THIRD EDITION

Evolutionary Psychology

Lance Workman
Will Reader

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Written for undergraduate psychology students, and assuming little knowledge of evolutionary science, the third edition of this classic textbook provides an essential introduction to evolutionary psychology. Fully updated with the latest research and new learning features, it provides a thought-provoking overview of evolution and illuminates the evolutionary foundation of many of the broader topics taught in psychology departments. The text retains its balanced and critical evaluation of hypotheses and full coverage of the fundamental topics required for undergraduates. This new edition includes more material on the social and reproductive behaviour of non-human primates, morality, cognition, development and culture as well as new photos, illustrations, text boxes and thought questions to support student learning. Nearly 300 online multiple choice questions complete the student questioning package. This new material complements the classic features of this text, which include suggestions for further reading, chapter summaries, a glossary and two-colour figures throughout.

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Evolutionary Psychology

An Introduction

THIRD EDITION

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For Sandie

To Anna and Georgia. Thank you for all the love you give. I love you both.

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Preface to the third edition

Evolutionary psychology: past, present and future

If we use the 1992 publication date of *The Adapted Mind* as the birth date of evolutionary psychology then, at the time of writing, it is now 21 years old, traditionally the age at which children become adults and are expected to make their way in the big, wide world. It therefore seems to be an appropriate time to ask whether evolutionary psychology has, as it were, become a respectable member of the scientific community, or whether it is still metaphorically tied to the apron strings of its progenitors at the University of California, Santa Barbara: loved by its parents but ignored or even despised by its peers?

Part of an answer to this question can be seen in some subtle changes to this book compared to previous editions. When we wrote the first edition way back in the late 1990s and early 2000s the Santa Barbara version of evolution psychology was preeminent. The manifesto that was enshrined in *The Adapted Mind* proposed domain specific mental modules that evolved in some mythical time and place referred to as the Environment of Evolutionary Adaptedness, or the EEA. We were enthralled by tales of hunter-gatherers in the Upper Pleistocene, of images of minds festooned with tools like Swiss Army knives, and of the principle that minds adapted for ancestral tasks might be less than successful in the twentieth (as it then was) century. This precocious child gained many vocal supporters in the scientific community, philosopher Daniel Dennett and psycholinguist Steven Pinker to name just two prominent members. But there were many critics and many points of criticism. Developmentalist Annette Karmiloff-Smith, for example, questioned the notion of innate mental modules, evolutionary anthropologists such as Eric Alden Smith pointed at problems with the concept of the EEA and David Buller, well, David Buller seemed to dislike all of it. Not to be outdone by his erstwhile colleague, philosopher Jerry Fodor – who started the whole modularity movement in the first place – wrote a book with Massimo Piattelli-Palmarini which attempted to show that the whole concept of evolution by natural selection was philosophically untenable (an argument that was dismantled by two other philosophers, Ned Block and Philip Kitcher, who managed to keep their faces admirably straight throughout).

This third edition sees a subtle change in emphasis. Rather than presenting the Santa Barbara school as the definitive version of evolutionary psychology, we discuss other versions – some more influenced by behavioural ecology – that make no appeal to modularity, domain specificity and the EEA. This should not be seen as us distancing ourselves from the Santa Barbara school, but more our recognising what the core principles of an evolutionary psychology are and pointing out that a version of evolutionary psychology can survive even if the aforementioned assumptions are proved to be incorrect. As the philosopher of science Imre Lakatos might say, these assumptions are part of the protective belt rather than the hard core of evolutionary psychology. These changes appear in many chapters, but particularly chapter 1.

As well as these scientific and philosophical objections there are those who see evolutionary psychology to be politically distasteful, particularly the research on sex differences in mate choice which is seen as merely reinforcing patriarchal stereotypes of men and women. Such a point seems to imply that evolutionary psychology is some kind of political dogma which provides us with rules as to how we should live rather than a field of scientific enquiry. We hope we have addressed this issue in revisions to chapter 1.

