1
Mental evolution

The high standard of our intellectual powers and moral disposition is the greatest difficulty which presents itself, after we have been driven to this conclusion on the origin of man.
Charles Darwin: *The Descent of Man* (1871)

For millions of years man has regarded his fellow animals with great interest as sources of food, danger, power, amusement or companionship. At various times and places he has also regarded them with more detached curiosity. Most often this curiosity has been directed towards the physical characteristics of animals. Over the centuries the increased understanding of the anatomy and physiology of non-human animals produced by such curiosity has made an incomparable contribution to our knowledge of the human body. Less frequently this curiosity has been concerned with the way that other animals move within and act upon their worlds. Do animals have minds, as men have minds? Do they possess anything resembling human intelligence: can individuals from species other than man learn from experience, think or communicate? Can they feel pain, or pleasure? Can any being, but a human being, act in ways that can be judged right or wrong? Are some species more man-like, in ways other than physical resemblance, than are other species?

Attempts to obtain answers to questions like these have been made here and there over the centuries. Such attempts took on new importance in the middle of the nineteenth century, when theories concerned with the evolution of life on this planet changed man's perception of the way he was related to other living things. Until then, interest in such questions had been sporadic and disconnected. But from this time began a continuous tradition in the study of behaviour and the animal mind.

The beginnings of this tradition in Victorian England of the 1870s coincided with the separate birth of attempts to change the study of the human mind from its traditional position as a speculative sub-branch of philosophy into something that more closely resembled a natural science, a subject which would deserve the title of scientific psychology. These two developments soon became entwined, and one consequence, nearly fifty years later, was the rise within North American psychology of a movement known as behaviourism. This movement came to dominate American psychology for many decades. This dominance persisted during a period in which psychology was regarded as a relatively minor subject – or better, a subject of dubious intellectual content – elsewhere in the world. In our time behaviourism continues to affect our world by directly influencing the way we teach our children and treat those we consider mentally disordered.

Beyond the specific effects of the behaviourist movement the century-old tradition of what may more generally be termed animal psychology has had a deeply pervasive effect on how we see our fellow men. The general acceptance in our day of one theory of evolution, that of Charles Darwin (1809–1882), has been accompanied by less widespread acceptance of his view that the differences between the psychology of man and those of other animals are differences of degree, and not of kind. Whether this particular belief has been accepted or not, the general view of man as a part of nature implied by Darwin's theory has meant that following his work the study of animals has had a new kind of relevance to the understanding of man.

The chapters that follow cover a period of sixty years. They describe the changes that occurred in the way animal behaviour was studied and in the kinds of question that were asked about the mental functions of non-human species. Some of these changes were the results of new discoveries and techniques or of events in the lives of the people that pursued such questions. Other changes reflected major shifts in attitudes towards the study of mind, in subjects only indirectly related to psychology or in the social and

institutional conditions in which psychological research was carried out. Consequently we shall sometimes be looking in detail at the lives and outlooks of particular individuals and at other times at such events as the emergence of a new kind of university in North America or the way that the First World War affected psychology, according to whatever seems most illuminating in trying to understand how and why various studies of animals were undertaken.

During the period covered by this book there were recurring clashes between two distinct scientific traditions, the evolutionary and the physiological. For almost twenty years before Darwin first published his theory of evolution, experimental physiologists, mainly working in German universities, had been making a series of important discoveries about the nervous system. A general theoretical concept for much of this work was the idea of the reflex. Eventually this concept was extended in a way that many hoped would provide a generally adequate explanation of why animals, and possibly people too, act in the way that they do. However, this did not have a major effect on the study of animal behaviour until the beginning of the twentieth century and so discussion of the physiological tradition is postponed until the fourth chapter.

The present chapter looks at some of the British scientists and philosophers whose work contributed to the beginnings of animal psychology. Darwin himself was clearly the most important figure and the publication of his book *The Descent of Man* in 1871 the most important point of departure. However, there were other important developments in the early 1870s which did not arise at all directly from concern with the problems of evolution. Interest in the nature of learning processes came mainly from philosophy, as seen in the work of Alexander Bain (1818–1903). It was also given major prominence in the second edition of Herbert Spencer's (1820–1903) influential *Principles of Psychology* published in 1870. Animal psychology later came to place overwhelming emphasis on experimental methods; the first use of an experimental paradigm for studying animal behaviour that had any continuity was by Douglas Spalding (*c.* 1840–1877), who was much more concerned with the issues raised by the philosopher-cum-psychologist Bain, than with the evolutionary questions to which Darwin's work was directed. Although Thomas Huxley (1825–1895), the final contributor discussed in this chapter, was a close friend and colleague of Darwin and for a time at the centre of the debates on evolution, his subsequent influence on animal psychology did not stem directly from his contributions as a prominent Darwinian.

