' of von Sternberg's film *Blonde Venus*

at first sight locks androgynous Dietrich in a plot confining her to a domestic existence as mother and wife. The film's contrastive *mise-en-scène* of marriage and an extra-marital affair is complicated through an interplay showing the Dietrich character as a celebrated variété performer in New York, however. It is in this middle part where the film indulges in the famous 'Hot Voodoo' number, showing Dietrich engaged in a striptease act involving her own simian mask: in a gorilla costume completely hiding her, the Blonde Venus enters the stage to start a dance accompanied by female dancers in blackface and black curly wigs. While the choir girls move ecstatically according to a stamping, 'African' rhythm, Dietrich slowly and lasciviously peels herself out of the gorilla costume until she finally, her upper body glistening in blonde light, her lower body still covered by gorilla fur, falls into singing her 'Voodoo Song'. The lyrics of the song deal with an 'African Queen' seeking liberation through encountering a primitive culture:

> Did you ever happen to hear a Voodoo
> Hear it, and you won't give a damn what you do.
> Tom-toms put me under a sort of hoo-doo
> And the whole night long
> I don't know the right from the wrong.
> Hot Voodoo – black as mud
> Hot Voodoo – in my blood
> It carries me back to a cannibal isle.
> Hot Voodoo – dance of sin
> Hot Voodoo – worse than gin
> I want to start dancing in cannibal style.
> That beat gives me a wicked sensation
> My conscience wants to take a vacation.
> Hot Voodoo – head to toes
> Hot Voodoo – burn my clothes.
> I want to start dancing
> Just wearing a smile![11]

Dietrich's version of a 'feminine primitive' is highly reminiscent of both the island setting in *King Kong* and Josephine Baker's offensive flirt with racist clichés, and it has created a considerable amount of discomfort among film critics. Even though Dietrich's performance quite daringly sails between the 'Scylla of racism' and the 'Charybdis of sexism' (Modleski 1991: 127), the Hot Voodoo number has, in my opinion, still a markedly different quality than Stein's tragic deployment of a gorilla costume. It is certainly true that the Voodoo scene is inspired by a 'commodified primitivism' capitalising on racially motivated notions of a – as Susan Gubar put it – 'degenerate (but titillating) deviancy' (Gubar 1997: 223). It also seems crucial to me, however, that in contrast to the short story, Dietrich's character uses the ape costume in a decidedly anti-essentialist way. Her mask remains a temporary disguise inviting the viewers of the scene to defamiliarize the

[11] Lyrics quoted after Jacobs 2000: 144.

visual regime constructing women as objects of a male gaze: Dietrich foregrounds the deliberately transgressive character of her dance when she puts on her blond afro wig with a cool smile, self-consciously moving in line with a row of dancers carrying shields with a *vagina dentata*-motif.

The unsettling effects of Dietrich's simian voodoo act are not completely pacified by the overall structure of von Sternberg's film. Even though *Blonde Venus* draws heavily on conventions of a domesticizing maternal melodrama, there remains a productive tension between spectacle and narration, between enactment and emplotment. This tension is reinforced if we do not just focus on the gorilla striptease, but on the sequence of three structurally related scenes staging the Dietrich character as an object of male gazing. In the first of those scenes, the young Helen Faraday is shown swimming in the nude in a German lake, voyeuristically observed by a group of men including her future husband. After this early, relatively crude primitivist tableau and after Helen's performance in her gorilla costume, the film shows a third variété scene set in Paris, where Dietrich seems to be playing herself as a coolly androgynous performer in a man's suit, self-confidently playing a masculine role, but simultaneously flirting with her former lover.[12]

How far Dietrich's provokingly white and blonde Venus has already departed from the masculine primitive still enacted by King Kong and his white woman, becomes obvious in a direct comparison of the two films. In the 1933 film, the chivalric gorilla has to be sacrificed to make possible the marriage of Ann Darrow and her human saviour. In von Sternberg's 1932 version of the woman and her ape the gorilla costume is left behind to envision a female existence beyond marriage. Seven years after the retro-Darwinian atmosphere created by the 'Monkey Trial,' Marlene Dietrich's *Blonde Venus* thus deserves credit for boldly stepping into the post-Darwinian phase of American modernism.

As a last example of a potentially feminist appropriation of the modernist repertoire of ape and monkey figures I will look at Isak Dinesen's 1934 novella 'The Monkey'. The text was first published in a collection titled *Seven Gothic Tales* and it starts out in the initially idyllic setting of a convent hosting wealthy widows and aristocratic bluestockings in the splendid isolation of Northern woodlands. This peaceful community is disturbed when the Prioress learns that her favourite nephew has been discarded by his patrons at court as they suspect him of nurturing homosexual inclinations. There seems to be only one way out of the young man's dilemma: Boris asks his aunt to arrange a marriage with Athena, the daughter of an aristocrat residing in the neighbourhood of the convent. This turns out to be easier said than done, however: Athena's father is delighted about the offer, but his daughter has made up her mind against matrimony. The Prioress persuades her nephew to break Athena's resistance by means of a seductive meal leading

[12] The ambiguity of Dietrich's performance has produced an intense feminist discussion: Cf. Doane 1991: 26, 215; Modleski 1991: 127; Gubar 1997: 223; Kaplan 1997: 73–4. The subversive potential of the figure of Helen Faraday also had to be dealt with in the film's production history. On the negotiations mediating between three different script versions oscillating between a containing and a titillating way of telling the story cf. Jacobs 2000 and Baxter 1988.

to a grotesquely violent erotic encounter between Boris and his athletic bride-to-be. When Athena wakes up the morning after the Prioress insinuates that her nephew could have impregnated the young woman just by kissing her. Thus bribed into marriage, Athena threatens to kill Boris, whereupon the heated argument is interrupted by a remarkable chase followed by an even more remarkable transformation involving the Prioress and her pet monkey:

> With the most surprising, most wonderful lightness and swiftness she heaved herself straight up along the frame, and at the next moment was sitting squeezed together upon the sculptured cornice, shivering in a horrible passion, and grinding her teeth at the party on the floor. But the monkey followed her. As quickly as she had done it, it squirmed up the doorcase and was stretching out its hand to seize her frock with both hands, and bending double, as if ready to drop on all fours, madly, as if blinded by fright, she dashed along the wall. But still the monkey followed her, and it was quicker than she. It jumped upon her, got hold of her lace cap, and tore it from her head. The face which she turned towards the young people was already transformed, shrivelled and wrinkled, and of dark brown dolour. There was a few moments' wild whirling fight. Boris made a movement to throw himself into it, to save his aunt. But already at the next moment, in the middle of the red damask parlour, under the eyes of the old powdered general and his wife, in the broad daylight and before their eyes, a change, a metamorphosis, was taking place and was consumed.
>
> The old woman with whom they had been talking was, writhing and dishevelled, forced to the floor; she was scrunched and changed. Where she had been, a monkey was now crouching and whining, altogether beaten, trying to take refuge in a corner of the room. And where the monkey had been jumping about, rose, a little out of breath from the effort, her face still a deep rose, the true Prioress of Cloister Seven. (Dinesen 1979: 115)

At a first glance, the 'writhing and dishevelled' state of the Prioress-turned-monkey reminds one of the animalizing transformation of the beautiful heroine of Rider Haggard's novel *She*. A closer inspection of Dinesen's key scene reveals, however, that the 'double metamorphosis' (Mieszkowski 2003: 175) of the novella rather resembles Marlene Dietrich's gorilla act, as it involves more than just a linear change: whereas She ends up as a shrivelled monkey, Dinesen turns the Prioress into her monkey and the monkey into a Prioress. And yet: while Dietrich's simian enactment only punctuates the melodramatic emplotment of von Sternberg's film, the Prioress's transformation is embedded into a much more sustainable structure of motives and resonances associating the convent's mistress with her pet monkey. From the beginning on, Dinesen invests the Prioress with animalistic features and metonymies linking the woman and her animal.[13] In a further key scene of

[13] The Prioress and her monkey both have gnarling teeth and darkly glistening eyes (Dinesen 1979: 73, 72); there is a 'strange and disquieting smell' in her room (75); she scratches and licks her lips in a simian fashion (101, 104) and announces her predilection for almonds imported from Sansibar, the place her monkey is also reported to originate from (102, 72).

the story, these associative traces are compressed into an image employing the figure of the monkey as a poetological animal. When Athena pays her first visit to her future father-in-law, she mentions having seen the monkey lingering at the bottom of a statue of Venus, replacing one of the Goddess's cupids. It is this observation that results in a revealing conversation on the function of such Ianus figurations producing two substantially different explanations of those 'Wendish idols' (Dinesen 1979: 90) providing the Goddess of Beauty with an apish face on her back. In this conversation, Athena questions the vicar's attempt to contain the double-edged figure as stemming from a medieval iconography illustrating the 'idea of original sin': 'but how … did they know, in the case of that goddess of love, which was the front and which the back?' (90).

The image of the double-faced goddess foregrounds the monkey as a 'reversible sign' (Mieszkowski 2003: 193, 195) and emblematizes a textual 'undecidability' (Aiken 1990: 134) which affects different dimensions of Dinesen's novella. For a start, the story's gender trouble surpasses Dietrich's cross-dressing in *The Blonde Venus*: the arguably homosexual Boris has girlish curls, his warrior-like bride Athena is compared to a 'young sailor' and described as 'six feet high and broad in proportion, with a pair of shoulders which could lift and carry a sack of wheat' (Dinesen 1979: 107, 89), and the Prioress is characterized as a woman 'old enough to have done with the business of being women' (Dinesen 1979: 80). Next to these sexual inversions the novella's spatial and colour symbolism also suggests an even more fundamental dissolution of dichotomies: after the monkey has wrecked chaos in the convent's library, the neatly black and white floor or the room remains covered by pages torn out of books of a colour as brown as the monkey's face (Dinesen 1979: 72). Finally, Dinesen's play on generic conventions equally subverts dichotomous narrative economies. The text thus refrains from reproducing those gothic subgenres staging the uncanny in stereotypically gendered 'paranoid' or 'hysterical' ways.[14] Furthermore, the highly ambiguous quality of the monkey contributes to disturbing the didactic logic of the traditional beast fable. Instead of closure, the final words of Dinesen's 'The Monkey' thus provide an unsettling open ending also undermining the very possibility of poetic justice:

> 'Discite justitiam, et non temnere divos'. 'Respect justice, and do not despise the gods'. This cautionary moral is a parodic mirroring of the traditional fable form, but it may also contain a truth; perhaps justice has been done in the world of this ironic fable. We are compelled to ask a multiplicity of questions. Are the gods just? Who are the gods? Is the monkey a god or a demon? Is the fated union of Boris and Athena a blessing or a curse? Is their story comic or tragic? Is the attitude of amor fati a stance of heroism or cowardice? (Lokke 1990: 94)

[14] According to Ballaster 1996: 62, such gothic tendencies can be differentiated according to a 'male' logic of projection (i.e., in forms of monsters) and a 'female' logic of introspection (as dreams or hallucinations).

Despite its much more radical textual masquerade, Dinesen's novella does pick up some of the leitmotifs orchestrating the modernist mise-en-scène of gendered ape and monkey figures. It is therefore not surprising that the text even resonates with the fate of the great ape who had just embarked on his tragic mission just a year before the publication of 'The Monkey': When Athena's father is described as an 'old man gorilla, outside his lair, ready for the attack' (Dinesen 1979: 84), we are tempted to read King Kong's heartbreaking rampage into this characterization. At the same time, however, Dinesen's text resolutely departs from the iconography of a 'masculine primitive' when she has her effeminate hero, after the fight with his powerful bride, envision an inverted scenario turning the beauty into the beast: 'And if she should really become aware of him, would the giant's daughter (…) carry him with her upon the palm of her hand to Hopballehus, and make him groom her unicorns?' (Dinesen 1979: 113).

With this transformation of the lady into the monster, Dinesen has thoroughly undermined both Victorian and modernist emplotments of the iconic story of the woman and her ape. The novella demonstrates that under the pressure of modern technologies and spectacles of displaying animalistic monstrosity, traditional forms of narrative containment may yield to a textual enactment of the power of simian mimesis. For many modernist protagonists interacting with significant and signifying monkeys, the alternative may still be one between the cage and the stage. For the Prioress and for Isak Dinesen, who once introduced herself as the 'Queen of Northern Monkeys', her self-reflexive simian masquerade has become a source and a tool of authorial empowerment.

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PART 2
Darwin's Cultural Resonance Today

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Chapter 5
Neo-Victorian Darwin: Representations of the Nineteenth-Century Scientist, Naturalist and Explorer in Twenty-First-Century Women's Writing

Ann Heilmann, Cardiff

Introduction

When Erasmus Darwin Wells, the faux-Darwinian protagonist of Andrea Barrett's *The Voyage of the Narwhal* (1998), first contemplates writing a natural history of the Antarctic after returning from a life-threatening expedition, he is determined to resist narrative conventions of exploration: 'He wouldn't be in the story … He would be erased, he'd be invisible. It would be as if readers gazed at a series of detailed landscape paintings. As if they were making the journey themselves' (Barrett 2000: 293). Ironically, in his very endeavour to shake off the self-aggrandizing impetus of the traditional explorer he lays claim to a quasi-divine function: the naturalist's vision is to guide our understanding of the world even as he himself ostensibly retires from view. The journey into exploration, Barrett suggests, is also always a journey into the naturalist's mind. This 'voyage in' is key to twenty-first-century women's literary investigations of nineteenth-century science. While Barrett's protagonist may well desire to disappear in his story, in the contemporary historical imagination the (proto-) Darwinian figure of the evolutionary naturalist and explorer has a tangible presence. In light of the significant transformation of science in the course of the nineteenth century, the scientist is represented in contemporary women's writing across three different time periods. These phases are implied in the convoluted name of Erasmus Darwin Wells: the early nineteenth century, whose Linnaean concept of a divinely ordained Chain of Being in which every species had its prearranged place (Schiebinger 1993: 145; Gould 1987: 263–90) came to be challenged by evolutionists like Erasmus Darwin (Darwin's grandfather); the mid-Victorian age, shaped by the impact of Darwinian evolutionary theory; and the *fin de siècle* with its alliance of science and art (as illustrated in the naturalist movement and the scientific romances of H.G. Wells). The texts discussed in this essay cover the first two periods and focus their attention on questions of race and gender: categories at the heart of the foundational discourses of eighteenth and nineteenth-century

science.[1] Significantly, the authors interrogate historical conceptualizations of racial and gendered hegemonies and contrast traditionalist-imperialist masculine characters with alternative figures ('feminine' male scientists and aspiring women naturalists), thereby attending to contemporary concerns about gendered approaches to science; yet they do not overturn conventional dichotomies. While setting out to question established paradigms, these works reaffirm the alignment of masculinity with 'penetration' and femininity with 'nature'. This dichotomy, and more generally the centrality of gender to scientific enquiry, is arguably over-determined by the Baconian juxtaposition of male explorer and female object of exploration. It is, nevertheless, striking that the roots of essentialist thought appear to remain uncontested in contemporary women's writing. One question this essay seeks to address is therefore the extent to which the traces of the Baconian gender binary may survive in feminist counter-narratives of nineteenth-century science.

As Eve Fox Keller has pointed out, Bacon's science/nature metaphor offers scope for a more complex reading (Fox Keller 1995: 33–42). However, the crude gender dichotomies that persisted in Victorian scientific practice are manifested by the Royal Geographical Society continuing, into the twentieth century, to 'present exploration as a battle with Nature, testing the manliness of the explorer'; 'no woman', Jeannette King notes, 'received the Society's gold medal for exploration before the First World War' (King 2005: 41). In Barrett's novel it is the sister of the imperialist scientist Zeke (Zacharia) Vorhees who comments on the gendered nature of exploration: men, Emily remarks, 'make fun' of women's popular fiction and its contraction of the 'wide world' to the domestic realm: 'You like tales of adventure in which the hero … explores that wide world. But the novel[2] is about tyranny; the tyranny of family and circumstances, and how one survives when running away isn't an option. Which it never is for women like us' (Barrett 2000: 371). Emily's point is problematized in a text whose male naturalist too is trapped by circumstances and, by choosing a different course of action to that of the colonial explorer, finds himself faced with the 'tyranny' of familial and social recriminations.

Whether subject to domestic pressures or engaged on the Tennysonian mission 'to strive, to seek, to find, and not to yield' in the quest for 'a newer world',[3] the figure of the neo-Darwinian explorer serves a mirror function, pointing as it does to current debates. As Sally Shuttleworth has argued, the emergence in the 1990s of 'the Victorian natural history novel' enacted a nostalgic return to the idea

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[1] See, for example, the Linnaean 'sexual' classification system of plants and the positioning of the African body as the 'link' in the Chain of Being between human and animal life.

[2] *The Wide, Wide World*, an 1850 bestseller by the American evangelist Susan (Bogart) Warner, who published under the pseudonym of Elizabeth Wetherell.

[3] As King points out, Tennyson's 'Ulysses' was 'originally dedicated to Franklin', the Arctic explorer whose lost expedition led to recovery missions of the kind fictionalized by Barrett (43).

of a natural order that 'appear[ed] … manageable … in human terms' at a time when the Thatcher government summoned 'Victorian values' to justify its social Darwinist policy decisions (1968: 256, 260). What a decade on appears to propel (post)millennial, specifically women writers towards a reassessment of nineteenth-century and in particular Darwinian science is not so much the Thatcher-inflected invocation of neo-Victorian socio-economic principles in post-crash austerity politics (which most of the texts discussed predate) as the rise of neo-essentialism in contemporary (popular) science discourse[4] and the ongoing underrepresentation of women in the scientific world.[5] The historical framework of the neo-Victorian novel here no longer performs a nostalgic as, rather, a cautionary purpose in pinpointing the moment of transition between shifting models of evolution, the clash of which raised vital questions about the ethics of science. It is this concern with ethics which shapes the encounters between scientists in contemporary neo-Darwinian literature by women. If the turn to ethics, as John Glendening notes, is a central feature of the neo-Victorian novel about science and religion (2013: 23), religion in the texts selected becomes coterminous with personal, professional and, crucially, gendered ethics.

How, then, do contemporary women writers reflect on the gendered discourses and ethics of science in their narrative return to the nineteenth century? What types of scientist do they depict, and juxtapose, to examine conflicts between 'old' and 'new' paradigms of exploration and the rise of evolutionary theory? In their portrayal of Darwinian characters, what do they foreground? To contextualize these questions, this chapter will discuss four texts published between 1998 and 2009, by two British and two North American[6] women writers: Ruth Padel, Tracy Chevalier, Andrea Barrett and Barbara Chase-Riboud. I begin with early nineteenth-century science as represented in Chase-Riboud's *Hottentot Venus* (2003). Set predominantly in 1810–15, the novel illustrates the racial and sexual casualties of the Chain of Being concept by focusing on the real-life case of Saartjie Baartman, a (South African) Khoekhoe woman exhibited as the 'Hottentot Venus' in freak shows in London and Paris. After her death in 1815 Baartman's body was dissected by the pre-eminent French scientist Georges Cuvier, professor of comparative anatomy at the Muséum d'Histoire naturelle, vice rector of the science faculty of the University of Paris and a protégé of Napoleon Bonaparte's (Crais and Scully 2009: 131). Baartman's body parts were displayed in his museum and later the Musée de l'Homme and Musée d'Orsay in Paris (the latter as late as 1994; Qreshi 2004: 246; Holmes 2007: 169; Crais and Scully 2009: 142).

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[4] See neuroscientist Cordelia Fine's assessment of popular biology's gender essentialism.

[5] See recent pronouncements by molecular biologist Nancy Hopkins about the 'systematic but invisible and unconscious gender bias' as 'one of the final remaining barriers to gender equality in science' (Matthews 2013: n. pag.).

[6] Born and educated in the US, Chase-Riboud lives in Paris and Italy (Spencer 2009: 738–9).

In the penultimate chapter the text moves into the Victorian period, dramatizing an encounter between Darwin and Cuvier's post-mortem subject, here called 'Sarah',[7] in order to probe the conceptual connections between proto-evolutionary and evolutionary (polygenic and monogenic) theory.

The continuity of scientific racism from the early to the mid-nineteenth century is also examined in Barrett's *Voyage of the Narwhal*, set in the 1850s, in which the explorer Zeke brings back an Eskimo woman and child from his expedition to the Arctic and exhibits them in scientific shows, at first alive and, following the death of the mother, in skeletal form. In a titular echo of *The Voyage of the Beagle*, the novel retraces a Darwinesque scenario, offering an alternative to science's colonial approach by embracing the perspective of a second, differently constituted naturalist equipped with a feminine sensibility: a quality which enables an empathetic response to the ethnic and sexual Other, opposes racial objectification and allows for a female contribution to the naturalist project. This female contribution is addressed further in Ruth Padel's poem cycle *Darwin: A Life in Poems* (2009), which places Darwin within domestic contexts and highlights the importance of women to the development of his thought.

That women could play a pivotal role as naturalists in their own right is the subject of Tracy Chevalier's *Remarkable Creatures* (2009). The novel focuses on the early nineteenth-century fossil hunters and palaeontologists Mary Anning and Elizabeth Philpot, both historical figures, depicting their struggle to be acknowledged by male scientific circles. Anning's discovery of ichthyosaur, plesiosaur and pterosaur specimens challenged religious dogma and became key to extinction theory, influencing Georges Cuvier and Charles Lyell, whose *Principles of Geology* (1830–33) in turn inspired Darwin on his *Beagle* voyage (Desmond and Moore 1992: 116; Padel 2009b: xii–xiv). Each of the texts poses probing questions about the colonial heritage of science and its racial and sexual politics. This imperial legacy is at the centre of Chase-Riboud's *Hottentot Venus*.

Barbara Chase-Riboud, *Hottentot Venus* (2003)

In Saartjie Baartman, 'All biographies become One': thus reads the concluding line of 'Africa Rising', the poem about African women which accompanies Chase-Riboud's 1998 sculpture of the Hottentot Venus displayed at the African Burial Ground in New York (*Africa Rising* Brochure).[8] The sculpture and the novel are 'intimately intertwined'; one determined the other (Spencer 2009: 750), and both endow the black woman with the beauty, vitality and agency she was denied by

[7] To distinguish between the historical subject (in criticism variously rendered as Saartjie, Sartjie, Sara, Sarah Bartman or Baartman) and Chase-Riboud's character, the name Sarah will be used to refer to the novelistic figure.

[8] This site of the segregated mass burial ground for slaves is located below Wall Street and was accidentally uncovered during digging work in 1991; see Miranda and Spencer 2009: 922.

Western science. Baartman's case, Chase-Riboud affirms, encapsulates 'the whole history of scientific racism from the beginning to the end' (Spencer 2009: 740). The novel metaphorically dissects the scientists whose gaze, pen, and scalpel dissected Baartman. Baartman's exhibition followed in the wake of ethnographic studies that had established Africans as the lowest rung of humanity, the point of contact between animals and humans in a chain of biologically fixed hierarchies.[9] Comparative autopsies of humans and animals and the study of skeletons served to provide scientific evidence for the existence of this chain, in which primates, in particular the orangutan, and African peoples were held to represent 'transitional forms'; the black woman, doubly deviant vis-à-vis normative white masculinity, came to be seen as the embodiment of racial and gendered alterity (Schiebinger 1993: 148). Baartman thus constituted the epitome of abjection, while simultaneously being invested with sexual fantasies which focused on her buttocks as displaced markers of African women's exoticized genitalia: the preoccupation of ethnographers since the seventeenth century.

Baartman's exploitation reached an apex with her three-day subjection to the scientific observation of her nude body in the Jardin des Plantes, the gardens adjoining Cuvier's natural history museum, Paris, in 1815 (Holmes 2007: 135–7). Chapter 18 of the novel re-imagines the factual events through the eyes of one of Cuvier's staff painters. The racist and dehumanizing statements articulated in her very presence by Sarah's scientific observers are, Chase-Riboud notes, key to her book's conception (Spencer 2009: 752), and are drawn from Cuvier and other Enlightenment and nineteenth-century scientists, philosophers and statesmen, including Broca, Galton, Hegel, Huxley, Jefferson, Lincoln and Voltaire (Chase-Riboud 2004: 319). Enlightenment science, as Ashraf Rushdy points out, is thus exposed as the very 'source of slavery' (Rushdy 2009: 770). The ostensibly factual premise of scientific discourse is uncovered as mere fabrication: the 'Heroine's Note' which introduces the novel connects the colonial project of subjugation through naming with fairytale tropes (Miranda and Spencer 2009: 916).[10]

The black woman was more than a personification of racial abjection. The scientific obsession with Baartman as a specimen of a racially and sexually Other genus was underpinned by distinctly pornographic impulses. This can be inferred from the factual Georges Cuvier and Henri de Blainville's fruitless endeavours to persuade Baartman to permit an examination of her genitalia (see de Blainville 1816: 189). The subsequent reproduction of a lithograph of her nude body taken at the Jardin des Plantes exhibition in Frédéric Cuvier (Georges's brother) and Geoffroy Saint-Hilaire's *Natural History of Mammals* (1824) illustrates the interlocking discourses of racial and sexual abuse to which Baartman was subjected.

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[9] For an overview of the historical contexts of the Baartman case see Qreshi; for the novel's representation of science see also Heilmann and Llewellyn 2010: 120–31.

[10] 'Once upon a time, there was a Khoekhoe nation … [T]o tell … my true story, I was stuck with a name we didn't choose but must use so that those who gave us these names may listen' (Chase-Riboud 2011: n. pag.).

As the only human display object in a book on mammals, Baartman was singled out as the embodiment of African sub-humanity; at the same time the emphasis placed on her breasts conferred erotic value on her body as an object of desire for the male scientific gaze. The pornographic gaze was also at evidence in Cuvier's autopsy report. Addressed at his male fellow-scientists – 'the intelligentsia born of the Age of Enlightenment: medical doctors, anatomists, paleontologists, alienists, naturalists, evolutionists' (Chase-Riboud 2004: 281) – it repeatedly refers to 'our Bushwoman' (Cuvier 1817: 264, 270, 271). In the novel Cuvier takes triumphant quasi-sexual possession of the secrets of a body which during Baartman's lifetime always eluded his grasp, brutally laying it bare to the penetrative gaze of the scientific fraternity: 'I have the honor to present to the Academy the genital organs of this woman, prepared in a way that leaves no doubt about the nature of her apron' (Cuvier 1817: 266, Chase-Riboud 2004: 282). Chase-Riboud bestows a measure of agency on her violated heroine by granting her a post-mortem voice that offers a commentary on the proceedings, thus exposing the male scientist's disturbed psyche to the condemnation of the reader. As Carlos Miranda and Suzette Spencer argue, Sarah's spectral voice and gaze serve to invoke 'specularity to interrogate specularity, several overlapping histories of subjection foundational to modernity, and readers' own investments in these histories' (Miranda and Spencer 2009: 926).

That these histories are complicated by internal contradictions, as Rushdy points out, is brought to the reader's attention through Chase-Riboud's use of chapter epigraphs from Cuvier's writings which contest the old canons of science such as the Chain of Being theory, only to reinstate them in Cuvier's response to Baartman (Cuvier 1817: 769). Thus extracts from Cuvier's *Lectures in Comparative Anatomy* (1800–1805) pronounce that 'There are no missing links', deriding the idea that 'one can arrange all organisms into one long series' as 'the most untruthful concept ever introduced into natural history' (Chase-Riboud 2004: 219, 307). Yet when the fictive Cuvier is faced with Sarah, he instantly reaffirms the belief in an unalterable difference between black and white as 'two separate and distinct species' (Chase-Riboud 2004: 215). During the autopsy the old philosophy assumes the significance of a quasi-religious credo: 'In the Great Chain of Being that credits the Hottentot as being the missing link between animal and human realms, Sarah Baartman is the true transitional figure between man and ape.' (Chase-Riboud 2004: 282)[11] The recourse to outdated theories, Slamisha Tillet argues, enabled Cuvier to '"prove" French cultural and racial supremacy while simultaneously justifying French colonisation, enslavement, and disenfranchisement of blacks in both Africa and the New World' (Tillet 2009: 945).

Of all the scientist figures, Nicolas Tiedemann, the painter present as Cuvier's exhibition, stands alone in recognizing Sarah's humanity. Chase-Riboud's character is drawn from Cuvier's in-house painter Nicolas Huet (Holmes 2007: 137, 145) and Frederick Tiedemann, an abolitionist scientist who used comparative brain

[11] Cuvier and de Blainville's reports both drew attention to what they considered Baartman's simian features.

dissection to refute the hypothesis that black Africans were more closely related to primates than to whites (Tiedemann 1836: 519, 521, 525–6). This provides the context for the penultimate chapter of the novel, set in the year 1860, in which Sarah's spirit observes the conversation between Tiedemann and Darwin in front of her display case in Cuvier's natural history museum. The encounter between the two generations of scientists marks the continuation of scientific racism in the Victorian period. Indeed, the mid- to later-nineteenth century experienced a hiatus in renewed scientific interest in Baartman as paradigm proof of racial hierarchies (Crais and Scully 2009: 145). By this stage the earlier theory of polygenism had been replaced by evolutionary monogenism. Polygenism posited the proliferation of different species of humans fundamentally different from each other, while monogenism embraced the concept of humanity as one single species.[12] Despite the rise of monogenism the claim for white supremacy still relied on the notion of a racial ladder, with Africans placed at the bottom. References to the 'grotesque' appearance of the 'Hottentot Venus' served to establish the superiority of European precepts of aesthetic beauty (Hudson 2008: 34). Darwin's *The Descent of Man* (1871) utilized the example of Hottentot steatopygia as a means of drawing attention to the variability in aesthetic sensibilities between races: what was regarded as a marker of beauty in one race could be perceived as deformity by another (Darwin 2004: 645–6). In the novel Darwin refers to his well-known image of the 'tree with many branches' (Darwin 2004: 294; Padel 2009b: xv) to challenge racial hierarchies, but he nonetheless honours Cuvier's achievements: 'The work of Cuvier is primordial, his theory of catastrophe brilliant.[13] Every scientific discovery stands on the shoulders, or rather on the brain, of its predecessor.' (Chase-Riboud 2004: 299) Faced with Tiedemann's sense of guilt, Darwin justifies Baartman's scientific abuse with reference to 'modern science, anthropology, ethnology … paleontology … zoology … anatomy … After all, it is science, civilisation, history, progress, truth which are at stake' (Chase-Riboud 2004: 300). Darwin's *esprit de corps* and loyalty towards the father generation of scientists overrides the conceptual and ideological differences between Chain of Being and evolutionary theories. Indeed, as Clifton Crais and Pamela Scully observe, Cuvier was of pivotal importance not only to nineteenth-century science but to Darwin himself: 'Without Cuvier, Darwin may well not have discovered evolution' (Crais and Scully 2009: 131).

In contrast to Chase-Riboud's representation of Darwin, Barrett's Victorian naturalist of *The Voyage of the Narwhal* not only breaks with scientific traditions but also transgresses against the principle of professional and even family allegiance when he rebels against his prospective brother-in-law Zeke's command and later releases the Inuit child Tom from captivity. Like Darwin, Erasmus is a monogenist, but while Chase-Riboud's Darwin traces a slave-making instinct

[12] See Stephen Jay Gould's summary of Louis Agassiz's ideas in 1980: 141.

[13] Cuvier's evolutionary theory was premised on the concept of a series of catastrophes causing the extinction of species.

in an ant species, thus implying a biological cause for the equivalent impulse in humans (Chase-Riboud 2004: 296–98; Darwin 2009: 708–12), Erasmus asserts that the concept of polygenism must be rejected precisely because it opens the door to slavery: 'Differentiation always implies ranking' (Barrett 2000: 121); a point reaffirmed by his abolitionist friend and sister-in-law Emily: 'polygenism is harmful because of the ammunition it provides to the proponents of slavery' (Barrett 2000: 272). Emily here refers to Louis Agassiz, whose mid-nineteenth-century differentiation of humans into eight distinct species furnished support for racial subjugation (Gould 1980: 142). Agassiz's position was challenged in *The Descent of Man*, where Darwin argued that 'the most weighty of all the arguments against treating the races of man as distinct species, is that they graduate into each other, independently … of their having intercrossed' (Darwin 2004: 203). It is Louis Agassiz and A.A. Gould's *Principles of Zoology* (1848) that in Barrett's novel propels Erasmus into writing his own counter-narrative to Zeke's distorted version of natural history. His belief in the common cause of all races prompts a deep conviction in the moral responsibilities of the scientist and the imperative of being guided by a humanitarian ethos. This impels him to intervene in Zeke's exploitation of Annie and Tom, the Eskimo mother and child Zeke displays to rapt scientific audiences gnawing raw meat in indigenous attire. Erasmus's endeavours come too late for Annie, who dies of exhaustion, and whose skeleton is instantly mounted in the museum, where it joins the stuffed dog of the explorer Dr Kane. As in *Hottentot Venus*, the text highlights the scientific equation of the racially Other woman with the animal.

Andrea Barrett, *The Voyage of the Narwhal* (1998)

While Barrett's novel takes its inspiration from the various Arctic recovery missions undertaken in the late 1840s and 1850s to find traces of Sir John Franklin's lost expedition of 1845,[14] its title manifestly echoes Darwin's *Voyage of the Beagle* (1839). Ironically, Darwin's concluding assertion that 'nothing can be more improving to a young naturalist, than a journey in distant countries' (Darwin 2009 [1839]: 516; Barrett 2000: 290) serves as an epigraph to the chapter in which Erasmus returns from a traumatic two-year confinement to the Arctic ice, where he lost his best friend, half of the Narwhal crew, all of his specimens, and eight of his own toes, to face public disgrace for abandoning his commander and brother-in-law. The novel illustrates the extreme human cost of the public ethos established by Franklin of 'polar exploration as a humanistic enterprise involving great self-sacrifice' by dramatizing the despotism, loss of life and racial abuse involved in a tragically misconceived notion of masculine heroism (King 2005: 43). It also invokes the deceit that underpins this trope through the discovery of traces of cannibalism among the explorers (Craciun 2011: 446), evidence hotly refuted

[14] Franklin's exploration of the Northwest Passage resulted in the loss of the crew of two ships (Glendening 79).

in the novel by the authorities. Like ethnographic and anatomic studies of the fundamental alterity and therefore subhumanity of the black body, Franklin's and other expeditions served the imperial project by helping 'map the hinterlands of Britain's most remote territorial interests, the aboriginal lands beyond its existing North American colonies'; massacres of local populations were 'covered up by the Admiralty' (Craciun 2011: 472, 478).

If the ruthless explorer Zeke appears modelled on Franklin, *The Voyage of the Narwhal* draws numerous parallels between the figure of the compassionate – hence vulnerable and, again, feminized – naturalist, Erasmus, and Darwin: both have a difficult father relationship (with the difference that Erasmus is propelled on his first expedition, in his early twenties, by the intervention rather than against the resistance of his father); both lost their mother early in life; and both suffer from psychosomatic illnesses (Darwin's manifesting itself in vomiting spells, Erasmus's in 'blinding headaches'; Barrett 2000: 35). Like Darwin's, Erasmus's health was permanently impaired as a result of his travels. Erasmus's position on the Narwhal resembles Darwin's on the Beagle: both are unsalaried naturalists who act as companions to unpredictable and despotic commanders. Zeke shares important aspects with Darwin's Captain FitzRoy, including his ferocious temperament, deficiency in 'sound judgment or common sense', and staunch belief in the righteousness of slavery (Darwin 2002: 40).[15]

For all his correspondences with Darwin, Erasmus nevertheless appears his flawed counterpart: far from the starting point, his voyage almost marks the end of all ambitions. Aged forty, he already has an unsuccessful expedition behind him, and sets out with the hope to redress his previous failure. On his first voyage, in his early twenties, he had been forced to hand over his notes, to see them published under his commander's name, the stepping stone of his international fame.[16] As King observes, the novel uses the dual motif of an expedition and the narrative about the expedition to draw attention to the interrelationship between processes of colonial appropriation, narration and historiography (King 2005: 45). For Erasmus history repeats itself when Zeke demands that everybody sign over their diaries to him for his sole disposal, and undertake not to publish any account of their journey for up to a year after their return. As a man of an autocratic disposition, who in the face of his crew's desperate desire to return home contrives to delay their departure indefinitely, Zeke recalls Franklin and his disastrous 1819–21 expedition, which resulted in the death of most of his crew while expediting his scientific standing as the author of the *Narrative of a Journey to the Shores of the Polar Sea* (1823): for

[15] Zeke, however, appropriates others' accounts, whereas FitzRoy published Darwin's early *Beagle* work alongside his own (Padel 2009b: xi). It was Darwin (in his 1830 *Journal of Researches*) rather than FitzRoy who stood accused of failing to acknowledge other scientists (Nevel 2002: xviii).