Some adopters of our text have requested more primate comparative material in order to help illuminate our understanding of the evolution of human reproductive strategies. In chapter 4 (mate choice) we have greatly expanded our coverage of the social and reproductive behaviour of primates by incorporating new material on gorillas, bonobos and baboons. In particular we feel that the discussion of female coalitional behaviour adds balance to the male-centred common chimpanzee material presented in earlier editions.

Chapter 6 on social development includes more recent research on the fascinating notion that children base their future reproductive strategy on the environment in which they develop, a hypothesis that gives the lie to those who think that evolutionary psychology is nothing more than a blind and mechanical unfurling of a rigid developmental manifesto. Evolution has not only made us sensitive to environmental conditions, but it may also have given us a plan to help us deal with it.

If proof were needed that the Santa Barbara school is alive and kicking chapter 9 on cognition presents research that our memories might be sensitive to something called *s-value*, or survival value. Items that are presented under a context relevant to conditions in the EEA seem to be more memorable than those presented in a non-EEA relevant context, even when the latter context is more familiar to participants than the former. The fact that these results have been replicated by a team led by long-standing memory researcher Henry Roediger III, who has no evolutionary axe to grind, make these somewhat startling results all the more compelling. Later in the chapter research by Tooby and Cosmides on deontic problem solving reinvigorates the notion of cheater detection as a means for understanding why some problems are difficult and others easy. A proposition that had previously been given something of a pummelling by some of the big names in logical reasoning research.

The 'social chapters' (7 and 8) both have new material that reflects current areas of debate. Chapter 7 now considers the 'Cinderella Effect' (the notion that parents invest more in 'biological' than in 'non-biological' offspring), while chapter 8 has added a new pre-industrial culture – the Aché to add balance to debates concerning how levels of reciprocation vary between different human societies. The changes to chapter 9 on language are rather more modest. Here we include more on the apparent ability of prairie dogs to generate novel, mutually comprehensible 'words' for things they have never encountered before, a re-evaluation of Chomsky and more on FOXP2 and Specific Language Impairment. We have included some new material on the evolution of schizophrenia in chapter 12 alongside a recent evolutionary based explanation for the eating disorder anorexia nervosa. We anticipate that these explanations will appeal and disturb in equal measure.

Chapter 13 contains new material on the hunt for 'candidate genes' that are considered to play a role in individual differences. We are less positive about the findings here than we were in previous editions, since these proposed single gene effects have not stood up well to scrutiny or where they appear to do so the amount of variation they account for between people appears to be really quite small. Finally chapter 14 on culture re-evaluates the status of memes in cultural transmission and has a new section on the importance of cultural specialisation to our rapid cultural development. In many ways it is the topic of culture which sees evolutionary psychology at its most inter-disciplinary, with contributions from historians, anthropologists, economists, biologists and philosophers as well as psychologists, and at its most ambitious: the attempt is to use evolution to partially explain how we got where we are now as twenty-first century hominins, the ape that tweeted, we might say.

So where are we now? The above should make it clear that to us evolutionary psychology is not an only child. The offspring of Santa Barbara is still doing well and if it is not universally loved, well that is a result of its reluctance to adhere to the status quo. But its siblings (or half-siblings) that are perhaps not so strident in their pronouncements, not so fundamentalist in their commitment to particular assumptions such as modularity or the EEA, are finding a voice too.

Who should read this book?

We have designed this book for those with a background in psychology. Unlike many books on the same topic we do not require readers to have prior knowledge of the intricacies of natural selection, genetics or inclusive fitness theory. We have also tried to relate evolutionary theory, where relevant, to some of the classic studies and theories familiar to readers with a psychological background – the 'Robber's Cave' study, Piaget's developmental theory, Bartlett's research on memory to name but three. We have also, where possible, organised the chapters in this way: developmental psychology, social psychology, individual differences, cognitive psychology and so on.