Nevertheless, Darwin's views on evolution provided the most important starting point and the debates that followed were major elements of the intellectual environment in which animal psychology developed. These are described in the following section, where Darwin's views would receive fuller discussion if these were not already so adequately described elsewhere. In contrast, the contributions of the other men described in this chapter are less widely known.

Charles Darwin and *The Descent of Man*

In 1831, when HMS *Beagle* left Devonport in England to sail for South America and the Pacific Ocean, the physical extent of the earth and its present geography had in general terms been well charted. The main purpose of the voyage was to provide more detail about islands and coastlines on the other side of the globe.

The age of the earth, and the variety and origins of terrestrial life, were not understood. Since the beginning of the century the discovery of fossils and the study of geological strata had begun to extend man's temporal horizon. At least within scientific circles there was rapidly weakening belief in the estimate, derived from Biblical texts, that the earth had existed in its present form for about four thousand years. Attempts to reconcile the geological evidence with the account of the earth's origin found in the book of Genesis were of major concern to scientists of that era and of considerable public interest.

Speculation on the past history of life on earth posed even more of a threat to orthodox Christian belief. But the few theories of evolution that appeared early in the nineteenth century received little public debate.

Until the earth's physical history was better understood there was no secure framework for such theories. For the moment, increased understanding of the way that the structures and behaviour of living organisms were so well adapted to their particular environments provided further evidence for a divine creator, the argument for God's existence based on the perfect design of nature. The most systematic attempt to describe and explain changes in species, that of Jean Lamarck, was largely rejected in his native France and in England, where it became widely known just before the *Beagle* set sail. As well as being seen as a dangerously atheistic doctrine, it was considered scientifically unacceptable. Lamarck had died in poverty and scientific disrepute. At his funeral his daughter is said to have cried out: 'My father, time will

avenge your memory!'[1]

In one way her prophecy proved to be correct in that his name became attached to an idea that he regarded as one of the less central aspects of his theory. The 'principle of the inheritance of acquired characteristics', alternatively known as the 'law of use and disuse', was to retain considerable currency for well over a century. According to this principle, the effects of an individual organism's interaction with its environment on its structure can be inherited to some degree by its descendants. In the present context, the important aspect for psychology of this Lamarckian principle is the idea that specific actions that an animal has acquired during its lifetime, and which have become habitual, may become at least partially instinctive in its offspring.

Among the few civilians on board the *Beagle* was a young man of twenty-two, whose student years at Cambridge had allowed plenty of time for his enthusiasms as a naturalist and had provided good training in geological investigation. The voyage provided ample opportunity for Darwin to make himself completely familiar with the current state of geological theory from the books he had brought with him. The scientific expeditions he undertook in Argentina and Chile removed any of his remaining doubt about the antiquity of the earth's crust. It became quite clear to him that conditions on earth had remained essentially the same for millions of years. Just as fascinating as the rocks and strata of the southern part of the continent were the varied and exotic species he encountered, and their occasionally striking resemblance to creatures whose fossilized remains he now collected. He began to grapple with the problem of understanding the origin of species.[2]

Darwin's interest in the relationship between man and other animals was apparent long before he found a satisfactory answer to the species question. Among the other civilians on board the *Beagle* were three natives of Tierra del Fuego, taken as hostages on an earlier expedition and now to be returned. In their few years of exile the three Fuegians had learnt some English and Spanish and acquired many European habits and manners. One of them, Jeremy Button, with his good humour and sympathy towards anyone in distress, had become a universal favourite on board the ship. Darwin's contact with these three left him ill-prepared for his first sight of Fuegians who had never left the island: 'It was without exception the most curious and interesting spectacle I ever beheld: I could not have believed how wide was the difference between savage and civilized man: it is greater than between a wild and domesticated animal, inasmuch in

Fig. 1.1. Jean Lamarck

man there is a greater power of improvement'.[3]

The contrast between Jeremy Button and the people Darwin encountered during the *Beagle*'s stay in Tierra del Fuego made a deep impression on him. Questions of why the Fuegians' way of life remained so wretched, or why they should have remained in so inhospitable a land, seem to have occupied Darwin for years after his visit. In his early comments upon such matters a very Lamarckian viewpoint was prominent: in his account of the *Beagle*'s voyage he reflected that, since there was no reason to believe that the population was declining, the Fuegians must enjoy a certain kind of happiness to render life worth having, and concluded: 'Nature by making habit omnipotent, and its effects hereditary, has fitted the Fuegian to the climate and production of his miserable country.'[4]

In Darwin's notebooks and scattered references in early published works one can find reflections on the relation between man and other animals, evidence for his early acceptance that man was to be included within a general theory of evolution and indications of the important part that the Lamarckian principle played in his thought about psychological questions.[5] Yet four decades were to pass after the *Beagle* first set sail, before he wrote directly about such issues.