[16] The novel here draws on the US South Sea Exploring Expedition of 1838-42 led by Charles Wilkes (Philbrick 2013;Tyler 1968). Thanks are due to Lyndsey Evans for drawing my attention to this historical context.

Zeke as for the historical Franklin, glory and commercial success override regard for human life (Craciun 2011: 435, 456, 463). In this respect Zeke also carries literary echoes of *Frankenstein*'s arctic explorer Walton; in his role as Erasmus's nemesis he further evokes aspects of Frankenstein's creature. The futility of Zeke's aggressive and casualty-laden version of exploration is indicated by both Annie and the captain of the Harmony, who rescues the surviving crew members: 'Like children', Annie reflects, 'they gave their names to the landscape, pretending to discover places her people had known for generations' (Barrett 2000: 344).[17] Annie's statement is reinforced by the captain of the whaling boat: 'All you men who go off on exploring expeditions, with funding and fanfare and special clothes, thinking you'll discover something when every place you go some whaling ship has already been' (Barrett 2000: 144). The impulse for exploration originates from the personal narcissism of the privileged under-employed.

This version of masculinist science is countered by the novel's concluding section, which depicts an alternative community of humanitarian scientists, artists, colonial and social Others, composed of Erasmus, his painter brother, the Inuit boy Tom, an Irish Famine survivor and former cook of the *Narwhal*, and Alexandra Copeland, Barrett's New Woman character. Equipped with a strong drive for independence and an active life, Alexandra pursues her professional training with stealth and determination. The illness of her male mentor, an engraver, enables her to become a professional. The major part she takes in completing a commission under the engraver's identity gives her the confidence to illustrate Erasmus's natural history book in her own name. Her encouragement of Erasmus's venture is instrumental in lifting his depression, superimposing, as King notes, 'a narrative of female emancipation' on the 'surface plot of masculine discovery' (King 2005: 40). The novel ends with Alexandra and Erasmus's shared work on his book and a return journey to the Antarctic. Jointly undertaken by Erasmus and Alexandra, this is a voyage to redeem all the previous expeditions, with the aim to reunite Tom with his community. The positive outlook of a successful working partnership (replicated in real-life scientific couples like the Bucklands and Mantells)[18] outlines the potential for a different kind of engagement with science and nature exploration, which refuses to take hostages and lives in harmony with rather than in subjection of other races. As King observes, the novel thus provides a counterpoint to the separate spheres argument upheld by *The Origin of Species* (King 2005: 38, 49).

The curative effect of a companionate marriage and the importance of an emotionally engaged life empathetic to, and shared with, others are also central to Ruth Padel's poetry cycle on Darwin. If Barrett's authorial interest in science derives from her background in biology and zoology (van den Berg 2007: 208), Padel's is shaped by family inheritance and her identity as Darwin's great-great-granddaughter.

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[17] A similar point is made by Chase-Riboud in *Hottentot Venus* 2007: 17.

[18] Mary Morland Buckland, a geologist and one-time illustrator for Cuvier, assisted in her husband William's work, while Mary Mantell provided drawings for Gideon's books (Pierce 2006: 57, 60).

Ruth Padel, *Darwin: A Life in Poems* (2009)

In a matrilineal nod to her patrilineal legacy, Padel attributes the inspiration for her poem to her grandmother, Darwin's granddaughter Nora Barlow (Padel 2009a: xiii–xiv). Barlow edited the first unexpurgated edition of Darwin's *Autobiography* in 1958, reinstating a paragraph previously omitted at Emma and (her son) Francis Darwin's instigation, in which Darwin emphasized his religious disbelief with reference to Christianity's punitive doctrines (Padel 2009a: xiv; Darwin 2002: 50; Browne 2002: 433–4). Padel's 'biopoem' represents what Richard Holmes calls a 'new species of biography' by creating 'emblems' of the inner life of the man organized around quotations from his correspondence, journals, autobiography, and scientific work, annotated with marginal contextual notes (Holmes 2009: n. pag.). The composite structure of the poem cycle dramatizes the composite nature of the voices reconstructed, imagined, documented. An apt illustration of Padel's use of vernissage techniques is 'The Balance Sheet' (2009a: 59), which reproduces, in altered format, Darwin's list of reasons for and against marriage, compiled in July 1838 (Desmond and Moore 1992: 257).

Where Darwin placed two columns side by side – a possible sign of the initial open-endedness of the question which may suggest that it was only in finding more to add to the 'Marry' column that he arrived at his decision – Padel assigns both categories roughly the same amount of space, but her top-to-bottom structure erases the dialogic set-up of Darwin's decision-making process and pre-empts the outcome as 'Against' necessarily turns into 'For' as the reader moves down the page. If the historical man chose to start his columns with 'Marry', Padel's Darwin seems more set against marriage at the start. It is left to the reader's discretion to resist her linear textual representation and compare the content of the two answers line by line. While Darwin had placed 'Children' against 'Freedom to go where one liked' as his first pair of opposites, Padel draws on his second reason for marriage, highlighting his need for 'A constant companion … Better than dog'. Each of the three couplets 'for' marriage place attention on Darwin's objectification of the wife-to-be into a utilitarian entity whose sole function it is to provide creature comfort: 'An object to be loved and played with' / 'good for one's health' / 'think of a nice soft wife on a sofa, looking at me / with a good fire and books'. Small wonder, perhaps, that Darwin, real and re-imagined, came to the conclusion that he had better 'Marry, marry, marry, Q.E.D.' (Padel 2009a: 59; Aydon 2002: 136; Desmond and Moore 1992: 257). His proposal to Emma Wedgwood, his first cousin and childhood friend, followed some four months later. While his 'Balance Sheet' gives little sense of Darwin's desire, or capacity, to share a life with another human being whom he would take seriously as an individual, Padel goes to great lengths to show that the purely functional place marriage and a wife initially occupied in his mind quickly transmuted into a profoundly affectionate, intense relationship to an individual who became and remained of vital importance to him (the factual Darwin extolled his wife as his 'greatest blessing'; Darwin 2002: 56). Once he has made up his mind about his choice of future wife, Padel depicts

his extreme fear of rejection (prompting psychosomatic disorders), his decision to ignore his father's advice by confiding his religious doubts to Emma, a devout Christian, and the depth of feeling with which he responded to the letter she wrote him while pregnant with their first child, fearing she might die and in death be forever separated from him because of his lack of faith: 'When I am dead, / know I have kissed and cried over this many times' ('He Leaves a Message on the Edge', Padel 2009a: 80; Browne 2002: 236).

Emma is key to Darwin's emotional life. Her voice, the widow's, concludes the book. While Darwin's autobiography devotes considerable space to his father's towering personality and his strong bonds to other male scientists (Valerie Sanders draws attention to Darwin, Huxley and Hooker's homosocial attachment within their heterosexual family contexts; 140), Padel's poem cycle is structured around his relationships with women: his wife, his mother and his daughter Annie. A traumatic caesura in his life, Annie's death in 1851 consolidated his belief in evolution while also intensifying anxiety about the defective genetic legacy he might have inflicted on his children (Sanders 2009: 160). Padel emphasizes its catalytic effect on his rejection of Christianity: from then on he would accompany the family to church on Sundays, but leave them at the door ('The Devil's Chaplain', Padel 2009a: 103–4). If the loss of his daughter determined his categorical dismissal of religion,[19] it was his mother who, in Padel's vision, set the scene for his journey into nature exploration. The mother's naturalist-poetic lesson about flowers initiates the cycle and, it is implied, provides the spark for the boy's development: 'He brought a flower to school. / He said his mother / taught him to look inside the blossom / and discover the name of the plant.' ('The Chapel School', in 'Finding the Name in the Flower', Padel 2009a: 3).[20]

Like the flower, the mother remains inscrutable, and the young boy is haunted by the silence following her death: a silence repeated many years later, when it threatens to overwhelm his daughter Ettie, 'terrified of all the no-talking' after Annie's death ('The Devil's Chaplain', Padel 2009a: 103). The mother's loss is further symbolized by her facelessness: where Elizabeth Barrett-Browning's heroine Aurora Leigh suffers from the overabundance of male representations of the maternal, eternally feminine face, Darwin has 'No memento of her face' at all ('The Year My Mother Died', Padel 2009a: 3). A lifetime later, after another funeral, he rediscovers her likeness: 'in a box from London, from a brother', 'a pretty face kept secret / all these years.' ('He Discovers a Portrait of his Mother', Padel 2009a: 139). This poem of maternal rediscovery is placed in penultimate position, thus acting as a mirror to 'The Year My Mother Died', the second poem in the cycle. The mother, her loss and recovery, frame Darwin's life cycle: his voice

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[19] In Darwin's *Autobiographies* this is presented as a gradual process originating from his scientific observations (2002: 50).

[20] This contrasts with the near-absence of the mother from the *Autobiographies* and the lack of any 'distinct remembrance of any conversations' with her; rather, here it is a fellow student at school who initiates the boy into collecting minerals (2002: 2–3).

begins and ends with his mother. (Chase-Riboud too has Darwin reminiscence about his mother, who, he tells Tiedemann, first took him to see Baartman: like the miniature Darwin finds in Padel, Baartman's fractured body parts come to stand in for the dead mother; Chase-Riboud 2004: 295).

Darwin's emotional proximity to women, Padel suggests, enhanced a naturally feminine sensibility and temperament that only briefly deviated into more traditionally masculine pursuits (snipe shooting in his youth). Femininity and masculinity are here again juxtaposed, with femininity being aligned with a more fully developed impulse towards humanitarianism. Two haunting experiences combine to shape the young Darwin's humanitarian impetus: the horror of the operating theatre in Edinburgh ('Haunted', Padel 2009a: 13), the horror of slavery in Brazil: 'lightning / snaps beneath his feet. He sees the slaves / themselves. Auctions. Blows. Humanity betrayed.' ('A Quarrel in Bahia Harbour, Padel 2009a: 34). This is what will distinguish him from other scientists, making him impress on his children that 'shooting is cruel' – 'Since *Beagle*, he hasn't used [a gun]' ('Painting the Bees', Padel 2009a: 114). In stark contrast, Alfred Russell Wallace, his companion in evolutionary thought, is depicted as an adept in the science of brutality. Padel draws on Wallace's account of his hunt of Great Apes in 1855 to establish his cruelty in the face of his recognition of the Mias's kinship to humans. Because they have no animal enemies, they are not alert to danger; their innocence and peaceful nature make them an easy target. His only disappointment derived from the Mias's habit, when wounded, to build nests in which to die: 'If they finish it they never fall. / I lost two that way'. Wallace recalls shooting mothers with babies clinging to their bodies. That he notes females only giving birth to one child at a time and emphasizes how much effort it took to kill each one of them turns the slaughter of primates into a form of genocide ('Journey up the Sadong River', Padel 2009a: 109–11).

There is nothing much to distinguish Wallace's barbarity from that of the slave-hunters Darwin had observed in Brazil. Darwin, by contrast, is shown in communication with Jenny, an orangutan exhibited in London Zoo in 1837. Padel lends Jenny a voice, thus signalling an exchange ('Notebook M', Padel 2009a: 53). Ultimately, her text establishes Darwin and his approach to science as premised on a strong humanitarian ethos, whereas Wallace, for all his insight into evolution, represents the 'old', morally irredeemable science driven by conquest: a tradition of inhumanity and cruelty for cruelty's sake.[21] By equipping Darwin with a new

[21] Wallace's response to apes has discomfiting contemporary resonances. The *Times Higher* issue of 4–10 August 2011 reported on *Project Nin*, a documentary about a chimpanzee who was brought up as a human and taught sign language as part of a scientific experiment. When the project was concluded after five years, the chimpanzee was abandoned. '[P]laced in a cage full of other chimpanzees – an environment to which he was completely unsuited', he was subjected to hepatitis and HIV injections to test experimental vaccines. As Duncan Wu notes, 'One of the most heartbreaking remarks in the film comes from one of those involved: "We were aware that the animals were attempting to communicate with us using sign language, but none of us understood it"' (2011: 47).

sensibility, Padel makes him susceptible to the frailties of a symbolic femininity. It is almost as if his bouts of illness were psychologically self-inflicted, bodily symptoms of his rejection of, revulsion from the destructive body politics of his fellow scientists. This is reminiscent of Barrett's Erasmus Darwin and also, to an extent, of Tiedemann in *Hottentot Venus*.

The three texts discussed so far all dramatize a conflict between 'old' and 'new' approaches to science by setting up a contrast between two types of scientist. There is first the 'masculinist' explorer intent on subjugating nature, women and other races; a man wrapped up in himself, alienated from human society other than his community of like-minded scientists, who is driven by the need to establish or maintain his name and fame: this reflects Padel's Wallace as much as Barrett's Zeke and Chase-Riboud's Cuvier. An alternative to this figure is presented in the shape of a feminized, sensitive, humanitarian naturalist, who, because he sees the common ground rather than the differences between and within species, discovers new ways of conceptualizing the world, its origins and evolution; this applies to Padel's Darwin, Erasmus Darwin in Barrett's novel and Tiedemann in *Hottentot Venus*. A man painfully unsure of himself precisely because he goes against conventional wisdom, this 'new' kind of scientist is given to self-doubt, which manifests itself in hysterical ailments. He is vulnerable to censure by, and indeed shown to suffer intense fear of becoming the target of, other scientists (see Erasmus Darwin in *Voyage of the Narwhal*, see also Darwin's two decades of hesitation about publishing his evolutionary theory). The metaphor of the 'voyage in' adopted by these texts serves to visualize the ossification of old-style science and the birthing pangs of the new humanitarian scientist, who cuts himself adrift from the politics of domination before he has as yet found and formulated a new system of thought with which to replace it. The literary metaphor of the frail and feminine 'new' scientist is deeply indebted to the symbiotic relationship Darwin himself established between his wrecked body and his revolutionary science. As Janet Browne argues, illness was 'integral' to Darwin's self-presentation as the author of *The Origin of Species* and constituted an effective means of 'avoiding tiresome social obligations and unpleasant scientific controversy'. By drawing on his invalidism as a device for promoting his work, Darwin initiated a process through which 'his "public" body gradually came to evoke the disembodied quality of thought' (Browne 2002: 318–9).

If contemporary women writers' Darwinian characters are distinguished by their troubled, feminized bodies and minds, their female counterparts thrive in situations of conflict and display the physical prowess the men lack. The sea journey as a metaphor of transformation pertains to them too, albeit in a different way. Arguably for the black object of the imperialist gaze, Baartman, there is little difference: her voyage from South Africa to Britain takes her from sexual and racial persecution in her home country to sexual and racial objectification and post-mortem mutilation in Europe. But for the white middle-class women characters the sea journey represents not so much a voyage in, as it does for the men, as rather a voyage out and away. A wholesale break with the female condition

of domesticity, passivity and dependency, this journey promises the attainment of independence and a professional life. Thus in *Voyage of the Narwhal* Alexandra is able to combine Erasmus's return journey to the Arctic with a homecoming for Tom and a vehicle of personal liberation for herself. As she assures Erasmus, who is reluctant to subject her to the discomfort and danger of the trip, 'I *want* to go … It's what I've always wanted. … I want to *see*. I want to travel, I want to see everything' (Barrett 2000: 387). This is also the case for Elizabeth Philpot, Chevalier's spinster in constrained circumstances. When, as in Austen's *Sense and Sensibility*, Elizabeth finds herself and her sisters displaced to the provinces after their brother's marriage, she experiences a consummate transformation as a result of a short sea journey from Lyme Regis to London, undertaken to persuade the Geological Society formally to recognize her friend, the working-class fossil hunter Mary Anning. Having always thought of the sea as a 'boundary keeping me in my place on land', she now comes to perceive it as 'an opening … On board the *Unity* I had no choice but to see the greater world, and my place in it.' (Chevalier 2009: 286) The feeling of independence she develops in the course of her journey generates a new sense of self and a professional identity: 'I was responsible for myself. I was Elizabeth Philpot, and I collected fossil fish' (Chevalier 2009: 289).

Tracy Chevalier, *Remarkable Creatures (*2009)

This final novel returns us to the early nineteenth century and the scientists who preceded and influenced Darwin: Georges Cuvier and his theory of evolution resulting from a series of catastrophes, which Darwin countered with his theory of continual gradual evolution; Charles Lyell and his *Principles of Geology*, which accompanied Darwin on the *Beagle*. The 'remarkable creatures' of the title refer to the dinosaur species – ichthyosaur and plesiosaur specimens – whose discovery challenged the Christian doctrine of Genesis and the divine creation of all beings, providing proof of the evolutionist concept of extinction. The title also denotes the agents of this discovery: the two historical women, Mary Anning and Elizabeth Philpot, whose voices narrate the story, and who, like the creatures they unearth, move from obscurity to scientific recognition. This novel, then, traces the female contribution to the new field of palaeontology and the emergence of the woman naturalist at the very time when science was engaged in defining (black) femininity as monstrosity (the novel's time frame of 1804–21 covers the period of Baartman's exhibition): three quarters of a century before women were to gain access to a university science education.

Anning came from a working-class dissenting family in Lyme Regis and took to fossil hunting following the lead of her carpenter father, who was intent on subsidizing his trade (Torrens 1995: 258–9). That she survived being struck by lightning as an infant became a staple of her legend (Pascoe 2006: 141). The incident serves Chevalier as a metaphor for establishing her heroine's quasi-elemental difference from others, a sense of uniqueness which enables her to

disregard conventions in her work as a fossilist. The support and encouragement Anning received from older women[22] are in the novel gathered together in the figure of Elizabeth Philpot, with whose encouragement Mary learns to read at Sunday school. A London solicitor's daughter, Philpot became a fish fossil collector alongside two of her sisters after their move to Lyme Regis in 1805 (Pierce 2006: 68–9); her collection was studied, and one of her fossils named, by Louis Agassiz (Pierce 2006: 102, 179). Anning's discovery of the first complete ichthyosaur and plesiosaur skeletons (Pierce 2006: xi) and struggle to have her contribution acknowledged are dramatized in the text in the course of four consecutive finds,[23] three of which involve a male scientist's betrayal, each time prompting Elizabeth's spirited intervention. The first ichthyosaur specimen (discovered by Joseph and Mary Anning in 1811–12, when Anning was twelve; Torrens 1995: 259) is bought for a small sum by the local MP Henry Hoste Henley and later sold on (for considerable profit) to William Bullock's Egyptian Hall in London (and thence to the British Museum in 1819; Torrens 1995: 260), where Chevalier's Elizabeth is outraged to come across the skeleton dressed in a waistcoat and with a monocle pressed into one of its eyes. (A year earlier, in 1810, the factual Bullock had been offered, but refused to display, Baartman; in 1824, he would have less compunction about exhibiting Eskimos; see Altick 1978: 275.) Mary's second ichthyosaur is sold on her behalf by the Oxford geologist, the Reverend William Buckland (a man Darwin considered good-natured if 'vulgar and almost … coarse')[24] to a private collector. The third ichthyosaur is appropriated by Lieutenant-Colonel Thomas James Birch, who in the novel deploys his sex appeal to seduce Mary into working for him without remuneration and then departs with an exceptional collection of fossils, leaving a heart-broken Mary behind.[25] It is only when Elizabeth demands payment for Mary that he auctions his collection off, transferring the proceeds to the poverty-stricken Annings.[26] This emotional crisis is followed by a professional one, when Mary's fourth find, a plesiosaur (discovered in 1823), elicits a patronizing response from Cuvier, whom Anning had consulted about the unusual length of the animal's neck: 'Baron Cuvier holds the view that the structure of the reported plesiosaurus deviates from some of the anatomical laws he has established.' (Chevalier 2009: 281) Cuvier's (factual) insinuation of fraud (Torrens1995: 264) prompts Elizabeth's journey to London, where she persuades Buckland, the incoming President of the Geological Society, to credit Mary for her discovery of the specimen to be exhibited to the Society,

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[22] Her first mentor was a wealthy local lady who presented her with a geology book; later she made friends with scientist wives Mary Buckland and Charlotte Murchison (Pierce 2006: 17, 60, 131–32; for Murchison also OND).

[23] Anning's most important historical five finds between 1811–12 and 1830 (Torrens 1995: 266–7) are in the novel contracted into the shorter period 1811–24.

[24] Darwin, *Autobiographies* 59. For details of Buckland see Pierce 2006: 52–8.

[25] For rumours about Anning and Birch see Torrens 261; also Pierce 2006: 162–64.

[26] The auction released £400 and took place in Bullock's Egyptian Hall in 1820 (Pierce 2006: 25–6, Torrens 1995: 261).

thereby restoring her professional reputation.[27] Listening to Buckland's speech from the landing outside the room (ladies being no more permitted entry to the Geological Society than working-class women like Anning are allowed access to Lyme's Assembly Rooms), Elizabeth believes that her mission has failed: 'That is all she will get … a scrap of thanks crowded out by far more talk of glory for beast and man. Her name will never be recorded in scientific journals or books, but will be forgotten' (Chevalier 2009: 308). In the event, Buckland's speech to the Geological Society proved to be the making of Mary's international reputation, establishing '23 year old Mary as a curiosity in her own right. People now came to Lyme to visit *her*' (Torrens 1995: 264). Even in her lifetime Anning became the object of mythmaking and has since inspired multiple responses in the form of fiction, poetry, television, dance and cartoons (Torrens 1995: 283, 277). In Chevalier's novel a visit by Charles Lyell and Charles Prevost, a collaborator of Cuvier's, culminates in Prevost's purchase of a plesiosaurus specimen for Cuvier's natural history museum.[28] As Judith Pascoe points out, Anning's 'finds served as the building blocks of nascent geological sciences', directly influencing the work of Louis Agassiz and Gideon Mantell (Pascoe 2006: 140–1). Chevalier notes in her 'Afterword' that Cuvier was the first scientist to name Anning in writing, in 1825, followed by Buckland in 1829 (Chevalier 2009: 347; also Torrens 1995: 266); Henry De la Beche, President of the Geological Society (as well as a one-time apologist of slavery),[29] honoured her achievements a year after her death, in 1848 (Torrens 1995: 270). Anning's fossil collection was visited by international scientists and European royalty (such as in 1844 the King of Saxony; Torrens 1995: 269). Against the double odds of gender and class Anning entered the annals of history and science as 'the greatest fossilist the world ever knew' (Torrens 1995: 257–84). In her review of Chevalier's novel, Padel draws a line of influence from Anning to Darwin (Chevalier 2009b; see also Pierce 2006: 148–9).

If, in dramatizing the professional and also emotional turmoil her female fossilists have to negotiate, Chevalier concludes with a feminist success story, Anning's 'afterlife' exemplifies the considerable tensions and complex gender dynamics that underpin representations of early women scientists. Pascoe argues that, because in her own time her contribution to science was 'only glancingly acknowledged' (Pascoe 2006: 141) – an experience which increasingly embittered Anning in her later years (Pierce 2006: 156) – twentieth-century and contemporary historians of science may have tended to downplay any association with femininity, either in Anning herself or in fictional portrayals of her by 'mostly women

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[27] The historical Anning received acknowledgement, by the Reverend William Daniel Conybere, only for being the 'proprietor' of the specimen. Cuvier's charges followed the Geological Society event and were laid to rest at another Geographical Society gathering in 1824 (Pierce 2006: 87–8, Torrens 1995: 263–4).

[28] Some of Anning's earlier finds, sold in the Birch auction, had already made their way to Cuvier (Torrens 1995: 261).

[29] As a plantation owner in Jamaica he had sought to defend slavery in the 1820s (Pierce 2006: 64–6).

writers [with] … general or child audiences in mind' (see Torrens 1995: 276–7). 'The Anning who was entangled in popular literature was faintly distasteful to scholars who wanted to advance her scientific credentials', a sentiment which, Pascoe notes, has also extended to male novelists like John Fowles (Pascoe 2006: 154).[30] Yet, as she points out, the 'emphasis on … myth-squashing … risk[s] overlooking the ways in which Anning was caught up in some myth-making of her own, and the extent to which she benefited from the proliferating legends', not least those by younger women enthusiasts like Anna Maria Pinney, who in diary entries of 1831 romanticized Anning as a 'dashing figure who lived a life of close escape and dangerous schemes' (Pascoe 2006: 155, 154–6). Pascoe draws attention to Anning's notebook, whose editorial selection principle resembles that of contemporary scientists (such as Gideon Mantell and Thomas Hawkins). In its interweaving of extracts from poetry, eighteenth-century literature (among them the bluestocking Anna Seward) and religious commentators with her own observations, Anning's Commonplace book reflects the 'blending of literary and scientific aspirations [common] in the romantic period', while at the same time signalling a self-conscious project of self-fashioning, through invocations of Byron, as a romantic hero (Pascoe 2006: 152–4; see also Torrens 1995: 269). In considering her self-constructionist endeavour, Pascoe presents Anning herself as a species of fossil, of whom only 'fragmentary remains' have been preserved (Pascoe 2006: 167). It is these fragments of mythical and historical narrative that Chevalier assembles together in order to provide a fictional commentary on the 'missing parts, pieces of a story that may never be entirely recuperable' (Pascoe 2006: 167). By exploring Mary's emotional and erotic fulfillment, however short-lived, alongside her professional achievements, she reclaims her from the image of the 'prim, pedantic vinegar looking, thin female, shrewd and rather satirical in her conversation' of contemporary scientists' description (Gideon Mantell; see Torrens 1995: 268).

In conclusion, in their revisionary accounts of nineteenth-century science and the emergence of Darwinian evolutionary theory, twenty-first-century women writers draw on the figure of the naturalist and explorer to raise feminist concerns about the gendered ethics of science, then and now. The Baconian tradition of the subjection of nature, animal and human life is condemned, and the figure of the masculine scientist rejected in favour of a flawed, feminine figure of indecision, whose evolutionary stance is informed by a firmly humanitarian outlook. Bacon's model of gender differentiation thus remains ultimately unchallenged, with femininity – rather than masculinity – being encoded as the agent of an advanced state of humanity. Politically invested counter-narratives to essentialist models prevalent in current popular biology and neuroscience (Fine), the texts associate the historical advent of Darwinism with the rise of an ethnically bound

[30] Fowles mentions Anning in his 1969 *The French Lieutenant's Woman* (46), where he erroneously claims that no species bears her name (six do, including two named by Agassiz; Torrens 281 n.147 and 282; Pierce 180). During his curatorship of the Lyme Regis Philpot Museum he discouraged fictional approaches to Anning (Pascoe 2006: 144–6).

science committed to gender and race equality, thereby exposing contemporary deterministic thought as pertaining to an obsolete form of science invalidated in the nineteenth century. By ending their protagonists' journeys with the recognition of the interconnectedness of all life, they arrive at similar conclusions as today's post-genomic science which, as Angelique Richardson points out, is increasingly 'concerned with the interdependence and connectedness of life and environment' (4). In their representations of Darwin and (proto-)Darwinian characters, post-millennial women authors emphasize the influence of women, creating female characters who embrace unconventional lifestyles in their search of personal liberation through scientific exploration. They thus also commemorate the contribution of women to the history of science.

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Chapter 6
(Mis-)Representations of Darwin's *Origin* and Evolutionary Master Narratives in *The Sea* (2005) and *The Secret Scripture* (2008)

Felix C.H. Sprang, Hamburg

Introduction

In their introduction to the *Cambridge Companion to Darwin's* Origin – published in the bicentenary year – Michael Ruse and Robert J. Richards, the editors, remind us at the very beginning that:

> [in] 1859, the English naturalist Charles Robert Darwin published his major work, the *Origin of Species*. In this work, he argued that all organisms living and dead are the end result of a long, slow, natural process of development from forms far simpler and that indeed all life, by reason of its descent from but a few ancestors, is related. He also proposed a mechanism, natural selection, meaning that only a few survive and reproduce and that success in this process is on average a function of the distinctive features of organisms – over time, this leads to change, change that is in the direction of adaptation. (2008: xvii)

At first sight, this seems to be an adequate summary of Darwin's theory. On closer inspection, however, we can see that Ruse and Richards resort to key terms that distort Darwin's theory of evolution as it is outlined in the *Origin*:

1. they use the term 'end *result*' – obscuring the fact that evolution is a permanent process without end
2. they construct the status quo as the '*end* result', that is, they suggest a teleological progression from first causes to an end
3. they use the term 'development' rather than the appropriate term 'evolution'
4. they describe evolution as having a 'direction', even if it is only a 'direction of adaptation' – thus again construing a teleological progression

I am sure that Ruse and Richards know better – but when they attempt to communicate Darwin's ideas in a nutshell they distort his theory fundamentally. The difficulty, as Stephen Jay Gould, among others, has pointed out, is conventional thinking:

> Claims for progress represent a quintessential example of conventional thinking about trends as entities on the move. From life's infinite variety, we extract some 'essential' measure like 'average complexity' or 'most complex creature' – and we then trace the supposed increase of this entity through time […]. We label this trend to increase as 'progress' – and we are locked into the view that such progress must be the defining thrust of the entire evolutionary process. (1996: 146)

The crux of paraphrasing Darwin's theory is that the metaphors provided by natural languages inevitably reduce the complexity of Darwin's 'long argument'. And this is, of course, the crux that Darwin himself faced when choosing an appropriate title.[1]

Misreadings of Darwin's theory are usually the result of discounting the fact that Darwin's 'long argument' is rendered in highly metaphorical language. Undoubtedly, in the natural sciences – and the life sciences that attempt to describe living organisms in their ecological complexity in particular – the use of metaphors is largely taken for granted (cf. Miller 2000). Biochemists speak of folded proteins or enhanced enzyme activity and use these metaphors illustratively to visualize abstract phenomena. However, scientific metaphors do not only fulfil didactic purposes or shape popular conceptions, they fundamentally define the questions put to the data and the hypotheses accepted in the scientific community.

So what I would like to point out is that literary Darwinism has fallen short of acknowledging that a critical stance towards metaphors is essential to understanding Darwin's theory. When we turn to literary Darwinism, we often find concepts of mimetic representation paired with a focus on plot structures suggesting a development:

> The main plot structures in literary representations map simultaneously onto elementary human motives and basic emotions. The story of growth from childhood to adulthood, the adventure of quest, the romantic comedy love story, the saga of revenge, the drama of jealousy – all have their place in the structure of elemental human motives, and they each have their characteristic set of emotions. (Caroll 2004: 114)

Darwin himself knew only too well that his theory simply could not be reduced to a short paragraph, let alone a title. It cannot be reduced because the theory is not a simple formula but rather a set of analogies and interferences based on observations and, to a lesser extent, experiments (cf. Gutmann 2005: 249–52). In other words: the book is not only 'one long argument' (as Darwin pointed out himself) but also an 'entangled bank' from which the theory must be inferred by the reader (cf. Depew 2008; Ruse 1983: 42). This statement may look like a typical post-structural witticism. But it is adamant, in my view, that literary Darwinists read Darwin's *Origin* as a meta-scientific text that does not only redefine the relationship between factual premises and explanatory power (cf. Curtis 1986:

[1] The debate between Darwin and Murray about an appropriate title is documented and reveals that Darwin was aware that a short title could distort his theory (cf. Browne 2002: 81).

156–7) but also constantly urges us to reflect on the fact that we as humans bring categories of progress and development to the process we call evolution.

Darwin's critical stance – his awareness of metaphorical distortions expressed in his diaries and notes[2] – is reflected, time and again, in the *Origin*.[3] Darwin did not only correct and amend the text for each new edition, he also included passages in which he explicitly addressed criticism brought against his line of argument and his choice of metaphors (cf. Wallace 1995: 17–20). In the third and corrected edition of the *Origin*, for example, Darwin responds directly to criticism directed at his use of the term 'selection',[4] and in the fifth edition of the *Origin*, Darwin's stance is even more radical when he explains that 'natural selection is a false term' (1869: 93). I think it is noteworthy that Darwin dismisses a term so central to his book on the grounds that the term opens up a metaphorical field of agency and thus suggests a personification of nature.

David Kohn has suggested that 'Darwin's teleology lies, ironically, in the *usefulness* produced by a *purposeless*, that is to say natural, process. Natural process produces designful order without being designed, without compelling recourse to a supernatural Designer' (1989: 233, emphasis in original). I think that Kohn's line of argument is flawless but I am not convinced that such a neat dividing line between teleological language and teleological thinking can be drawn in Darwin's *Origin*, or in any text, be it non-literary or literary, for that matter.[5]

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[2] On 1 May 1881 Darwin wrote, for example, 'I have as much difficulty as ever in expressing myself clearly and concisely; and this difficulty has caused me very great loss of time; but it has had the compensating advantage of forcing me to think long and intently about every sentence, and thus I have been led to see errors in reasoning and in my own observations or those of others' (Francis 1887: 136–7).

[3] If not otherwise stated, I am quoting from the first edition of the *Origin*.

[4] 'Others have objected that the term selection implies conscious choice in the animals which become modified; and it has even been urged that as plants have no volition, natural selection is not applicable to them! […] In the literal sense of the word, no doubt, natural selection is a misnomer; but who ever objected to chemists speaking of the elective affinities of the various elements? – and yet an acid cannot strictly be said to elect the base with which it will in preference combine. It has been said that I speak of natural selection as an active power or Deity; but who objects to an author speaking of the attraction of gravity as ruling the movements of the planets? Every one knows what is meant and is implied by such metaphorical expressions; and they are almost necessary for brevity. So again it is difficult to avoid personifying the word Nature; but I mean by Nature, only the aggregate action and product of many natural laws, and by laws the sequence of events as ascertained by us' (Darwin, 1861: 84–5).

[5] While Darwin was eager to avoid teleological thinking that would imply the direct and permanent interference by a supernatural being towards that goal, he was less careful with deictic categories – foremost the conflation of attributes such as higher, later in time and improved. Rasmus G. Winther has pointed out that Darwin obviously thought that the process of variation and selection could be best described with the term 'development' as can be seen 'in both the 1869 and 1872 editions of *On the Origin of Species* where he substituted "is developed" for "gains an ascendancy"' (2000: 441). Despite persistent caveats

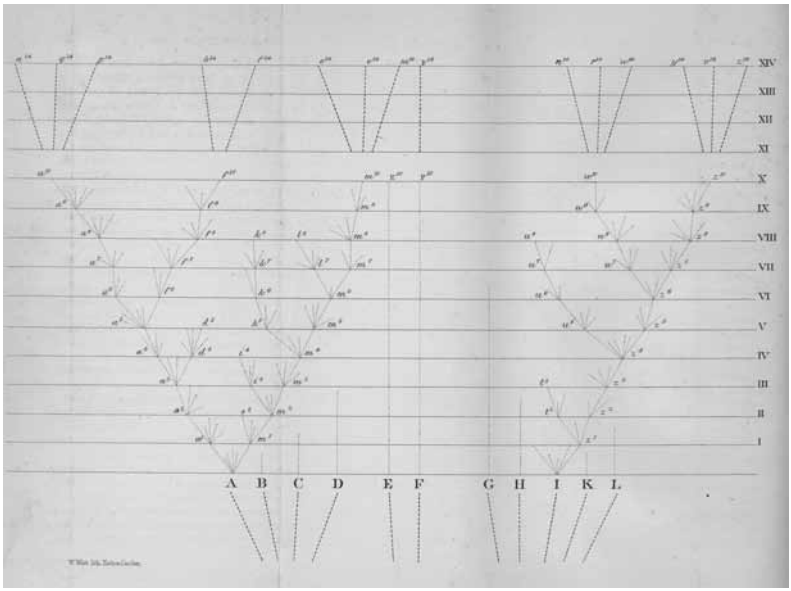

Fig. 6.1 Diagram (The process of variation and selection) from the *Origin*, foldout sheet following p. 116. Reproduced with permission from John van Wyhe ed. The Complete Work of Charles Darwin Online. (http://darwin-online.org.uk/)

This is not to say, however, that Darwin was not aware of the distortions to his theory that came with concepts such as 'development' and 'progress'. Following Michael T. Ghiselin, we should accept that 'Darwin's thinking on progress definitely evolved, and [that] he seems to have vacillated on various topics' (1995: 1029; cf. Heads 2009). This is particularly evident in the only graphic representation in the *Origin*, a single folded lithographic diagram by William West, and Darwin's explanation of it:

> The modified offspring from the later and *more highly improved* branches in the lines of descent, will, it is probable, often take the place of, and so destroy, the *earlier and less improved* branches: this is represented in the diagram by some of the lower branches not reaching to the upper horizontal lines. (1861: 119, my emphasis)

The illustration, as well as Darwin's comment, convey a common conceptual metaphor: that which is higher up is conceived of as more highly developed (cf. Brink-Roby). The unreflected categories that suggest a hierarchical interpretation

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throughout the *Origin* that there is no teleological progress in nature, Winther suggests, Darwin ultimately believed that 'heredity was a developmental, not a transmissional, process' (2000: 453).