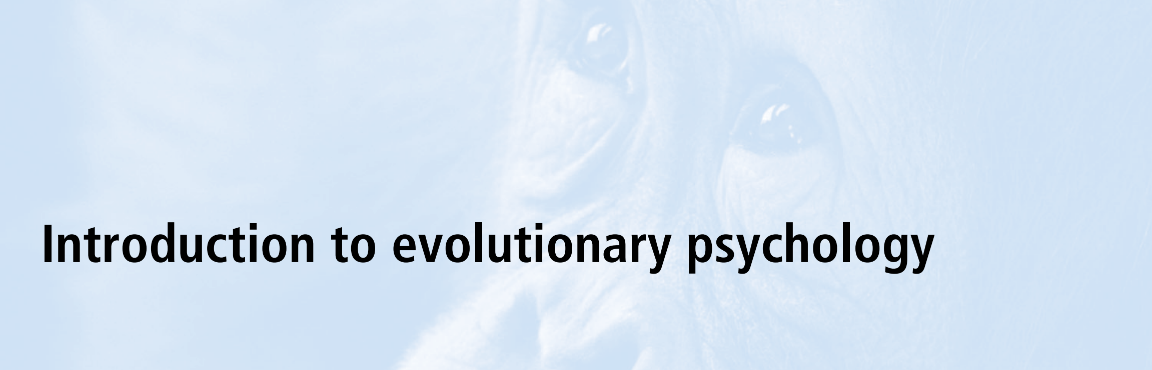
This said, we also explain the traditional psychological concepts too, so the book will be accessible to anybody with an interest in evolutionary psychology whatever their background.

Pedagogical features

We hope that the book's greatest pedagogical feature is the book itself. We have tried to explain the relevant concepts and research as clearly as we can. We also hope that we have tried to convey our enthusiasm for evolutionary psychology tempered with a critical eye when we think things don't quite add up. In addition to this we have included extra **critical thinking** questions at the end of each chapter which can be used – for example – for seminar discussion points. Perhaps the biggest change from previous editions is that we have written 240 **multiple-choice questions** (twenty per chapter) for either formative or summative assessment.

Acknowledgements

Finally, once again we would like to take this opportunity to thank all of the instructors and students who have made use of the first and second editions of our book and in particular to those who have provided useful feedback. In particular we would like to thank Richard Andrew, Gordon Bear, Jannes Eshuis and Fred Toates. At Cambridge University Press we would especially like to thank Valerie Appleby, Martin Barr, Joanna Breeze, Charles Howell, Hetty Marx and Carrie Parkinson.



1 Introduction to evolutionary psychology

KEY CONCEPTS

the Environment of Evolutionary Adaptedness (EEA) • proximate and ultimate levels of explanation • the inheritance of acquired characteristics • particulate inheritance • eugenics • the Great Chain of Being (*scala naturae*) • sociobiology • modularity

Evolutionary psychology is a relatively new discipline that applies the principles of Darwinian natural selection to the study of the human mind. The principal assumption of evolutionary psychology is that the human mind should be considered to be an organ that was designed by natural selection to guide the individual in making decisions that aid survival and reproduction. This may be done though by species-specific 'instincts' that enabled our ancestors to survive and reproduce and which give rise to a universal human nature. But equally the mind is an organ which is designed to learn, so – contrary to what many people think – evolutionary psychology does not suggest that everything is innate. In this chapter we trace the origins of evolutionary psychology, and present some of the arguments between those who hold that the mind is a blank slate and those who believe that human behaviour, like that of other animals, is the product of a long history of evolution.