In the years following his return to England,

Darwin was busy publishing accounts of the work carried out on the voyage and with various kinds of biological research. In the orderly seclusion of his country house in Kent he worked only intermittently on the problem of evolution. He was already gaining a reputation as a leading scientist from other work by the time that, late in 1838, he first began to develop the principle of natural selection as a general theory of evolution. A brief essay on the theory was written for publication in the event of his death and the ideas were tried out on a few close associates. Meanwhile he continued to amass evidence and develop the theory in detail.

Darwin was by no means the only person concerned with the question of species. A younger man, Alfred Wallace (1823–1913), began as a collector of beetles as Darwin had done. Lacking Darwin's private fortune, Wallace had made a career as a collector of tropical specimens, largely butterflies, first on the Amazon and then in the East Indies.[6] He had corresponded a little with Darwin on the subject of evolution, but the latter in reply had been careful to refrain from describing his own particular theory. Then in 1858, lying in bed with fever on a small island in the Moluccas, the idea of natural selection as the mechanism of evolution occurred to Wallace, as it had twenty years earlier to Darwin. The paper describing the theory was sent by Wallace, with a note requesting that, if Darwin considered it to have any merit, it should be forwarded to the foremost society for the study of natural history, the Linnaean Society. Darwin, greatly perturbed, consulted the friends who had already read his unpublished essay. The delicate problem of priority of publication was then amicably resolved by arranging that Wallace's paper and one hastily prepared by Darwin should be presented at the same meeting of the society, in the absence of both authors. Neither paper mentioned the evolution of man, and neither paper roused great interest.

This event spurred Darwin to complete at least an abridged version of the book that he had been planning for so many years. This was published in 1859: *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*. The book had two aims: first, to demonstrate that evolution had taken place and, second, to argue that the primary mechanism of evolution was natural selection. The first purpose was clearly achieved: within scientific circles at least, there has never since been any serious questioning of the view that life on this planet is constantly changing and that species that exist now have their origin in very simple forms of life that existed millions of years ago.

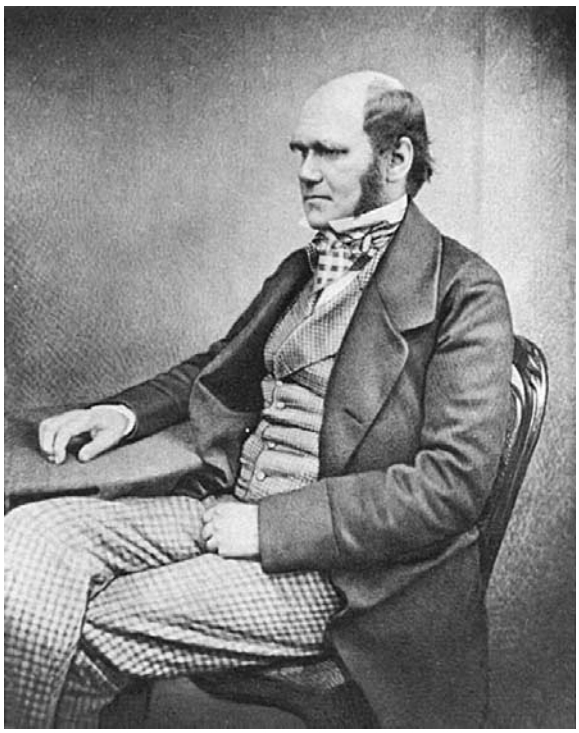

Fig. 1.2. Charles Darwin at about the time of writing *The Origin of Species*

The second purpose was less easily achieved.

Darwin's theory is one that emphasizes diversity, in the form of chance variations from one generation to the next. In 1859 these variations were seen as always being infinitesimally small. But some slight variability was all that was needed, given that particular variations added just a little to the chance that the individuals possessing them would survive. With sufficient time the environment could exert a constant pressure in selecting individuals with these favourable characteristics and a new species would emerge.

This theory raised problems that were seen as increasingly serious as the years passed. Because of the difficulties described below, by the end of the century Darwin's account of evolution in 1859 was widely held to have been disproven and to be of historical interest only. It was not until the 1930s that natural selection re-acquired, and has since maintained, its central role in evolutionary theory. Thus, although animal psychology developed against the evolutionary background provided by Darwin, it did so at a time when his major theoretical contribution was thought to be of decreasing importance. Disturbing criticism had already begun when Darwin at last

came to write on the evolution of the human mind and it affected what he had to say.