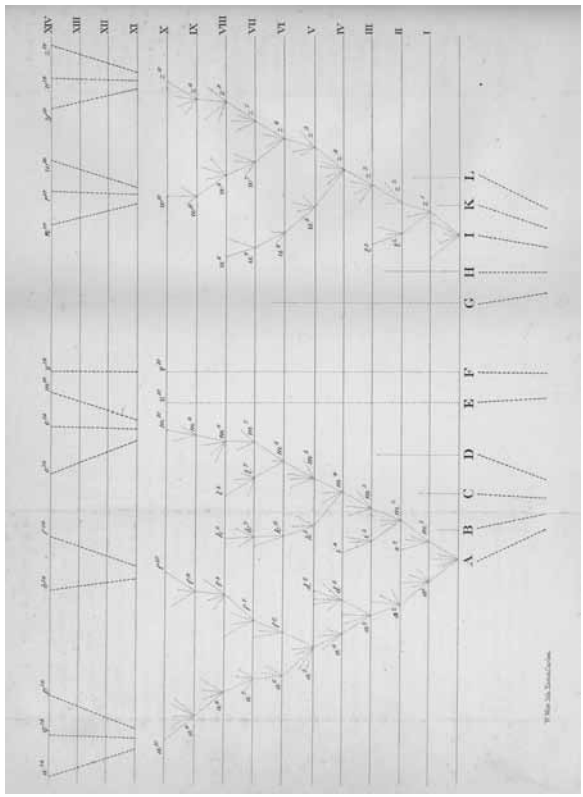

Fig. 6.1 Diagram (The process of variation and selection) from the *Origin*, foldout sheet following p. 116, turned 90-degrees counterclockwise. Reproduced with permission from John van Wyhe ed. The Complete Work of Charles Darwin Online. (http://darwin-online.org.uk/)

are evident when we turn Darwin's diagram on its side. In Western cultures we need to turn it anti-clockwise so that we are not invited to construe the diagram along the categories of a development from left to right, that is, from an earlier stage to a later stage that by definition is then more developed.

Daniel Dennett, among others, has pointed out that the scientific community has largely failed to address the intrinsic value judgement in connection with the metaphor of the tree of life when using visual aids such as cladograms:

> What is the overall shape of this huge Tree of Life spreading its branches through 3.5 billion years? […] The usual practice in scientific graphing is to plot time on the horizontal axis, with earlier to the left and later to the right, but evolutionary diagrams have always been the exception, usually plotting time on the vertical dimension. Even more curiously, we have accustomed ourselves to two opposite

> conventions for labeling the vertical dimension, and with these conventions have come their associated metaphors. (1995: 86–7)

While the thought experiment of turning Darwin's diagram anti-clockwise may arguably free our conception of the process of evolution from the constraints of spatio-temporal categories with their hierarchical conventions, language will not allow for a simple reorientation of the underlying categories. The term 'development' is only conceivable as a process from less developed to more developed states or conditions. Hence, while neutral change is arguably conceivable, language will inevitably force us to take sides and pass a value judgement whether that change is for the better or the worse. It is precisely because of these underlying conceptual metaphors that evolution is often erroneously described as a development (cf. Larson 2006).

Misconstruals of evolution as a development abound since the publication of the *Origin*, and the 'Darwin Year' 2009 was no exception. In May that year the discovery of a unique fossil at the Messel pit near Darmstadt was made public by an international research team (cf. Franzen et al. 2009). The fossil was dated to 47 million years ago and was given the name *Darwinius masillae* because it was thought that this primate was the ancestor of all living primates: monkeys, apes and man. A lively debate soon took hold of the scientific community whether Ida (the fossil's pet name) was actually a missing link[6] or 'simply' the ancestor of a sister group of primates now extinct.

The debate itself reflects a lot of preconceived ideas about the *development* of species – but for our purpose it is sufficient to note that the cladogram used to depict the debate in the *New Scientist* places *Homo sapiens* at the top. Moreover, by including branches for the genus *Homo* (*Homo erectus, Homo habilis, Australopithecus*) but not for the genus *Pan* (Chimpanzee) the diagram suggests that we, *Homo sapiens*, are the 'end result' of a long development. The branching of Bonobos and Chimpanzees in the genus *Pan* – not depicted here – is in fact more recent (1.2 million years ago).[7] The diagram thus construes evolutionary relationships as results of a development, as results of a more or less lineal progression from less developed to more developed forms.[8]

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[6] It should be noted that Darwin does not use the metaphorical compound 'missing link' in his *Origin*.

[7] It is thought that the speciation took place at about 1.2 million years. On yet a more fundamental level, it can also be argued that Bonobos and Chimpanzees are so closely related to humans that all three should be classified with the genus *Homo*: *Homo paniscus*, *Homo sylvestris*, or *Homo arboreus*. Alternatively, *Homo sapiens* could be reclassified as *Pan sapiens*. Cf. Wildman et al.

[8] The best criticism of this dilemma, to my knowledge, is Dennett's discussion (1995: 86–7). Virginia Richter has also pointed to the fact that literary texts of the nineteenth and early twentieth centuries explore this notion that the other species of the genus *Homo* have to 'carry the whole burden of an animal heredity' for our species, *Homo sapiens* (2011: 166).

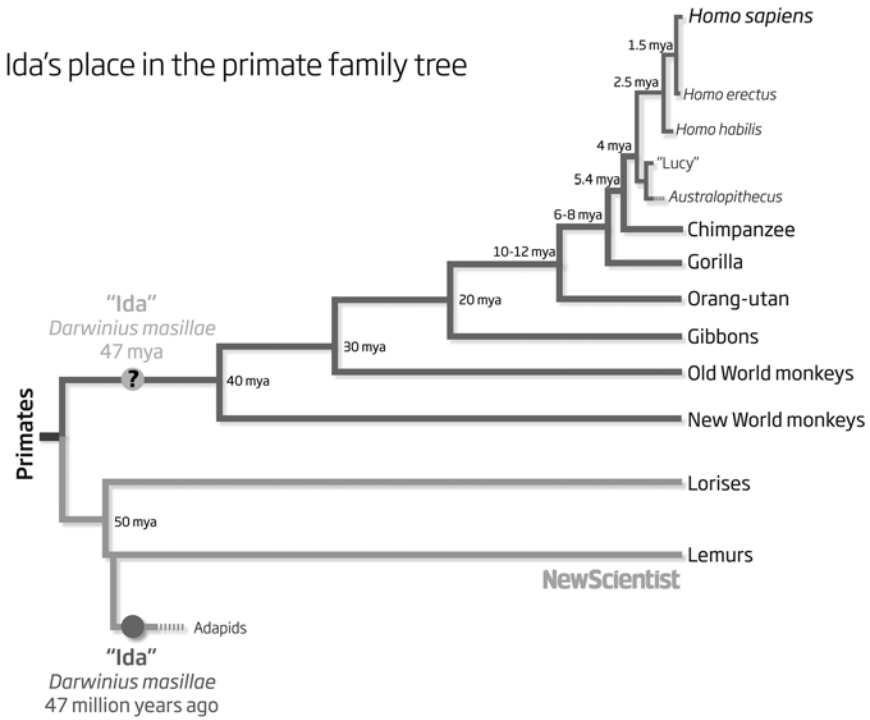

Fig. 6.2 Ida's place in the primate family tree, *New Scientist* 30 May 2009

Misrepresentations and the Novel

Misrepresentation of Darwin's theory in popular science journals such as the *New Scientist* and in contemporary novels can sensitize us to the preconceived ideas that frame Darwin's theory. Gillian Beer, who gave rise to a whole branch of Darwin studies in the humanities, has convincingly shown that it was exactly the idea of progress that influenced and unsettled nineteenth-century novelists when they turned to Darwin. 'Darwinian' plots in Thomas Hardy, Charles Dickens and George Eliot are ripe with reflections on the idea of a development from one and only one origin.[9] In the Victorian age, Darwin's theory was met with conventional thinking in which progress was the norm. Throughout the nineteenth and early twentieth century, Beer has argued, novels juxtaposed the 'slow, seeming passivity of natural selection' (2008: 288) with the toil and trouble of human existence. Even Hardy, who focused on the 'variant, the aberrant' and thus 'questioned the normative'

[9] The question of origin is never explicitly addressed in the *Origin* – even the genealogical lines in the diagram end in seven origins, not in one.

(2008: 292) in his novels, juxtaposes extinction and decay in the social sphere with the grandeur, beauty and purposefulness of the natural world. It is largely owing to Darwin's influence that Victorian novels often use the paradigm of progress as a backdrop to render the description of a deteriorating society more dramatically. Progress was conceived of as the 'natural' trend – and societies were the more to blame if they failed to implement that natural trend in domains of human life.

Gillian Beer has shown with reference to Victorian novels (and Hardy's novels in particular) that fictional writing often constructs human and cultural development within an evolutionary master narrative: 'The 'entangled' or 'tangled bank' which in Darwin's text is peopled by plants, birds, insects, and worms, here has room also for man, not set apart from other kinds' (2000: 238). Contemporary novels usually refrain from that perspective and juxtapose the natural world and the sphere of human interaction. Construed as an opposition, the two narrative strands bring to the fore that human beings are social animals governed by norms rather than natural laws (cf. Wilson 33–4). At the same time, novels often explore the liminal space of human beings caught between the natural world and the social sphere. Some recent novels, such as Ishiguro's *Never Let Me Go* (2005), have addressed issues of social Darwinism or eugenics explicitly, but in the context of investigating the notion of evolution as progress I am more interested in novels that deal with Darwin's theory implicitly.

It has already been argued that the legacy of Darwin's *Origin* in the literary world rests to a large extent on the fact that the theory of evolution misconstrued as a story of progress filled a lacuna that had opened with the demise of Christian faith in God's providence. Thus evolutionary theory allowed for the continuity of a Christian paradigm disguised as a scientific model: nature as an agent stepped in for God, and evolution became a secular master narrative. As an explanatory model, Beer has pointed out, Darwin's text served as a 'fulcrum' (2009: 287) that allowed for a new variation of a strategy that is deeply inscribed in human nature: 'making sense' of the contingencies of life.

Recent novels have challenged the appropriation of evolutionary theory for this master narrative. I do not want to dismiss the objection that a critical stance towards 'making sense' may in fact be a typical modern or postmodern position regardless of a particular philosophical or scientific framework. I think, however, it is worthwhile to investigate the role that evolutionary thinking plays for that critical stance. I have chosen two exemplary best-selling novels that implicitly address evolution as a master narrative: *The Sea* (2005) by John Banville and *The Secret Scripture* (2008) by Sebastian Barry. At first glance, *The Sea* and *The Secret Scripture* only refer to evolution perfunctorily, and it is thus not surprising that neither reviews nor literary criticism have addressed the use of evolution as a motif in these novels. Both novels, however, use evolution as a backdrop for discussing issues of contingency, and in both cases evolutionary time is contrasted with historical time.

With respect to Darwinian master narratives it is noteworthy that both novels have a similar plot structure and operate with a traditional type of closure. In *The*

Secret Scripture the reader is informed in the end that the two narrators in the novel, Roseanne and her psychiatrist Doctor Grene, are mother and son. In *The Sea* the art historian Max Morden, who narrates his story, discovers in the end that the elderly landlady at the seaside resort he had been visiting regularly is Rose, the nanny from his childhood days. In both novels, family ties, branches of the great tree of life, are discovered against all odds of human interference. The novels thus seem to repeat Victorian juxtapositions arguing that blood is thicker than water – that what matters in the end is genealogy.

However, closure on the plot level remains a contested model in both novels. Doctor Grene and Roseanne's explicit acknowledgment of their mutual recognition is postponed: 'I will tell her. Just as soon as I can find the words. Just as soon as we reach that part of the story', Doctor Grene commits to his diary at the end of the novel (2008: 308). Likewise, the recognition of Rose and Max at the end of *The Sea* is not a ceremonious moment, with the narrator Max explaining: 'After all, why should I be less susceptible than the next melodramatist to the tale's demand for a neat closing twist' (2005: 235). In both novels the fictional world adheres to the generic convention of closure but it is definitely qualified as a convention that hardly resolves the contingencies of life. Recognition as closure is paired with the theme of loss in both novels: the wife of Max Morden and the wife of Doctor Grene are both affected with cancer and they both lose their struggle for life with their husbands attending them.

Rejecting closure and conventions of story-telling, the two novels bring into focus a debate in the field of literary Darwinism recently sparked by Paul Kramnick. Kramnick accused literary Darwinists for harbouring '[t]he idea […] that a certain cognitive mechanism – linking stories or being good at telling stories – is present in us now because it conferred a fitness advantage in the past' (2011: 325). Kramnick's general attack is certainly reductive in that he maintains all literary Darwinists argue that human beings have an innate disposition for telling and enjoying stories.[10] However, he certainly has a point that evolutionary psychology is not the be-all and end-all of literary analysis. In his response to Kramnick's essay, Paul Bloom concedes that:

> [w]hile literary critics can safely ignore those interested in theories about the origin and nature of stories, the converse isn't true. Anyone interested in where stories come from and why we like them would benefit hugely from input from scholars who are experts on how stories work, including those involved in literary criticism. (2012: 393)

The Sea and *The Secret Scripture* seem to make exactly this point: their narrators triumph over an innate cognitive mechanism for telling stories – if such a mechanism exists at all. And the metafictional comments remind us that narrative structures are not natural but conventional.

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[10] For critical responses to Kramnick's essay by Paul Bloom, Vanessa L. Ryan and G. Gabrielle Starr, among others, see the critical response section in *Critical Inquiry* 38.2 (2012): 388–430.

According to Stephen Jay Gould 'the neglected subject of directionality in time [should] become a focal point in the study of history' (1988: 336). The contribution of literary Darwinism, if such a field of critical enquiry is feasible, I think lies in stressing the urgency of thinking about the directionality of time in the study of literary texts. Such an inquiry, guided by evolutionary theory, would not simply oppose an *ordo naturalis* with an *ordo artificialis* but instead question the very notion of a natural order. In rejecting the binary opposition, literary Darwinism of that kind shares fundamental concerns with post-structural theories. But it is the critique of developmentalism that I am most interested in, a critique of developmentalism that is informed by evolutionary theory, relates conceptions of evolution with generic conventions of plot structures but does not subscribe to ideas of evolutionary psychology. While directing our attention to novels that expose the contingencies of plots and thus our desire for closure may not necessarily tell us something new about generic conventions and poetic licence, it will help us address the fundamental question of why evolution is generally conceived of as progress.

There are marked differences in how the two novels approach the issue of directionality in time. While *The Secret Scripture* investigates the difficulties of conceptualizing Irish history as a coherent chronological narrative based on documented evidence, an issue explored in most of Barry's writing (cf. Foster), *The Sea* fundamentally questions the reliability and relevance of one's personal memory over the course of roughly three generations. *The Sea* thus questions whether isolated impressions and personal perspectives can add up to a plot. These two opposing points of entry to the problem of coherence and story-telling have been addressed by Derek Hand in his most recent study on the Irish novel. Hand has argued that Banville's fiction 'manifests a serious and worthwhile effort to consider the contradictions of Ireland and its history, to critique the very possibility of the unquestioned grand vision that underpins the fictional world of a writer such as Sebastian Barry' (2006: 260). I should like to argue that the two models of narrativizing that Hand has identified are underscored by employing evolutionary thought. Explicit references to evolution in *The Secret Scripture* remind the reader of a reality that cuts deeper than human history:

> The human animal began as a mere wriggling thing in the ancient seas, struggling out onto land with many regrets. That is what brings us so full of longing to the sea. (2008: 144)

> They say that we come from apes and maybe it is the residing animal in us that knows things deep down that we almost don't realise we know. (2008: 269)

The idea of a development from a 'mere wriggling thing' to *Homo sapiens* reflects what Gould identifies as 'conventional thinking about trends as entities on the move'. But the passage also distorts this notion of progress by claiming that 'struggling out onto land' was accompanied 'with many regrets'. Likewise, the second quote reiterates a common misreading that man descended from apes but it delineates primeval knowledge as something positive, something precious that is in danger of being lost. These nostalgic references to an evolutionary past serve

a particular function in the narrative: they juxtapose evolution as a contingent process with human history as a chaotic but nevertheless goal-oriented and purposeful endeavour. They thus assure readers that it is worthwhile investigating and rethinking the Irish past as a past that continues to shape human lives.

At the same time, *The Secret Scripture* points to another evolutionary commonplace: against the background of evolution individual lives are of no consequence. The very first sentence of the novel carries this conviction: 'The world begins anew with every birth, my father used to say. He forgot to say, with every death it ends' (2008: 3). And the notion is raised repeatedly in the novel, for example with references to family trees: 'Of course, this is the fate of most souls, reducing entire lives no matter how vivid and wonderful, to those sad black names on withering family trees, with half a date dangling after and a question mark' (2008: 12). As a result, the novel directs our gaze at the middle ground with evolutionary processes as one extreme of the continuum and personal lives as the other.

In *The Sea* there are no explicit references to evolution but the sense of human beings occupying a liminal space between the natural world and the social sphere is constantly evoked: 'One of nature's most important roles in this fiction is to remind humankind of its inconsequence' (McMinn 2004: 138). The image of an indifferent world is perhaps most striking in the account of Myle's and Chloe's suicide in *The Sea*. This is how the protagonist Max remembers the moment when the twins deliberately swam out into the open sea:

> They were far out now, the two of them, so far as to be pale dots between pale sky and paler sea, and then one of the dots disappeared. After that it was all over very quickly, I mean what we could see of it. A splash, a little white water, whiter than all around, then nothing, the indifferent world closing. (2005: 244)

The joint suicide, a tragedy that haunts all the characters in the novel, is of no consequence when seen from an evolutionary perspective. This passage corresponds with the closing passage of the novel when Max recalls going for a swim on his own as a child:

> I had gone swimming alone … The sky was hazed over and not a breeze stirred the surface of the sea, at the margin of which the small waves were breaking in a listless line, over and over, like a hem being turned endlessly by a sleepy seamstress. … I was standing up to my waist in water that was perfectly transparent, so that I could plainly see below me the ribbed sand of the seabed and tiny shells and bits of a crab's broken claw, and my own feet, pallid and alien, like specimen under glass. As I stood there, suddenly, no not suddenly, but in a sort of driving heave, the whole sea surged, it was not a wave, but a smooth rolling swell that seemed to come up from the deeps, as if something vast down there had stirred itself, and I was lifted briefly and carried a little way toward the shore and then was set down on my feet as before, as if nothing had happened. And indeed nothing had happened, a momentous nothing, just another of the great world's shrugs of indifference. (2005: 263–4)

The 'great world's shrugs of indifference' in *The Sea* are construed as incidents or occurrences that have no discernible teleological force. Joseph McMinn has argued that 'the image of the sea, or of swimmers, offers Banville an analogy for the experience of not really being in the world, but rather at a remote, distressing angle to it' (2004: 141). He also claims that 'the sea has an unavoidable and hypnotic association with death' (2004: 139). McMinn's interpretation certainly accounts for the recurrent sea imagery in Banville's fiction. I should like to add that the sea imagery in *The Sea* also connects human beings with their evolutionary past. The notion of life 'struggling out onto land' (Banville 2008: 144) that is evoked in *The Secret Scripture* is not explicitly discussed in *The Sea*, but with its sustained sea imagery the novel also pitches human toil against evolutionary time.

Human life is explicitly qualified as inconsequential in *The Sea* on several occasions: 'Yes, things endure while the living lapse' (Banville 2005: 9), 'What are living beings, compared to the enduring intensity of mere things' (232). Individual lives here are not compared to potent natural forces or elements, the means of comparison, the 'things', are artefacts: a bridge spanning a railway line and a steam engine. The juxtaposition of 'living beings' and 'the enduring intensity of mere things' nevertheless calls to mind a geological and evolutionary perspective in which individual organisms perish without leaving a measurable impact.

The Sea and *The Secret Scripture* certainly do not propagate a naïve concept of evolution as progress. Some of the implicit and explicit references to evolution as an erratic process can, of course, be read as very general expressions of melancholia: *The Sea* and *The Secret Scripture* pitch the protagonist against the vastness of evolutionary eternity. Max Morden and Doctor Grene are conceptualized within a Darwinian spatiotemporal continuum – within a master narrative of continuous change in which the individual as an organism is transient. Statements to this effect are echoed throughout both novels. However, the poetic function of those references goes beyond postmodern sentiments of individual lives being inconsequential. It is important to note that Banville and Barry apparently choose their metaphors carefully when referring to evolution. In *The Sea* and *The Secret Scripture* evolution is portrayed as a directionless and purposeless process that serves as a crucial part to establish a metaphysical backdrop. Readers are invited to create and interpret the characters and the fictional world against this backdrop. Characters 'searching for God in a world where no god is to be found' (McNamee 2006: 3), we are reminded, cannot simply turn to a comforting evolutionary master narrative. Readers will have to look closer to home in order to find reassurance for their fictional counterparts. Evidently, while evolution must remain an elusive process, history and autobiography may provide the sense of belonging in this world. The novels thus reject theories of intelligent design as well as models derived from social Darwinism in favour of a more humbling project of 'making sense' of the contingencies of life. Ultimately, Banville has pointed out, art may be the best place to look if we are in need of a *telos*: 'one of art's greatest attractions is that it offers "the sense of an ending". The sense of completeness that is projected by the work of art is to be found nowhere else in our lives' (1998: 41).

The Sea and *The Secret Scripture* represent two separate approaches to referencing evolution as a directionless and purposeless process: *The Sea* graphs individual human life on an evolutionary trajectory. Evolution, present in the complex sea imagery throughout the book, exposes the futility of making sense of life's contingencies. In contrast, *The Secret Scripture* highlights the urge of human beings to write personal, human and national history. The novel suggests, however tentatively, that this endeavour is a successful strategy to fend off anxieties that ultimately stem from considering human life as part of an evolutionary process. Despite their different outlooks on how to cope with these anxieties, *The Sea* and *The Secret Scripture* both conceptualize life as contingent and remind us that the evolutionary processes that govern life are processes that lack a *telos*. It must remain speculative whether this rather subtle critical stance on evolution misconstrued as progress is not simply subsumed, by readers and critics, under a more general critique of progress typical of our age. But if that general critique feeds back into a critical appreciation of evolutionary theory, 'we may hope to make sure but slow progress' in untangling the concept of evolution and our 'deep perception of evolution as progress'.

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Chapter 7
Evolution for Better or for Worse? Science Fiction Literature and Film and the Public Debate on the Future of Humanity

Angela Schwarz, Siegen

Introduction: Enhancing Nature

'How beauteous mankind is! O brave new world, / That has such people in't!'(Shakespeare 1998: *The Tempest*, V, i, 184–5). If it does not evoke a sixteenth-century playwright or a twentieth-century novelist, this exclamation may bring to mind the great expectations directed towards today's cosmetic surgery and the much-acclaimed wonders that it may work. You can have your abdomen reshaped, lips enlarged, ears, nose, chin, cheeks remoulded, buttocks lifted, breasts augmented, reduced, lifted, all to conform to a certain ideal of beauty prevalent in the society or culture – and era – you live in. Magazines for adolescents, adult women and more recently adult men, popular lifestyle programmes on TV or internet websites (some 20 million hits on Google for the search terms 'cosmetic surgery') present the surgical enhancement of appearance as the most promising means in the pursuit of happiness. More and more people most willingly accept this interpretation. In short, cosmetic surgery is widespread and it is common talk. Nonetheless, some things seem conspicuously absent from the general talk in schools, homes, pubs, beauty parlours: it does not seem that these 'consumers' of cosmetic surgery, having had their body contoured or enlarged to their liking, ever wonder if that new 'Supersize Me' is still the same person.

As easily as having one's nose reshaped or getting rid of one's wrinkles, according to the promises brought forth by the optimists in the discourse on human enhancement and on transhumanism, it will be possible in another few years to take enhancements beyond the surface. Technology will become readily available or be on its way to improve mental capacity and physical performance. Genetic engineering will ensure that the parental dream of a better life for one's children will come true as 'better' children, 'better' humans (cf. Annas 2009: 233). Striving for constant improvement, extricating the species from the fetters of nature, ultimately perfection: this seems to be an aspiration of humans independent of culture or century. It is, however, only a fairly recent development which has put humanity in the position to take the 'lego (or building bricks) of life', including that of human life, into its own hands. It began 150 years ago when Charles Darwin replaced the idea of divine creation with the principle of evolution. Seen in

the light of this ground-breaking explanation of life on earth, human nature came under close scrutiny as well. It not only lost its god-like character – created 'in his own image' (Genesis 1:27) – but its rootedness in a definition fixed once and for all. In fact, Darwin opened up the floodgates to more than the issue of humanity's simian ancestry. His evolutionary theory brought questions of the prospects or limits of human evolution, its progression or regression, issues of influencing this evolution and thus the one field that had been barred to human intervention until then onto the agenda. The first decades after 1859 saw a whole gamut of arguments and concepts put forth, but it was in the second half of the twentieth century, when the structure of DNA was decoded, that the debate quickened its pace. It has reached a new stage of urgency since the beginning of the new millennium and the deciphering of the human genome.

Very often scientists have accompanied the announcement of their findings with rosy sketches of future possibilities and frequently these bold announcements reverberate in the consciousness of the general public, though it should be noted that even in the present times of hard-driven competition for research funding, one occasionally still encounters more cautious statements. And of course, sometimes it is the media, rather than the researchers themselves, that inflate the news of genome, cloning, biotechnological innovations, human enhancement and the like. It is the mass media that, according to surveys conducted in the past decade, provide the general public with most of its scientific information.[1] But although a lively debate on the implications of these momentous powers of alteration exists – a discussion led by biologists, doctors, philosophers, social scientists, journalists, in books, quality papers and highbrow talk shows, lectures, TV documentaries – very little of it percolates down to the level of the average citizen. Even popular science, striving hard to bring abstract scientific research to the homes of people of diverse backgrounds, interests and degrees of awareness, fails to bridge the information gap. There is no popular debate on biotechnological enhancement or genetic manipulation on the same level of intensity and familiarity as there is on the enhancement of appearance, although the fundamental questions raised, that is, those as to human nature, are identical. Starting out from this premise, my paper argues that it is the genre of science fiction (SF) which, based on contemporary scientific research, is of key importance in familiarizing the public, or more precisely the individual, with the potential future biological evolution of humanity and its implications. The genre not only incorporates the promises of the more optimistic – or fund-oriented – scientists, it is not designed to inform a public largely ignorant and wary of future changes and to getting the point of the (economic) potential of genetic science and technology across,[2] but also integrates

[1] Cf. King, Klotzko 1998: 115–16; Shepherd et al. 2007: 277–392.

[2] This is the underlying principle of the public understanding of science's approach, as it is motivated by the endeavour to improve knowledge of (genetic) science in order to pave the way for a more general public acceptance (see Bates 2005: 47–9). To scientists and educators it appears shallow at best, misleading in most of its products (see Michael

them in a multifaceted discussion of its consequences.[3] This holds true especially for widely known texts and films that reach mass audiences. These more recent productions include issues of the human predicament raised by the advent of cybernetics in the 1950s, cyberpunk art in the 1980s and intensified claims of transhumanism to transcend the limits of the body in the 1990s. Even if one may come to the conclusion that the dystopian aspects predominate in them, SF truly popularizes the fundamental pros and cons of the biotechnological or genetic encroachment on nature with the objective of creating the better, even the ideal human being.

The argument is based on the conception of science fiction as a testing ground to explore and evaluate contemporary and future developments, as an 'aesthetic experimental laboratory of society' (Fuhse 2008: 7). Science fiction is particularly interesting in this context, because, as a forum of popular discourse, it reaches a much greater audience than even popular science, and in this capacity makes and keeps evolution a topic of a truly common debate.

What kind of ideal human beings people the worlds of this genre? Science fiction literature and film as it evolved in the late-twentieth and early-twenty-first centuries offer a plethora of answers to this question. The creatures encountered in these texts and films may roughly be divided into three groups: first, the group of technologically enhanced beings, called cyborgs; secondly, another group that might be called '100 per cent organic', whose members have been 'improved' by genetic engineering; and a third group, characterized by being 100 per cent technology, such as machines and robots – a group which includes androids who are part flesh. The latter group will be omitted here, for these mechanical alter egos, even if depicted as the better humans, are not, in essence, humans who have been altered: strictly speaking they are not ideal *humans*.

This paper then offers a look at the 'stuff' the other two groups are made of, and particularly at the way the genre goes beyond mere 'fantasizing' to broach fundamental issues raised by developments of contemporary science, such as the extent to which humanity intervenes with its own biological makeup and in the long run with its own evolution, the question at which point of 'enhancement' a person may no longer be human, as well as the issue underlying them all, the essence of humanity, human nature. The focus will be on bestselling SF novels by North American writers and blockbuster movies of the last two decades, the years of the greatest advances in biological and technological research so far. They have turned the fiction of the creation of humans into a serious possibility. The analysis of the texts and films is preceded by an overview of theses and promises of science

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and Carter 2001: 5–32). Nonetheless the genre draws the attention of scientists and those dealing with technology assessment, even more so since the mid-1990s, as visions of the future – be they literary fiction or scientific prognosis – are often labelled science fiction (see Gammel 2010: 209–13).

[3] 'It is in the realm of science fiction that most of the important speculation about the human predicament and the future of humanity is envisioned' (Annas 2009: 231).

and its adherents. This is to elucidate the optimistic scientific proclamations and dreams of future evolution found in non-fictional contexts that are then mirrored in fictional ones.

Truth is Stranger than Fiction: Science, Scientists and Promises of a Better Future

The immediate post-war era after World War II appears as an intricate combination of pessimism and optimism. The future had never looked so gloomy, with humanity in possession of the weapon of ultimate destruction, the atom bomb, and with the wartime experiences of the species' tendencies to cruelty against fellow-humans. It had never looked so auspicious with 'prosperity for all', as secretaries of state for economic affairs were quick to announce at least in some countries, and with endless possibilities opened up by science and technology. While Sputnik spurred the fantasies of space travel, James Watson and Francis Crick suggested that humanity was approaching a new dimension of control on earth after they had discovered the structure of DNA in 1953. For visionaries, human evolution began to appear as a matter of schedule, less one of a principle in nature that, seen from the point of view of an individual, worked randomly. Watson famously put the change that biochemists and biologists deemed appropriate into the proper perspective: 'We used to think our future was in our stars, now we know our future is in our genes' (in Annas 2009: 232).

Despite the general skepticism that was to follow in the 1960s and 1970s as to the possibilities of science and technology, scientists went on to lay great stress upon the giant leaps humanity was making. The most spectacular exploration of the twentieth century, the voyage of Apollo 11, offered an opportunity to do so in front of an audience of hundreds of millions. 'We are expanding the mind of man', Wernher von Braun said one day before the launching of Apollo 11. 'We are extending this God-given brain and these God-given hands to their outermost limits and in so doing all mankind will benefit' (in Annas 2009: 231). It is a noteworthy fact, expressed in these two quotations, that the two discourses on future possibilities – the one in biology, the other in space exploration – overlapped. And both propagated their potential in metaphors of spurring on human evolution.

At about the same time von Braun drew attention to the stars, the emergence of a new biology or new genetics suggested a biology-based immortality, or at least the possibility to change human capabilities by altering the genes (cf. Annas 2009: 232). Four main elements can be discerned in the scientific and media coverage relating to these topics:

Mechanical and Biotechnological Enhancements

For centuries, artificial or mechanical parts had been attached to bodies, to replace limbs for instance. In contrast, today's replacements provided by modern medicine and biotechnology in particular are altogether of another quality, for they fuse

biological with technological elements. Artificial limbs today are much more sophisticated than the wooden leg that seems to stumble through every pirate movie. A case in point may be the carbon prostheses used by athletes such as the South African sprinter Oscar Pistorius. They make the athlete, who was born without lower limbs, a quick sprinter, thus reconstructing body functions lost due to a disability. In this way, technology enhances life and already points to the potential of enhancing the capabilities of physically intact bodies in the near future.[4]

Technology has far advanced beyond the outwardly attached prostheses; it has created and continually refined intricate implants such as cardiac pacemakers or retina implants. In consequence, it is more appropriate to talk of a reinvention of nature, as Donna Haraway[5] has done, or of a redefinition of being human. Some experts like Joseph Rizzo, co-director of the Boston Retinal Implant Project, think that a bionic eye will be available soon to make the blind man see. In ten years, experts expect to know how to make paralysed limbs functional again by using computer chips.[6] Many more technologies seem imminent, their use as an enhancement of the human body enthusiastically welcomed by those wholeheartedly advocating the human-technology integration. Strictly speaking, people with enhancements, like a pacemaker or an implant, are cyborgs or cybernetic organisms.[7] Some think that future enhancements will be so sophisticated as to render those who have them a favoured (sub)species in the struggle for life, the next step in human evolution.[8]

Cure of Diseases on the Genetic Level

The most prestigious project at present is the identification of the genetic roots of illnesses.[9] Even before the human genome was decoded in 2001, scientists announced their newly-found intimate knowledge of the basics of life as the means to overcome all evil: 'Evolution, disease, everything will be based on what's in that magnificent tape called DNA' (George Cahill, qtd. in Doyle 1991: n. pag.). Many patients set their hopes in the research on stem cells, with scientists working on it in various countries, such as the US, Great Britain, France, South Korea and many others. Popularized versions of these optimistic statements already make

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[4] Importantly, the discussions surrounding Pistorius's taking part in the 2012 Olympic Games, and specifically the argument that his high-tech prostheses give him an undue advantage over sprinters on their own two feet, testify to the problems in the cultural and social negotiation of the definitions of human nature.

[5] See Haraway 1991.

[6] Cf. Kaku 1997: 139–40. For press reports on successful cures, see Lawrence 2012 and Willingham 2011.

[7] In the sense of this definition, 10 per cent of the American population are cyborgs (Hayles 1995: 321–35).

[8] Cf. Kaku 1997: 141, and Mariske 2007. For a popular science version in favour of these technological transformations, see Kobald 2007.

[9] For additional prognoses, see Kaku 1997: 195ff.; Broderick and Garreau 2001.

treatment with stem cells look like the most common treatment of the near future. In some cases, the popular presentations of a spectacular breakthrough may easily outlive the supposed 'success'.[10]

This, in turn, would imply that, with major diseases kept at bay, the average life-span may extend considerably (cf. Fisher 1999). 'Advances in manipulating cells and genes, as well as nanotechnology, will push the body's accepted boundaries', an expert announced only a few years ago. '… people can live from 120–150 years' – the media even quoted him having promised 500 years (Van der Weyden 2003: 273). To cite the breathtaking statement of William Haseltine, Chairman and Chief Executive of the Human Genome Sciences: 'Death is a series of preventable diseases' (qtd. in Annas 2009: 232). Indeed, 'we are knocking at the door of immortality' (Van der Weyden 2003: 273).