The origins of evolutionary psychology

The fundamental assumption of evolutionary psychology is that the human mind is the product of evolution just like any other bodily organ, and that we gain a better understanding of the mind by examining evolutionary pressures that shaped it. Why should this be the case? What can an understanding of evolution bring to psychology? After all, scientists were able to learn a great deal about bodily organs such as the heart and the hand long before Darwin formulated the theory of natural selection. Unfortunately, not all body parts are as easy to understand as heart and hand. A classic example is the peacock's tail. This huge structure encumbers the animal to the extent that it makes it difficult to escape from predators and requires a considerable amount of energy to sustain it – energy that might otherwise be used for reproduction. Darwin was similarly troubled by this and in a letter to his colleague Asa Gray remarked that 'The sight of a feather in a peacock's tail, whenever I gaze at it, makes me sick' (Darwin, 1859). Or to take another even more perverse example, the male Australian redback widow spider (*Latrodectus hasseltii*) who sacrifices himself to the female following copulation: why would you design an animal to do *that*? These types of questions are known as **ultimate** questions as they ask why a particular behaviour exists at all. These are usually contrasted with **proximate** questions which ask about, for example, how a particular behaviour develops, what are its neural or cognitive underpinnings or whether it is acquired or innate.

The answers to these questions highlights a deep-rooted problem in the foundations of traditional psychological thinking. To the extent that psychologists ever consider why we perform particular behaviours – and this, admittedly doesn't happen very often – they usually concern themselves with the benefit to the individual who performs the behaviour. But current Darwinian theory turns this thinking on its head. We are not necessarily the beneficiaries of our own behaviour: the beneficiaries of behaviour are, in many cases, our genes.

It is worth pausing for a second to reflect upon this point and considering its implications. The peacock dragging his tail behind him might well prefer – should he be able to consider such things – to be rid of it. The male redback widow spider might choose, on reflection, to forgo indulging the cannibalistic urges of his erstwhile squeeze. But placing the individual at the centre of the action in this way doesn't always give us the complete picture. Modern evolutionary theory sees the individual as merely an ephemeral and transient bit-player in the theatre of existence, acting out a script that was not of his or her writing, a script written in the language of the genes. Richard Dawkins probably best summarised this when he made the famous replicator–vehicle distinction (see chapter 2). 'We are survival machines – robot vehicles blindly programmed to preserve the selfish molecules known as genes' (Dawkins 1976, p. xxi). If you think about it this has to be the case. Life originated from replicating chemicals – precursors of DNA – and only after many millions of years did these chemicals start to build structures around them to form the precursors of cells: unicellular organisms became multicellular, tissue became organs until we eventually ended up with animals with brains and behaviour. So bodies and brains clearly benefited DNA otherwise they wouldn't have been produced; they would have been outcompeted by the brainless and the bodiless. So our genes aren't for our benefit, we are for their benefit. Dawkins goes on to say '[t]his is a truth which still fills me with astonishment'. If you aren't astonished, you haven't understood it, but don't worry, we discuss this further and in greater depth in chapter 2.

It is worth adding a caveat to all of this: the above only applies to evolved behaviour (or organs); any behaviour which has not evolved, such as a purely learned behaviour, may not benefit genes at all. Deciding exactly which behaviours are evolved and which are not (and which are a bit of both) is a difficult task and one to which we return many times throughout the subsequent chapters.

In terms of psychology, we have only scratched the surface in trying to apply evolutionary thinking to understanding behaviour. Many of the ideas expressed in this book will doubtless be proved wrong in the fullness of time, but if we are to properly understand humanity in all its shapes and sizes, loves and hates in sanity and madness, then we need an understanding of basic evolutionary principles and, in particular, the gene-centred view of life.

It is said that science has presented humans with three hammer blows to its sense of self-importance. Copernicus taught us that the Earth was not at the centre of the universe; Freud showed us that our instincts are emotional and sexual rather than rational and godly; and Darwin demonstrated that we were descended not from angels but from apes. To this we might add the gene-centred view of life which shows that in many cases we are not the final beneficiaries of our own behaviour; the buck stops not with us but our genes.