For natural selection operating on small and occasional variations to produce the intricate forms of life that exist now – the vertebrates, for example, with their complex brains and sense organs – demands a vast amount of time. In 1859 Darwin was satisfied, because of the geological evidence, that enough time had been available. The evidence from nineteenth-century physics disputed this. Calculations based on principles of thermodynamics whittled down the duration of the period when the earth could have supported life from the thousand million years demanded by Darwin's 1859 theory to perhaps only twenty or thirty million years. By 1870 the physicists' estimates had become widely known and accepted. The temporal horizon that had receded for the first half of the century now advanced, pressing biologists to find more rapid processes of evolution.

Darwin needed no critics to point out another problem, the absence of any accompanying theory of heredity. The occurrence of variation, slight differences between parents and offspring, was assumed, but not explained; no account was attempted of the much more salient aspect of heredity, the similarities between parents and offspring and the stability of species. For a while it seemed, as Darwin hoped, that one could understand evolution without making many assumptions about the process of inheritance. The more hostile reviews by fellow biologists immediately following the publication of *The Origin of Species* had in general increased Darwin's confidence that his theory was correct. But in 1869 there appeared a challenge to his ideas that he found particularly perturbing. This was a review, by an engineer, not a biologist, that included both a clear presentation of the arguments from physics regarding the limited age of the earth and an essentially mathematical demonstration which, based on the current 'blending' view of heredity, showed that new species could not arise by the continual selection of small variations.[7] One of the examples from this paper described the chance arrival of a European on some desert island where his particular characteristics equipped him to survive much better than its original inhabitants. Given that he exploited his superiority to the full, it appeared to follow from Darwinian theory that eventually the island would be peopled by a new race with European characteristics. This was absurd; the obvious outcome was that within a few generations there would be little trace of his arrival, a process of 'blending' would have taken place whereby the favourable characteristics he possessed were steadily diluted generation by generation. In the absence of a theory of heredity it was not at all clear how to refute such an argument.

This example leads to a third major issue that was added to those of time and of heredity in the debates on evolution preceding *The Descent of Man*: does the principle of natural selection explain the evolution of man? Publication of *The Origin of Species* had been long delayed by Darwin's belief that the favourable reception of a revolutionary idea requires cautious preparation, and also, maybe, by a fear of possible persecution and distaste for the public controversy that he knew would follow, given the religious beliefs of English society at that time. To prepare a theory then that could be seen as encouraging the spread of atheism was perhaps equivalent to advocating a point of view today that would encourage paedophilia. The arrival of Wallace's paper in 1858 had ended this delay, yet still there was no discussion of man. The *Origin* contained a single sentence referring to the question, which promised that the theory would shed light on human origins. Although veiled, the implication that man was as much the product of biological evolution as any other species was immediately perceived and provided the basis for most of the hostility and the intense public interest generated in the early 1860s. This was fanned when the implication was stated openly in 1862 by Thomas Huxley, by then known as Darwin's foremost champion, in his book, *Evidence as to Man's Place in Nature*. In this book Huxley concentrated on the anatomical similarities between the human brain and those of the great apes.

Two years later Wallace published a paper that applied the theory of natural selection to human evolution.[8] Two of the problems he discussed suggested a solution that emphasized the distinctiveness of man. One was the intellectual chasm that, despite the physical similarities, appeared to divide man from the great apes. The other was the indication from the limited amount of human fossil evidence then available that man had existed in his present form for a remarkably long time: these prehistoric ancestors who had lived in the same world as the mammoth and other mammals now long extinct did not appear to have been very different, in body or in size of brain, from the Victorians who discovered their remains. Wallace's explanation in 1864 was that natural selection had first produced a series of physical changes leading to the achievement of an upright posture by man's ancestors, and at that point a slow development of his brain had taken place. Once this had reached a sufficient level man's consequent control over his environment made him a species uniquely free from

the pressures of natural selection.

The ability to make fire, clothes, tools, shelters and devise varied forms of social organization meant that the human race could triumphantly survive enormous changes in climate and habitat without the aid of any further physical change. Wallace saw these abilities as depending upon both the possession of a well-developed brain and, as importantly, upon the continuity of cultural traditions. The human brain is not so complex an organ that each individual can be expected to discover unaided the advantages of rubbing two dry sticks together in an appropriate way or how to construct a bow. Human evolution meant, for Wallace, the gradual accumulation of knowledge and skills. In studying the human mind the important question was to understand the mechanisms, not of heredity, but of cultural transmission.