Cloning Animal Life

In 1997 two researchers at the Roslin Institute in Edinburgh announced that they had successfully cloned a sheep. The sole survivor of 277 cloned embryos was made known to the public not under its name in the sequence of experiments, '6LL3', but as 'Dolly' (named after Dolly Parton), thus investing the duplicate with individuality. Although the announcement immediately set off an international debate on outlawing the cloning of human beings (cf. Kailer 2011: 37–43), an ongoing debate, research in this field is continuing. In 2005, the statement of a South Korean cloning pioneer, claiming that he had successfully cloned human stem cells, turned out a fake. And two years before that a company by the name of Clonaid, appropriately associated with an obscure sect rather than with science, claimed to have cloned humans – another scoop that turned out to be a fake. One may marvel at the craving for recognition behind the odd messages about human cloning that appear from time to time, but there is little doubt that, to quote Thomas Stojanov from an Australian newspaper, 'the race is on' (Smith 2008: n. pag.). And it is a race not simply spurred on by the impulse to boldly go where no one has gone before, but just as much, if not more, by economic interests.

Fourth Level, Genetically Engineered Enhancement

Cloning adds nothing new and holds little attraction for those who want to have children. In contrast, the possibility of ruling out hereditary diseases that might otherwise predetermine a life of suffering, an early death or both may seem appealing. And having progressed on this road, why not think about genetic changes to boost intellectual capacity? To these, the neurobiologist Joe Tsien of Princeton University presented his smart mouse, called Doogie,[11] a few years ago.

[10] See for example a stamp issued in South Korea in 2005 to celebrate the alleged success of the country's researchers. A black and white version can be found in Haran et al. 2008: 47.

[11] The mouse was named after a character in a popular TV show, a boy playing an ingenious physicist.

In 1999 he told the press 'that he had used genetic engineering techniques to create mice that had better memories and could therefore learn faster than other mice'. According to Tsien, who described his research as more important than cloning, his findings could be made applicable to humans sometime in the foreseeable future. He had no doubt that everyone would want to use genetic engineering techniques to have smarter babies: 'Everyone wants to be smart' (qtd. in Annas 2009: 233).[12]

As to the presence of this topic in contemporary public debate one may conclude that 'no area has elicited as much controversy as the speculative prospect of genetic engineering', but it is equally true that no other field of science has been holding its spell over society just like this one (cf. Bates 2005: 47–9; Annas 2009: 227). The public debate resonates with the tantalizing promises evoked by scientists such as the few quoted above. The scientists either do not draw attention to the implications or they caution the general public on many occasions or only in isolated discourses – James Watson, for one, did so when he retired from his position in the Human Genome Project. They do not raise questions such as the following: What would a 'better human' be like? Who is to decide what qualities are to be held desirable or worth preserving? What will happen to those who are termed 'defective'? More basically, what does it mean to be human? What changes in 'humanness' would result in better humans (cf. Annas 2009: 227, 234)? Answers to issues such as these are left for other discourses. Rather, it is the occasional website of transhumanists, the newspaper and news shows coverage of new scientific feats, of the implementation of laws following from them such as pre-implantation genetic diagnosis, or of advisory committees assembled by governments which engage in discussing ethical issues of genetic interventions as implied in, for example, stem cell therapy. However, very few, if any of the questions aired in intellectual circles seep into popular discourse. If people actually deal with matters like these, they are incited to do so by other formats and genres.

Science Fiction and the Improvement of Creation

Science fiction as a genre has taken up many of these threads and loose ends of a debate that is either ignored or restricted in its comprehensiveness. Though texts and films focus on specific technologies or social practices or realms and are limited in this sense, they offer a larger scope of aspects in almost always including the social, political and ethical implications of the 'improvements' discussed. They react to contemporary issues and integrate tendencies of a larger public to deal with them, either in a critical or escapist manner. Among the themes of biological science that continue to permeate the genre are mutation and evolution as well as genetic engineering (cf. Slonczewski and Levy 2003: 175).

[12] And, as it says on his homepage at Georgia University today – referring to his Brain Decoding Initiative: 'I am aware that it is going to be very challenging, but you know that life without challenges is just too boring' (Tsien 2011).

Technologically Enhanced: Human – Cyborg

After World War II, in the atmosphere of the Cold War, Science Fiction quickly grasped the implications of science and the 'Modern Synthesis', the term Julian Huxley had coined for the blending of genetics and the theory of evolution in the 1940s.[13] One of the most innovative, highly influential and popular SF-authors of this early phase was the American novelist Philip K. Dick. In his short stories and novels he speculated as to the future of human evolution, or rather the implications of contemporary research,[14] whereas many others followed the trend of the 1950s and 1960s to explore the galaxy and meet different life-forms and new challenges in outer space. Due to Ridley Scott's popular screen adaptation *Blade Runner* (1982), Dick's 1968 novel *Do Androids Dream Of Electric Sheep* is probably his most well-known text. Both text and film – which had Dick's backing – had a great impact on the controversies on 'what constitutes the authentic human being?' (Dick 1985: 2), as Dick put it himself. But since it focuses on manufactured humanoid beings or 'replicants', organic rather than cybernetic bodies, it does not fit as precisely into this study of technologically or genetically enhanced creations as the works of others do.

Some of the most influential of these creations have been produced by the American-Canadian writer William Gibson, whose interests lie with the human-machine-interface and variations of reality. In novels like *Neuromancer* (1984) and the short story *Johnny Mnemonic* (1981) he has his characters explore their humanity by tumbling through Cyberspace, a term he himself created. Because of the film adaptation in 1995 with Keanu Reeves as the protagonist, only loosely based on the novel, *Johnny Mnemonic* is more widely known. The story's highly complex plot broaches diverse issues such as cybernetics, genetic engineering, virtual reality and dangers from powerful multi-national corporations (cf. Tabbert 2008: 25). What is of interest here is the data storage system implanted in Johnny's brain, which allows him to store huge amounts of data – 80 gigabytes or with a double system, 160 gigabytes. As he himself is unable to access the data, unaware of them, he is the most likely person for the transmission of highly sensitive information. They are retrieved when Johnny enters a trance-like state and a password known only to the employer is entered into his mind. Employed by wealthy individuals, corporations and criminal gangs, he manages to make a modest living.

There are various threads to pick up from these few remarks about the plot. Two of them are particularly relevant to the way potential interventions into the make-up of humanity are popularized in science fiction. Firstly, Johnny Mnemonic is technologically enhanced. However, he gains no advantage from this, rather the

[13] They quickly accepted at least the popularized elements of the theory. Cf. Prince 2000: 37.

[14] From the rich literature of critical assessment, see Tabbert 2007; Vest 2009a; Vest 2009b; Pinsky 2003; Knight and McKnight 2008.

contrary holds true since the enhancements make him even more vulnerable. In the course of the story he is reduced to a mere object, a data-storing unit, which has to be destroyed. Secondly, the technological transformations of the body are dictated by the presets of science, economy and ideology. In Gibson's debut novel *Neuromancer* this element is even stronger. The protagonists live in 'an age of affordable beauty' (Gibson 1995: 9) – that is, plastic or cosmetic surgery – , in which cloning (Gibson 1995: 94–5) and DNA-treatment of illnesses are common. What is more, 'implants, nerve-splicing, and microbionics' (Gibson 1995: 13) are available in all shapes and sizes, for example, 'vatgrown sea-green Nikon transplants' (33) or (in *Idoru*) 'video units coupled directly to the optic nerve' (70) instead of eyes. Their availability and application transform the human body into an infinitely modifiable entity. Thus the body loses one of its central functions, that of a container of identity, and enters into a state of, as Tabbert aptly puts it, fluidity (Tabbert 2008: 31, 33 and Säbel 2000: 264). In *Neuromancer*, identity has become the result of vogues or an industrial production process, changing daily or even hourly according to the moods and economic needs of a person at a time (Tabbert 2008: 32–4). Though Gibson does not criticize this chameleonic use of the body, he leaves the reader with a set of questions: Who sets the standards for the transformations? Is this being with the sophisticated prostheses still human? Does it retain individual traits, a distinguishable identity? To where does this development of transformations, responding solely to the laws of 'the art of the possible',[15] lead? These are some of the questions which are enwrapped in the popular format.

These questions are raised in a different manner by another popular Cyborg character of the Cyberpunk era, in *Robocop*. The film, written by Michael Miner and Edward Neumeier, who said he was inspired by *Blade Runner*, was a great commercial success. Part of its audience may most vividly remember the massive amount of shooting occurring after the body of the murdered policeman Alex Murphy has been turned into a machine, patrolling the streets of crime-ridden Detroit in the near future. While uncovering a conspiracy within the corporation whose technicians created him, the Cyborg Robocop discovers more and more elements of the person that are part of him. He tries to find out what or who he is and why he was transformed to become this technified and commodified human-machine hybrid. In the final sequence, he is asked what he is called: 'Murphy', he says, choosing an individual identity over the anonymity of a replaceable machine. In this way the film 'dramatises the resilience of a subject, albeit a cyborg, amidst the most incredibly … subjugating conditions, and allegorises its attempts to find meaning and value within a corrupt and decadent … world'. Its visions bolster up whatever optimism may exist in a general public turning to the implications of contemporary biotechnology and genetic science, as 'the dystopic projection of a hyper-alienated future coincides with a utopic hope for spiritual survival,

[15] 'Die Kunst des Möglichen' – 'the art of the possible' – is a slogan on the website of the plastic surgeon Dr. Fabian Blaschke (Blaschke 2011).

salvation, and redemption' (Best 1987: n. pag.). And this redemption, so runs the message at the end of the film, lies in his reconnecting with the human being he used to be.

The bodies of the beings populating these future worlds are technically altered, either by choice or by force. Real people encountering them on the screen or in the books may not use the term 'transhuman', may not even share the transhumanist optimism that these biotechnological enhancements transport humanity onto the next level of evolution with 'radically advanced intelligence, near immortality, [and] deep friendship with AI creatures' (Schneider 2009: 242). Nonetheless, they are confronted with potential technological developments, with beings changed by them, with questions as to the necessity or desirability of going beyond the boundaries set by the (natural) body, as to the issue of the individual's and humanity's uniqueness.

100 per cent Organic: Genetically Engineered[16]

Brain enhancement and video unit eye-substitutes are for the technophiles. What about the adherers of the purely organic? For those asking for more or rather something else, contemporary science and science fiction provide an alternative with the alteration of the genes of unborn-life. One of the most haunting visions created by science fiction is the one of a future society split into the group of genetically engineered healthy people and the group of naturally conceived and less healthy people – a vision consistent with propositions of today's transhumanists. The former group has a life mapped out for them in happiness and success, the latter in disabilities and positions of menial work. In the world of the American feature film *Gattaca* (1997), named after the initials of the four bases of DNA, the 'valids' and the 'invalids' have 'know thy place' written into their genes.

In *Gattaca*, the genetic code is the be-all and end-all. A dictatorial ruler or super-state is conspicuously absent; instead, the genes reign supreme.[17] They

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[16] See also Turney 1998.

[17] At the time of filming the opportunity of having one's personal DNA tested was not far away. In 2006, the gene testing service 23andMe was founded, offering for a fee of $399 to anyone interested "personal genotyping" in order to identify predispositions for specific illnesses or conditions such as cancer, diabetes or baldness. 23andMe is not the only business in an emerging market of DNA tests that turn a person's genetic makeup into a commodity (celebrated by *Time Magazine* in October 2008 as number one invention of the year). The *Time* article rejected the idea that human genotyping might turn out a nightmare as in the film *Gattaca*, and welcomed it instead as a matter of business and a potential future status symbol. The two founders of the firm see themselves more as social entrepreneurs instead of businesswomen appealing to potential customers to "donate" their genetic information to a database collecting everyone's genetic footprint for better health care (Hamilton 2008). Needless to say, the reliability of the tests to predict future illnesses is limited and people have not even begun to fathom the consequences of providing DNA information to others than the persons tested, e.g. employers or insurers.

determine the course of a life from birth or rather from the moment of the first genetic manipulation. Like predestination in Calvinism a person is doomed either to salvation or fall, success or failure in this genetically remastered society. Confidence and hope are useless in a seemingly rational world like this. Valids like the character Eugene, who after an accident gives his biological identity to the invalid Vincent (who adopts Eugene's first name Jerome and his genetic identity like a disguise or mask), are denied the chance to grow, to evolve as persons. Genetically reprogrammed to uniformity, the valid person is incapable of acting autonomously (cf. Platzgummer 2003: 74–9). The person becomes a beautiful and healthy form, only following its function. In the first draft of the film script, in a voice over after having been admitted to Gattaca, Jerome says:

> The majority of people are now made-to-order. What began as a means to rid society of inheritable diseases has become a way to design your offspring – the line between health and enhancement blurred forever. Eyes can always be brighter, a voice purer, a mind sharper, a body stronger, a life longer. Everyone seeks to give their child the best chance … (Niccol n.d.: n. pag.)

It is a warning, of course. Who is to say what is best? To the invalid Vincent, it is his genetic defect, as this perfect world would define it. It makes him capable of learning, adapting, even surviving, despite the medical prognosis at his birth that he would die before the age of thirty because of a cardiac defect. He is the sole character with emotions, the better human, not a saviour of humanity but a fitter being in the struggle for life.

Audience reviews show that messages like these, issues of genetic engineering and eugenics as the guiding principle of man-made evolution, do not go unnoticed. Over and again the aspects raised and the tone in which they are presented have been critically weighed – just as their scientific credibility. For example, some comments underline the fact that the film 'doesn't talk down to its audience' and is one 'with morals behind it' of which writers, directors and 'hopefully audiences … too' (Petrie n.d.: n. pag.) will learn. Many point out that in times of discussions on 'designer babies', genetic engineering or a two-class society health service, the film is up-to-date even twelve years after its release, perhaps even more so today than in 1997, that it still raises people's awareness for a number of issues (Halpern 2011 and Pflug 2009). In any case, the film has provided people otherwise incurious as to the findings of science with food for a lot of thought – every time it is watched. [18]

[18] Amazon review: 'ein fantastischer Film der bei jedem neuen Anschauen mehr Fragen aufwirft und einen nicht mehr loslässt' (Gierden 2008).

For Better or for Worse?

The look at the way questions of evolution are broached and debated in science fiction was motivated by the observation that the innovations in the fields of genetics, biotechnology and genetic engineering have not entered the homes, schools, pubs or other popular venues through scientific and popular scientific publications. Important subjects today are debated in a casual and easy-going manner, more often and potentially on a more solid basis of information than in previous decades due to the expansion and differentiation of the media and the facts and interpretations they provide. There is no doubt that these changes should be an issue, since a considerable part of our future development is connected to these fields of scientific research and innovation. And it may very well be a matter much talked of, for which the general attention to the 'art of the possible' in the field of enhancement of appearance provides telling evidence.

That research in this field produces much to talk about is obvious even if one only limits oneself to the more sensational statements and visions of scientists. Only a few examples and scientists have been quoted here to hint at the fact that it is not always the media that inflate the visions born out of new scientific findings. They have reasons of their own to paint images of rosy futures with endless possibilities or, as Craig Venter, the leading scientist of the Human Genome Project puts it, the solution to whatever problem in hand.

It is here that science fiction comes in as a 'storied discourse' of the issues involved, present-day science and technology, possible future developments and, even more importantly, our evaluation of them and of the impact they are going to have on our lives (Prince 2000: 15; Kailer 2011: 151–2). If one had to pinpoint a general tendency in the genre's evaluations of changes within the last two decades it would be a radical pessimism, which is, of course, all in line with the general tendency of thriving dystopia within the genre (cf. Rabkin et al. 1983; Edward 2003; Ryan and Kellner 2007; Baccolini and Moylan 2003; Voigts forthcoming).

What is more important in this context is the fact that the genre, and in particular its more popular products, confronts a large audience with images of science, with new scientific visions and their broader implications in a form many people can easily connect to. In this context, the way it does so, whether its messages have to be toned down so as not to alienate mass audiences (cf. Kailer 2011: 9ff.; Mikos 2003: 271ff.) or whether its representation of bioethical issues is primarily escapist or critical, is not of prime importance. The simple fact of their putting the subject on the agenda of people largely ignorant of them, however, is. How audiences resolve these visions in their minds, how they evaluate them, are questions as yet unexplored. Some may say that the genre invites people to discard their visions and interpretations as mere fantasy and thus avoid discussing them. The underlying argument here has been that people actually deal with the visions of SF, that science fiction, specifically in the form of the blockbuster feature films, incites discussions in the general public – meaning not the media or some highbrow definition of 'public discourse' but rather people usually indifferent to detailed and highly complex information – to an extent and in a way that no announcement

of a scientist or newspaper article, however sensational, does. It is not yet clear whether the majority would repudiate all the visions, would criticize them, would be curious or whether they would even join Miranda in exclaiming: 'O brave new world, / That has such people in't!'

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PART 3
Darwin as ‘Pop Star’ of Contemporary Theory

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Chapter 8
Displacing Humans, Reconfiguring Darwin in Contemporary Culture and Theory

Virginia Richter, Bern

A Tale of Two Darwins

> The frightening thing about Darwin is not nature red in tooth and claw. The frightening thing about Darwin is not our ancestors the apes. The frightening thing about Darwin is what my mother called chaos. I realise that there is some specific scientific meaning to the word *chaos*. But I think that my mother's meaning is more profound: there is no plan, there never was one. Everyone knows this. It is a cliché of modernism. Everyone knows this now. But Darwin knew it first. And Darwin knew it best. (Schine 1998: 177)

Recapitulating a part of Charles Darwin's voyage to the Galapagos Islands in search of her own past (or 'evolution', a term that significantly replaces non-biological designations such as 'story' or 'history' in recent biographical fictions),[1] the narrator of Cathleen Schine's novel *The Evolution of Jane* (1998) expresses the cultural shift that has occurred since Darwin's lifetime: from being a controversial and 'frightening' thinker, the eminent Victorian has become a central figure not only in present-day debates across various disciplines, from biology to cognitive linguistics and psychology, but in popular culture as well. One aspect effectively sidelined in the early stages of Darwin's reception, his rejection of divine design, that is, of teleology, is so widely accepted today that it can indeed be called 'a cliché of (post)modernism'. In fact, in 2009 – the bicentenary of his birth and the hundred-fiftieth anniversary of the publication of *On the Origin of Species* – Darwin was celebrated like a pop star. Conferences, new biographies, scholarly monographs and special editions of academic journals (for instance, *Victorian Studies*), while very extensive in number, were no more than could be expected in view of the relevance of Darwin's work. However, the popular hype of things Darwinian we have been experiencing since 2009 goes far beyond these established academic rituals. There have been countless exhibitions, festivals and interactive

[1] A topical example for this generic trend is Benjamin Hale's *The Evolution of Bruno Littlemore* (2011), a narrative told by a chimp become human, which draws extensively on Darwinian patterns.

media events.[2] Undoubtedly, the interest in evolution theory has spread far beyond a scholarly context. This is, of course, also true about the immediate impact of Darwinism. After the publication of *On the Origin of Species* in 1859, Darwin's ideas were popularized in various non-scientific media, for example in numerous caricatures. What interests me here, however, is the sudden upsurge, after a long period of relative neglect, of general interest in Darwin after the last turn of the century, for which the bicentenary celebrations are a symptom rather than a cause.

The Natural History Museum, London, launched the celebrations with an exhibition on Darwin's 'Big Idea', inviting visitors to 'discover the man and the revolutionary theory that changed our understanding of the world' ('Visiting the Darwin Centre'). Exhibits ranged from 'fantastic fossils' that had inspired Darwin on the voyage of the Beagle to a first edition of the *Origin*. Other events had a similarly popular appeal. The HMS Beagle Project planned to rebuild a modernized seagoing replica of the ship on which Darwin circumnavigated the globe, and to restage the voyage: 'International friendships and scientific alliances will form, and people the world over will follow the voyage, adventure and science aboard through the Beagle's interactive website' ('Beagle'). The University of Cambridge, Charles Darwin's *alma mater*, presented a festival (5–10 July 2009), featuring not only Darwin scholars, historians of science and scientists, but also poets and writers of fiction. The programme included lectures, debates, musical performances, film viewings and street theatre, as well as a major exhibition at the Fitzwilliam Museum. As the festival website put it, 'there was something for everyone' ('Darwin 2009 – A Festival'). The experience of the 'Darwin Year', this mixture of academic tourism, shared celebrations and professional marketing, has been neatly captured by George Levine: 'I have emerged from the bicentenary celebrations with about six Darwin-related t-shirts, a Darwin sweat shirt, several Darwin dolls and pens, three Darwin caps, and a Darwin bumper sticker' (Levine 2006: v). To which I could add my own modest trophies, a fridge magnet with Darwin's 'I think' diagram and a *Beagle* bookmark.

How has Darwin, the recluse of Down House, turned into an object of – however high-brow – merchandising? Why does he still have to offer 'something for everyone'? Put differently, what is Darwin's cultural function in the present? Why have his works gradually acquired a cultural value and urgency that is about to eclipse other important thinkers such as Marx, Nietzsche and Freud?

As the passage from Cathleen Schine's novel quoted above shows, the popular reception of Darwin's evolution theory has always been connected to fear.[3] Schine's protagonist Jane Barlow Schwartz identifies three Darwinian topoi that have continued to evoke anxiety: a view of nature that is not harmonious and

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[2] See the introduction of this volume for a review of activities in the context of the bicentenary celebrations.

[3] See my analysis of 'anthropological anxiety' in the wake of Darwin's evolution theory in *Literature after Darwin* (2011).

benign, but, in Lord Tennyson's phrase, 'red in tooth and claw';[4] the genealogical connection of all organisms including the human animal; and, most frightening of all, contingency, the a-teleological, unpredictable structure of natural selection. Peter J. Bowler has shown that contingency has been ignored in the early reception of evolution theory, although it constitutes a crucial aspect of Darwin's theory; hence, Bowler speaks of the 'non-Darwinian' revolution.[5] I would like to suggest that these three features are still central to contemporary perceptions of Darwinism, but their cultural meanings, and hence their value for the production of belief – of shared interpretations of our world – have changed. To take the most obvious example: while Darwin's suggestion that man is 'the co-descendant with other mammals of some unknown and lower form' (Darwin 1998: 152) was repulsive to his Victorian readers; today we are quite comfortable with the assertion that we share about 98 percent of our DNA with the chimpanzees. Publications that refer to the 'human animal' and call *Homo sapiens* 'the third chimpanzee' are bestsellers (such as Jared Diamond's *The Third Chimpanzee: The Evolution and Future of the Human Animal*). Revulsion has changed into acceptance and even fascination. Nevertheless, the trope of the 'ape ancestor' that is simultaneously the 'ape within' of modern man continues to be used to invoke negative qualities considered to be the – unchangeable – results of evolution: behaviour patterns such as violence, rape, war and general 'savageness'.

This ambivalent revalorization, I claim, is equally valid for the other Darwinian topoi. In contemporary Western liberal culture, the belief in a clock-like ordered nature, prevalent in Darwin's youth and singled out for explicit rejection in *On the Origin of Species*, has been widely replaced by a view of nature as a complex, unstable system, the future of which is contingent upon a multitude of small, unpredictable events. Considering Darwin's ubiquity one might think that order and teleology have largely disappeared from our views of nature;[6] however, as will be discussed below, some media representations and scholarly positions based on evolutionary psychology continue to adhere to the idea of a biologically determined human nature. Conversely, the insecurity resulting from the widespread acceptance of contingency may still be scary, but simultaneously it has become a point of anchorage for popular representations of (human) nature as well as for critical theory that highlights contingency as a positive, dynamic force, because of its very indeterminacy. An example for the latter interpretation of Darwinism

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[4] Tennyson, *In Memoriam*, Canto 56. See Schine 1998: 177–8.

[5] See Bowler 1975, 1983, 1992.

[6] This, obviously, is a sweeping claim that, like all such generalizations, is only partly true. Within religious discourse, we can find both appropriations of Darwinism that attempt to reconcile it with Christian faith (including the idea of a caring Creator and a final goal of creation, namely the perfectibility of humankind), and fundamentalist rejections of evolution theory. Neither the vast literature in this field nor the publications of the 'anti-religious camp', represented first and foremost by Richard Dawkins and Daniel Dennett, can be considered here. For a balanced assessment of the issues at stake, see Bowler 2007.

is Elizabeth Grosz's *The Nick of Time* (2004), a study of variation, transformation and temporality. For Grosz, evolution constitutes a force of openness and difference that can be aligned with radical (for example, feminist) politics. Nature and culture, the body and the mind thus no longer stand in opposition, '[b]iological organization, whose morphological structures engender the variety of life in all its forms, instead of ensuring that life conforms to existing social categories, boundaries, and limits, instead of containing existence to what is or has been, opens up and enables cultural, political, economic, and artistic variation' (Grosz 2004: 1).

A very different take, namely an adherence to evolutionary determinism, is pursued under the heading of 'literary Darwinism'. While also taking the continuity of nature and culture, and the formative influence of evolution as their premise, the proponents of this school of thought focus on the *result* rather than the *process* of evolutionary adaptation. In consequence, the human mind and human cultural practices are considered as, to a large degree, determined by long-term evolutionary processes: 'innate human dispositions exercise a powerful shaping force on all forms of cultural order' (Carroll 2004: 23). This does not utterly preclude cultural variation, as the leading theorist of this approach, Joseph Carroll, emphasizes: 'cultural forms are themselves the product of a complex interaction among various innate dispositions and between innate dispositions and variable environmental conditions' (2004: 23). However, this is a far cry from the scary yet productive 'chaos' of Darwinism. Here, Darwinian contingency – defined by Grosz as 'endless openness to the accidental, the random, the unexpected' (Grosz 2004: 7) – has been domesticated. In Carroll's and Grosz's readings, we get two irreconcilably different Darwins.[7]

Darwin stands at the centre of such intellectual debates and continues to engage the popular imagination for a number of reasons. By his contemporaries, he was regarded as a destroyer of established truths, but also as someone who opened vast new vistas of scientific inquiry. This contradictory reception – oscillating between fear and hope, between chaos and a new order, between the destruction of a *grand récit* and the offer of a new one – continues to inform the views of Darwinism in the present. Darwin raised questions that are still topical, and that crucially affect human self-perception as well as our conceptions of the world. Is there a continuum or a divide between nature and culture? What are anthropological givens, what are cultural constructions? In how far does evolution determine human behaviour? What is the status and function of human artefacts such as art and literature? How would a Darwinian framework restructure academic research not only in disciplines such as socio-biology, evolutionary development, anthropology and primatology, but in the humanities? And what exactly do we mean if we invoke such a Darwinian framework?

I suggest that there is more than one 'Darwin' – maybe not just two but, in the words of Stevenson's Dr Jekyll, a whole 'polity' (Stevenson 2003: 48) – and that it

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[7] I will return to this discussion in the third part of my essay.

is precisely the richness, indeterminacy and even contradictoriness of his texts that makes Darwin and his work such a productive starting point for interpretations and theories within and without academia. But it is not only the intellectual and scholarly level on which Darwin is stimulating. His popular appeal is only explicable in terms of the affect of his work. But the affective response is as wide-ranging as the intellectual one, as I can only briefly indicate here by mentioning two titles in which Darwin's name is invoked. In the documentary *Darwin's Nightmare* (2004), the filmmaker Hubert Sauper describes the introduction of the Nile Perch into Lake Victoria, which led to the subsequent extinction of indigenous fish species in the lake. The international traffic with Victoria Perch, soon to become one of the most popular kinds of fish on European dinner tables, in turn has financed the traffic in weapons in the countries adjoining Lake Victoria. War, famine and prostitution appear as more or less direct consequences of the human intervention in the lake's ecosystem. Sauper offers a view of nature and culture as an 'entangled bank', in Darwin's term, a story in which the extinction taking place in the depth of the lake is mirrored by the human brutality on its shores. These events have *per se* nothing to do with Darwin. However, the title is well-chosen because it allows audiences to activate one of the available Darwinian frameworks, the semantic cluster of extinction, the war of nature and ecological connectivity. Because the film is framed in such a way, the events described acquire a wider resonance. From being a documentary about a particular time and place, a particular human conflict and a particular kind of fish, the story becomes part of a larger pattern, a metaphor for the condition shared by humans and animals.

My second example is George Levine's recent book *Darwin Loves You* (2006), whose title has been inspired by a bumper sticker bearing these three words in an ironic subversion of the even more popular 'Jesus Loves You'. Needless to say, the Darwin constructed here is vastly different from the one in *Darwin's Nightmare*. Defending Darwinism from the charges of a mechanistic and intrinsically amoral world-view and of 'sanctioning … the worst of dog-eat-dog capitalism' (Levine 2006: ix) – or, one might add, fish-eat-fish capitalism – Levine proposes a 'kinder, gentler Darwin' (Levin 2006: 202), a theorist of non-theistic enchantment. In the famous last passage of *On the Origins of Species* in which the author describes the 'entangled bank' bordering a country lane, Darwin sees more in nature than 'a Struggle for Life', 'the war of nature' and 'famine and death' (Darwin 1860: 490). He sees the richness and interdependence of an ecological system, 'with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth' (Darwin 1860: 490), humble yet complex organisms that allow him to see a larger picture and to react with a sense of wonder:

> There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved. (Darwin 1860: 490)

This is not stark and meaningless chaos. The sense of wonder at a beautiful world in which death is very present but in a sense has lost its sting, the enchantment evoked in this sentence, produces a powerful affect whether it is theistic (with the phrase 'by the Creator' inserted in the second edition), or non-theistic, without God, as in the first edition. As Levine comments:

> In the intensity of his engagement with the natural world, Darwin offered one of the very richest compensations for the imperfections, cruelties, and indifferences that his studies seemed so often to reveal. Reading his work with care, one will find … that far from proposing a world that mechanistically functions without spirit or moral compass, Darwin's writing belongs to a great tradition of romantic literature and thinking that imagines nature, with all its obvious horrors, as essentially benevolent and altruistic – quite the reverse of what many modern uses of 'natural selection' describe. … Darwin's world, while it points always toward that naturalistic explanation, pushes frequently also toward the sublime, toward that dizzying vision of endless time, of staggering complexity, of interdependence and paradox, that replaces the 'enchantment' that a divinely constructed nature has been said to produce. (Levine 2006: 41)

I propose that both Darwins, the benign one constructed in *Darwin Loves You* as well as the bleak one in *Darwin's Nightmare*, have a certain justification, a foundation in his own texts. As various studies on the reception of Darwinism show, most recently the collection edited by Eve-Marie Engels on the ethical and epistemological impact of Darwin (2009), Darwinism has always been open to the most diverse responses across different disciplines and ideological positions. Which Darwin we need, and which Darwin we like, is highly dependent on our various strategic position-takings and intellectual commitments. I will return to this question regarding my own discipline, literary studies, in the final part of my paper. But first I take a look at yet another of the topoi enumerated by Schine's Jane Barlow Schwartz, a particular Darwinian configuration which was highly resonant for the Victorians and continues to haunt contemporary debates: the encounter between humans and apes, and the recognition of their similarity.

The Darwinian Mirror Stage

Famously, the debates following the publication of *On the Origin of Species* focused on Darwin's 'monkey theory', as the descent of all primates from a common ancestor was inaccurately but popularly referred to. Before Darwin, the dual nature of humankind was largely undisputed. Through his body, man was linked to the world of animals, so that Linnaeus, for example, could include the species *Homo sapiens* in the order Primates on anatomical grounds, together with such interesting species as *Homo nocturnus*, today better known as the orangutan (*Pongo pygmaeus* and *Pongo abelii*).[8] Even if Linnaeus's taxonomy was not

[8] On the history of the classification of great apes, see Corbey 2001, esp. 164–5.

undisputed, it was not fundamentally problematical since the other and more important part of the human being, his mental and spiritual side, was clearly not a part of nature, but God's gift to his favoured creature. This comfortable division was shattered by Darwin's claim of common descent and his inclusion of the higher human faculties in the process of natural selection. In a radical break with Western philosophical tradition, Darwin proposed a monistic view of the human animal.[9]

Collectively, Darwin's contemporaries recoiled from evolution by natural selection. The 'anxiety of simianation' (Bernstein 2001), of 'going ape', proliferated both in general debates and in fictional writings. However, the sheer abundance of visual and textual material stressing the *similarity* between apes and humans – novels, caricatures and practices such as the highly popular ape tea parties at zoological gardens – suggests that the Victorians were not only shocked but also amused and fascinated by the 'monkey theory'.[10]

Obviously, this caricature is not terribly threatening. Rather, it is funny, irreverent and subtly erotic. An ape-like Darwin and a coy Victorian chimp lady are sketched against a tropical idyll, their gestures following the conventions of the depiction of lovers. Together, they are gazing into a small hand-held mirror. What is going on in the triangular exchange between the male human gaze, the female simian gaze and the mirror, the symbol of truth and of vanity? Is Darwin wooing the chimp lady, trying to seduce her by an appeal to her charming face? Is he instructing her about simian-human genealogy by pointing out the similarities between their features? Or is Darwin admiring his own magnificent cranium, the sign of human superiority despite his ape-like body? Is the connection between Darwin and the ape the familial relationship between cousins, the didactic relationship between teacher and pupil, or the desire pulsating between lovers? We cannot tell, because the reflection in the mirror is hidden from the viewer. I suggest that this mirror scene points us to a central configuration within Darwinian discourse. A human being gazing into a mirror and discerning the features of an ape, or looking at an ape and suddenly recognizing, as if in a mirror, himself, experiences anagnorisis, the moment of recognition we know from Greek tragedy, for example when Oedipus realizes that he himself is the murderer of King Laios whom he is seeking.[11] The shock of recognition is a constitutive moment in the human-ape encounter; however, the effect of anagnorisis is deeply ambivalent,

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[9] Prior to Darwin's theory, particularly its elaboration in *The Descent of Man*, only very few European philosophers argued for a naturalistic explanation of human mental powers, most notably Julien Offray de la Mettrie in *L'homme machine* (1748).

[10] For an analysis of visual representations of Darwinism including caricatures and book illustrations, see Janet Browne, 'Constructing Darwinism in Literary Culture' (2005). See also the exhibition catalogues edited by Donald and Munro (2009), and Kort and Hollein (2009).

[11] For an elaboration of anagnorisis in fiction on animals, see Gerhard Neumann, 'Der Blick des Anderen' (1996).

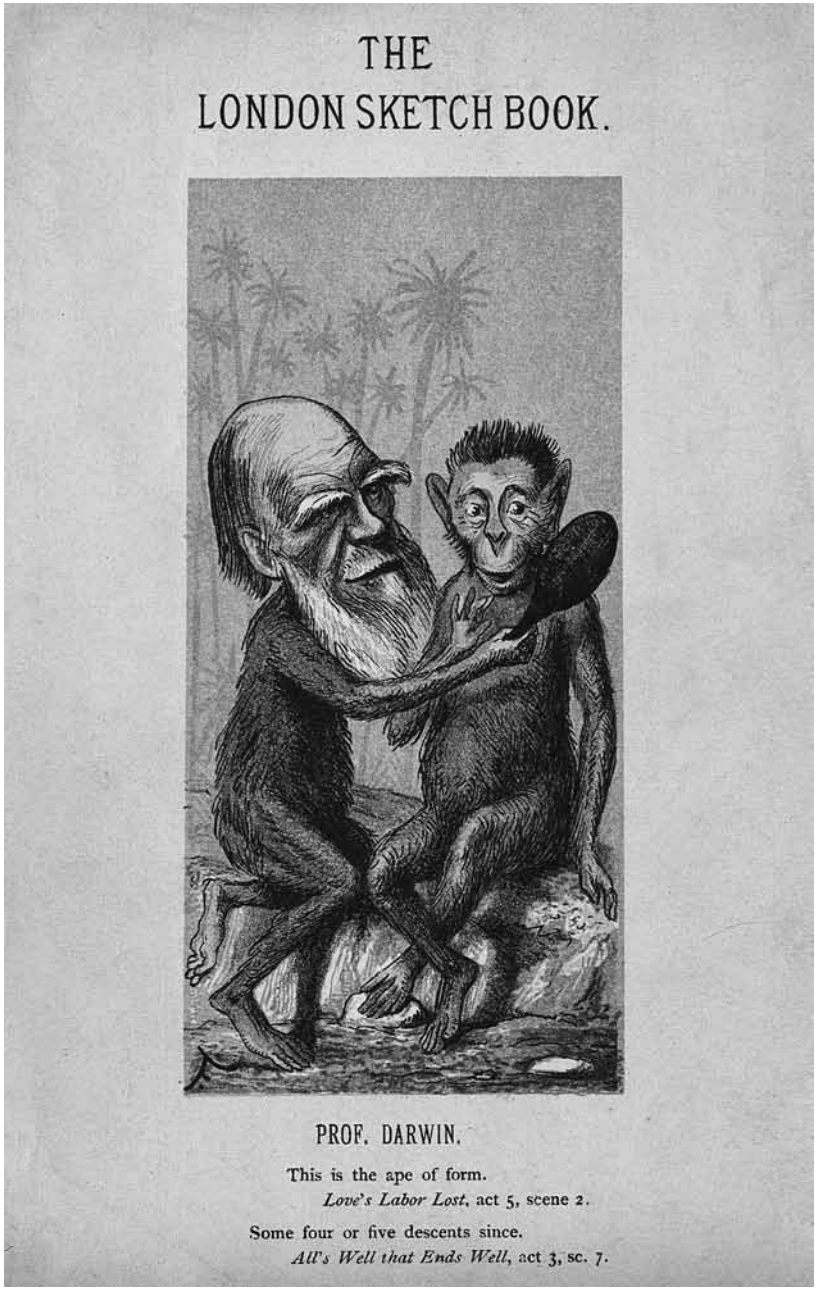

Fig. 8.1 Artist unknown, 'Prof. Darwin', *The London Sketchbook*, 1874. Reproduced with permission from Wellcome Library, London.

resulting either in a denial of identification or an all-too-eager over-identification with the simian other. I argue that a crucial difference between the Victorian and the contemporary response to Darwinism consists precisely in our stance toward anagnorisis, a shift from disavowal to embracing our simian heritage.

Mirror scenes between humans and apes proliferated in the fiction of the last decades of the nineteenth and the first decades of the twentieth century, reflecting both anthropological anxiety – the insecurity about human ontology after Darwin's intervention – and a desire for knowledge, equally connected to the Darwinian revolution and directed precisely at the human status that had become deeply ambivalent. The imagined encounter between humans and apes, or humans and their ape-like ancestors, is described as a shattering recognition of the animality of human nature and consequently, the subversion of the received world order. In Arthur Conan Doyle's adventure novel *The Lost World* (1912), on an isolated South American plateau British explorers meet various groups of inhabitants arrested at different points of evolutionary development: Jurassic dinosaurs, primitive Indians and anthropomorphic ape-men, the missing links postulated by Ernst Haeckel. Only the last group are perceived as dangerous because of their simultaneous familiarity and strangeness, their fusion of humanity and animality. The narrator, journalist Edward Malone, describes his first encounter with one of these creatures as uncanny in the Freudian sense – as shocking because he can recognize his own human identity in the repulsive features of the other:

> A face was gazing into mine – at the distance of only a foot or two. The creature that owned it had been crouching behind the parasite, and had looked round it at the same instant that I did. It was a human face – or at least it was far more human than any monkey's that I have ever seen. It was long, whitish, and blotched with pimples, the nose flattened, and the lower jaw projecting, with a bristle of coarse whiskers round the chin. The eyes, which were under thick and heavy brows, were bestial and ferocious, and as it opened its mouth to snarl what sounded like a curse at me I observed that it had curved, sharp canine teeth. For an instant I read hatred and menace in the evil eyes. Then, as quick as a flash, came an expression of overpowering fear. There was a crash of broken boughs as it dived wildly down into the tangle of green. I caught a glimpse of a hairy body like that of a reddish pig, and then it was gone amid a swirl of leaves and branches. (Conan Doyle 1912: 117)

We can imagine that this play of emotions, from spontaneous disgust and hatred to fear, is reciprocated by the ape-man who is looking at a human face for the first time. The mutual recognition is reinforced in the encounters that follow. The category confusion produced by the similarity between humans and anthropoids is so threatening to both groups that a genocidal war erupts, resulting, naturally, in the triumph of *Homo sapiens* and the extinction of the ape-men.

A similar feeling of threat and disgust at the confrontation with the simian mirror image is expressed by Thomas Henry Huxley. In this case, however, the physical revulsion is superseded by an intellectual upheaval, which, albeit threatening at first, is the first step towards the pursuit of a deeper, daring knowledge about human nature:

> Brought face to face with these blurred copies of himself [i.e. apes], the least thoughtful of men is conscious of a certain shock, due perhaps, not so much to disgust at the aspect of what looks like an insulting caricature, as to the awakening of a sudden and profound mistrust of time-honoured theories and strongly-rooted prejudices regarding his own position in nature, and his relations to the under-world of life; while that which remains a dim suspicion for the unthinking, becomes a vast argument, fraught with the deepest consequences, for all who are acquainted with the recent progress of the anatomical and physiological sciences. (Huxley 1863: 59)

This idea of uncovering a hidden truth, however unpleasant it may be, is the final constitutive element of the trope of the simian mirror. The human being looking at himself in the mirror and seeing the insulting caricature of an ape, or looking at an ape and recognizing with a sense of shock his own face, is at the same time an explorer embarking on the discovery of a new continent of knowledge, conducting a vast argument which distinguishes the thinking from the unthinking. Despite Darwin's inclusion of the higher intellectual capacities into the workings of natural selection, Huxley succeeds in salvaging the human intellect from the Darwinian humiliation. Huxley's reading of Darwin implies a heroic success story in which upwardly mobile *Homo sapiens* has worked his way up from his very humble beginnings in primordial slime to his current position as the king on the hill, an animal, yes, but a thinking animal towering above all others. In this way, Huxley contributes to the containment of the most subversive aspect of Darwinism, the contingency of natural selection and consequently, of human supremacy.

The Darwinian mirror scene partly reinforces Huxley's heroic revision of evolution theory, but more often than not undermines it by referring the human observer to the materiality underlying his identity construction, and consequently his mortality. In Jacques Lacan's account of human identity formation, the mirror is constitutive of the transition from a fragmented body image to an experience, or rather illusion, of wholeness. Intriguingly, Lacan begins his essay on the mirror stage with a reference to apes. While human infants are fascinated by the discovery of their reflection in the mirror, young apes according to Lacan fail to make the connection between their real and their represented selves (Lacan 1980: 1). The infant's identification with his mirror image implies that the human subject is divided between his physical body (which cannot be perceived by his own eyes as a totality) and the reflection in the mirror, which alone can supply a sense of completeness, called by Lacan the 'jubilant assumption of his specular image by the child' (Lacan 1980: 2). Consequently, human identity is built on a division between the physical entity and the cultural construction of wholeness, whereas the ape, who finds the mirror image 'empty' (Lacan 1980: 1), is at one with itself. If the mirror is replaced by the 'insulting caricature' of the ape (Huxley 1863: 59), throwing back the anamorphic distortion of the human figure, the illusion of wholeness and identity is shattered. In the caricature shown above, Darwin can see either his own reassuringly human face or the subtly disquieting reflection of the friendly, intelligent and yet uncanny chimp lady, depending on how the mirror is tilted. What is interesting about this illustration is precisely its dynamic

Fig. 8.2 Markus Roost, Untitled, *Die Zeit*, No. 44, 22 October 2009. Reproduced with permission from the artist.

and shifting quality, which it shares with many other visual representations of the human-ape encounter.

Is the configuration I have been describing so far historically specific to the immediate aftermath of Darwin's evolution theory? In other words, are these exclusively Victorian fears that have become obsolete today? After all, we are happy to acknowledge our genetic closeness to the great apes, or to admit that apes use and even make tools, live in socially complex groups and have an effective system of communication, or the fact that apes have a form of cultural memory and even produce art, as the primatologist Frans de Waal tells us (de Waal 2001: 30–1 and 174–5) – in short, that the difference between humans and other animals is, as Charles Darwin claimed, only a matter of degree and not of kind. What was deeply shocking to Darwin's first readers has become a generally acknowledged truth. Significantly, however, the trope of the mirror in which the human beholder suddenly sees his own simian features has survived. Interestingly, this human-ape anagnorisis is still staged as a shock.

This sudden apparition of man's true nature is certainly more frightening than Darwin's flirtation with the chimp. The photomontage accompanied an article about the origins of evil that appeared in 2009 in the German weekly *Die Zeit*. In both the illustration and the article, it is striking how stable certain rhetorical elements have remained. As in the writings of Darwin, Huxley and Victorian anthropologists and novelists, a face-to-face encounter is presented that allows us to catch a glimpse of the past. What we see in this magic mirror is, once again, the insulting caricature of the ape, here in the shape of a gorilla who functions as a representative of brute force and evil, despite Dian Fossey's efforts to reconstruct this species' image as 'gentle giants'. This is King Kong in the bathroom. In

addition, the article reproduces a conflation of three entities that is also familiar from Victorian anthropological texts or even from Sigmund Freud's *Totem and Taboo*: the rhetorical superimposition of the ape, prehistoric man and contemporary 'primitive' societies, suggesting that human behaviour, in particular in its more unpleasant aspects, is inherited and therefore predetermined and unchangeable:

> Research like that conducted by Lucerne ethnologist Jürg Helbling shocks us also because we perceive in the archaic behaviour of tribal peoples as if it were our own past, and we are confronted with the fact that our ancestors also committed murder, rapine and plunder. And we get the feeling that as we look at primitive peoples we get to see something primeval, something frightening that is older than our civilisation, stronger perhaps than our own present moral code – something that for centuries has been termed 'evil'. (Schmitt 2009: 37, my translation)[12]

I will leave aside the obvious critique of this description of the so-called *Naturvölker* as living outside history and outside culture. As the article implies, the modern anthropologist, discovering humankind's violent past preserved in the 'archaic behaviour' of our less fortunate contemporaries in the jungle, is as 'frightened' as his Victorian ancestor contemplating the genealogical links between apes and humans. The rhetoric employed here – both on the visual and the textual level – draws on a tradition that is as old as Darwinian evolution theory itself. However, one could ask, why is this tradition still alive? And are its implications really still the same? At this point, we have returned to my initial question about the cultural function of Darwinism in the present.

Darwin in the Humanities: Seeking our Inner Ape

Although Darwin barely mentioned humankind in *On the Origin of Species*, the question of human nature has always been perceived as the central issue of Darwinism. However, the answer it has to offer is far from unequivocal. Anthropological models based on Darwinism can either stress the unfinishedness of evolution, its continuing dynamics, or conversely the slowness of adaptive processes that is tantamount to a standstill. The view adhered to in the *Zeit* article and in many other publications is that human nature is practically unchanging, frozen in a moment that is long past. It is not so much the tribal community that is 'prehistoric' as rather our own modern society: human behaviour today is

[12] 'Forschungsarbeiten wie [die des Luzerner Ethnologen Jürg Helbling] erschüttern uns auch, weil wir im archaischen Verhalten der Stammesvölker gleichsam unsere eigene Vergangenheit erblicken und damit konfrontiert werden, dass auch unsere Vorfahren einst mordend, raubend und brennend ihr Unwesen trieben. Und es beschleicht uns die Ahnung, dass wir beim Blick auf Naturvölker etwas Urzeitliches zu sehen bekommen, etwas Erschreckendes, das älter ist als unsere Zivilisation, stärker möglicherweise als unsere gegenwärtige Moral – etwas, für das seit Jahrhunderten der Begriff des 'Bösen' geprägt wurde.' (Schmitt 2009: 37)

allegedly still driven by genetic adaptations acquired in the palaeolithic age as, for example, the editors of *The Adapted Mind* maintain: 'the evolved structure of the human mind is adapted to the way of life of Pleistocene hunter-gatherers, and not necessarily to our modern circumstances'.[13]

By extension, cultural activities are frequently placed within an evolutionary framework in a way that stresses trans-historical universalism rather than the historical and cultural specificity of human practices – which, in fact, are not even uniquely human any longer. Frans de Waal argues that possibly 'our artistic impulse is ancient, antedating modern humanity, and perhaps even our species' (de Waal 2011: 152), and goes on to give a number of examples of painting apes and dogs enjoying classical music, an anecdotal procedure that resembles Darwin's own in *The Descent of Man*.[14] This claim of a human-animal and culture-nature continuum and the naturalist position more generally have found a response in some recent approaches in literary studies that look at the anthropological and evolutionary foundations of literature. The presupposition of approaches such as 'literary Darwinism' (Carroll 2004) is that innate human dispositions – the product of natural selection – influence to a high degree all cultural activities, even if they do not determine them completely. The 'Darwinian paradigm' – or this particular interpretation of it – is regarded as normative. Positions that do not fit in, such as post-structuralist constructivism, are rejected as incoherent, empirically unfounded and plainly misguided (Carroll 2004: 23–5). Valid questions to be asked by literary scholars are, according to Carroll, 'what is [the] species-typical or universal structure [of the adapted mind], and what bearing does it have on literary representation?' (124). The result of such questioning, for example with regard to *Pride and Prejudice*, could be that '[t]he protagonists satisfy normative sociobiological expectations' (Carroll 2004: 134), namely: 'Strong men of high status gain sexual access to young and beautiful females' (Carroll 2004: 132). This may be true – but then, Mr. Collins who surely is an exemplar bound for extinction gains 'sexual access' to Elizabeth Bennet's best friend Charlotte Lucas, highlighting, if anything, the predominance of cultural and socioeconomic factors over the biological – but surely it is a very impoverished interpretation of Austen's novel. In addition, this type of research question focuses exclusively on the normative functions of literature to the detriment of its critical, socially subversive and aesthetically singular aspects.

In fact, Carroll is not interested in hermeneutic approaches that lead to a better understanding of individual works. He advocates an empirical methodology in which works of fiction are just a means to an end. His method of preference is quantitative analysis directed at reader psychology and, to a lesser extent, author psychology:

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[13] Barkow, Cosmides and Tooby 1992: 5. The caveman trope according to which gendered behaviour in particular continues to be determined by Pleistocene adaptation has been widely popularized; see McCaughey 2007.

[14] On the evolutionary emergence of the aesthetic sense, see the argument recently put forward by Winfried Menninghaus (10 and passim).

> Could we, for instance, take the opening chapter of Jane Austen's novel *Pride and Prejudice*, have an experimental subject read it while under a scanning machine, and find out something about the way comedy actually alters the brain? By correlating the responses of individual people with other data on the same people – psychological and social profiles, for example – and by comparing such correlations across individuals and groups of individuals, we could begin to formulate precise empirical propositions about the conditions under which audience response varies. (Carroll 2004: 38)

Given the necessary technology, we could. I leave open the question whether we should. If we do, we leave behind one academic discipline, literary criticism, and enter another, cognitive psychology or the sociology of literature.

Despite its obvious limitations – at least from the point of view of 'traditional' literary studies – literary Darwinism, together with other naturalist approaches such as cognitive poetics and linguistics, positions itself at present very successfully, albeit controversially, in the field of theory formation within the humanities.[15] What is the appeal of such approaches? Partly, the naturalist or materialist or cognitive turn has to do with a growing dissatisfaction with the premises and methodology of cultural constructivism. Such unease has been expressed for example by Catherine Belsey, a prominent representative of post-structuralist theory who surely cannot be suspected of a naïve return to human nature as a foundational category. But according to Belsey, it is culture that now has become foundational, and therefore limiting, in critical theory: 'A thoroughgoing attribution of primacy to ideas, to the cultural script, has installed a new kind of tyranny' (Belsey 2005: xi). Concomitantly, there is a growing interest in methodology, on the one hand in traditional philological methods and textual criticism, on the other hand in empirical psychological and sociological methods based on large amounts of data – in both cases, approaches invested with the hope of providing a more secure footing for literary studies.

In this context, literary Darwinism claims a closer observance of the scientific ideal, of *Wissenschaftlichkeit* as opposed to the often more associative hermeneutic methods common in the humanities. If, however, the axiomatic assumption that nature is the foundation for all cultural activity leads to the conclusion that all literary texts reflect this unvarying nature – that all novels are about sexual selection – then the aesthetic distinctiveness and historicity of literature is completely lost. Moreover, literary Darwinism commits a methodological fallacy of its own when it regards the interest the humanities have in historicism and cultural construction as flawed:

> There is human knowledge that accumulates and there is human knowledge that has to be constantly negotiated anew. Literary scientism in this situation fails to

[15] The *Journal of Literary Theory* has been running a series of articles on literary Darwinism, empirical methodology and related topics since 2007. The full texts can be accessed online under the heading 'Controversy' (http://www.jltonline.de/index.php/articles). *Critical Inquiry* has repeatedly printed contributions on Darwinism and the humanities, see for example Gross 2010.

> understand or acknowledge the methodological aim and status of hermeneutic approaches to literature. It is not a *deficit* of these approaches that they ask particularistic questions; it is their explicit way of searching for models of understanding that are appropriate to the peculiarities of their object. (Kelleter 2007: 171, emphasis in original)

A further problem of literary Darwinism is that it presupposes a very rigid Darwinian framework: it assumes a human nature that suffers from arrested development. This paradigm is thus caught up in the trope of the mirror that always reflects one and the same, primeval image of human nature – a kind of Dorian Gray theory of evolution. Not only does this approach ignore the historical, cultural and individual specificities of literary texts, it also misunderstands its own epistemological foundation, namely Darwinian evolution theory. The sadly misnamed literary Darwinism looks for predictable patterns, whereas a constitutive moment of Darwin's Darwinism is the unpredictable variation, the uncontrollable event, the contingent new form.

As Gillian Beer has emphasized, Darwin's theory is far from privileging normativity. Perpetual change, not the endless repetition of the same universal pattern, governs the evolutionary process. At a point in history when human bodies are subjected to enormous processes of standardization, we can and should rediscover Darwin's idea 'that diversity, difference, nonconformity, otherness, are creative forms – diversity is *the* creative medium and abundance of difference essential to survival' (Beer 1998: 26f., emphasis in original). And it is not only difference and diversity that are crucial here, but – it bears repeating – the unpredictability of these processes of change: 'New characters appear more or less at random and are whittled down by a merciless struggle for existence to leave only those with survival value. This is evolution by trial and error, not by design' (Bowler 2007: 80). This, again, is Cathleen Schine's 'chaos': scary, because the future is uncertain, and at the same time liberating and productive – because the future is uncertain.

In this sense, Darwinism has been deployed by the feminist theorist Elizabeth Grosz. The fact that past events set the terms for, but do not control the future means that individuals just as well as populations are always in a state of emergence: rather than being predetermined by a residual 'inner ape', human beings constitute and modify their identities performatively, by actualizing directions latent in their respective culture. The concept of the 'event' is crucial for Grosz's theoretical exploration of Darwinism:

> Darwin brings the concept of the *event* to the sciences. Events are ruptures, nicks, which flow from causal connections in the past but which, in their unique combinations and consequences, generate unpredictability and effect sometimes subtle but wide-ranging, unforeseeable transformations in the present and future. Events erupt onto the systems which aim to contain them, inciting change, upheaval, and asystematicity into their order. (Grosz 2004: 8)

Since Jurij Lotman's seminal study *The Structure of the Artistic Text* (1977), the event plays an important role in literary and particularly in narrative analysis. Drawing on Lotman, Mieke Bal stresses the transformative character of the event within a plot structure: 'an event is a process, an alteration' (Bal 1997: 182). Events, one could say, correspond to the 'random variations' of evolution: they are surprising twists, modifications, new departures within established generic patterns. Without such patterns, events would be meaningless; without events, however, genres would lose their creative, transformative potential. Critical engagements with literary texts should pay heed to both: the pattern as well as the event. A methodologically sound and historically sensitive reading of Austen's *Pride and Prejudice* therefore has to take into account both the nonconformist event – Elizabeth's flagrant break with conventions when she rejects not one but two marriage proposals – and the normative generic pattern from which it deviates and to which it ultimately returns. In my view, a cultural theory based on a reading of Darwinism that foregrounds the event – and with it, processes of transformation, difference and unpredictability – does better service to the humanities, and literary studies in particular, than a theory that ignores the human potential for change as well as historicity and cultural diversity – a theory caught up in the search for the ape that is still lurking within us all.

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Chapter 9
Ordering Darwin: Evolution and Normativity

Nils Wilkinson, Siegen

Theorizing Order

How does cognitive ordering affect our perception and understanding of Charles Darwin and the theory of evolution? Without any doubt there are countless varieties of both Darwin as a cultural icon and utilizations of evolutionary theory (which this book demonstrates). This essay does not support the idea that there is a single, objective answer to this question (though it considers addressing this idea to be a vitally metaphysical and thus highly ethical issue), but it supports the idea that there is a way of understanding why generalizations are possible (because metaphysical truths, though constructed and culturally and historically embedded they may be, do exist and we align ourselves to this truth and consequently to its ethics and politics). The complexity of specializations within science leads to unbridgeable gaps between scientists who then resort to simplifications so as to be able to at least communicate some of the dense knowledge acquired over a long period of time. This problem appears even more striking when we consider the distortions of scientific insights in the arts and science pages of the popular press. Here, an uncritical reader with only surface knowledge of biological science may be led to think that biology actually holds the answer to the question of what human nature *is* (look out for sentences that start with 'scientists now have found the key to…'), rather than showing that nature is a malleable, ongoing process of *becoming*. For example, if we look into Heinz-Jürgen Voß's work on the history of not only medical theories of sex, we see that constructivist notions have long been part of such inquiries and that they are *not* a symptom of the two cultures of hard vs. soft science. I understand this essay as a contribution to science studies, which reflects the structures underlying scientific inquiry.

Let me start with a deceptively essentialist statement: order is a constant anthropological factor because all socio-political and intellectual endeavours of human beings prove to be attempts at establishing order. Such is the main statement of political scientist Andreas Anter in his book *The Power of Order: Aspects of a Basic Category in Politics* (2007: vii). For instance, all central political or theoretical terms are terms of order: legitimizing, negating, empirical, normative, judicial, economic, political, sociological and so on (Anter 2007: 1–5). 'The history of political thought', Anter further declares, 'is the history of conceptions of order

that for their part reacted to processes of creation and decline of political and social orders. At the same time, it is the history of the battle of rivalling concepts' (2007: 1; my translation).[1] It is here that constructivism helps us understand how conceptions of order are dwellings for those who establish and follow them. For all of us, the axiom is that order is a principle of distinction because order is established through a line of demarcation differentiating itself from something else: 'Only that which has a border, can be defined' (Anter 2007: 266).[2] Anter quotes Pierre Bourdieu's *Distinction: a Social Critique of the Judgment of Taste*: 'The maintenance of order is the keeping of all *detachments*, differences, ranks, priorities, exclusiveness, distinctions, *ordinal characteristics* and thus relations of order that lend a societal formation's respective structure' (in Anter 2007: 266, emphasis in original).[3]

Anter (2007: 115) also argues that every order is an order of governance, hierarchy and of power constellations and every order that wants to assert itself does so by promising security (Lat., *se cura*, Eng. 'without worries'), stability (spacial) and continuity (temporal), reliability and absence of danger, and in return demands conformity, conviction and trust:

> Every order is an order of power at the same time. This applies most notably to political orders, which can be defined as durable and solidified power relations. But the character of power does not always necessarily have to come to light. Quite the contrary, successful and stabilized orders often distinguish themselves in that their power structures are either concealed or 'institutionally reinterpreted'. If an order manages to present itself as free of power, possibly as free of domination, it attains an even more comfortable position. The more inconspicuous its character of power, the more successful its claim to validity, the greater its stability. It exists because it exists. (Anter 2007: 96)[4]

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[1] 'Die Geschichte des politischen Denkens ist die Geschichte von Ordnungsvorstellungen, die ihrerseits auf Prozesse der Entstehung und des Verfalls von politischen und sozialen Ordnungen reagierten. Zugleich ist sie die Geschichte des Kampfes rivalisierender Konzepte.'

[2] 'Definierbar ist nur das, was eine Grenze hat.'

[3] 'Die Aufrechterhaltung der Ordnung … ist die Wahrung aller *Abstände*, Differenzen, Ränge, Prioritäten, Exklusivitäten, Distinktionen, *ordinalen Merkmale* und dadurch der Ordnungsrelationen, die einer gesellschaftlichen Formation ihre jeweilige Struktur verleihen.'

[4] 'Jede Ordnung ist zugleich eine Machtordnung. Dies gilt vor allem für politische Ordnungen, die man als dauerhafte und verfestigte Machbeziehungen definieren kann. Dabei muß der Machtcharakter einer Ordnung keineswegs immer offen zutage liegen. Im Gegenteil, erfolgreiche und stabilisierte Ordnungen zeichnen sich häufig dadurch aus, daß ihre Machtstrukturen entweder verdeckt oder "institutionell umgedeutet" sind. Wenn es einer Ordnung gelingt, sich als machtfrei, womöglich sogar herrschaftsfrei zu präsentieren, gelangt sie in eine umso komfortablere Lage. Je unscheinbarer ihr Machtcharakter, desto erfolgreicher ihr Geltungsanspruch, desto größer ihre Stabilität. Sie existiert, weil sie existiert.'

It is order's function to reduce complexity, to relieve the strain, and to establish a sense of certainty and reliability. One needs to know where one stands with a particular order. The greater the expectation of security, the stronger the power's position. One has to experience the given order as secure if it is to be trusted (Anter 2007: 103–4). At the same time, there is the need for autonomy and self-assertion, the idea of defining oneself independently from a given power structure, which is in friction with the urge for security – both security and transgression belong to the realm of passion. Anter refers to sociologist Georg Simmel, for whom human beings have a double relation towards subordination: apart from the need to be secure, one needs the opposition in order to be able to locate oneself within a given structure. 'One could say', Simmel argues, 'that within a unitary human behaviour, obedience and opposition are two sides or links that are oriented towards two different directions and merely appear as independent drives' (qtd. in Anter 2007: 101–2). Power's role is to balance habituation and persuasion. Yet, 'there has never been absolute security. At no point in time has it ever been about anything other than the reduction of insecurity. As much as there is no order that is absolutely secure, insecurity remains a basic condition of human existence' (Anter 2007: 124).[5]

Anter points out that even anarchists declare in their first publication of *Anarchy: The Journal of Order* that 'society seeks order in anarchy' (2007: 82). At the same time, the paradox is that every order has to allow disorder to a certain degree for it to stand its ground – disorder is order's structural precondition. Paul Weiss describes this condition in his work *Some Paradoxes Relating to Order*: 'We want and work toward order in the sciences and logic, in our homes and in our lives; nevertheless we defy it as being too constraining. We cherish spontaneity, rebellion, novelty, creativity, and the breaking of the burdens and restraints to which we are subject' (qtd. in Anter 2007: 112).[6] The idea of chaos thus also initiates the negotiation of possibilities. Order is a question of degree in that it tries to keep disorder at bay; of relativity in that it is established within a relational pattern; and of interdependence between freedom and order, but nevertheless, according to Anter's study of many scientific disciplines, order is the remaining telos of the political *per se* (cf. 2007: 1). It is often handled as an unavoidable, philosophical ultimate term (cf. 6) wherein the dualism of order (Lat., *ordo*, 'set, array, positioning') vs. chaos (Lat.., 'void') is constitutive for all disciplines. The (imaginary) enemy that is chaos is thus simultaneously the secret guardian of order (cf. 77).

Order is a compulsory imperative of seeking universal explanations that pose the question of power and sovereignty and eventually of competing concepts and narratives of reality and identity. Referring to the French political scientist Julien Freund, Anter differentiates the concepts of a compulsive order of things ('ordre impérieux'), that is, for instance, the physical-biological order, and the order of a human imperative ('ordre impérative'), that is, the contingent order established by

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[5] '[Absolute] Sicherheit hat es nie gegeben. Zu keiner Zeit ging es um etwas anderes als um die Reduzierung von Unsicherheit. So wie es keine Ordnung gibt, die absolut sicher wäre, bleibt Unsicherheit eine Grundbedingung menschlicher Existenz.'

[6] English in original.

human beings throughout time (cf. Anter 26). 'What we define as "reality"', Anter argues, 'presents itself to our sensory organs through a chain of perceptions which we arrange in order to be able to understand and explain them' (Anter 2007: 11).[7] Epistemology itself is an ordering process making it a principle of intelligibility (cf. 11–12). Symbols, ideals, types and very often their embodiments by various personae not only represent these epistemes, functioning as a point of reference by which we are able to express, negotiate and question systems of meaning, but also reveal that ordering processes are a reflection of our being in the world – a fact that helps us to question clear-cut differences between subjectivity and objectivity.

It becomes clear that concepts of reality need to refer to something that is called a benchmark, a pillar, a point of orientation. Guarantors of reality, paradigms or regulative principles are God, metaphysics, the transcendental, fetishes, the absolute, substance, monism, the monad, identity, the phallus and so on – but also The Author, as I will explain later. The interpellation of a collective symbol then has the function to structure and position a person within a given structure, or to exclude them. The space of liminality, the border to chaos, is theoretically approached with concepts of ambivalence, paradox, discontinuity, exception, indistinguishability, alterity and the like, and reflects the process of a founding repudiation in order to set up a structure in the first place.

Western historiography suggests that a particular world order and its regulative principles have been rather stable and fixed in antiquity and medieval times:

> The idea that the worldly order is a product that grew out of human action is modern. From antiquity to medieval times it appeared in the eyes of the observer as an effigy of a transcendental order created by God. The key notion of order was therefore originally a metaphysical one. As much as *kósmos* and *order* are synonyms in Greek, the world appeared as a cosmos in which all things have their place. The idea of an opposition between divine and human order was foreign to ancient thinking. Humans saw themselves as part of an all-embracing, eternal order out of which they both could not and did not want to step. The cosmos appeared as an all-inclusive model of that order to which humans were subject. (Anter 2007: 28)[8]

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[7] 'Was wir als "Wirklichkeit" bezeichnen, präsentiert sich unseren Sinnesorganen in Form einer Kette von Wahrnehmungen, die wir in eine bestimmte Ordnung bringen, um sie verstehen und erklären zu können.'

[8] 'Der Gedanke, daß die weltliche Ordnung ein Produkt sei, das erst durch menschliches Handeln entstand, ist ein neuzeitlicher. Von der Antike bis zum Mittelalter erschien sie dem Betrachter noch als Abbild einer transzendenten, von Gott geschaffenen Ordnung. Der Ordnungsgedanke war ursprünglich im Kern also ein metaphysischer. So wie *kósmos* und *Ordnung* im Griechischen Synonyme sind, erschien die Welt als Kosmos, in dem alle Dinge ihren Ort haben. Der Gedanke eines Gegensatzes zwischen göttlicher und menschlicher Ordnung war dem antiken Denken jedenfalls fremd. Der Mensch empfand sich als Teil einer umfassenden, ewigen Ordnung, aus der er weder heraustreten konnte noch heraustreten wollte. Der Kosmos erschien als umfassendes Modell jener Ordnung, der die Menschen unterworfen sind.'

Where God was the prime ordinator of all things, the given structure of society and its political order were seen as divine endowment and every ordering gesture a sign of transcendence (Anter 2007: 29–31). Order (and also the concept of nature) was a theological category in which '[legitimacy] and the belief in God were thus interlaced in minutest detail' (Anter 2007: 30).[9] This anchorage of order in the transcendentally supported and solidified power interests, as Moshe Halbertal makes clear in *People of the Book*, '[a] widespread belief in a personal God who rewards the righteous and punishes the wicked is the main motivation for maintaining the basic norms necessary for social stability' (qtd. in Anter 2007: 31).[10] God is the metaphysical source out of which everything else unfolds. Society's order was believed to be a product of God's unfolding potency and God could be found in all things (cf. Anter 2007: 37).

Paradigm shifts such as the Copernican Revolution or the Age of Enlightenment have fundamentally questioned the idea of a fixed cosmos. With the vanishing of a divine transcendental telos and the new focus on the immanence of human existence, the very idea of being human became an unfixed and shaky concept and conjured up the idea of the malleability of the human mind and body rather than stasis and order; in other words, it transferred malleability from God's into our hands. Answers to the question of the natural order were now to be found within human existence itself, not outside. Ordering gestures were now a sign of rationality and the human subject the source of this process – the world being still an effigy, but an effigy of a (divine) spirit from within.[11] The process of secularization and the industrial revolution saw society as a machine, which became the spirit of order of the industrial world (cf. Anter 2007: 34).

But if God has vanished, what do we turn to in order to explain the architecture of our dwelling? In *We Have Never Been Modern*, Bruno Latour describes the trouble that arose historically from separating the sphere of the political (everything pertaining to the slippery field of human interaction – ideology) and the scientific (in which scientists merely report on what mute objects tell us about the world – knowledge) and crossing out God (cf. 1993: 27ff.) while accusing all other cultures of messily mixing up these two spheres into illusory fetishes (cf. Latour 1993: 37–8). But if constructing a dwelling through reduction of complexity and exclusion is a cognitive necessity in order to speak in the first place, what are our 'factishes' that we need to act and argue (Latour 1999b: 21)?

Again: 'Every political community expresses its order in the form of specific symbolization. Therefore, the interest of a theory of order has to focus on these symbols, the concepts of order and self-descriptions of the political system' (Anter 2007: 23).[12] With regard to science studies, it is vital to understand ordering as

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[9] 'Legitimität und Gottesglaube waren somit aufs Engste verbunden.'

[10] English in original.

[11] See also my remarks below on theism.

[12] 'Jede politische Gemeinschaft bringt ihre Ordnung in Form spezifischer Symbolisierungen zum Ausdruck. Daher muß sich auch das Interesse der Ordnungstheorie auf diese Symbole, die Ordnungsvorstellungen und Selbstbeschreibungen des politischen Systems richten.'

a cognitive process in which the alleged characteristics of observed things are eventually characteristics of the observer within a particular scientific discourse (Anter 2007: 14) seeking to select, categorize and control. Establishing a theoretical, scientific order is then, ultimately, not merely discovery, but creation (of order) (cf. Anter 2007: 21), because it is always intertwined with the question of what to do with it, and how to dwell in it. Thus, my question is: How does this law of cognitive ordering affect our understanding of Charles Darwin and how is he appropriated (where appropriation is *not* understood in a negative sense, but rather as a form of making sense of the world)?

What is a Darwin? The Foucauldian Author and Normativity

In Darwin's theory of evolution ideas of chaos and disorder no longer obstruct our views on the world, but rather are the effigies of nature. Ambivalence is inescapable and the world no longer follows the rules of a divine plan. From the beginning, this very idea of a disorderly, disruptive, fluid and incalculable nature proves to be a problem for Darwin's theory.[13] If nothing is fixed and everything subject to change, how are we supposed to be able to define what surrounds us?

The five basic arguments of his theory, to bring at least some order to this question to make it intelligible, are that species are subject to change, that they share a common origin, that evolution is a continual process, that species split into different new species and that this process is defined by natural selection (cf. Voss 2008: 98). Darwin established a theoretical order that differentiated between species and variety, but at the same time pointed out the frenzy of trying to order the large number of animals and plants that came to England from numerous travels around the globe, with the participation of many scientists of the time who were negotiating and shaping the concept of evolution as well – all this made the distinction between species and variety almost a farce. In the second chapter of *The Origin of Species*, 'Variation under nature', he states:

> In determining whether a *form* should be *ranked* as a species or a variety, the opinion of naturalists having sound judgement and wide experience seems the only guide to follow. … Compare the several floras of Great Britain, of France or of the United States, drawn up by different botanists, and see what a surprising number of forms have been ranked by one botanist as good species, and by another as mere varieties. Mr H. C. Watson … has marked for me 182 British plants, which are generally considered as varieties, but which have all been ranked by botanists as species; and in making this list he has *omitted* many *trifling* varieties, but which nevertheless have been ranked by some botanists as species, and he has entirely omitted several highly *polymorphic* genera. Under genera, including the most polymorphic forms, Mr Babington gives 251 species, whereas Mr Bentham gives only 112, a difference of 139 *doubtful* forms! Amongst animals which unite for each birth, and which are highly locomotive,

[13] See also the preceding discussion of Darwin and chaos in Richter's essay.

> doubtful forms, ranked by one zoologist as a species and by another as a variety, can rarely be found within the same country, but are common in separated areas. How many of those birds and insects in North America and Europe, which differ very slightly from each other, have been ranked by one eminent naturalist as undoubted species, and by another as varieties, or, as they are often called, as geographical races! ... I was much struck how entirely *vague* and *arbitrary* is the distinction between species and varieties. (Darwin 1972: 38, the emphases in italics are mine)

Note the use of words that follow the logic of ordering that is never innocent or disinterested in its structuring of chaos: arbitrarily ranking the polymorphic, omitting what is considered trifling, only to be able to have a form, yet one is constantly in doubt (how can anything be ranked as trifling if polymorphism is the universal state of nature in Darwin's eyes!). Darwin himself reflects on the process of meaning-making, taxonomy and imposing order on the overabundance of animal and plant varieties, which themselves suggest that doing so is futile. Language here exposes itself in that ordering nature is an agency of humans, a creation *in order to give sense to* it so that we as scientists find it categorized and controlled (see also Sarasin 2009: 35ff.). Julia Voss states in her German introduction to Charles Darwin that up to this day there are disputes on what constitutes a 'species' and what 'variety' is (cf. Voss 2008: 78, 106). In his book *Darwin and Foucault*, Philipp Sarasin observes:

> Species are thus schemes of classification that were not simply subsequently, *a posteriori*, constructed and therefore do not even depict nature 'in itself'. … Species are rather schemes that through the real changes of living organisms, through their 'connections' (that means their procreation), as well as through their adding up of individual differences are *transgressed*, perpetually that is, again and again, much as these schemes are subsequently, *a posteriori*, applied as grids onto natural phenomena, no matter how appropriate these schemes may be for the time being – *if* they are not able to account for the historicity of its object. Any ahistorical, mere taxonomic grid that is meant to circumscribe and define a species will be blown up by this long-term movement of living organisms. (2009: 72)[14]

[14] 'Die Arten also sind Klassifikationsschema, die nicht nur einfach nachträglich, *a posteriori*, konstruiert wurden und die damit auch nicht die Natur ‚an sich' abbilden. … Die Arten sind vielmehr Schemata, die durch die realen Veränderungen lebender Organismen, durch ihre ‚Verknüpfungen' (das heißt ihre Fortpflanzung) wie auch durch die Aufsummierung individueller Unterschiede *überschritten* werden, und zwar dauernd, immer wieder, so sehr diese Schemata auch nachträglich, *a posteriori*, als Raster über die Naturphänomene gelegt werden und wie adäquat diese Schemata den Phänomenen zum gegenwärtigen Zeitpunkt auch sein mögen – *falls* sie nicht die Geschichtlichkeit ihres Objekts in Rechnung zu stellen vermögen. Jedes ahistorische, bloß taxonomische Raster, das eine Art begrenzen und definieren soll, wird von dieser langfristigen Bewegung lebender Organismen gesprengt.'

One way of managing the unmanageable was offered by Ernst Haeckel by using a genealogical tree. Darwin's visual approach was more rhizomatic, but later adopted the image of the tree as well.[15] Voss's book on Darwin illustrates how from its outset the theory of evolution has also been subject to intense disputes about what sense of human order one should derive from his texts – these disputes have far from receded. The proliferation of books on biopolitics shows how much human nature is disputed within the realm of the political. Today we deal with many hybrid forms of ethics that arise from the intermingling of the spheres of science and politics. What has Darwin come to stand for when many make reference to him to solidify their world-views, but come to different conclusions?

Darwin's name has become the vital point of reference under which we negotiate evolutionary theory and human nature, but his theory has been expanded, altered, qualified and his name appropriated, occupied by scientists and laymen alike speaking in his name, but meaning different things. Darwin's contemporary Alfred Russell Wallace may well have become the person that we would refer to today when speaking of evolutionary theory since he basically had the same key ideas.[16] Darwin was quicker, however, and took up his place in history – his name and image thus being the point of reference when speaking of a collective idea that is called evolutionary theory. I suggest we read Darwin with Michel Foucault's concept of the author as it helps to bring some clarity into what is going on within the debate on evolutionary theory or Darwinism. Speaking again of rivalling concepts, 'discourses are objects of appropriation', too, Foucault (2008: 286) states, and so is Darwin. Referencing him, which is in itself an appropriation, is a rhetorical appeal aiming at persuasion and claiming truth-values.

Foucault draws on Saint Jerome's idea of how to treat the œuvre of an author – while reading, please note the parallels in what ranking and omitting means:

> (1) if among several books attributed to an author one is inferior to the others, it must be withdrawn from the list of the author's works (the author is therefore defined as a *constant* level of value); (2) the same should be done if certain texts contradict the doctrine expounded in the author's other works (the author is thus defined as a field of conceptual or theoretical *coherence*); (3) one must also *exclude* works that are written in a different style, containing words and expressions not ordinarily found in the writer's production (the author is here conceived as a stylistic *unity*); (4) finally, passages quoting statements made or mentioning events that occurred after the author's death must be regarded as interpolated texts (the author is here seen as a historical figure at the crossroads of a certain number of events). (2008: 287–8, my emphasis)

This brings us back to Anter, because we can see that ordering an author's œuvre happens within a realm of power. For logic's sake the polymorphism of one

[15] See Sprang's preceding discussion of vertical and horizontal diagrams in this volume.

[16] This did not happen, however. My point will become clearer with regard to Foucault.

single person is arbitrarily omitted and smoothed out in favour of coherence and unambiguity. The author as a historic person gradually moves into the background and is replaced by an image of the author – which itself has many authors. Foucault continues:

> Modern literary criticism ... still defines the author in much the same way. ... The author is ... the principle of a certain unity of writing – all differences having to be resolved, at least in part, by the principles of evolution, maturation, or influence. The author also serves to neutralize the contradictions that may emerge in a series of texts: there must be – at a certain level of his thought or desire, of his consciousness or unconscious – a point where contradictions are resolved, where incompatible elements are at last tied together or organized around a fundamental or originating contradiction. Finally, the author is a particular source of expression that, in more or less completed forms, is manifested equally well, and with similar validity, in works, sketches, letters, fragments, and so on. (2008: 288)

I suggest we appropriate this to Darwinist thought when considering those authorities and experts who organize the representation or image of Darwin. These processed coherences become normative views, survival guides for reading Darwin, doctrines for social action. However, for Foucault, despite the author's ideological function to bring coherence and intelligibility to complexities, exactly the opposite happens: he understands authors to be 'founders of discursivity' in that 'they … have established an endless possibility of discourse' (2008: 289). My aim here is not to expose and criticize this ordering process as fallacy; it is to understand how appropriations work – and why, for example, creationism is cognitively possible. Even if I aligned myself with opponents of creationism, I would nevertheless want to be able to understand why, cognitively, creationism is understood by some as a proper theory that follows all the rules of ordering I have theorized above. It cannot be explained away simply by exposing it as fallacious. This would not help to undermine its power and the debate's political and ethical significance. Speaking with Latour: 'it is because [reality] is constructed that it is so very real, so autonomous, so independent of our own hands' (1999a: 275). Foucault's concept of the author as a structuring principle helps to understand this power vector more thoroughly.

Rephrasing Foucault's text: To say that Darwin founded evolutionary theory does not (simply) mean that we find concepts of survival of the fittest, natural selection, species and variety, or struggle for existence (all of which Darwin disagreed with; he preferred the term 'natural preservation', which has not made its way into the collective memory) in the works of Richard Dawkins or Joseph Carroll; it means that Darwin made possible a certain number of theoretical divergences – with respect to his own texts, concepts and hypotheses – that arise from the evolutionary discourse itself. The initiation of a discursive practice is heterogeneous to its subsequent transformations. To expand a type of discursivity such as evolutionary theory as founded by Darwin (or Wallace or all others at

the time), is not to give it a form of generality it would not have permitted at the outset but, rather, to open it up to a certain number of possible applications (literary Darwinism, evolutionary psychology and so on). But by remaining the primary coordinate the author allows a limitation of the cancerous and dangerous proliferation of significations within a world where one is thrifty not only with one's resources and riches but also with one's discourses and their significations. The scientific author is the principle of thrift in the proliferation of meaning. He is a functional principle by which, in our culture, one limits, excludes and chooses; in short, by which one impedes the free circulation, the free manipulation, the free composition, decomposition and re-composition of science. The scientific author is therefore the ideological figure by which one marks the manner in which we fear the proliferation of meaning and consequently taxonomize polymorphic nature (Foucault 2008: 291–2).

Looking at the very proliferation of works and discourses that evolutionary theory has spawned one can observe what Foucault is describing, namely that we try 'to isolate in the founding act an eventually restricted number of propositions or statements to which, alone, one grants a founding value' (2008: 291–2). As stated above, scientists speak in the name of Darwin or Darwinism, but evolution as a theory as such remains in dispute.[17] Even the gesture of referring the metaphor of selfish genes to Richard Dawkins follows Foucault's concept of the author. Dawkins himself stated that it has been misread as promoting concepts of greed and competition, as he explains in *The Selfish Gene's* 30th anniversary edition:

> Another good alternative to *The Selfish Gene* would have been *The Cooperative Gene*. It sounds paradoxically opposite, but a central part of the book argues for a form of cooperation among self-interested genes. ... One of the dominant messages of *The Selfish Gene* ... is that we should not derive our values from Darwinism, unless it is with a negative sign. Our brains have evolved to the point where we are capable of rebelling against our selfish genes. The fact that we can do so is made obvious by our use of contraceptives. The same principle can and should work on a wider scale. (Dawkins 2006: xiv)[18]

There is a paradox in his statement that we are made of genes, or that we *are* genes, yet we rebel against our own matter – is it an unwanted or unconscious expression owed to the notion of the body/mind-split – humans as vessels *for* genes?[19]

We do find the basic current of what Anter describes as the attempt to establish order in all these varieties. In Joseph Carroll's *Evolution and Literary Theory*,

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17 Cf. Brockman for different approaches.

18 For a contemporary critique of this concept, see Denis Noble 2010.

19 We can find a similar argument in Dorothy Nelkin's and Susan Lindee's *The DNA Mystique*: 'Dawkins may seem materialist and antireligious, but his extreme reductionism, in which the DNA appears as immortal and the individual body as ultimately irrelevant, is in many ways a theological narrative, resembling the belief that the things of this world (the body) do not matter, while the soul (DNA) lasts forever' (1995: 53).

order can be found in the idea that 'all 'proximate causes' or immediate human motives are regulated by the principles of inclusive fitness as 'ultimate cause' (1995: 2), directed by the need for reproductive success. Order and its subsequent representation in symbols or narratives are established through cognitive mapping: 'representation is an extension of the organism's adaptive orientation to an environment that is, in the first place, spatial and physical. … [The] primary purpose of literature is to represent the subjective quality of experience [and that it] [reflects] and [articulates] the vital motives and interests of human beings as living organisms' (Carroll 1996: 2–3). Carroll goes on to utilize these ideas in order to debunk poststructuralist thought (Carroll 1996: 49ff.), but I would have to say that in my view that is a non sequitur.

Other theories also reflect the idea of the human need to reduce complexity and to subsume all acts to those of an expression of reproductive fitness. Regarding literature, D.T. Max gives some examples in his article 'The Literary Darwinists':

> One idea is that literature is a defense reaction to the expansion of our mental life that took place as we began to acquire the basics of higher intelligence around 40,000 years ago. At that time, the world suddenly appeared to homo sapiens in all its frightening complexity. But by taking imaginative but orderly voyages within our minds, we gained the confidence to interpret this new vastly denser reality. Another theory is that reading literature is a form of fitness training, an exercise in 'what if' thinking. If you could imagine the battle between the Greeks and the Trojans, then if you ever found yourself in a street fight, you would have a better chance of winning. A third theory sees writing as a sex-display trait. Certainly writers often seem to be preening when they write, with an eye toward attracting a desirable mate. In 'The Ghost Writer', Philip Roth's narrator informs another writer that 'no one with seven books in New York City settles for just one woman: 'That's what you get for a couplet.' Yet another theory is that the main function of literature is to integrate us all into one culture; evolutionary psychologists believe shared imaginings or myths produce social cohesion, which in turn confers a survival advantage. And a fifth idea is that literature began as religion or wish fulfillment: we ensure our success in the next hunt by recounting the triumph of the last one. Finally, it may be precisely writing's uselessness that makes it attractive to the opposite sex; it could be that, like the male peacock's exuberant tail, literature's very unnecessariness speaks to the underlying good health of its practitioner. He or she has resources to burn. (2005: n. pag.)

What these examples show is that all theories aim at a coherent theory of human nature and seek to explain what the undercurrent or the ultimate cause of all our norms is. If we consider Anter's statement from the beginning that conceptions of order follow the logic of creation and decline of rivalling concepts, we need to ask: Why do these issues remain so pressing, and why the drive for finding the ultimate cause?

The Question of Ultimate Causes, Theism and Science

In 1971, Fritz Krafft's *History of Natural Science: The Founding of a Science of Nature due to the Greeks*, explains that the impulse of looking for 'unitary and universally valid principles' (35; all further quotations my translation)[20] with the help of the logos or the ratio, that is, the power of thought, goes back to the Greeks. Two words are important here: first, that of *principle*. A principle is general, not singular. Originating in the Greek word for *arche*, the Latin word *principium* means 'beginning', 'origin', 'cause', both logically and temporally (cf. 1971: 35). Searching for an origin can thus be done within a scientific, but also religious or mythical frame.

Tracing the origin of numerous phenomena demands the ability of *abstraction*, the second important term: derived from the Latin 'subtract' or 'remove', abstraction means to reduce the complexity of numerous objects, processes or conditions, lining them up towards a term that *ex post facto* can be applied to all of them, with the decisive effect that the term that at the end of a process now stands as origin, a *petitio principii*, which for Krafft involves neglect and fragmentariness (1971: 31–2). Similar to Darwin's critique of taxonomy, it is the scientist who has to coin observed variations as negligible and insignificant in order to have the concrete. This remains a fundamental issue in all scientific inquiry, which, for example, guides Anne Fausto-Sterling's critique of gender bias in biology:

> This is, in fact, one of the very interesting things about biological investigators. They use the infrequent to illuminate the common. The former they call abnormal, the latter normal. Often … the abnormal requires management. … [Management] means conversion to the normal. Thus, we have a profound irony. Biologists and physicians use natural biological variation to define normality. Armed with this description, they set out to eliminate the natural variation that gave them their definitions in the first place. (1997: 245)

Krafft argues, and this is similar to the observations of Walter Ong in his study *Orality and Literacy*, that one needed the written word combined with mass migration in order to achieve a high level of abstraction. Fixating experience in written signs makes it possible to understand temporal and spatial developments. The Greek alphabet was the first to include consonants and vowels, thus reducing potential misunderstandings in reading ideograms as opposed to hieroglyphs, which needed interpretation (cf. Krafft 1971: 39–40). The circle of those being able to read and write helped to circulate knowledge through rhapsodies, whose singing was the profession of the educated (cf. 1971: 41). The fixated text encounters spatial and temporal changes and development so that the original words can become dated or find new meaning in a different context, which is commented on in additional texts and songs, resulting in the attempt to find a synthesis (cf. 1971: 41). Being human, we interpret what we see according to our

[20] 'einheitlichen und allgemein gültigen Prinzipien'

understanding of ourselves, implementing a bodily image in the phenomena that we observe – personification of phenomena in allegories such as demons or deities is an expression of this. Krafft assumes that scholars countered the contradictions within texts, which emerged due to temporal and spatial changes, by gradually refuting anthropomorphic representations and replacing them with other divine, non-physical forces that are above human contradictoriness (1971: 42). Deducing samehood and the permanence in phenomena, a single deity would not only represent what before was attributed to numerous deities, but would also stand for abstract terms such as justice or power (cf. 1971: 44). In accordance with human hierarchies, one God (hierarchically, genealogically justified) stands above other Gods, as the God of the spirit and of order, in which Krafft sees the nucleus of the natural sciences (cf. 1971: 44).

What also follows is a gradual change from polytheism to monotheism, because all causes are now traced back to a single origin through which all further phenomena unfold their power. This dictates, despite various differences, further philosophical concepts of the one cause (cf. Krafft 1971: 44–5):

> [Natural science] presupposes an order, an order that can be perceived with basically the same means that create and conserve natural science; because 'Same recognizes Same'. And thus the human spirit, construed as a lower effigy of the divine spirit because originally understood vice versa as elevation and idealization of the human spirit, can perceive the effects of the divine spirit in nature, and that means: conducting natural science. … Only this [the rational idea of God; N.W.] allows cognisability of nature through the human ratio and the belief in the simplicity of nature. … Only this alone furthermore allows the belief in a spacially and temporally unlimited validity of that which has once been identified. (Krafft 1971: 45–6)[21]

Modern science merely avoids the reference to a God, but its logical functioning is heir to monotheism. Krafft explains that for some Greek scholars God and Nature were exchangeable terms, because nature was the effigy of the divine spirit and nature thus divine (cf. 1971: 46). The provocative result for Krafft is that science can replace religion, because believing in its power has its foundations in the same principles and abstractions of monotheism (cf. 1971: 46).

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[21] '[Naturwissenschaft] setzt eine Ordnung voraus, eine Ordnung, die mit prinzipiell gleichen Mitteln wie die, welche sie herstellt und bewahrt, auch erkannt werden kann; denn 'Gleiches erkennt Gleiches'. Und so kann der Geist des Menschen, als geringeres Abbild des göttlichen Geistes gedeutet, weil ursprünglich umgekehrt als Überhöhung und Idealisierung des menschlichen Geistes gedacht, deshalb auch die Wirkungen des göttlichen Geistes in der Natur erkennen, und das heißt: Naturwissenschaft treiben. … Nur sie [die rationale Gottesauffassung; N.W.] gewährt eine Erkennbarkeit der Natur durch die menschliche Ratio und den Glauben an die Einfachheit der Natur. … Nur sie allein gewährt weiterhin den Glauben an die örtlich und zeitlich unbegrenzte Geltung des an der Natur einmal Erkannten.'

By the second half of the fifth century, the Greek word *zoon*, originally meaning 'that which moves freely', had become such an abstract term that it was able to comprise all living things (as opposed to dead matter). The effect is that the abstract singular term no longer summarizes various phenomena, but instead the phenomena themselves now express the same basis (cf. Krafft 1971: 48). The definite article, for example *the* rooting in *this*, which came with the Greek language, furthers linguistic abstraction (cf. Krafft 1971: 50). Cicero, for example, not knowing this article, had to translate the Greek 'the warmth' with 'that which in reality is warm' (cf. 51) in order to construct a linguistic subject of which then can be spoken. Speaking of Being with a capital letter, the German *Sein*, becomes thus a term for *that which remains in the course of change*, 'das Bleibende in der Veränderung' (Krafft 1971: 53), substance and essence. The metaphor that originally represented non-human phenomena anthropomorphically is now used rationally for thinking in proportions and harmony or in conclusion by analogy (cf. Krafft 1971: 54). In this sense, theology, philosophy and natural science share a common background.[22]

Conclusion

My aim here is to inquire about the implications of this historical development for our concepts of order which some explain with natural science and others with constructivism. Following Latour and other scholars such as Evelyn Fox Keller,[23] I think we should rework the differentiation of nature and nurture and look critically at notions of order, how they are represented and what is at stake when criticized, and, what kind of orders the differentiation between nature and society produces, as Latour does. The humanities have made great efforts in order to theorize the space of liminality as a space for political contestation. If establishing order is understood as a biological, cognitive imperative, or an innate structure of the human brain, we nevertheless rely on poststructuralist critique that helps to trace those lines of demarcation that separate, or rather construct, the normal from the abnormal – especially in the name of science. A vital aspect that needs considering whenever we theorize evolutionary implications and its explanatory value for the humanities is the question of agency. In their book *Flesh*

[22] See also Martin Albrow's description of the change from Christian ideas of 'history as universal, working according to God's will, divided by a divine event, Christ's coming, and then further divided into periods by epoch-making events', to the idea of history as an instruction for princes when 'the concerns of the higher orders extended over an ever widening area of territory' and lead to the 'conception of a world order with a single ruler. … Universal history required the creation of a unified field of human discourse, providing a single frame of events, making one world' (1996: 11).

[23] I especially refer to *The Mirage of a Space Between Nature and Nurture*, where Fox Keller asks, '[How] malleable is a given trait, at a specified developmental age?' (2010: 75) – quite a Promethean question.

Machine: Cyborgs, Designer Babies and New Eugenic Consciousness the Critical Art Ensemble points out that:

> the idea that natural selection is a blind process is certainly a turning point in Western thinking. There is no teleology, not even the guiding 'invisible hand.' Instead, evolution gropes through time, producing both successful and unsuccessful species. Its varied manifestations display no order, only accident. This notion is an incredible challenge to the Western desire for rational order. At best, God *is* playing dice with the universe. The very anarchistic strength of this notion is also its scientific downfall. How can the accidental be measured in causal terms? For example, the engine of physical adaptability is mutation. If mutation is the accidental, uncommon, unexpected, and anomalous, how can it be *quantified*, when the knowledge systems of science are based on the value of *expectation and typicality*? Can we say with any degree of assurance that social development is analogous to this model of biological development? It seems extremely unlikely that culture and nature proceed in a similar fashion. Cultural dynamics appear to be neither blind nor accidental. While the occurrence of chaotic moments in social development cannot be denied, unlike with biological evolution, they do not render the same totalizing picture. Cultural evolution, if there is such a thing, seems for the most part to be orderly and intentional. It is structured by the distribution of power, which can be deployed in either a negating or affirming manner. (1998: 41–2, my emphasis)

Post-structuralism and natural sciences are not mutually exclusive.[24] When a peahen chooses one mate among the others for its plumage, is not the fact of choice a question of difference as Philipp Sarasin muses in *Darwin and Foucault: Genealogy and History in the Age of Biology*? 'Ultimately, no eye [on the peacock's plumage]', he argues, 'represents a distinct, clearly defined characteristic – this would be a code – rather this process of signification is subject to further deferments and suspensions of meaning, thus remains open in this way and produces an infinite abundance of forms and colours' (Sarasin 2009: 422, my translation).[25] What the plumage refers to is a copy without an original. 'The copies in the field of culture vary as much as DNA varies spontaneously in the field of biology' (Sarasin 2009: 424).[26]

Today, and after Darwin, we live with the idea that the worldly order is a product of evolution, its driving force DNA. Is the key notion of DNA therefore a metaphysical one because with it we are trying to understand our origin? In this

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[24] Though I would add that the critique of post-structuralism's denial of concepts of ontology, subjects and experience is vital (cf. Becker 2007: 111f.).

[25] 'Kein Pfauenauge repräsentiert je endgültig eine bestimmte, klar definierte Eigenschaft – das wäre ein Code –, vielmehr ist dieser Signifikationsprozess immer weiterern Verschiebungen und Aufschüben der Bedeutung unterworfen, bleibt auf diese Weise offen und produziert damit einen unendlichen Reichtum von Formen und Farben.'

[26] 'Die Kopien im Feld der Kultur variieren ebenso, wie die DNA im Feld des Biologischen spontan variiert…'

sense science indeed can replace religion: in the *kósmos* and *order* of evolution all things have their place. With DNA, we see ourselves as part of an all-embracing eternal order out of which we cannot step, but marvel at the products of its unfolding potency. Yet ethical issues remain. Instead of a 'we are all one' monomyth, or a justification of and marriage between monotheism and biology in creationism, one could also utilize evolutionary theory to undermine these approaches and instead argue for polytheistic narratives as more in line with the grandeur of Darwin's view of life – every person is genetically unique, think of the narrative possibilities. In his essay 'In Praise of Polytheism', Odo Marquard rightly points out the destructive potency towards polymythic narratives that monotheism and the myth of progress show in its parallel exoticization of the cultural Other (1989: 96–7).

The question of who will finally deliver the key orientation and an appropriate life doctrine remains subject to debates over debates over debates – it may not be answered, but we are hell-bent on it. What room will the key open, anyway, what will science find? A 'prosthesis', Luce Irigaray might say, 'which assists the horrified gaze to construct, laboriously, 'consciously', concept by concept, the rationality of his repression. … [He] restricts himself to reframing, remarking, or 'analyzing' its contours, re-stratifying its stages, so that order, good 'conscious' order, may prevail' (1985: 138). The Human Genome Project promised to unlock what had been barred up until then, but eventually would give insight, clarity and unambiguousness. 'What will he, what will they, have seen as a result of that dilation? And what will they get out of it? A disillusion quite as illusory, since the transcendental keeps its secret' (Irigaray 1985: 145). I want to point out that a scientific view is a *view* of things – technical, medial, ideological – and therefore not outside issues of metaphysics. Science is not innocent. With it, we position ourselves and act according to our desires with which we passionately attach ourselves and thus grow towards and receive our environment.

I have focused strongly on the cultural-symbolic level in this essay, but the discussion can be widened into the realm of the socio-individual (e.g., the notion that all relations between men and women necessarily follow the urge to reproduce, or are an expression of competitiveness) and the material (e.g., how science is embedded within capitalist modes of production). Within these realms, order is the telos of the political *per se* and will remain so. Thomas Hardy's poem 'God's Funeral' reads, 'And, tricked by our own early dream / And need of solace, we grew self-deceived, / Our own making our maker did we deem, / And what we had imagined we believed' (2006: 298). Do we not find Darwin in these realms serving as a means to establish order? Is Darwin not, when utilized as icon, a 'counterfeit of straw"' and a 'Monarch of our fashioning' (2006: 298)? That is the transcendental secret Irigaray speaks of. I do not mean to debunk this icon as illusory (which would be quite illusory too), but to show that the more inconspicuous its character of power, the more successful its validity claim and the greater its stability, and that our ordering processes are inextricably linked to the metaphysical.

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Chapter 10
The Limits of Sociobiology: Is There a Sociobiological Explanation of Culture?

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Introduction

The Darwinian revolution not only generated an incredible amount of *new* knowledge about nature; it also initiated a new *kind* of knowledge. This new kind of knowledge was only superficially connected with the secularization of theologically or metaphysically based assumptions on the nature of human beings. It transformed the very meaning of 'being human', thereby changing the self-understanding of mankind as such. The fundamental nature of these transformations led Freud to his well-known diagnosis that the Darwinian revolution, along with the Copernican and the psychoanalytic revolutions, were the most serious threats to the narcissism of mankind, which in turn resulted in a (seemingly) complete and comprehensive victory of the paradigm of scientific enlightenment (Freud 1999).

And the evolutionary paradigm did indeed begin to integrate even those arguments and observations that were the strongholds of physico-theology, not to mention religiously inspired ethics.[1] However, when it comes to the attempt to finally explain the mode of 'being human' in terms of belonging to the species *Homo sapiens*, very fundamental questions have to be answered, particularly those concerning the scope of scientific theories, the methodological relation between the humanities and the sciences, the validity of scientific descriptions for the explanation of human actions and so on. In fact, 'Darwinism' is not just a couple of well-discernible and easily definable approaches. The term actually refers to a line of thinking that has itself undergone serious transformations, alterations and revisions. It is therefore necessary to reconsider a number of arguments (some historical and some proposed more recently), which seem to substantiate the assumption that biological descriptions are in fact of the same logical type as those descriptions which we usually refer to in order to determine culture and cultural achievements. Here the question arises whether or not biological descriptions provide a meaningful basis for the explanation of those achievements. As this question is still being posed far too generally to be addressed within the framework of this paper, I will focus my inquiry on one of the latest offspring of the fruitful

[1] For an instructive overview see Jahn 1990; Mayr 1984 and 1997.

Darwinian tree, a family of approaches that explicitly claim to have provided an empirically sound and comprehensive basis for the explanation of the cultural self-expression of humans, namely sociobiology.

Elements of Sociobiological Reasoning

'Sociobiology' designates a type of approach that is supposed to cover natural as well as cultural transformation processes (e.g. Wilson 2002; Wickler & Seibt 1990). It follows the path that was laid out by Darwin in his attempt to explicate the natural origin e.g. of human expression and human behaviour. In order to do so, Darwin identified some fundamental emotions that are expressed by primates, including humans – an identification that was heavily dependent on the mode of description applied. 'Anxiety', 'anger' or 'guilt' are quite obviously not description-independent, a fact that Darwin himself acknowledged at least to a certain extent, insofar as he tried to standardize the use of the terms through several attempts to control the respective connotative semantic fields (Darwin 1965).[2] This line of argument became relevant again in the context of anti-behaviourist approaches of behavioural biology developed by Konrad Lorenz and his school. Referring e.g. to Holst's ingenious, neurobiologically inspired behavioural psychology [Ger., *Verhaltensphysiologie*], he emphasized the thick descriptions of animal behaviour in terms that reflected the strongly intentional logical grammar of human emotions and reactions (an approach often criticized as 'anthropomorphic').[3] The dominance of this – ironically non-Darwinist – type of behavioural biology came under attack from sociobiological approaches that relied heavily on models borrowed from decision theory and economics, namely the theory of games.[4] In contrast to the older behavioural biology approaches, sociobiology allowed behaviour to be understood in terms of 'strategies', which could be represented through their impact on differential reproduction by means of population genetic modeling. This research approach provided a more 'neutral'[5] description of reproduction processes within populations, and at the same time allowed researchers to avoid some strong assumptions concerning the relation between genotypes and phenotypes of populations and their individual constituent organisms. By providing a Darwinist explanation of even one of the most stubborn problems of evolutionary theory

[2] In fact, this even included (as well as a reference to some muscular stimulation experiments) the use of a questionnaire in order to provide some 'empirical' basis for his further explication and explanation of the origin of human expression and behaviour (Darwin 1965: 13ff.).

[3] See Lorenz 1965 & 1966; compare with Holst 1969 & 1970.

[4] Cf. Lewontin 1961; Maynard Smith 1982; Maynard Smith & Szathmary 1996; Neumann & Morgenstern 1980; Wilson 2002; for further reading Wickler & Seibt 1990.

[5] This is a relative statement, which does not imply that the descriptions used in the framework of sociobiology were in fact neutral at all – that they are in fact not was frequently noted (for further reading see Dupré 2001).

– namely the advance of altruism – the scope of sociobiology seemed to have no natural limits. Insofar as humans are conceptualized as specimens of *Homo sapiens*, the scope of sociobiological explanations (by their own logic) ought to cover human functions and performance in the same way as it should cover those of other (non-human) life forms. Accordingly, *Homo sapiens* became what it was supposed to be in terms of evolutionary theory, namely just one life form alongside others, such as *Pacifastacus leniusculus* or *Pan troglodytes*.

This extension of the scope of a scientific theory poses a serious threat to the 'humanities' which – at least in the form of *Geisteswissenschaften* (Dilthey 1922 and 1927) – claimed an empirical as well as a methodical primacy for the description, explication and explanation of those human expressions, performances and capabilities that are connected with the understanding of signs and symbols (e.g., Cassirer 1972). In contrast to this position, sociobiology can be considered much more than just a scientific theory: it seems to be a scientific basis for the unification of knowledge originally provided by disciplines of different types (this remains true, even if we refuse to reduce the methodological schema of disciplines to just two types; e.g., Snow 1960). The resulting threat to the humanities can then be summarized in terms of a dilemma:

> either the humanities will choose to become transformed into a sub-domain of scientific approaches (e.g. in terms of sociobiology), in which case they will lose their methodical autonomy but gain scientific validity, or
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> the humanities will emphasize their autonomy of scope and method, and run the risk of losing their relevance for research on the human condition.

But the seemingly insurmountable explanatory force of sociobiology itself has been – from the very start – accompanied by thorough criticism, which has focused on three main aspects:

1. Empirically, some of the central assumptions that came under attack concerned the relation between genotype and phenotype. These attacks involved the reference to epigenetic mechanisms (e.g., Jablonka & Lamb 2005), re-describing the relation between organism and environment – including DNA as a resource for organismic reproduction – in terms of developmental system theory approaches (e.g., Gray 1992; Gilbert 2001; Griffiths & Neumann-Held 1999; Moss 2003; Oyama 1985), and finally developing explanatory alternatives to central parts of the evolutionary narrative. The latter concerned, for example, the determination of fitness values (Dupré 2001: 54ff.), the modularity of brain organization or the interpretation of paleoanthropological data in terms of reproduction strategies (Dupré 2001: 24 ff.; for a fundamental criticism of modularity, cf. Wheeler 2005).
2. However, it was not only the 'evidence' provided, which can be divided into the 'absurd, the banal and the mildly interesting' (Dupré 2001: 54), that

came under attack, but also some methodical aspects of sociobiological theory building. It can be doubted, for example, that the terms required to constitute an experimental setting that is supposed to provide data on the reception of 'beauty', are unambiguous, description-independent and cross-culturally definable (Dupré 2001). It was pointed out that the term 'gene' is at best homonymic, that its meaning depends on the theoretical context chosen, and that these contexts are mutually irreducible. Following Moss (2003), 'developmental' genes may be discerned from 'preformationist' genes, where only the latter are assumed to govern not only the development, but also the expression of all organismic features.[6] Additionally, doubt was cast on the structure and adequacy of the models themselves, by requiring them, for example, to yield the correct interpretation of a given population structure and reproductive situation in terms of decision theory and game theory (e.g., Lewontin 1961).

3. Finally, methodological objections are relevant that focus particularly on the adequacy of the description of the explanandum or the modelandum respectively – following Dupré again in his criticism of evolutionary psychology, which resembles sociobiological explanatory strategies at this juncture:

> But perhaps an even more important point is the way in which the attempt to accommodate the empirical variability of human behavior leads to the introduction of ever more flexible, and arguably ad hoc, auxiliary assumptions. If a behavior is thought to be more or less universal across cultures it is because it evolved. If there is an exception … it is because there is sensitivity to cultural influences. … At any rate, it is clear that once these strategies are admitted to be subject to cultural influence, any amount of variability will be fully explicable within the sociobiological paradigm. And as is a familiar truism in the philosophy of science, a theory that can explain anything explains nothing. (Dupré 2001: 66)

However, this rejection of the explanatory power of sociobiology does by no means exploit the potential of methodological reconstruction of the theory structure – which is indeed the main task of this paper (see below).

Setting aside the first two types of objection, the systematic core of the counterarguments to sociobiology in terms of the third type is the claim that the explanandum has to be described and that the adequacy of this description must be evaluated without directly referring to the explanans. As we will see, this argument is directed against the research strategy of sociobiology as such, by attacking the theoretical fundament of the models it employs (an argument ironically provided by a hermeneutic consideration on the relation between

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[6] We might radicalize this kind of criticism by analyzing the phrase' x is a gene for y', and finding it to be an elliptic expression for the reproducible manipulation of living entities (Bölker et al. 2010; Kay 2000; Brandt 2004).

explanans and explanandum, and modelans and modelandum, respectively). The relevance of this – at first glance trivial – objection becomes particularly apparent when we determine the exact systematic role that genes and memes are supposed to play in sociobiological explanations.

Back to the Roots: The Definition of Genes and Memes

One of the important elements of sociobiology is the application of Hamilton's equation (Wilson 2002: 118ff.). It states, roughly speaking, that evolution (specifically of altruistic behaviour) is possible, if the gain in fitness for a specific behaviour is at least slightly bigger than the loss to be expected for this behaviour – in reference to the degree of relationship of the interacting units. In short, the relative benefit for a given unit under selection has to outweigh the costs. Altruism, then, can be explained this way, by considering the grade of genetic relationship as a measure of the outcome that is finally the relative abundance of a gene or its alleles within a population (cf. Dawkins 2009; Wilson 2002). According to the concept of inclusive fitness, the relationship between genes and phenes can be understood as that of causes to effects. The central, if not exclusive, unit of selection then is finally the gene, and at this point Dawkins very carefully introduces the term in order to avoid simple ontological reductionism:

> What is a selfish gene? It is not just one single physical bit of DNA. Just as in the primeval soup, it is all replicas of a particular bit of DNA, distributed throughout the world. What is a single selfish gene trying to do? It is trying to get more numerous in the gene pool. Basically it does this by helping to program the bodies in which it finds itself to survive and to reproduce. (Dawkins 2009: 88)

The definiens of gene is its being a replicator and, as such, the referent of the term 'gene' should not be reduced to 'strands of DNA', but must be regarded as including all direct or indirect offspring of a DNA strand. From this standpoint, the phenotype is a mere epiphenomenon of evolution, a kind of a vehicle for genes. But even this – pretty discouraging – perspective seems to be too substantialistic, as it presupposes that the genotype is necessarily individualized in phenotypes of organisms – animals, plants, bacteria and so on. This *can* be true, but it is not *necessarily* the case, because the term 'gene' refers to a relation within a network of competing replicator systems. Thus, a single phenotype does not define the borders of a replicator – only a system of those vehicles that play a specific role for the success of the replicators does:

> The vehicles that we know best are individual bodies like our own. A body, then is not a replicator; it is a vehicle. I must emphasize this, since the point has been misunderstood. Vehicles don't replicate themselves; they work to propagate their replicators. Replicators don't behave, don't perceive the world, don't catch prey or run away from predators; they make vehicles that do all those things. (Dawkins 2009: 254)

The two systems are not coextensive because genes – even if they belonged to the same replicator – can follow several differing strategies in order to achieve the ultimate goal – to improve their respective fitness. Within this framework even all extraorganismic features of organisms can be integrated – think of the nests of birds, the webs of spiders or Beethoven's symphonies. As one consequence, the relation between genotype and phenotype comes down to the relation between a replicator and its vehicles. However, Dawkins is by no means content with some extreme geno-centrism; rather, he extends his approach structurally to those features that are usually not subsumed under biological categories such as the extended phenotype, by employing an analogy:

> The new soup (the old one is the primordial soup) is the soup of human culture. We need a name for the new replicator, a noun that conveys the idea of a unit of cultural transmission, or a unit of imitation. 'Mimeme' comes from a suitable Greek root, but I want a monosyllable that sounds a bit like 'gene'. I hope my classicist friends will forgive me if I abbreviate mimeme to meme. (Dawkins 2009: 192)

The features of memes are those we know from genes: they are replicators that have only one single task, namely to replicate themselves (successfully). Dawkins characterizes them by their 'longevity', 'fecundity' and 'copying-fidelity', they are described as building a 'meme-pool' and as being more or less 'successful' (Dawkins 2009: 194ff.). To give an example fitting the current occasion:

> Similarly, when we say that all biologists nowadays believe in Darwin's theory, we do not mean that every biologist has, graven in his brain, an identical copy of the exact words of Charles Darwin himself. Much of what Darwin said is, in detail, wrong. Yet in spite of all this, there is something, some essence of Darwinism, which is present in the head of every individual who understands the theory. The meme of Darwin's theory is therefore that essential basis of the idea which is held in common by all brains that understand the theory. (Dawkins 2009: 196)

It is according to this explication that we now need to scrutinize the methodological structure of the analogy for the relation between the meme and its phene (namely cultural expression).

Three Dimensions of 'As If'

The very starting point for Dawkins's determination of the relation between genes (as explanans) and some forms of biological organization (as explanandum) is the assumption that organisms, including of course *Homo sapiens*, are 'survival machines':

> Replicators began not merely to exist, but to construct for themselves containers, vehicles for their continued existence. The replicators that survived were the

> ones that built survival machines for themselves to live in. The first survival machines probably consist of nothing more than a proactive coat. But making a living got steadily harder as new rivals arose with better and more effective survival machines. Survival machines got bigger and more elaborate, and the process was cumulative and progressive. (Dawkins 2009: 19)

The scenario resembles some of the recently discussed scenarios on the origin of life, for example, in terms of hypercycles, proto-cells, pyrit-layers and so on. But as the scenario itself is extremely implicit, it is hard to empirically evaluate its scientific relevance.[7] Nevertheless, there are some features that are most relevant for understanding the nature of the entire argumentative strategy:

1. The Darwinian[8] selection concept works even for the predecessors of living entities in a narrower sense.
2. The survival mechanism is cumulative and – as a result – progressive.
3. The replicators are described as agents.

Premises 1 and 2 are relevant insofar as evolutionary concepts refer by definition to reproducing units only.[9] Consequently, the validity that can be claimed by this type of theory is limited by the very premise of the existence of organisms whose evolution can be reconstructed (cf. Gutmann 1996). Setting aside the severe methodological problems connected with premises 1 and 2, however, premise 3 reveals the most important cornerstone of Dawkins's argument, as it describes pre-organismic and organismic units in terms of human actors. This strategy appears to be neither a rhetorical attitude designed to make some very abstract thinking more tangible, nor is it a mere accident, which the following characterization of (at least one type of) a replicator shows. In order to provide a sound explanation for the large amount of non-expressed DNA based upon the 'selfish-gene' approach, Dawkins points out:

> Biologists are racking their brains trying to think what useful task this apparently surplus DNA is doing. But from the point of view of the selfish genes themselves,

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[7] The details matter if the structure of those scenarios is to be evaluated at all; the evaluation differs fundamentally if, e.g., some thiosulfate, RNA and proto-DNA world is assumed to have preceded the DNA world of organisms known to exist since the Cambrian revolution (for a comprehensive overview cf. de Duve 1994).

[8] It is worthwhile noting that Darwin's own approach is not strictly Darwinian at all, but integrates some Lamarckian arguments, not only regarding the pangenesis concept of heredity. Even for Darwin the reference to some kind of functionalist description of evolving units is indispensible. It was the result of a sequence of 'syntheses' that finally led to the rigid architecture of strong Darwinian thinking (cf. Gutmann & Weingarten 1999; Gutmann 1996).

[9] Darwin introduced the evolutionary mechanism (i.e., reproduction) by effectively applying his comprehensive knowledge on the breeding and cultivation of animals and plants (Gutmann & Weingarten 1999).

> there is no such paradox. The true 'purpose' of DNA is to survive, no more and no less. The simplest way to explain the surplus DNA is to suppose that it is a parasite, or at best a harmless but useless passenger, hitching a ride in the survival machines created by the other DNA. (Dawkins 2009: 45)

The use of intentional phrases is abundant in the entire text, and Dawkins of course is aware of the problems connected with this strategy. His awareness is reflected not only by the quotation marks in the citation above, but also by his discussion of the use of intentional vocabulary:

> How could wild animals 'know' who their kin are, or in other words, what behavioral rules could they follow which would have the indirect effect of making them seem to know about kinship? The rule 'be nice to your relations' begs the question of how relations are to be recognized in practice. (Dawkins 2009: 99)

Dawkins answers the question by proposing the sufficiency of stating that animals behave 'as if they were' acting in terms of intentional action: 'Animals have to be given by their genes a simple rule for action, a rule that does not involve all-wise cognition of the ultimate purpose of the action, but a rule that works nevertheless, as at least in average conditions' (Dawkins 2009: 99). This argument reveals one dimension of an 'as if' description, which can be termed the dimension of functional equivalence. When stating that A is 'x-ing' (where 'x' stands for a type of action), we are elliptically assuming that the behaviour of A is being described in accordance to some rules which, applied in the context of human action, would be called 'x-ing'. In consequence, we are simply assuming that when behaving *as if* 'x-ing' the animals in question increase the frequency of the relevant vehicles and thus – indirectly – increase the abundance of the genes (Dawkins 2009: 89ff.). For example, the same strategy holds true for describing human brains as computers, which constitutes a further 'analogy' of the 'as if' type (Dawkins 2009: 276ff.). This interpretation of the intentional phrase has the advantage of preserving the original meaning (namely 'x-ing') and at the same time insisting on its *metaphorical* character. As far as this argument goes, it should be possible for all relevant cases within evolutionary narratives to provide a sound re-interpretation so that in consequence no intentional terms remain.

But this self-understanding is actually a kind of self-deception, because Dawkins does not get rid of intentional terms at all; he just replaces *some* of them (concerning the 'purpose of DNA', the 'being nice to x', etc.) by *some* different terms, which are in fact as intentional as the set replaced. Because stating that animals have 'been given some rule', that they are 'programmed' and so on are phrases of a metaphorical nature, and again we would have to assume that those statements are given in the logical grammar of 'as if' descriptions. We could call this second dimension the dimension of model adequacy of functional equivalence (i.e., the first dimension), because now we are assuming that the intentional term identifies the *model*, which is supposed to be useful and adequate. The adequateness

of the model cannot be expressed in terms of equivalence again, because the equivalence has to be proven as *being adequate* (otherwise we would run the risk of a vicious circle). Dawkins does not discuss the problem of adequacy at all, but simply states an 'analogy', which refers to some functional similarity between – in this case – computer and brain: 'Functionally, the brain plays precisely the role of on-board computer – data processing, pattern recognition, short-term and long-term data storage, operation coordination, and so on' (Dawkins 2009: 276). So far so good, but how do we know, and why does it seem obvious to propose the analogy between a brain and a computer? Obviously, behind this analogy stands the entire history of building and running computers, including the discussion of Turing tests (cf. Boden 2006). As even v. Neumann had to admit, there are extremely severe differences between neural processing on the one hand, and computers on the other (cf. Dreyfus 1979). Nevertheless, we *can* use computers in order to describe and structuralize some of the properties of organismic systems within organisms. But in doing so, we are not just stating an obvious analogy, we are in fact describing the brain *as if it were* a computer. In doing so, we are not only claiming some functional equivalence between computer and brain but we are doing something more, because the relation is asymmetric: the brain is – formally speaking – occupying the place of the explanandum (or the modelandum if we emphasize the active nature of modeling something on the basis of a comparison), whereas the computer holds the position of explanans (or modelans). And indeed, we know how to plan, build and run computers, and from this *knowhow* we hope to gain some *knowledge*, which allows us to understand how the brain (at least in some respect) actually works. The adequacy of the model can be assessed if we are able to draw some inferences and prognoses for the modeled unit (in this case the brain), and insofar as the model works, we may assume it to be adequate. Nonetheless, it still remains in the position of 'as if'.

The same logic can be observed for the types of model Dawkins focuses on, namely benefit-cost models, game theory models and other types of economic models (e.g., Lewontin 1961; Maynard-Smith 1982). Also, in this case it is human behaviour that provides the basis from which we borrow the knowhow and knowledge (including the language particles) that allow us to describe and understand what is going on in nature. And again, as in the case of the brain model, we can assume that the population model is adequate if we are successfully able to draw inferences and prognoses on the basis of the knowledge.

Only if we overlook the asymmetry of the comparison (which is then described as an analogy by Dawkins) does the comparison result in the *identity* of the two units (brain/computer and population/economic relations) compared. Of course, Dawkins does not follow the constructive strategy just presented, but proposes a somewhat different understanding of modeling. This brings us to a further dimension of 'as if', which may be termed the *hermeneutic as if*. Dawkins mirrors the (epistemic) basis of his model by identifying this very basis itself as being an (ontological) instantiation of the modelandum, that is, he *naturalizes* the epistemic basis of the modeling procedure:

> Just as we may use a slide rule without appreciating that we are, in effect, using logarithms, so an animal may be pre-programmed in such a way that it behaves as if it had made a complicated calculation. … When a man throws a ball high in the air and catches it again, he behaves as if he had solved a set of differential equations in predicting the trajectory of the ball. … At some subconscious level, something functionally equivalent to the mathematical calculations is going on. Similarly, when a man takes a difficult decision, after weighing up all the pros and cons, and all the consequences of the decision that he can imagine, he is doing the functional equivalent of a large 'weighted sum' calculation, such as a computer might perform. (Dawkins 2009: 96)

By stating an 'as if' relation in the case of animal behaviour, we find the functional equivalence dimension at work. This leads to the description of human action in terms of physics and mathematics, which shows the dimension of model adequacy in action. However, the last step of Dawkins's argument, cited above, *reverses* the direction of description, implying that human action (e.g., throwing a ball) actually *is* an instantiation of the mathematical modeling. In the second example we find the same subtle inversion. Here, Dawkins states that human decision-making is just an instantiation of the procedure we used in the first step to compare it with. By this reversal of direction, the original basis for the description of the explanandum (or the modelandum) itself becomes integrated into the realm of the processes to be explained or modeled; we are actually identifying the *means* with the very *objects* of description. If we do not allow this move, we finally see the third dimension of 'as if' modeling at work: it is human actors that provide the very basis for the description of the explanandum, namely human action. Insofar as human actors are defined by their ability to determine purposes (e.g., for the action to be performed), to determine the appropriate means of achieving the respective goals and finally to take responsibility for the results and effects of their actions (cf. Habermas 2001; Janich 2001), even modeling human action in terms of, for example, physical and mathematical calculation is primarily a kind of human action. Our reconstruction shows the somewhat surprising result – at least from a naturalistic point of view, like the one Dawkins holds – that one of the conditions for successful modeling of animal behaviour is the acceptance of the fact that the explanatory (or modeling) basis cannot be integrated into the scope of the explanation (or the model). At least it cannot be integrated as such, that is, *as*[10] human action.[11]

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[10] This 'as' is to be understood as the hermeneutic 'as'; cf. Gutmann 2011.

[11] Neglecting the second dimension of 'as if', Dawkins's explanation of human behaviour in terms of 'selfish gene' metaphysics comes under threat from an unexpected direction, namely the criticism arising from the so called panglossian paradigm, which we will not develop here (for the paradigm itself cf. Gould and Lewontin 1979). For a systematic explication of this literal understanding of intentional expression cf. Gutmann et al. 2011.

'As-if-explanation' and the Problem of Metaphors

This brings us back to our original question, namely whether a sociobiological explanation of culture is possible. The answer to this question depends on the methodological status of the analogy that was drawn between genes and memes. In the case of genes, our analysis of 'as if' statements leads to the conclusion that the dependency of the explicatory language game on the description of the explanandum is of a semantic and not of an (exclusively) empirical nature. The relevance of this for the concept of memes becomes apparent if we re-write the analogy in two different and opposing ways:

1. We might consider that memes are only *metaphorically* described as genes. More precisely: they are described as if they were genes. In this case the explanation of culture via memes is possible, but it does not follow from this that reproductive success is in fact the criterion for the adequacy of meme models.
2. Alternatively, we might consider the analogy to literally express the relation between memes and culture *as* the relation between genes and phenes. In this case, the only criterion for the identification of a meme is its reproductive success.

If the first interpretation of the analogy is true, then sociobiological explanations have a metaphorical status. In this case the explanatory power of sociobiology rests completely on the interpretation of the 'as if'. And as long as we properly distinguish between the three dimensions of 'as if' relations explicated above, the explanation of culture by memes goes just as far as the analogy itself is supposed to be valid. The validity, however, cannot be assessed on grounds of sociobiology *alone*, because in order to adequately describe the explanandum we needed a semantically richer language than the one provided and applied within the sociobiological framework. This, however, is just the *same epistemic situation* we had to face when explicating the meaning of 'being a (survival) machine' according to the logic of sociobiology, which involved going beyond biological descriptions and employing an analogy to artifacts. As a result, sociobiology then needed language particles that cannot be provided by sociobiology itself, thus losing its status as a comprehensive and scientific theory covering even the phenomena of culture. At least, by acknowledging its limitations, sociobiology would remain a *scientific* theory, albeit one that fails to provide an explanation for everything, particularly culture. By being *just one* scientific theory competing with others for the best available explanation of (biological) phenomena, it is then open to empirical, methodical and methodological criticism of the well-known type we referred to in the introductory section of this paper.

However, we need not bother ourselves with this option of the 'as if' status of memes, because this interpretation is explicitly rejected by Dawkins himself. He insists on the vehicle nature of phenotypes, including the extended phenotype, an insistence that leads to his rather problematic 'turning things on their head' stories:

> It is hard for many biologists even to see that there is a question here at all. This is because it is second nature for them to pose their questions at the level of the individual organism. Some biologists go so far as to see DNA as a device used by organisms to reproduce themselves, just as an eye is a device used by organisms to see! Readers of this book will recognize that this attitude is an error of great profundity. It is the truth turned crashingly on its head. (Dawkins 2009: 237)

According to this logic, turning the truth back on its feet again would mean rejecting a merely metaphorical interpretation of Dawkins's analogy. In this case it would no longer be analogy that governs the explanatory relation between memes and culture, but memes that hold exactly the same place as genes in Dawkins's narrative. And referring to our analysis of 'as if', the analogy now becomes a proper explanation by leveling out the difference particularly between the second and the third dimensions of 'as if'. Memes could then be treated not just as if they were genes, they would *have* the same epistemic status 'as' genes. Consequently, the analogy collapses into a statement of identity, and the criticism we developed above is then also valid for the concept of memes, as we assume that the description of the explanandum or modelandum fails in exactly the same sense as it failed in the case of genes within the sociobiological framework. Consequently, if we stick to the *literal* interpretation of stating that memes are just (like) genes, the outcome is disastrous for Dawkins's argument: If it is true that cultural units are simply the outcome of meme reproduction, defined not by sense, meaning, truth or other metaphysical monsters, this applies exactly to Dawkins's own approach. By stating that memes 'propagate themselves in the meme pool by leaping from brain to brain', reproducing by 'turning it (the brain, MG) into a vehicle for the meme's propagation in just the way that a virus may parasitize the genetic mechanism of a host cell' (Dawkins 2009: 192), we seem to get rid of meaning, sense and truth – they were nothing more than 'ideas', competing with other ideas for the resources of their self-propagation. However, we must take it for granted that this is also true for the concept of the extended phenotype, and consequently for the selfish gene, as was assumed by Dawkins to be true for Darwin's theory. This leads to a serious dilemma, which resembles the structure of a performative self-contradiction:

1. If Dawkins is right, his theory is nothing but a vehicle for the reproduction of memes, and the same must be true for the contradicting theory. If so, Dawkins is not claiming that his theory is adequate – he is in fact *claiming* nothing, but producing memes. The *rightness* of Dawkins's concept would designate *nothing but* the successful reproduction of the underlying memes. The truth-value of this statement, however, remains as miraculous as the difference between true and false statements in general – at least when we express this difference in terms of meme reproduction (which necessarily fails, as we saw above).
2. If Dawkins in fact *claimed* his theory to be adequate, he would be doing something that he could only do if his own theory was not adequate.

> Dawkins is then *not just* producing memes; he is in fact also *claiming* the adequacy of (in this case sociobiological) descriptions of culture as an outcome of meme reproduction, and consequently the truth of some of the statements, which are supposed to be the result of arguments based on the theory of meme reproduction. And as long as the meaning, sense and truth of statements are relevant for the assessment of the (epistemic) validity of sociobiology (as a scientific theory), they cannot be understood in terms of sociobiology (i.e., as successful meme reproduction) alone.

In both cases the application of Dawkins's approach to the approach itself leads to a contradiction which forces us either to state that the adequacy of the approach is to be dogmatically taken for granted or, alternatively, that the theory of memes cannot be applied to the description of the explanandum – which we are accustomed to call culture. So, either the meme theory is adequate, which implies that it does not tell us anything adequate about culture, or the meme theory does indeed cover culture adequately, which implies that it cannot be a scientific theory.

Some Final Words

The result of our reconstruction may be seen as a disappointment by anyone attempting to determine what it means to be a human being, and indeed it is meant to be disappointing and even frustrating, not only in token but in type. As I have presented my criticism not as the application of some external strategy but as the development of fundamental internal and intrinsic contradictions of the sociobiological position itself, it cannot be opposed by doing more empirical research in order to extend the scope of sociobiological explanation. The counterargument is then valid for all positions that display the same argumentative structure as sociobiology. And as one cornerstone of this structure is the reference to human beings in the logical grammar of 'being a specimen of *Homo sapiens*', any approach may be under attack that does not explicate the relation between 'being human' and 'being a specimen of *Homo sapiens*' (a possible perspective is presented in Gutmann 2011). If we want to avoid a solution that is much too simple, and that emphasizes the two cultures and states the impenetrability of the cultural world by the sciences, then we might alternatively follow the structure of the constructivist argument presented above. By assuming that the original description of the explanandum (or the modelandum respectively) remains necessarily intact and does not become part of the scientific language game (in this case predominantly of a life science type), we do not imply that there are *no* relations between the two language games. In strict contrast to a simple juxtaposition, we would have to understand scientific descriptions of humans as specimens of *Homo sapiens* as a necessary possibility[12] of human self-thematization. This is true even for sociobiological modeling, at least insofar as we are willing to accept

[12] Concerning the iteration of modal expression cf. Gutmann 2011.

the methodological limits of the models themselves, some of which I scrutinized in this paper. Following my arguments, then, humans are humans only as long as both functions remain intact at the same time: being the (biological) *objects* of descriptions of which humans *as* humans are the *authors*.

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Chapter 11
‘Survival of the Fittest’ in Darwinian Metaphysics: Tautology or Testable Theory?

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Charles Darwin in Historiography – Scientist, Philosopher or Both?

Charles Darwin is often presented not only as a most eminent naturalist, but also as a prototypical empirical scientist, inductively deriving his theory of evolution based on empirical evidence rather than on theoretical, or even metaphysical or religious grounds. During his voyage on the HMS Beagle Darwin assembled a huge collection of animal-specimens, which contributed to the theory that changed our view of life. Such observations as those of the Galapagos finches were crucial for the paradigm shift linked to his specific theory of evolution, replacing belief in Genesis as well as pre-Darwinian theories of evolution. This positivist success story, dominating biology textbooks, sometimes presents Darwin’s theory of natural selection as simply a great victory of modern empirical science over earlier religious or philosophical prejudices. Although indeed this interpretation is broadly in line with today’s intellectual frontline between radicalized gene-Darwinism (Dawkins, 1976, 2007; Dennett, 1995, 2006) and radicalized religious literalism, the view involves gross simplifications. A detailed historical analysis shows that the relationship between Darwinism on the one side and religion, philosophy, and metaphysics on the other side has been much more volatile and intricate than this simple success story suggests (Desmond and Moore 1991; Depew and Weber 1995; Gould 2002; Knight 2004; Brooke and Cantor 2000; von Sydow 2005, 2012). Paradoxically, Darwin’s belief in natural theology, even after the voyage with the Beagle, had a strong impact on his theory of natural selection, even though this theory later subverted his religious tenets, ultimately rendering him agnostic at least (e.g., Ospovat 1995; Gould, 2002; von Sydow 2005). As a young man at the University of Cambridge, Darwin had studied theology. Although he was more interested in the ‘book of nature’ than in the Bible, the naturalist community in Cambridge brought him into further contact with England’s natural theology. Darwin read Paley’s *Natural Theology* (1802) voluntarily and with delight, learning it almost by heart. Even later he wrote that he has ‘hardly ever admired a book more than Paley’s Natural Theology’ (Darwin, 1985, vol. 7, letter to J. Lubbock, 22 November 1859: 388). Darwin’s theory of natural selection appears in fact to have absorbed ideas from Paley’s natural theology – among them his

early beliefs in pan-adaptationism and in an unchangeable and universal law of natural selection (von Sydow 2005): The so-called 'Panglossian' perfectionism (cf. Gould 2002: 264) is found in Paley's *Natural Theology* (1802) and is linked to his argument that organisms provide evidence for an omniscient designer. Even after adopting the general idea of a transformation of species in 1837 (an idea discussed by romantic and Lamarckian biologists before) and sketching a first version of his theory of natural selection in 1838, Darwin still retained a Paleyan belief in the ubiquity of adaptations, which he retained perhaps until 1844 (Ospovat 1981/1995: xv, 60–86). For Paley (1802), universal and unalterable natural laws, quite similar to adaptations, suggest the existence of a designer. Influenced by Paley – as well as by the general predominant Newtonian approach of the time – Darwin fashioned his theory of natural selection as one based on a simple, unchanging, uniform and universal mechanism (von Sydow 2005) that seems to exclude, for instance, an evolution of evolutionary mechanisms (von Sydow 2012).

It is generally accepted today that Darwin did not adopt his theory of natural selection on the Galapagos Islands or while traveling on the HMS Beagle (1831–1836), but rather when ordering his observations in the light of then available theories. His influences included not only Paley, but also Erasmus Darwin, Robert Edmond Grant, Charles Lyell, Adam Smith and Thomas Malthus: Erasmus Darwin (Charles's grandfather) and Robert Edmund Grant were among those who introduced him to romantic and Lamarckian traditions of transmutation of species. Furthermore, Darwin's gradualism was influenced by Charles Lyell's geological uniformitarianism; and his early optimism regarding individual competition followed the British tradition of Adam Smith and Milne-Edwards. Finally, Darwin explicitly recounts in his autobiography that he got the basic idea for his theory of natural selection when re-reading Malthus's *Essay on the Principle of Population*. The theologian and economist Malthus had argued against socialist utopianism in the context of a theodicy resembling that of Paley's natural theology. The permanent, ceaseless struggle for existence is interpreted as a side effect of God's operating by general law to prevent human vice from obstructing the high purpose of creation. Reverend Malthus claimed that, when one considered superfecundity, destruction and misery, the idea of a benevolent God could only be vindicated if he acted by general laws that lead to the improvement of the moral qualities of man. When Darwin in 1838 actually formulated his hypothesis of natural selection, he provided a missing link, not only for a theory of evolution, but – paradoxically – for Paley's and Malthus's theodicy as well (see Paley 1802, Chap. XXVI). However, partly based on his new theory Darwin in fact abandoned natural theology, eventually embracing agnosticism. Interestingly, in the fifth and sixth editions of the *Origin of Species* and in the *Descent of Man* Darwin states: 'I was not able to annul the influence of my former belief, then widely prevalent, that each species had been purposely created; and this led to my tacitly assuming that every detail of structure, excepting rudiments, was of some special, though unrecognized, service' (Darwin 1871: 153). He further concludes that these influences led him to 'extend the action of natural selection ... too far' (Darwin 1871; cf. von Sydow 2005).

Although Darwin was careful not to taint science with crude ideology, his theory, as the above sketch indicates, provides not only an empirical synthesis but a theoretical one as well. It is suggested that Darwin's pan-adaptationism, as well as his advocacy of the universality and unchangeability of the law of natural selection, may historically be based on metaphysical assumptions that paradoxically seem to play a partly religious role in Darwin's earlier advocacy of natural theology. Darwin clearly was not only an eminent scientist, but an eminent theoretician or even philosopher as well. The sailors on the Beagle did not know how right they were when they nicknamed Darwin 'the philosopher'.

This historical sketch is a good preparation for considering next the possibility that Darwinism might partly have a metaphysical basis. The section that follows, however, more directly provides a brief systematic introduction to Darwinian metaphysics (cf. similarly: von Sydow, 2012, for a brief review). This, in turn, is followed by a main section, turning critically to the potentially tautological formulation of the concept of 'the survival of the fittest' as one important basis for a Darwinian metaphysics, if not for Darwinism in general.

Universal Darwinism and Darwinian Metaphysics

Darwinian metaphysics in a broad sense may be linked to the influence of Darwinism on philosophy. Although books on the history of philosophy still often only mention Darwinism in a footnote, it may well have played a key role in the history of philosophy of the late nineteenth and twentieth centuries: for instance, in modern materialism, monism, pragmatism, and, with in part disastrous consequences, in various brands of social Darwinism. In the history of philosophy there has also been explicit but similarly heterogeneous criticism of Darwinism as in ontology or metaphysics (exemplified by such different authors as H. Drietsch, E. von Hartmann, H. Jonas, G.E. Moore, and A.N. Whitehead). Darwinism's main influence on the history of philosophy, however, may perhaps have been indirect, in providing the background for the change of focus of main philosophical schools of the second half of the twentieth century, who – with different arguments – all abandoned the field of philosophy of nature as their central constituent (this holds as well for logical positivism as for neo-Kantianism, phenomenology, existentialism and postmodernism). In this historical perspective the role of Darwinism seems important, but remains heterogeneous and difficult to assess.

Recent decades, however, have witnessed a renaissance of general naturalism in philosophy, often combined with the adoption of views from radicalized forms of Darwinism. The approaches of gene-Darwinism and process-Darwinism can be understood as two forms of a Darwinian metaphysics (von Sydow, 2012, 2013) because of their universal applicability across disciplines, their simple basic principles, their substantial changes of common-sense assumptions about what things exist and partly *a priori* (sometimes tautological) justifications.

First, what I call gene-Darwinism (cf. von Sydow 2012) is a biological approach most prototypically exemplified in the work of Richard Dawkins (1976, 1983; cf. e.g., Williams 1966) that has not only inspired considerable work in biology, but that is also often seen to have massive implications for the social, ethical and religious domains (e.g., Dawkins 2006). With regard to the unit-of-selection debate, gene-Darwinism radicalizes and purifies the existing reductionist tendencies of Darwin's theory by advocating a biological entity reductionism to the level of a single gene (cf. Gould 2002). Dawkins's Darwinism does not stop at the level of the individual organism, but rather at that of single selfish genes. Gene-Darwinism takes a nominalistic position on gene combinations, genomes, gene pools and groups, by which all are taken as ephemeral epiphenomena. Only genes, understood as short chunks of DNA, survived in the meiotic shuffle (gene-atomism). Moreover, in a radicalized interpretation of the central dogma of molecular biology, stating that information cannot explicitly be transferred from proteins back to the DNA, phenotypes (in contrast to genotypes) are regarded as mere 'puppets' or vehicles of the genes (germ-line reductionism).

Second, gene-Darwinism radicalizes the neo-Darwinian stress on natural selection by consistently advocating process reductionism, reducing all processes of information gain to processes of natural selection. Although Darwin clearly regarded natural selection as the core of his theory, he still allowed for a substantial causal pluralism, involving roles, for example, for the correlation of growth and use-inheritance. In addition, the modern evolutionary synthesis, particularly in its second phase with Dobzhansky and Mayr as main proponents, clearly put more stress than gene-Darwinism on the role of populations, phenotypes and causal pluralism (von Sydow 2012). In contrast, gene-Darwinism claims that all relevant evolutionary processes are essentially reducible to processes of *natural selection* (Darwinian process reductionism).

Finally, gene-Darwinism has often been linked to biologism. E.O. Wilson, representing at least early on partly gene-Darwinian ideas, claimed that ethics should become 'biologized' and be based on the 'morality of the gene' (1975: 3–6). This appears coherent with gene-reductionism as well as Darwinian process-reductionism, although some gene-Darwinians have actually argued that this conclusion need not follow.[1] Whatever the conclusion, gene-Darwinism claims that we are like

> Chicago gangsters, our genes have survived, in some cases for millions of years, in a highly competitive world. This entitles us to expect certain qualities in our genes. I shall argue that a predominant quality to be expected in a successful gene is ruthless selfishness. This gene selfishness will usually give rise to selfishness in individual behaviour. (Dawkins 1989: 2)

[1] Richard Dawkins has resisted to advocate a morality of the gene and claimed ideas or 'meme's may have some autonomy (Dawkins, 1982: 110–12). However, it is at least questionable, whether within his highly reductionist framework a truly emergentist position could consistently be advocated.

All aspects of gene-Darwinism have been challenged. For instance, a modern multi-level approach gained influence challenging gene-reductionism (Hull, 1981; Sober and Wilson 1998; Gould 2002; Wilson, 2005; Okasha, 2006; Wilson and Wilson 2007; Nowak, Tarnita & Wilson, 2010; von Sydow 2012). Nevertheless, gene-Darwinism, with its simplicity of very few first principles and universality of postulated application, has remained influential within but also outside of biology (cf. Dawkins 2006; Dennett 2006).

Process-Darwinism signifies another class of Darwinian metaphysics, that can be defined by strict Darwinian process reductionism, advocating that Darwinian processes essentially provide an exclusive and exhaustive explanation of knowledge acquisition in biology or other subject areas, while claiming the existence of such processes on at least one or several levels outside of biology (Campbell 1960; Dawkins 1983; Dennett 1995; Hull 1981; Hull, Langman and Glenn 2001; Popper 1972; Plotkin 1994; Skinner 1981; cf. von Sydow 2012). Although older roots of process Darwinism go back, for instance, to August Weismann, William James and Charles Sanders Peirce, it was Donald T. Campbell who first argued in a classical article that all inductive achievements and genuine increases in knowledge were basically 'blind-variation-and-selective-retention processes' (1960; cf. 1990). The term *process-Darwinism* may be used in the field of biology as well (for multi-level accounts that advocate strict process-reductionism). However, the term here signifies approaches of universal Darwinism postulating actual Darwinian processes in other disciplines as well. Table 11.1 below presents some subject areas in which Darwinian accounts have been influential, showing the units of selection, the alleged Darwinian process involved, and some main protagonists.

Table. 11.1 Process-Darwinism in Various Disciplines (cf. von Sydow, in press)

Subject Area	**Units of Selection**	**Darwinian Process**	**Authors**
Biology	Genes	Blind mutation and natural selection	G.C. Williams, R. Dawkins
Psychology	Acts, operants, associations	Trial and error	E.L. Thorndike, B.F. Skinner, D.T. Campbell
Philosophy of Science; Epistemology	Theories	Conjecture and refutation	K.R. Popper, S. Toulmin
History of Ideas	Ideas (or 'memes')	Blind variation and external retention	D.T. Campbell, R. Dawkins, D. Dennett
Economy	Firms, products, routines	Innovation and market selection	M. Friedman

Campbell (1960) posited in detail that the psychological processes of pattern recognition, creativity and operant conditioning (trial-and-error learning) are essentially Darwinian, analogous to the biological process of blind mutation and natural selection. Skinner, the father of operant conditioning, independently from Campbell concluded that the learning of operant behaviour corresponds to 'a second kind of selection' based on 'the first kind of selection' (natural selection) (Skinner 1981: 501; more recently, see, for instance, Hull et al. 2001). In economics the analogy between survival of the fittest (or natural selection) and market-selection is an old one, dating from early forms of social Darwinism (see Hofstadter 1955; Greene 1981). It needs to be noted, however, that in the past as well as in the present not all accounts of evolutionary economics have strictly reflected Darwinian approaches (see Hodgson 1993; Knudsen 2002; Nelson 2007). Nonetheless, the idea of natural selection played a crucial role, for instance, in M. Friedman's influential advocacy of an unconstrained free capitalism and laissez-faire policy (1953: 22, cf. von Sydow, 2012). Moreover, there seem to be similarities between neo-Darwinism and neo-classical economics (for a critical view, see Khalil 1983). Darwinian economics advocates that innovations, routines, or businesses on the whole are selected by given consumer-preferences or the invisible hand of the market (Knudsen 2002; Hodgson 2002).

The advocacy of Darwinian processes in different domains has often been implicitly or explicitly accompanied by a commitment to the general research-program of process-Darwinism, with the claim that not only the described processes, but all forms of knowledge-acquisition essentially are Darwinian 'blind-variation-and-selective-retention' (Campbell 1960; Popper 1972; Dawkins 1983; Dennett 1995; cf. Hull et al. 2001). This approach may be called metaphysical, not only because it is a universal approach (a 'universal acid', Dennett 1995) based on a second-level, extremely principled and purified ontological inventory (with one kind of process only), but because, as main proponents of process-Darwinism have argued, Darwinian approaches are not just true empirically, but also in principle (Popper 1972; Dawkins 1983). It is argued that conjectures must be blind and that, in principle, instructive learning is impossible. The theoretical, *a priori,* argumentations may perhaps be linked to two central philosophical or metaphysical issues (von Sydow, 2012, 2013): the fundamental problem of induction (going back at least to Hume) and the possible tautological interpretation of the concept 'survival of the fittest.' The remainder of this article will focus on the latter aspect only, now with regard to both biology and psychology.