A history of evolutionary thinking

Evolution before Darwin

For millennia humans have been fascinated by the natural world, not just the complexities of the organisms that constitute it, but the interdependencies that exist between different species. Flowers provide food for insects that are eaten by birds that are consumed by small mammals that are preyed upon by larger animals that eventually die and provide food for the plants that produce flowers and so the cycle continues. Surely such a complex system could not have arisen by accident? Surely this must have somehow been designed, created by some all-powerful being? The idea that nature in all its complexity was created all at once held sway for a long time, not just as religious doctrine but as a true account of the origin of Everything. It still does hold sway in the minds of many today. Debates about the scientific status of creationism and intelligent design have recently approached boiling point and, in the United States, entered the courtroom. In December 2005 Judge John Jones ruled that intelligent design was not science and therefore it is not permissible to teach it as science in the classroom. More recently the so-called ‘new atheist’ movement, headed by Daniel Dennett, Richard Dawkins, Sam Harris and the late Christopher Hitchens (sometimes referred to as the Four Horsemen) have written provocative and, in some cases, inflammatory anti-religious texts. However, the purpose of bringing up religion in this chapter is not to ultimately bury it, but to show how many religions were grappling with the same problems as many scientists: to understand where life came from, and what it means.

Not every ancient belief system proposed steady states and immutability. The Ancient Greek philosopher Thales (*c*.624–545 BC) tried to explain the origins of life in terms of natural as opposed to supernatural terms. He also proposed that life 'evolved' out of simpler elements with the most basic element – from which all else ultimately derived – being water. Later another Ancient Greek, Empedocles (495–435 BC), suggested that in the beginning the world was full of bodily organs which occasionally came together and joined up, driven by the impelling force of Love. The results of most of these unions were 'monstrosities' and died out, but a minority were successful and went on to reproduce, producing copies of themselves. Although we can clearly recognise this as being fanciful in that we now see love as a human emotion rather than as an impelling force of nature, Empedocles' mechanism has conspicuous similarities to natural selection (see chapter 2). In particular, the idea that change occurs over time by a gradual winnowing of less successful forms. Aristotle (384–322 BC) seemingly killed off evolutionary thinking for some time by proposing that each species occupied a particular space in a hierarchical structure known as the *Great Chain of Being* or *scala naturae*. In this scheme, which was later adopted by the Christian religion, God occupied the topmost rung of the ladder followed by angels, then the nobility (males *then* females), then ordinary men, ordinary women, animals, plants and finally inanimate objects. Moving from one rung to another was not permitted which meant that there was a natural order of things. Aristotle's view was not merely descriptive (describing the way the world is) but was also *prescriptive* (this was deemed to be the way the world *should* be) so any change to the established hierarchy would lead to chaos until the order was re-established. By fixing the hierarchy in this way Aristotle's view effectively closed down debate about evolutionary change, not only would such an approach be considered theoretically incoherent, it was also considered morally wrong to question the way things should be.

Much more recently in 1798 the German philosopher Immanuel Kant wrote in his work *Anthropology* that:

> [A]n orang-utan or a chimpanzee may develop the organs which serve for walking, grasping objects, and speaking – in short, that he may evolve the structure of man, with an organ for the use of reason . . . (Kant, 1798)

In direct contradiction of Aristotle, Kant imagines how one organism can change over time, perhaps acquiring the characteristics of other organisms. Notice also that Kant does not merely refer to physical change: 'an organ for the use of reason' is a psychological faculty. In this way Kant presaged evolutionary psychology by two centuries.

Figure 1.1 Erasmus Darwin

Darwin's own grandfather, Erasmus Darwin (1731–1802), wrote that all living things could have emerged from a common ancestor (what he called 'one living filament'). He also suggested that competition might be the driving force behind evolution. He saw this competition occurring between different species and within a species between members of the same sex (presaging the theory of sexual selection proposed in 1871 by his grandson). In *The Laws of Organic Life*, he states:

> The final course of this contest among males seems to be, that the strongest and most active animal should propagate the species which should thus be improved. (Darwin, cited in King-Hele, 1968, p. 5)

Although we can see close similarities between these ideas and Darwin junior's theory of evolution, Erasmus failed to produce a plausible mechanism for evolutionary change.