Wallace did not regard the handing on of skills by one generation to the next as a particularly human trait. In the 1860s he combined his concern with mental evolution with an interest in the topic of nidification, the construction of nests. He came to believe that the way birds build their nests, and the way they sing, is much more dependent on learning than was commonly held. To a large extent these are skills that each individual has to acquire, mainly on the basis of imitation. Such learning by imitation provides for their continued persistence.

Wallace saw a great deal in common between the construction of shelters by birds and by man. Nonetheless it was clear to him that the human brain was entirely different from that of any other creature. What selection process could have led to its development?

According to Darwinian theory, a bodily organ is improved only to the extent that it provides an advantage over direct rivals in the struggle for survival. Darwin had not been impressed by the mental abilities of the Fuegians he had encountered; no large discrepancy between their minds and their level of existence was obvious to him. For Wallace it was otherwise. His travels had made him much better acquainted with non-European peoples than his fellow evolutionists. In 1869 he published a further paper on the subject, concluding that natural selection could not have produced the human brain: 'Natural selection could only have endowed the savage with a brain little superior to that of an ape, whereas he actually possesses one but very little inferior to that of the average member of our learned societies'. In his struggles with other species, millions of years earlier, what benefit to man followed from the capacity for acquiring complex language, inventing abstract logic and mathematics, creating music and art or developing a high moral sense? It seemed to Wallace that 'an instrument has been developed in advance of the needs of its possessor', and the only way he could see that this might have happened was by the intervention of some higher intelligence in the development of the human race.[9]

Fig. 1.3. Alfred Wallace prior to his departure to the East Indies

For Darwin to admit such a 'miraculous addition' was to undermine all that he and Wallace had achieved. A paper by Wallace once again added to the pressure on Darwin to make his own views widely known and in 1871 these appeared in *The Descent of Man*. The first two chapters were concerned with the physical resemblances between man and other mammals, discussing issues that were now less controversial and evidence that was often already familiar. The following two chapters are the ones of most interest here. They were entirely devoted to a comparison between the mental processes of man and those of other animals. Beginning with recognition of the great differences between even the inhabitants of Tierra del Fuego and the 'most highly organized ape', he set out to show that nonetheless there was no fundamental difference between man and the higher animals in their mental faculties.

He first considered the objection that there is a qualitative difference between man and other animals that can be expressed by the statement that the behaviour of other animals is entirely guided by instinct, while that of man by reason. He argued first that in almost any species the behaviour of an individual is in part instinctive and in part dependent on the individual's past experience. Furthermore, it appeared that instinct and learning are not inversely related across species: the beaver displays some of the most complex forms of instinctive behaviour of any mammal and is also quick to learn. It was clear to Darwin that there are gradations of intelligence between different species and that in some, notably the apes, behaviour occasionally demonstrates intelligence of an almost human level. As examples, he cited various reports of chimpanzees and orang-utans using tools such as stones to crack nuts and sticks used as levers. The human mind could be understood as a further step, even if a large one, in the evolutionary development of intellectual functions that could be observed in animals.

Another prominent objection was that based on language. To some of Darwin's critics it was self-evident that human language was so different from any form of animal communication that it could not be the result of evolution. Darwin's reply was to point out that several basic elements of language exist in the non-human world – the development of song in birds resulting from both learning and from an instinctive tendency, vocal mimicry in parrots and other birds, repertoires of calls in monkeys indicating various affective states – and that such elements, combined with a high development of mental powers, could well have led to the development of human language. The parallels that seemed to exist between biological evolution and what was known then about the historical development of languages added to his argument.

Finally, Darwin conceded that the most important distinguishing feature of the human mind was its moral sense, or conscience. He argued that the development of such a feature was the inevitable result, given the existence of certain basic instincts such as parental and filial affection, that followed from the evolution of intellectual powers and of language. 'Conscience' was by no means some fixed mental attribute, which was either possessed or not possessed; he pointed to the changes that had occurred recently in 'even the most civilized nations' in attitudes towards slavery, the status of women and indecency.

The central importance attached to intelligence, in the sense of skills in solving practical problems, should be noted. As we have seen, other distinguishing characteristics such as language and conscience were seen as inevitable by-products of the evolution of intelligence. But, to return to the problem that had caused Wallace's appeal to a higher intelligence, how had this occurred? Darwin's answer was to stress two mechanisms that had been given little prominence twelve years earlier. Both had the added attraction of facing the other two major objections to his theories, those of time and of blending; in principle they made possible a greater rate of evolutionary change, and also could prevent the rapid swamping of a newly emerged and favourable variation by cross-breeding within the species.