The Problem of Tautological Formulations of Natural Selection

The British evolutionist Herbert Spencer, in his *Social Statistics* (1851), coined the phrase:

'The survival of the fittest' (1)

The formulation was later adopted by Darwin in 1869 in the fifth edition of the *Origin of Species* as synonymous to his central term, 'natural selection', yet

without personifying nature (thus avoiding any religious imbroglio). This simple but resonant phrase provides the starting point for my argument here.[2]

Natural selection has often been defined in a much richer way, linked to other theoretical terms, such as common descent, blind mutation, gradualism, adaptation, and struggle for life. Nevertheless, survival of the fittest is an important explication of the central explanatory term of natural selection itself, which ever since Darwin has represented presumably the most central idea of Darwinism. Natural selection seems to have testable meaning of its own: Proposition 1 relates the explanandum, the question 'what will survive?' to an answer or explanans, 'the fittest'. Proposition 1, to most laymen and presumably to most biologists, appears to be a clearly testable empirical hypothesis. Nevertheless, the concept of natural selection has long evoked criticism due to the potential for tautological interpretation (Scriven 1959; Popper 1972; Gould and Lewontin 1979; Rosenberg 1983; Lipton and Thompson 1988; cf. also Williams 1966).

The most pressing problem seems to be the definition of the 'respectable' scientific term 'fitness', used in several formulations and closely related to the notion of adaptation. Whereas adaptation is normally used retrospectively, fitness is used prospectively. Whether an entity is biologically more fit than another appears to be an empirical question. But how is one to decide this question? What is the ultimate measure of fitness?

Fitness, one may argue, should ultimately measure the ability to survive, which can be investigated by empirically assessing actual survival. Under such a definition, however, Proposition 1 as a whole becomes an untestable tautology. One could only predict:

The survival of the survivor(s) (those who will actually survive) (2)

As a prediction, that is not very bold: Proposition 2 may indeed have some connotations – an interesting issue we cannot discuss here – but it has no directly testable empirical content or predictive force. Whatever the world is like, this proposition holds true. Despite the apparently suitable definition of fitness, Proposition 2 immunizes natural selection. Such a formulation may also be used to justify an interpretation of a particular given feature of a survivor or a surviving population as an adaptation, in a *post hoc ergo propter hoc* explanation or a 'just so story' (see the classical paper on this related but different issue: Gould and Lewontin 1979; cf. Scriven 1959; Fodor et al. 2010). In any case, Proposition

[2] Alternatively, *survival of the fittest* may be formulated in a more detailed and more precise way. Moreover, one may want to explicate a *relative* interpretation of fitness by comparing the fitness of two genotypes at a single locus. One may, for instance, reformulate Proposition 1: 'For all organisms *x*, if and only if organisms *x* with genotype *A* are fitter than all organisms *x* with non-*A* genotype, then organisms *x* with genotype *A* tend to survive more frequently than organism *x* with genotype Non-*A*'. Such an elaborate formulation may well be helpful, but the main ideas of the text do not require such detailed—and less accessible—specifications.

2 interprets natural selection not as empirical theory at all, but at best as merely a metaphysical framework. In what follows several alternative formulations of fitness will be discussed that may prevent a circular or tautological interpretation of natural selection.

As a first objection, one may point out that 'fitness' actually has several meanings in ordinary language (for instance, 'physical fitness', referring to power, speed and other well defined terms). Using the everyday meanings recalls perhaps the proposal to use 'fitness' as a theoretical primitive (cf. an interesting discussion by Rosenberg, 1983: 464). If these meanings are adopted, Proposition 1 clearly ceases to be tautological. Based on Proposition 1, and employing common-sense features of fitness, that is, one may derive specific predictive propositions, such as:

The survival of the strongest (3)

The survival of the most vivid (4)

People may in fact imagine one of these testable interpretations when hearing Proposition 1. Charles Darwin, despite usually using Proposition 1, in *Variation under Domestication*, wrote: 'The strongest ultimately prevail, the weakest fail…' (1875: 5). But is Proposition 3 generally true? No. It is uncontroversial that the 'weak' may at least sometimes be more fit in evolution. For example, whereas dinosaurs became extinct, the weak predecessors of man (the size of a mouse) must have been quite successful (similar examples at the level of individuals may be provided). Interpreting Proposition 1, Proposition 3 is therefore either false or requires a theoretical system that allows specification of which proposition applies, contingent on some premise where power, speed, reaction-time, co-ordination, agility or any of their combinations is the determining factor for fitness. Briefly, Proposition 3 is thus either plainly false or underspecified or requires *post hoc* adjustments.

A second objection to the tautological interpretation of Proposition 1 seems that fitness today is defined, not by survival but by reproduction-rate (reproductive survival). One may calculate the absolute fitness of a genotype by the number of individuals possessing it after selection divided by the number before selection: $\omega_{abs} = N_{after} / N_{before}$; or one may calculate a relative measure: $\omega_{abs} = \omega_{abs} / average(\omega_{abs,\ all\ genotypes})$. The time span involved is usually one generation (until the filial generation reaches reproductive age[3]). If this interpretation of fitness is applied to Proposition 1, the understanding of survival (the explanandum) needs to shift in the same way for reproductive survival, which results once again in a tautological claim (cf. Rosenberg and Bouchard 2008):

[3] There may be additional problems concerning an adequate choice of timespan. See Dawkins (1982/1989: 184) for an interesting discussion of the matter.

Those organisms leave most (or more) offspring who leave most (or more) offspring (5)

Instead of claiming that 'survivors survive', the claim now is that 'reproducers reproduce' ('those who reproduce better, reproduce better'). Interestingly, the meaning of the first part of the sentence (the explanandum) is assimilated exactly to the second part (the explanans). By linking reproductive fitness to reproductive survival, the resulting interpretation of Proposition 1 becomes again a tautology. Alternatively, one may of course stick with the simple survival-interpretation, at least on one of the two sides; for instance: 'Those organisms that tend to survive longer (organismic survival), reproduce better (reproductive survival)'. Long lifespan of animals (such as elephants), however, neither implies high reproduction rate nor high reproductive fitness. Thus this brings one back to a position between the Scylla of tautological formulation and the Charybdis of rendering natural selection plainly false.

Nevertheless, one may argue that we do not want to predict an organism's direct reproductive success (the number of offspring) by its personal fitness, but the occurrence of an organisms genes in the next generation, also influenced by an organisms effects on non-descendent kin (like the support of siblings); thereby potentially affecting copies of the organism's genes in other bearers. On the explanandum side, one is now interested in a general probability of the survival of an organism's genes, whether this is effected by the organism itself or by non-descendent kin (*inclusive reproductive survival*). Yet this modification on the explanans side requires analogous changes to the explanandum side as well. Personal fitness becomes changed into Hamilton's inclusive fitness. Deviations from predictions based on inclusive fitness will usually be attributed to auxiliary hypothesis not to the concept of inclusive fitness itself. To avoid rendering Proposition 1 plainly false, one needs to produce a tautological formulation:

Organisms with higher inclusive reproductive survival have higher inclusive reproductive survival rate (6)

A third objection is that in evolutionary biology there are clearly abundant *specific theories and hypotheses* that are testable. Used fitness values need not be defined based on survival or reproduction, but rather on some additional, specific theory of design. As an example, assume a chart, depicting an observed frequency distribution of the gradation of beak-sizes for a species of Darwin finches. One may further assume an existing specific biological theory allowing the expectation that the fitness-level of large beaks is greater than that of small beaks. Based on this theory and on the refined mathematics of population-genetics, a precise prediction can be derived for further generations of Darwin finches. The predictions are not tautological (although the equations of population genetics, like all mathematics, may be interpreted to be tautological); yet if the prediction were falsified, what would usually be abandoned would not be the idea of natural selection (Proposition 1), but the specific biological theory instead (thousands such specific theories have

been falsified in the past). Specific theories about evolution or fitness are by normal standards testable; this says little, however, about whether the principle of natural selection is testable (von Sydow 2012). Rosenberg (1994) stressed earlier that the problem of biological theories using specific optimal design arguments was that they 'easily lead to misidentifying the more fit as the less, and vice versa' (461); also that accounts of optimal design are too heterogeneous to count as a unified theory, at least testing something other than 'natural selection' itself. It appears that 'survival of the fittest' per se may remain a metaphysical framework as long as conflicting evidence is normally taken to refute auxiliary hypotheses rather than the metaphysical core. Interestingly, however, during the testing of specific theories, the actual meaning of 'fitness' changes both due to substantial modifications (cf. the inclusive fitness approach or the propensity approach discussed next) and due to reference to more specific associated theories. 'Survival of the fittest', that is, would not have a fixed meaning specified by the principles of the theory, but rather changed its meaning over time, in an *ad hoc* way, to account for empirical findings and theoretical changes – thus again rendering it irrefutable.

Finally, a fourth objection to the tautological interpretation of Proposition 1 is that fitness must be defined not by survival or reproductive survival, but by a probabilistic propensity or disposition to survive or leave offspring (Mills & Beatty, 1979; cf. also Rosenberg 2008). Accordingly, absolute individual fitness values reflect an organism's expected number of offspring. Technically, the expected value reduces a given probability distribution over propensities to a single value. The relative fitness of organism *x* being larger than the fitness of organism *y*—$\omega(x) > \omega(y)$—is stipulated as equivalent to the probabilistic survival relation that '*x* is expected to leave more offspring than *y*'. Using probabilities allows one to state that a more fit individual may (by chance) not survive, while yet allowing the fitness claim to be sustained, by using information on the type level. Although this reasonable move rules out strict falsification, it does not rule out statistical tests. This testability, however, again seems to concern specific claims about fitness; and a refutation usually will lead to another specific and again testable hypothesis about fitness values without allowing for dismissing the principle of survival of the fittest. In the finch example, let us assume that a (fit) finch with a large beak does not survive. It may be argued that it is nonetheless a fit animal. Yet, a low survival-rate of similar finches 'tested' over the long run would lead to a modified fitness-value rather than to a falsification of the principle of natural selection. A propensity-formulation, may well have its advantages, but used in this way, does not fundamentally change the dependency of the explanans on the explanandum, and essentially leads to the following interpretation of survival of the fittest that does not – at least not in a relevant way – resolve the problem of tautology:

Organisms that survive with a high probability
have a high probability to survive (7)

As has been shown up to this point, a tautological interpretation of 'survival of the fittest' can be defended quite well against a number of objections. Tautological

interpretations, therefore, may have played a considerable role in immunizing Darwinism in general and process-Darwinism in particular.

Such tautological interpretations of 'survival of the fittest', however, would even accommodate for evolutionary processes that have been in stark opposition to any strictly Darwinian understanding of evolution, such as drift, divine creation, directed variation, strict instructivism, saltation, group selection, internal constraints, synthetic (rather than variational) processes, and orthogenetic, self-organizational or self-determining tendencies (for a historic account, see Gould 2002; von Sydow 2012). Even if the tautology problem up to this point has not been resolved for 'survival of the fittest', the meaning of natural selection may be supplemented by neo-Darwinian tenets to make it testable. Even formulating the claim that 'survival of the fittest' does not rule out processes regarded to be non-Darwinian, actually implies that there are meanings of Darwinism (or natural selection) that can be delineated from alternative processes.

One may, for instance, test the concept of drift (random change of gene or feature frequency) against natural selection (actually together with drift) *contrastively* by theoretically constructing two likelihood functions for a given phenotypic feature (e.g., beak size) (Sober 2008: 189–263). If the empirically found difference went in a direction other than that predicted by natural selection, and if the changes remain too close to the original state, it follows that drift has to be favoured over natural selection. Tests may indeed need to be contrastive; and given the likelihood functions, the above example provides a possible empirical test of natural selection. First, however, 'survival of the fittest' would remain a tautology if one continues to define 'fitness' by reproductive outcome only (cf. Rosenberg 1983). If one were to adjust the likelihood function based on the data, one would never – even in contrastive tests – be able to refute natural selection. The proposal actually *assumes* that there is a solution to our central question in the first place (how fitness could be defined independently from survival) by specifying a given likelihood function. Nonetheless, in practical terms, contrastive testing allows for cases where immunization will presumably not occur. Experimenters may actually refrain from accommodating their selection hypothesis in the light of the outcome if from the outset they explicitly aim to test against drift. Again, this needs to be based on a specific biological theory (here treated as auxiliary hypothesis). Changing the auxiliary hypothesis, however, is neither logically excluded nor necessarily always wrong. Thus even for such contrastive testing, problems are not fully solved.

Second, the distinction between natural selection and drift is *conceptually* not the most central issue. Historically, Darwinism has mainly been associated with a relatively undirected chance process; and contrasting natural selection only against a process that is even more based on chance may be possible but seems to miss the point. Even in Darwin's time, John W.F. Herschel, astronomer and highly influential philosopher of science, disdainfully called natural selection the 'law of higgledy-piggledy'. The contrast to drift would not preclude to falsely identify 'survival of the fittest' with, for example, directed mutation, saltation or

an evolutionary direction based on internal constraints. Thus, contrasting natural selection with drift does not provide a sufficient specification of the actual neo-Darwinian meaning of the term 'natural selection', nor makes it testable in a way that excludes its main historical alternatives.

To account for central aspects of neo-Darwinian theory, one may refer to natural selection as a full Darwinian process of blind variation and external selection (von Sydow 2012), not just as its second step (natural selection in the narrow sense). A Darwinian process is a search algorism in a design-space that appears to have testable aspects. We examine the two involved processes separately.

Blind variation, the first step of such a Darwinian process – albeit not part of natural selection in the narrower sense – has always been essential to neo-Darwinism, delineating it from more directed accounts of evolution. The claim of blindness of variation appears testable, whether one thinks of refutations of naïve Lamarckism or of recent suggestions that perhaps rehabilitate some role for use-inheritance linked, for example, to epigenetics. Nonetheless, testing strict blindness of variation in general is not a trivial issue. For the most part, blindness has been tested against 'omniscience' only, using the radical alternative hypothesis that organisms produce variations almost perfectly directed towards adaptation. Nevertheless, one may argue that strict blindness (of mutations or other trials in process-Darwinism) is conceptually only one extreme of a continuum of myopia ranging from complete blindness to omniscient production of variation, trials or conjectures (cf. von Sydow 2012). Yet dismissing this dichotomous alternative, strict Darwinism could not be proven correct by refuting only an extreme antithesis of perfect use inheritance, even if done in several biological cases. It is much easier to show that variation is *not* omniscient than to test for strict blindness. A proper evaluation of the theory that all variations, mutations, trials and conjectures are blind needs not only to access the former but the latter as well. This holds for the different fields of process-Darwinism as well as for biology itself. But what would an empirical test of the blindness of a specific type of variation look like? As an example, assume that (a) neutral DNA – the so-called 'junk DNA', – was actually shown to be usable, with only minor modifications, to construct important elements in gene-regulation (as found, e.g., by Eichenlaub and Ettwitter 2011); that (b) mutations often transform whole strands of silent DNA into active DNA; and that (c) strands of such DNA have a significantly higher (albeit still low) fitness than purely random point mutations affecting the same number of nucleotides. Would this count as a violation of strict blind variation? If blindness is intended to be an empirical claim, such or similar examples must presumably be interpreted as disconfirming. Otherwise, another kind of immunization is present. Consider a second hypothetical experiment: (a) a species in its evolution has repeatedly profited from variations on a particular dimension (e.g., size); (b) evidence confirms that this species has an increased probability to produce mutations within this dimension; and (c) evidence confirms that mutations of this dimension have a significantly higher (albeit still very low) fitness than purely random point mutations affecting the same number of random nucleotides. Again,

an adapted dimension of variation that actually turns out to increase the probability of survival of the organism or evolutionary line in the future, may be interpreted as a disconfirmation of strict blindness of variation (cf. von Sydow, 2012). Alternatively, however, one may plausibly defend the blindness assumption by arguing (perhaps based with reference to the problem of induction) that one is here still concerned with blind variation alone, even if the study controlled for chance fluctuations on various possible dimensions of change. Yet would not such a move turn a supposedly empirical claim into a merely tautological one? Of course, using tautological claims in science is not necessarily deplorable (think of mathematical equations), but this would require a truly metaphysical justification, not a supposedly empirical one. It remains regrettable, however, that many common-sense advocates of the idea of strict blindness employ this concept with empirical meaning without providing means testing it (in this respect, Dawkins [1983] may be seen as a positive counter-example, in consistently advocating a metaphysical basis to Darwinian claims). If, however, one does not want to advocate Darwinism metaphysically, the operationalization of more subtle tests of a strictly defined understanding of blindness needs to be implemented. This is a difficult yet interesting task: for example, how might one control for chance fluctuations of the fitness of different dimensions of variation? Although the burden of proof is commonly placed on those criticizing the blindness assumption, for empirically minded advocates of the latter it is equally important to show the claim to be adequately testable. In conclusion, although 'blindness of variation' on the one hand seems a bold, non-tautological claim, it may be fully or partly immunized, by either advocating the concept of blindness metaphysically or by simply not testing against more subtle deviations. Taking such problems seriously, a more clearly testable version of the claim of blindness of variation (mutations, trials, conjectures, etc.), however, may well not stand up to more a refined empirical scrutiny (von Sydow 2012; cf. Fodor et al. 2010).

Alternatively one may want to abandon this central tenet of neo-Darwinism, as is sometimes done to extend process-Darwinism to fields outside of evolutionary biology (cf. Hull et al. 2001). Clearly this does not increase the testability of process-Darwinism. Yet natural selection may perhaps only require variation in the sense of a 'filter account', where more conjectures are made than are accepted. Darwin's Malthusian stress on a general overproduction of organisms seems testable,[4] but the question remains as to how a filter account could be refuted in general? Assuming, counterfactually, that almost all variations (mutations in biology, trials in psychology and conjectures in science) would be highly directed, and that almost all would survive (which is clearly not the case), this (by any historical standard) very non-Darwinian picture would be fully coherent with a filter interpretation of Darwinism, as long as only one variation would not get into

[4] One may argue that this has actually been criticized historically in the work of Wynne-Edwards. But even if his approach would partly be true, it is not necessarily to be understood as a refutation of a general filter idea.

the next generation. It would not be favorable to neo-Darwinism to be based only on refuting a straw-man hypothesis of totally omniscient trials. This would make fully or partly Lamarckian, orthogenetic, or saltationist accounts coherent with a neo-Darwinian account, which as a concept is inacceptable.

Is there a reasonable quantification, how small the percentage of surviving mutations, trials, or conjectures has to be, to count evolution as variational? Despite such difficulties, one may argue that a filter account at least provides a general idea of a simple algorism that can lead to evolution. Even if this abstract idea seems underspecified, as outlined before, it is correct and a merit of Charles Darwin. Nonetheless, this does not help us solve our main problem. First, the criterion of variation as such now does not distinguish natural selection even from mere drift defined by a random survival of variants. Second, as long as we do not add a criterion for fitness (the explanans) that is independent of survival, 'survival of the fittest' makes *no prediction* about *which* organisms survive (the explanandum).

This leads one back to the second step of a Darwinian process: natural selection or survival of the fittest (Proposition 1) in its narrow sense and its potentially tautological interpretations. It has been seen above, for instance, that disconfirming evidence will often be attributed to specific theories rather than to the principle of natural selection. Despite taking these tautological tendencies seriously and emphasizing their role, one may define natural selection itself using some further general attributes associated with neo-Darwinism, now linked to the second step of a Darwinian process, such as individual or genic selection, or the role of external environment (Darwinian externalism; cf. von Sydow 2012; Gould 2002). By counting progeny alone such distinctions are ignored (Rosenberg 1988).

Darwinism may be defined as a theory that is opposed to group selection, since Darwin's focus on the selection of individual organisms favoured "the most reductionistic account available" at that time (Gould 2002: 14, 125f., but cf. Sober 2011). Survival of the fittest can be turned into a testable claim by using 'Darwinian fitness' instead of fitness in a multilevel framework by using only the individual's or gene's fitness and by excluding a potential additive component of group fitness. Survival of the individually fittest organism or gene is testable, at least if one starts with a multi-level account (Sober and Wilson 1998; Gould 2002; Wilson and Wilson 2007). Although tautological arguments may have played a role in the unit-of-selection debate as well (von Sydow 2012), many evolutionary biologists want to define group level selection in a way that can be investigated empirically. Group selection since Wallace has been regarded to be a testable claim, although it has indeed fallen into disrepute since gene-Darwinism became popular (Dawkins 1976; Williams 1966). The recent revival of multi-level accounts, however, integrated selection on the level of the gene or individual with selection on the level of sub-populations, and allowed for slightly more altruism within species (Sober and Wilson 1998; Gould 2002; Wilson and Wilson 2007; cf. also Fehr, Fischbacher & Gächter, 2002; Nowak and Sigmund 2005). Thus defining natural selection based on a strictly reductive position in the unit-of-selection debate would render 'survival of the fittest' not only a universal law that is clearly testable, but also, presumably, plainly false.

One final way to achieve a testable, general definition of 'survival of the fittest', usable in biology as well as in the other fields of process-Darwinism, would be to understand 'fitness' as defined by an externally given, actual environment (von Sydow 2012). Historically, Darwinism has always stressed that organisms are determined by their environment, as opposed to other historical evolutionary approaches (orthogenesis, etc.) that stress the internal structure of an organism or population (Gould 2002; Fodor et al. 2010; von Sydow 2012). Variations may 'fit', in different degrees, into previously defined ecological niches. The general idea of distinguishing external from internal causes seems to be highly intuitive as well as allowing for testable externalist definition of natural selection. Nevertheless, practical testing of the survival of those organisms that best fit an *externally given* environment in fact poses many problems. In all situations that are slightly more complex than marbles and a predefined external sieve (almost all situations), one may easily resort to defining external fitness by survival, which would beg the question once again. Even though an internal-external distinction seems plausible and historically significant, evolution always involves a kind of dialectic interaction between genes, organism and groups (as internal causes), on the one hand, and their environments (external causes) on the other. One might even argue that an environment or niche could not be understood without an organism involved, and vice versa. Obviously, Darwinian externalism (Gould 2002, von Sydow, 2012) can only be tested by distinguishing both sides. This issue is at present far from completely resolved. Although recent decades have witnessed an increasing interest in the also historically important distinction between adaptations to an external environment and effects of internal morphological constraints (laws of form, correlation of parts) (see Gould and Lewontin 1979; Gould 2002), what remains disputable is how to distinguish such adaptations from internal constraints and so-called exaptations (features with changed function, Gould and Vrba 1998). It has recently been argued by Fodor and Piattelli-Palmarini (2010) that at least in the biological domain no experimental procedure or counterfactual argument can distinguish between adaptations and coextensive non-adaptations. Although Fodor and Piattelli-Palmarini have explicitly detached this problem from the tautology debate sketched here (2010: 210), these issues seem closely related. Their interesting proposal and its criticism cannot be discussed in detail here, but it appears that Fodor and Piattelli-Palmarini are nonetheless elaborating a new, at least potentially immunizing aspect of Darwinism (for further immunizing aspects, cf. von Sydow 2012). On a more pragmatic level, however, there seem to be ways to distinguish adaptations from exaptations at least intuitively (but quite inter-subjectively). For instance, the exoskeleton of arthropods is plausibly described to impose a rather *internal* constraint on the size of organisms, whereas the form of the whale (originally a land-based mammal) rather seems to be an adaptation to an externally given environment. Although such explanations remain post-hoc, they seem to improve the just-so stories where adaptation is the only option, by now allowing for alternative either adaptive or exaptive stories. Although one is still concerned with a kind of historical, singular explanation, we are now at least concerned with a kind of contrastive testing of hypotheses

(cf. Sober 2008). The structure of such post-hoc arguments indeed requires further explication (presumably involving probabilistic reasoning, counterfactual thinking, comparisons between classes of species, etc.), but the arguments themselves appear to have *prima facie* plausibility, potentially ruling out not only a tautological understanding of adaptationism, but of natural selection as well.

Moreover, it seems possible to formulate competing *predictions,* by testing internal (e.g., developmental) constraints against natural selection (given that we continue to use an externalist interpretation of this term). Although a disconfirming empirical result for natural selection may again be attributed to auxiliary hypotheses alone, researchers may not necessarily draw such immunizing conclusions without additional argument, if their intention from the outset has been to investigate the contrast of the two mentioned main hypotheses.

For the externalist definition of natural selection, however, we may leave aside the intricate issue of internal morphological constraints (and the interesting problem of co-extensionality; Fodor et al. 2010), since evolutionary biologists have started to distinguish, in practice, internal from external evolutionary causes in other fields as well (inner-populational dynamics and self-regulation in a multilevel-selectionist framework). Processes of frequency-dependent selection may yield an evolutionary outcome (potentially understandable as an 'attractor') that is mainly defined by the frequency-distribution of genes within the population rather than by the external environment alone (see, e.g., Nowak and Sigmund 2005). If one regards the initial frequency distribution of genes as an internal structure of the population and a population as a irreducible unit of evolution (perhaps due to such frequency dependent processes or other reasons), then the outcome of natural selection with regard to such populations may not only be determined by the external environment alone of such populations, but by their internal structure. Likewise, sexual selection, which in the gene-Darwinian tradition has been in principle assimilated to natural selection, on a population level may likewise be interpreted as a process internal to a population that leads to some independence of its environment (von Sydow 2012).

If sensitivity to the tautology problem increases, one can be optimistic that evolutionary biologists will develop much more refined concepts for a proper internal-external classification than exist at present. If one accepts distinguishing internal from external 'selection' (or auto- from heteroselection: von Sydow 2012), it should be noted that the term 'natural selection' should be restricted to external selection only; otherwise the hypothesis ceases to be testable.[5] If at least *natural* selection is to be defined as testable theory in reference to an externally given environment, as proposed here, the Darwinian idea 'survival of the externally fittest', although still a major breakthrough, may turn out not at all to be a general truth, nor even to characterize appropriately the overall process of evolution (von

[5] Please note as well, 'selection' as such becomes a tautological term or principle referring to Proposition 2, as long as it is not defined in a testable way by one of the other discussed criteria, each with its specific problems.

Sydow 2001/2012). The only alternative appears to be to use 'natural selection' as a metaphysical claim that provides a framework in which one may discuss interesting empirical questions (such as the unit-of-selection debate or internal vs. external selection), without being able to test the framework itself. Although it seems to be no trivial task to turn the postulated blindness of mutations as well as the externality of selection into testable aspects of the definition of 'survival of the fittest', it seems the only way to appropriately resolve the problem of tautology.

The Problem of Tautological Formulations of Reinforcement

In this last section, it is outlined that in psychology the important theory 'trial-and-error learning' is actually beset with an analogical problem of testability and potential tautological formulation. Despite many differences, trial-and-error learning has been framed as a Darwinian process, involving blind variation and selection (Skinner 1981; Hull et al. 2001). Based on Edward Lee Thorndike's (1911) law of effect, Burrus Frederick Skinner (1904–1990), the father of operant conditioning and influential advocate of behaviourism, posited a principle of reinforcement that may be formulated as 'if a behaviour or response is followed by a reinforcing stimulus, its occurrence becomes more frequent', or more briefly:

A response increases if it is reinforced (8)

Proposition 8, similarly to Proposition 1, establishes a relationship between an explanandum – 'the occurrence of a behaviour becomes more frequent' (a response increases) – and an explanans – 'a behaviour is followed by a reinforcing stimulus' (it is reinforced). The posited relationship between explanandum and explanans is normally interpreted as empirical generalization or empirical hypothesis. Skinner, however, actually proposed to define a reinforcing stimulus (a reinforcer) as any stimulus which, when presented after a response, leads to an increase in the future rate of that response. By this he avoided terms like 'pleasure', still used by Thorndike.

Early on, however, some authors noticed that on that basis the law of effect becomes a tautological claim (e.g., Postman 1947; Westmeyer 1973):

A response increases if a response increases (9)

Proposition 9, in analogy to Proposition 2, shows that the theory of reinforcement becomes an empty truism, or at best a metaphysical principle, if one follows Skinner in defining a reinforcer based on the response-rate alone.

Largely similar to the above discussion of fitness, one may object, for instance, that reinforcement has a common-sense meaning (cf. Proposition 3 and 4 in the survival-of-the-fittest debate). Postman (1947) was one of the first who pointed out the potentially circular interpretation and demanded that reinforcers be identified

with effects of pleasure as originally assumed by Thorndike. Interestingly, Skinner's (1984: 220) redefinition of feelings, 'we should speak of feelings only when what is felt is reinforcing', would even lead to a tautological interpretation if he had accepted the hedonic re-definition by Postman. Here Skinner seems to have built a second immunizing protective belt. Another formulation, also going beyond a Skinnerian notion of a reinforcer, links reinforcement to reduction of a deprivation-state (such as lack of food). Again, one may question whether it is in fact possible to define states that deprive (the explanans) independently from rates of behaviour (the explanandum). Yet even if a partly independent definition is possible, deprivation in the strictest sense is understood biologically and hence this definition would tend to rule out existing social needs and secondary reinforcers, presumably playing an essential role for human beings (Westmeyer 1973). Thus these definitions either become tautological once again or they disprove the theory of reinforcement under important classes of conditions.

In a second analogy to our discussion of the tautology problem in evolutionary biology, there are also many *specific* theories in the field of reinforcement learning that are, of course, testable. One may test specific theories about what stimuli count as reinforcers; for instance, with respect to people or situations. Second, one may test specific theories of learning, such as the Rescorla-Wagner law or one of a great number of more recent models. Although such specific models of learning often use several free parameters, most of them are clearly testable. Nonetheless, even the falsification of such theories will normally only lead to a replacement of such more specific theories without having to put the general law of effect into question.

One may claim, however, that reinforcers need to be trans-situational, trans-reactional, trans-personal and trans-temporal. The combination of the law of effect with such auxiliary hypotheses results in testable compound hypotheses (cf. Westmeyer 1973). In contradiction, studies of so-called 'biological preparedness' have in fact shown that certain reinforcers seem to be linked to particular plausible situations only. In such a situation one might still immunize the law of effect by giving up only a specific auxiliary hypothesis concerning the trans-situational applicability of reinforcers while retaining the law of effect (Westmeyer 1973: 55f.). Yet the above result has actually been seen as critical for the generality of operant conditioning. Thus the scientific community here seems to tend to interpret these finding as a restriction of the domain of application of the law of effect or of the auxiliary hypothesis that is may be seen to be actually essential to this law.

Another analogy to tautology debate in evolutionary biology is the proposal of a propensity definition of a reinforcer as a cure against the tautological understanding of reinforcement learning. It appears that this account can be described and challenged along similar lines as described above using a probabilistic formulation not only on the side of the explanans but also on that of the explanandum (cf. Proposition 7). This again appears would analogously lead to a decision between a true tautological and a false testable formulation.

The most reasonable alternative, as similarly proposed for natural selection, seems to link additional criteria associated with behaviouristic trial-and-error

learning explicitly to the definition of reinforcement learning. Like for natural selection, the most reasonable proposal for the trial-and-error learning uses the postulated blindness of trials (blindness) and the exogenous character of reinforcement (externalism) as serious criteria for a testable formulation of reinforcement learning.

It has already been seen that it is no trivial task to operationalize the idea of strict blindness within biology. Nonetheless, without the blindness-criterion, sudden intelligent insight (Eureka-effects) and Wolfgang Köhler's classical findings with chimpanzees could be reinterpreted without problem, but in a historically inappropriate way, as instances of operant conditioning. Yet conditioning has historically always been opposed to processes of sudden insight, just as Darwinism has been opposed to saltationism. Additionally, like in evolutionary biology it may be inappropriate to test blindness only against omniscience (direct insight) and not against partially directed trials. But even the preliminary historical distinction (blindness versus insight) makes plausible that the idea of blind trial-and-error learning can be formulated in a testable way. Taken as a testable theory, however, the claim of blindness, as some authors have argued, may well be empirically not universally valid (Sternberg 1998; cf. Hull et al. 2001).

With regard to externalism, reinforcement learning like natural selection is an opportunistic process of adaptation to the present, externally given environment. Similar to the biological internal-external distinction, it seems historically appropriate in psychology to distinguish between internal cognitive causes and an external environment. Skinner (1981: 503), for instance, explicitly advocated that in his theory 'there is no place for the initiating agent'. Nonetheless, again it is no mean task to operationalize this distinction. Although trial-and-error learning and behaviourism in general have explicitly stressed the opportunistic responses to an environment, and opposed the relevance of internal causes, it should be noted that one actually implicitly assumes internal changes, for instance, when accounting for secondary reinforcers. By taking the previous learning history of an organism into account, the internal-external distinction may become blurred and externality ceases to be a truly testable criterion. If the questions surrounding the operationalization of externality are not resolved, this poses a problem for both advocates and critics of reinforcement-learning. Although a more principled operationalization of externality would be helpful, common sense and history of science again do provide at least a preliminary understanding of the externality criterion. Historically, conditioning and behaviourism have been opposed to insightful inner restructuring, to learning based on inferences in internal representations – such as mental maps or causal relationships (for the latter see, e.g., Cheng 1997; Hagmayer et al. 2011; Waldmann and Hagmayer, in press) –, and to learning without external reinforcers. The historic studies by Edward Chase Tolman, for example, have often been interpreted as critical of strict reinforcement learning (without internally mediating variables). Tolman, for instance, studied the learning of rats in a maze, and showed that learning may take place without external reinforcement and without a rat having exhibited similar responses previously

(reasoning in mental maps). Such findings were mostly seen as problematic for strict classical conditioning and behaviourism, since they required the causal relevance of internal representations (such as reasoning with mental maps and expectations). Furthermore, Bayesian approaches in cognitive psychology suggest that humans test for instance logical hypothesis in a more intelligent, directed and inductively informed way than would be expected based on Popper's Darwinian approach of (blind) conjectures and (external) falsifications (e.g., Oaksford and Chater 2007; Kruschke 2008; cf. Sober 2008). Such examples may be taken to violate the externality assumption (and/or the blindness assumption), and even though further work is needed to operationalize the internal-external distinction (as well as the blind-seeing distinction), the examples show that the externality criterion (and the blindness criterion) for reinforcement learning may provide testable formulations. One might speak of *internal reinforcers* or perhaps, more accurately, of internal causes or reasons of behaviour as well. But the notion of 'internal reinforcers' would abandon the criterion of externality and-if defined in this way – the testability of the law of effect with regard to this criterion. If one gives up the criteria, a 'reinforcer' would be nothing but some cause or reason for showing a behaviour, whether in the past, in the present or the future, whether caused by the environment or the organism, whether based on observation or on reasoning. The law of effect would become an empty tautological principle or, more positively put, a metaphysical framework to produce and investigate interesting empirical claims, without being empirically testable itself.

Conclusion

First, it was shown that tautological interpretations of 'survival of the fittest', based on defining the explanandum by the explanans, are surprisingly stable against several modifications of the meaning of the term 'fitness'. Simultaneous shifts on the sides of both the explanans and the explanandum were shown to be possible. If natural selection in biology is defined in this circular way it can never be refuted and is at best a metaphysical principle. Second, it was argued that one may nonetheless provide testable definitions of natural selection, based explicitly on using the concepts of *blind* variation (blindness) and *environmental* selection (externalism) in its definition. Although taking the tautology problem seriously, and pointing out that even the criteria cited are not trivial to operationalize, it was defended that 'survival of the fittest' may be formulated in a testable way. The testable formulations, however, may actually lead to a falsification of natural selection or to restricting its domain of application. Finally, it was argued that in reinforcement learning, a Darwinian process analogous to natural selection, the problem of tautology can be discussed in an analogous way as well. Again much care is needed to disentangle tautological from testable aspects. Only then can one obtain a truly empirical theory that may indeed turn out to be false or at least incomplete. Alternatively, one may of course treat these theories as non-empirical

metaphysical frameworks only, generating empirical hypotheses and contributing to a larger Darwinian metaphysics without being testable. Nevertheless, an implicit shifting between a testable and an untestable interpretation can be an illicit tactic to immunize natural selection or reinforcement learning while conveying the impression that one is concerned with testable hypotheses.

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