A contemporary of Erasmus Darwin, Jean-Baptiste Lamarck (1744–1829), proposed just such a mechanism to account for change. Lamarck's first law suggested that changes in the environment could lead to changes in an animal's behaviour which, in turn, might lead to an organ being used more or less. The second law was that such changes are heritable. Taken together these laws prescribe an organism's continuous gradual change as the result of the interaction between the organism's needs and the environment. Most evolutionary biologists agree that **the inheritance of acquired characteristics**, as Lamarck's theory has since been called, is incorrect. Although the environment can indeed affect bodily organs, for example increased exercise can increase the capacity of the heart and lungs, such changes cannot be passed on to the organism's offspring. Although Lamarck's theory has fallen from favour, Charles Darwin did cite Lamarck as a great influence in the development of his theory of evolution: natural selection.

Darwin and natural selection

Natural selection depends on two components: **heritable variation** (individuals within a population tend to differ from each other in ways that are passed on to their offspring) and **differential reproductive success** (as a result of these differences some individuals leave more surviving offspring than others). You can see this process laid bare in asexual species where an individual reproduces simply by producing an identical copy of itself. In such cases, the overwhelming majority of offspring will be identical to the parent, but a few will be different in some way due to errors in the copying process. Should these different offspring survive and reproduce, then the majority of *their* offspring will be identical to them and the process repeats itself. However, copying errors seldom have positive consequences. To see this, imagine that you make an error copying down a recipe: there is a good chance that this error will make no noticeable difference to the end product (for instance you might add two grinds of pepper rather than one). On the other hand, it may make the end product substantially worse (adding a tablespoon rather than a teaspoon of salt); only very rarely will an error actually improve the recipe. Similarly, in the natural world, copying errors would probably have no effect or would lead to the individual failing to pass on its genes. On very rare occasions, however, an error might produce an organism that is actually better fitted to the environment than its parents or it might be able to exploit some property of the environment that its ancestors could not. In such cases, barring unfortunate random accidents, this individual will tend to produce more offspring and the 'error' will soon become the norm. In some cases the new lineage might outcompete the old, and come to replace it. In other cases, particularly if the two variants become geographically separated, both versions might coexist and ultimately form two different species.

As we shall see in chapter 3, the state of affairs is somewhat more complicated for organisms that reproduce sexually. For asexual species, variation only comes from copying errors (or mutations). Sexually reproducing species combine the genes of two individuals during reproduction, meaning that offspring will always be different from either parent. The increased variation produced by sexual reproduction is thought to be one of the reasons why sex evolved in the first place.

Mendel and the birth of genetics

Darwin knew nothing about genetics, and for good reason: at the time of Darwin's death, no one on earth knew about genetics except the Austrian monk Gregor Mendel.

Figure 1.2 Gregor Mendel

Between 1858 and 1875 Mendel conducted a series of breeding experiments on hybrid pea plants in the garden of his monastery in Brunn.

One of Mendel's greatest insights was that inheritance was **particulate**. Darwin presumed that the traits of an individual were some sort of blend of the traits of the mother and father, as might happen when mixing paint. Some observations seem to support this belief. In many species, the result of a mating between a comparatively large female and a small male will tend to produce offspring whose size is somewhere in between the two: a fact that animal breeders had known for some time. Mendel demonstrated that the blend model is incorrect. He found that if two pea plants were crossed, one having white flowers and one having red flowers, the offspring would be either red or white, never pink, as might be expected if the two traits blended. The reason why some traits, such as height or skin colour, seem to blend is because they are controlled by a number of genes, for traits controlled by single genes, inheritance is always particulate.