One mechanism was the Lamarckian principle. Since his days on the *Beagle* Darwin seems never to have seriously questioned his belief that the skills, habits and ways of thinking which an individual develops in his own lifetime are to some small degree passed on to his children, as part of their biological inheritance. The impression made by Jeremy Button's rapid acquisition of European manners appears to have left the conviction that mental evolution could be a rapid process. With circumstances favouring the practice of intellectual skills, frequent usage of the brain would produce cumulative changes over a relatively small number of generations. Although Fuegians might now be mentally inferior to any other members of the human race, it was conceivable that appropriate environmental changes could bring them to the level of Europeans in the not too distant future.

The second mechanism was that provided by sexual selection. The last, and major, part of *The Descent of Man* was devoted to this topic. It seemed to Darwin that many of the peculiarly human characteristics that perturbed Wallace might well have developed in this manner. As well as the possible sexual advantages conveyed by intelligence, the strange human lack of much bodily hair could, for example, have arisen in the same way as the exotic colouring or complex song of various birds, characteristics which do not obviously increase the chances of survival for their individual possessor.

The importance assigned to acquired characteristics and to sexual selection in the *Descent* marked a change of emphasis from the *Origin*, but change through survival of the fittest remained the central idea of Darwinian theory. In 1859 the aim had been to change man's view of nature from that of a harmonious world containing related, but distinct, forms of life, forms that had been reached under the guidance of some predetermined purpose or goal, to one of

continuous flux governed by laws of chance. This had involved breaking down the boundaries that appeared to separate species from species. In 1871 the aim was to remove a further barrier, that between the human and animal mind. For Lamarck the inheritance of acquired characteristics was guided by purpose; it aided ascent on the ladder of life, the *scala naturae*, stretching up from the simplest organisms to man and beyond. For Darwin there was no such scale; he cautioned himself against using 'higher' and 'lower', against the idea that one species can be compared in 'degree of evolution' to some quite different species. Instead there was the symbol of the irregularly branching tree of life. In his use of the Lamarckian principle the teleological element was absent. Any development of the human mind that stemmed from what previous generations had learned was just as much the outcome of an entirely mechanistic interaction between an organism and its environment as the development of any physical organ.

The arguments for mental continuity between man and other animals put forward in the *Descent* were far from overwhelming. Reviewers were quick to point out the dubiously anecdotal nature of the evidence. For Darwin, it was sufficient to conclude that 'the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind'. Yet his tone is not that of pronouncing the final word on an old subject, but rather of pointing out the way that a new field of enquiry might develop.

The Spencer–Bain principle

One kind of criticism that greeted the publication of Darwin's theory in 1859 was that it did not conform to the standards of scientific explanation as conceived in current philosophies of science.[1] Such matters were one of the concerns of an intellectual tradition distinct from that of the group of geologists and naturalists to which Darwin belonged. This philosophical tradition was vigorously represented by a man only three years older than Darwin, John Stuart Mill (1806–1873). His *System of Logic* of 1843, with its analysis of induction and the logic of experimental research, was later to have a great, but indirect, influence on the study of animals.

A more immediate influence on animal psychology was the philosophy of mind developed by the succession of empirical philosophers that had preceded Mill. The two most pertinent aspects of this philosophy were its belief that the human mind develops from an initially unformed state – the *tabula rasa* – as a result of an individual's experience, and the argument that the process underlying this development is the formation of associations between ideas, through the perception of related occurrences of events in the world. To these basic principles Mill added the suggestion that a compound idea, formed by the association of two simple ideas, might have different properties from those of its constituents, just as common salt has properties entirely different from those of its elements, sodium and chlorine. Mill's arguments on what came to be called 'mental chemistry' encouraged animal psychologists later in the century to retain a belief in the fundamental role of associative processes and yet also, in a sometimes ill-defined way, a belief that the functions and development of the human and animal mind have different degrees of complexity.

Mill considered these issues from the familiar viewpoint of philosophy. But one of his closest associates was a man who has been described as 'in a certain sense the first psychologist'.[2] If Alexander Bain deserves the title, it is because he was the first person to devote almost his whole life to the study of the mind. The two books he wrote in the 1850s, *The Senses and the Intellect* in 1855 and *The Emotions and the Will* in 1859, were the first systematic attempt to detach the study of psychological problems from its position as one of the traditional concerns of philosophy and establish it as a natural science.

Physiological research over the previous decades had begun to make the nervous system far less of a mystery than it had been before the nineteenth century. The principal theme of Bain's psychology was a detailed examination of the relationship between neural processes and psychological phenomena. This examination began, as was still considered necessary at that time, with discussion of proofs that the brain is the principal organ of mind. Mental and bodily events were held to occur in a completely parallel fashion, with no causal connection between them. In his analysis of psychological processes Bain relied mainly on the kind of introspective evidence and associationist framework used by Mill. But, also like Mill, Bain advocated the use of experimental methods in the study of mind. However he never became an experimentalist himself and the real beginning of experimental psychology came later in Germany.

The original contribution made by Bain which is of most interest here stemmed from his attempt to understand the 'instinctive germ of volition', or – in more familiar terms – the origins of voluntary action. Since his solution for what he termed this 'grand difficulty' was to have a long and influential history,

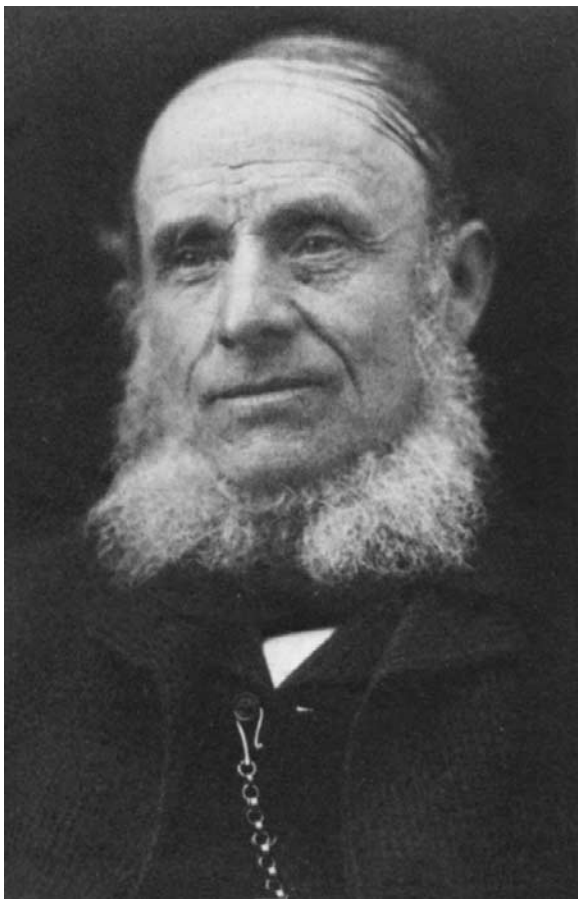

Fig. 1.4. Alexander Bain

and is still current, for example, in the form of behaviourism advocated by B. F. Skinner, it deserves close attention.

Bain was very much concerned to draw a clear distinction between reflexive actions produced by the nervous system in response to some external event, the kind of activity emphasized in the physiology of that era, and what he termed spontaneous activity; 'the exercise of active energy originating in purely internal impulses, independent of the stimulus produced by outward impressions, is a primary fact of our constitution'.[3] The existence of this spontaneous activity was seen as an 'essential prelude to voluntary power', where 'volition is a compound, made up of this and something else'.[4] The 'something else' must be an element that transforms the random nature of spontaneous activity, giving it the directed property of voluntary behaviour and connecting it with perception of the emotions of pleasure and of pain.

Pleasure and pain were discussed at length in Bain's psychology and provided a central theme in Mill's political and ethical philosophy. Modifying the criterion of utility used by his father, James Mill, and by Jeremy Bentham, Mill applied his 'greatest happiness principle' to the problems of politics and of personal morals discussed in his books, *On Liberty* of 1859 and *Utilitarianism* of 1863. An action that is good is one that increases the sum total of human happiness, or one that decreases the sum total of human misery. The principle was applied to questions concerning the forms that political institutions should take, the kinds of social or legal constraints that could be justified and the decisions an individual should make in his personal life. Mill did not discuss the psychological processes that make such decisions possible.

A theory as to how emotion and action came to be linked was first outlined by Bain in 1855 and then developed in his discussion of the will in 1859. It seems to have been prompted when, accompanying a shepherd, he watched the first few hours of life of two lambs. Bain noted that vigorous initial movements appeared to be completely random, but that when chance contact occurred, first with the mother's skin and then, after two or three hours, with her teat, the lamb's actions became progressively more directed in character. 'Six or seven hours after birth the animal had made notable progress . . . The sensations of sight began to have a meaning. In less than twenty-four hours, the animal could at the sight of the mother ahead, move in the forward direction at once to come up to her, showing that a particular image had now been associated with a definite movement; the absence of any such association being most manifest in the early movements of life. It could proceed at once to the teat and suck, guided only by its desire and the sight of the object.'[5]

Bain provided other examples – of a human baby learning to remove a needle pricking its skin or to gain warmth when chilled – to suggest that this process of 'trial and error', as he called it, was the universal means by which voluntary control over spontaneous activity is first achieved. He was unable to suggest the nature of the physiological mechanism that enabled this process to occur. 'I cannot descend deeper into the obscurities of the cerebral organization than to state as a fact, that when pain co-exists with an accidental alleviating movement, or when pleasure co-exists with a pleasure-sustaining movement, such movements become subject to the control of the respective feelings which they occur in company with. Throughout all the grades of sentient existence, wherever any

vestiges of action for a purpose are to be discerned, this link must be presumed to exist. Turn it over as we may on every side, some such ultimate connexion between the two great primary manifestations of our nature – pleasure and pain, with active instrumentality – must be assumed as the basis of our ability to work out ends.'[6]

These first two books were written by Bain during the years when he worked as a free-lance journalist in London and repeatedly failed to obtain any kind of university appointment. The rest of his life, before and after this period, was spent in Aberdeen. As a child he seems to have been as precocious as Mill, whose early educational attainments had amazed his father's associates. But Bain's situation was a very different one from the bookish atmosphere that Mill breathed from birth. Bain was the son of a weaver and from an early age had to work at the loom to earn money for an irregular education. As a Scot he was fortunate to live in possibly the only country 150 years ago where a boy from this kind of background could obtain a university education without very much difficulty, providing that he showed intellectual promise. After graduating he moved to London where he joined the circle around Mill. In 1860, at the age of forty-two, he finally obtained an academic post and returned as Professor of Logic to Aberdeen, where he remained for the rest of a long life.

Bain shared with Mill a surprising lack of interest in the debates of the 1860s over evolution. The observations on the behaviour of newborn lambs were exceptional in that there are few other references to animals in Bain's two books. This is in complete contrast to another author of a book on psychology that was also published in 1855. In the first edition of his *Principles of Psychology*, Herbert Spencer proclaimed that 'mind can be understood only by showing how mind is evolved'. Well before *The Origin of Species* appeared he had coined the phrase 'survival of the fittest' which was later adopted by Darwin.

Spencer's background was very different from that of either Bain or Darwin. As a boy he received an intermittent education from an uncle and from his father, a school master in the industrial town of Derby. From this education Spencer retained a life-long interest in a variety of subjects, especially scientific and political ones, a tendency to form strong opinions guided more by independent judgement than by custom or by careful study, and a critical attitude towards orthodox beliefs. By 1837, when Spencer was seventeen, the boom in railway building had begun in England. Spencer's childhood instruction in intellectual self-help was then followed by more formal training as a civil engineer over the next ten years when he worked for various small railway companies.

In 1848, on the strength of a few published articles, he went to London to work as a journalist, first as sub-editor on *The Economist* and then, like Bain, as a free-lance. His interest and ideas on psychology and on evolution were stimulated almost entirely by what he read. Mill's *System of Logic* was one important book. As Spencer acknowledged, he was never prone to study human nature in the concrete as well as in the abstract.

A few intellectual friendships were also highly important. He became close friends with Huxley, who served as a willing, but highly critical, sounding board for Spencer's ideas. Huxley commented that 'Spencer's idea of a tragedy is a deduction killed by a fact'[7] and continually advised the suspension of judgement in the absence of adequate evidence – advice rarely heeded by Spencer, whose attitude towards empirical evidence is indicated by his comment that he studied some topic so that 'I should be able to furnish myself with such detailed facts as were requisite for the setting forth of general conclusions'.[8]

Other friends of Spencer's included George Henry Lewes and Marian Evans. Lewes was a fellow journalist with a remarkably wide range of activities that encompassed literary criticism, writing biographies, acting and science. He wrote a lively book that summarized in a popular, but very informed, way the discoveries in physiology from continental universities. As will be seen later, this book's influence extended as far as Russia. Evans was also a journalist at the time. But after Spencer had made it clear that his friendship for her could never be any more than an intellectual one, he introduced her to Lewes and, partly as a result of the relationship that subsequently developed between them, she became George Eliot. Despite his own considerable achievements Lewes has remained known primarily for the support that enabled Eliot to write her novels.[9]

From his voracious reading and the exchanges with his group of friends during the early 1850s Spencer acquired a general vision of the world that was to have a more pervasive effect on nineteenth-century thinking than that of any other philosopher of his era. Much of what has since been called 'Social Darwinism' and the beliefs about the human mind which, later in this book, are termed 'Psychological Darwinism' could more appropriately be given the title 'Spencerism'. The key idea in Spencer's vision was that every aspect of the world is continuously changing and that the direction of this change is from simple to complex. An individual animal starts as an