In truth, it probably didn't need Mendel's data to highlight the inadequacies of the blend model. Any child who has mixed the colours in a paint set will soon realise that after a few mixes you always end up with the same dirty brown colour. Likewise if sex merely blended traits, after a sufficiently large number of generations everyone would end up being the same, reducing variation. Since natural selection depends on variation to work, evolution would soon grind to a halt. Darwin was certainly aware of the shortcomings of the blend model (Dawkins, 2003), but did not produce a better theory to replace it, although he did come close; in a letter to his friend Alfred Wallace (and co-discoverer of the theory of natural selection) in 1866 he wrote that:

> I crossed the Painted Lady and Purple sweetpeas, which are very differently coloured varieties, and got, even out of the same pod, both varieties perfect but none intermediate [. . .] [T]ho' these cases are in appearance so wonderful, I do not know that they are really more so than every female in the world producing distinct male and female offspring.

Unfortunately Darwin never made the next step that would have enabled him to understand the true mechanism of inheritance, nor, it seems, was he aware of Mendel's work. There were rumours that Darwin possessed a copy of the journal containing Mendel's article 'Versuche über Pflanzenhybriden' ('Experiments in plant hybridisation') but no copy was found in Darwin's extensive library now housed at Cambridge University. Generally, the scientific community was rather slow to realise the significance of Mendel's ideas and biology had to wait until the twentieth century before Mendel's work was rediscovered. The subsequent fusion of genetics and evolutionary theory led to what in biology has become known as 'the modern synthesis' (see chapter 2).

From evolution to evolutionary psychology

Although most of Darwin's examples in *The Origin of Species* concerned physical traits, he also believed that natural selection had a role to play in the evolution of behaviour. Darwin appeared to see the human mind as being explainable by the same fundamental physical laws as other bodily organs, in terms of mechanistic principles. In one of his early notebooks, written in 1838, he speculated that:

> Experience shows the problem of the mind cannot be solved by attacking the citadel itself – the mind is function of body – we must bring some *stable* foundation to argue from.

That stable foundation was **materialism**, the approach adopted by modern cognitive psychology that sees the mind as being ultimately reducible to the activity of the brain, or as Steven Pinker puts it, 'the mind is the information processing activity of the brain' (Pinker, 1997). This materialism is important to evolutionary psychology because if the mind is just the activity of the brain, then the brain, being a physical organ, is subject to the pressures of natural selection. Therefore the mind and hence behaviour is also, at some level, the product of evolution by natural selection (see chapter 9).

Darwin did make some forays into psychology. In *The Expression of the Emotions in Man and Animals* (1872; see chapter 11 in this book), Darwin theorises on the evolutionary origins of emotions and their expressions. In 1877 Darwin wrote *A Biographical Sketch of an Infant* based on his observations of his infant son. This last work, however, is largely descriptive and although it speculates on the instinctual basis of early crying and sucking behaviours, it makes no mention of the role of evolution and natural selection in shaping such behaviours.

Early attempts at an evolutionary psychology

Francis Galton

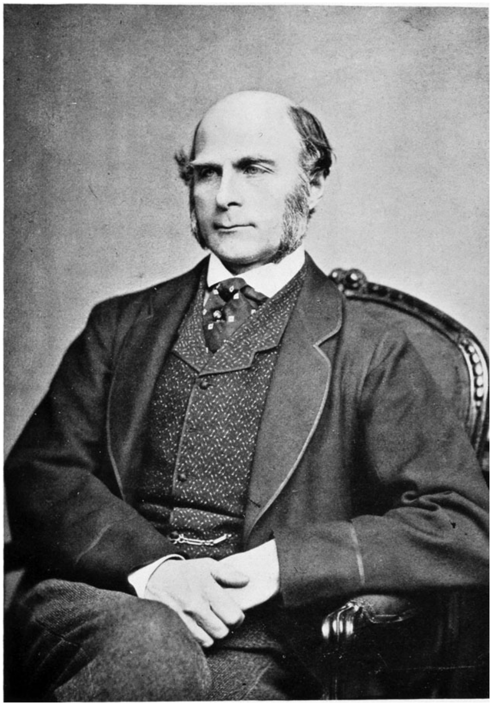


Figure 1.3 Sir Francis Galton

Darwin's cousin (also a grandson of Erasmus Darwin) Francis Galton (1822–1911) (see figure 1.3) was much influenced by the theory of natural selection: