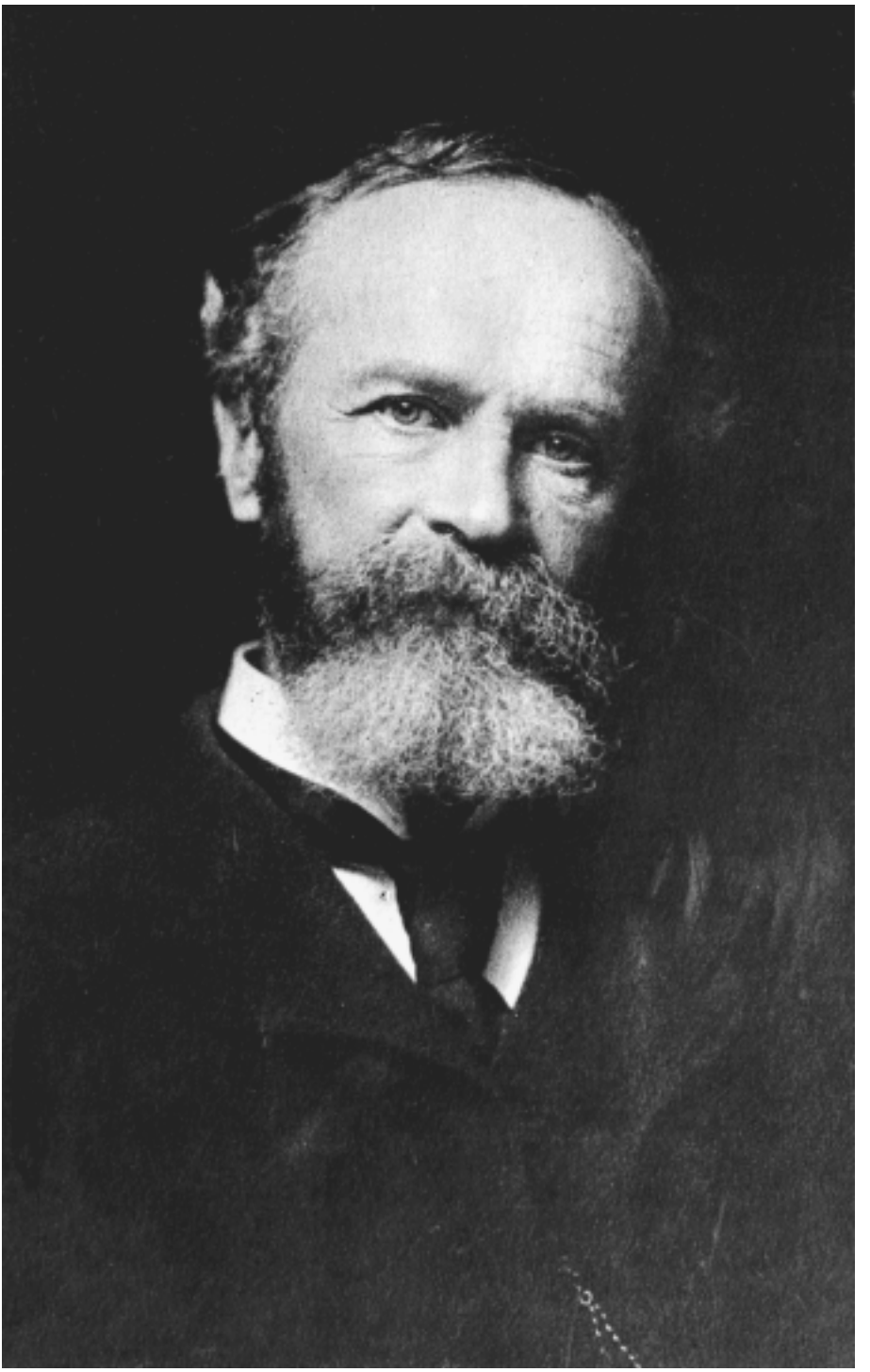


William James.
(Brown Brothers)

CHAPTER 9

Darwin, Galton, Cattell, James, and Hall

The *functionalists* formed the first major non-German school of psychology; they will be discussed in Chapter 10. Like the *Gestalt* psychologists (Chapter 7), the functionalists sought a new, more dynamic psychology, but in their case it was a psychology that would study the functions of the mind and the adaptive value of consciousness. Such interests and concerns were a product of the intellectual climate of the nineteenth century, which was dominated by Charles Darwin's theory of evolution.

CHARLES DARWIN (1809–1882)

Darwin's Early Life

Charles Darwin was born the fifth of six children in England on February 12, 1809, the day Abraham Lincoln was born in Kentucky. Darwin's family was wealthy, socially secure, well-connected both socially and intellectually, and involved in progressive causes such as the antislavery movement. His grandfather, Erasmus Darwin, was a prominent physician with strong interests in biology and natural philosophy. In *Zoonomia,* Erasmus Darwin proposed a natural explanation for the origins and development of life. At the time of his birth, Darwin's father, Robert Darwin, is said to have been England's highest paid provincial physician (Fancher, 1993a, p. 1); his mother Susannah was a member of the famous Wedgwood pottery family. The exciting story of Darwin's life and his formulation of the theory of evolution has been told many times: by Darwin himself, in an autobiography edited by his granddaughter Nora Barlow (Barlow, 1958); by Alan Moorehead, in a series of articles and a book (Moorehead, 1969a, 1969b); in a major biography by Ronald Clark (Clark, 1986); and by Irving Stone, in a best-selling novel (Stone, 1980). The pivotal experience of Darwin's life was his five-year stint as the naturalist on the round-the-world voyage of the Royal Navy survey ship *H.M.S. Beagle.* Darwin embarked on this voyage on December 27, 1831, shortly after receiving a B.A. degree at Cambridge. His academic record had been undistinguished, leading his father

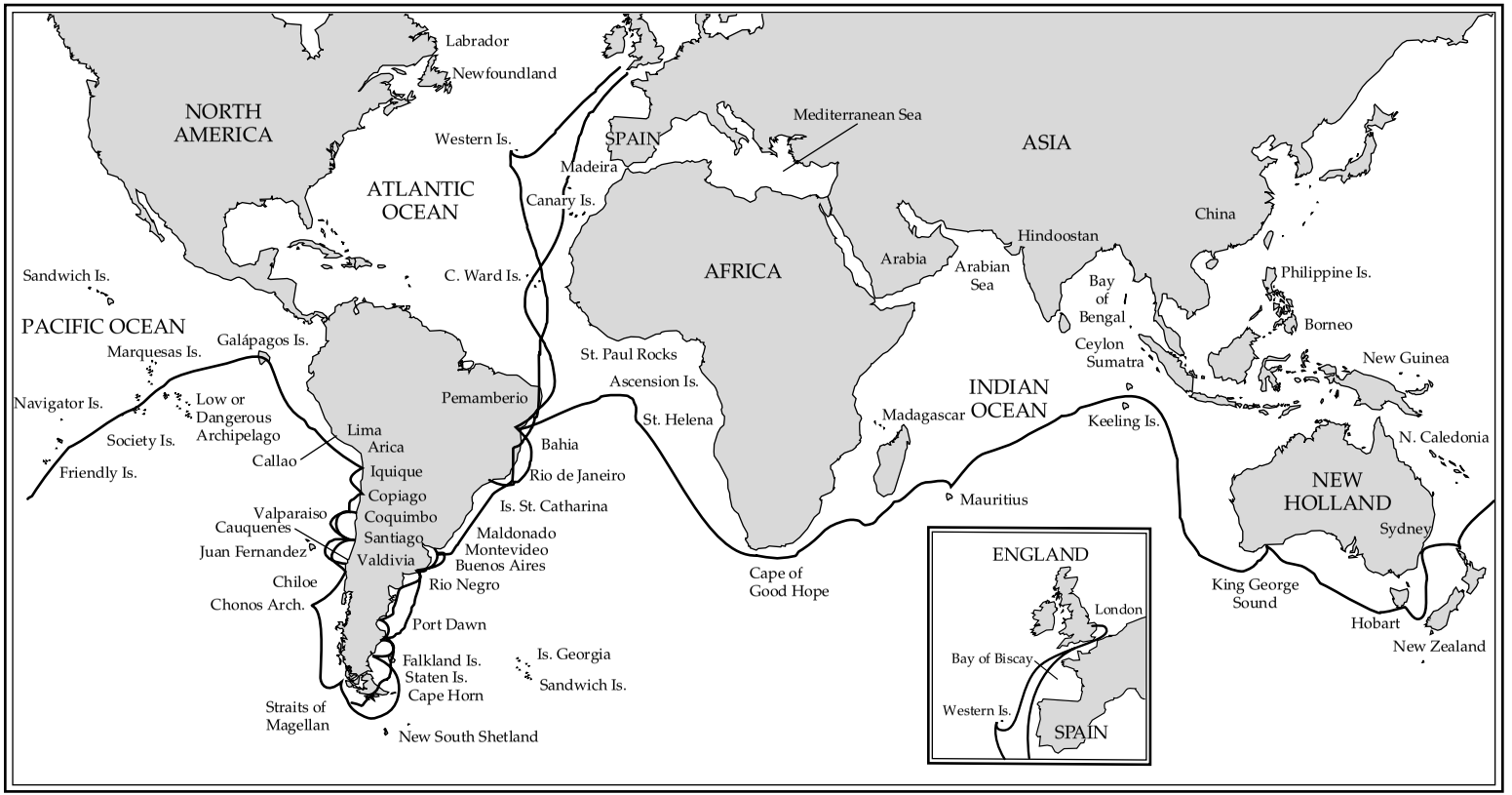
to upbraid him when he was 15 years old with this unhappy characterization and prediction: "You care for nothing but shooting, dogs, and rat-catching, and you will be a disgrace to yourself and all your family" (DeBeer, 1971, p. 565).

First, Darwin was sent by his father to study medicine at Edinburgh University. But upon observing surgical operations performed without anesthesia, Darwin ran from the operating theater, resolved never to return. In 1828, he entered Christ's College to prepare for the ministry of the Church of England. At Cambridge Darwin was described as being "of the most placid, unpretending, and amiable nature" but also as "a fellow who was forever asking questions" (Clark, 1986, p. 15). He graduated in 1831 with a "poor" (third-class) degree and vague plans to be a country parson and naturalist. Darwin hoped to emulate the one Cambridge man he admired, Professor John Stevens Henslow (1796–1861). Henslow was a clergyman and botanist whom Darwin accompanied on so many field trips that he became known as "the man who walks with Henslow." Darwin enjoyed being out in the country and collecting plant and animal specimens. On one trip, Darwin found a rare beetle, then another, and then a third; he popped them into his mouth for safekeeping as his hands were full (Clark, 1986, pp. 8–9). Through a combination of chance and happy circumstance, Darwin was offered a position as naturalist on board the *Beagle.* His father strenuously objected to his accepting the position, and, as fathers are wont to do, listed his objections: it was a wild scheme and a useless undertaking; the voyage would be long, and accommodation would be most uncomfortable on a small naval ship of the class known as "coffins" due to their unfortunate tendency to capsize; the position had been offered to others, including Henslow, who had shown good judgment in turning it down; the position was unsalaried and would cost Darwin the large sum of two thousand pounds; and, finally, no person of "common sense" would recommend that he go. Fortunately Darwin was able to find just such a person, his uncle Josiah Wedgwood II, a successful businessman who not only recommended that Darwin take the position but also paid his expenses.

The *Beagle's* captain was Robert Fitzroy, a staunchly religious man who believed in the historical accuracy of the account of creation given in the Bible's book of Genesis. Fitzroy hoped that a trained naturalist would be able to find evidence at the *Beagle's* many landfalls around the world to prove that the biblical account was true. When he left on the *Beagle,* the 22-year-old Darwin was a firm believer in the biblical account of creation. He later recalled that early in the voyage, the more worldly ship's officers often laughed at him when he quoted the Bible as an absolute and final authority. What Darwin saw during the *Beagle's* five-year, forty-thousand-mile voyage changed his mind and altered forever the scientific, theological, artistic, and literary conceptions of the human condition.

The Voyage of the *H.M.S. Beagle*

As Fitzroy had planned, Darwin left the *Beagle* and traveled inland at the ship's many landfalls. Because he was often seasick, Darwin welcomed these excursions and spent weeks away from the ship. He traveled extensively in South America and also in Australia, New Zealand, the Cocos Islands, and Mauritius.

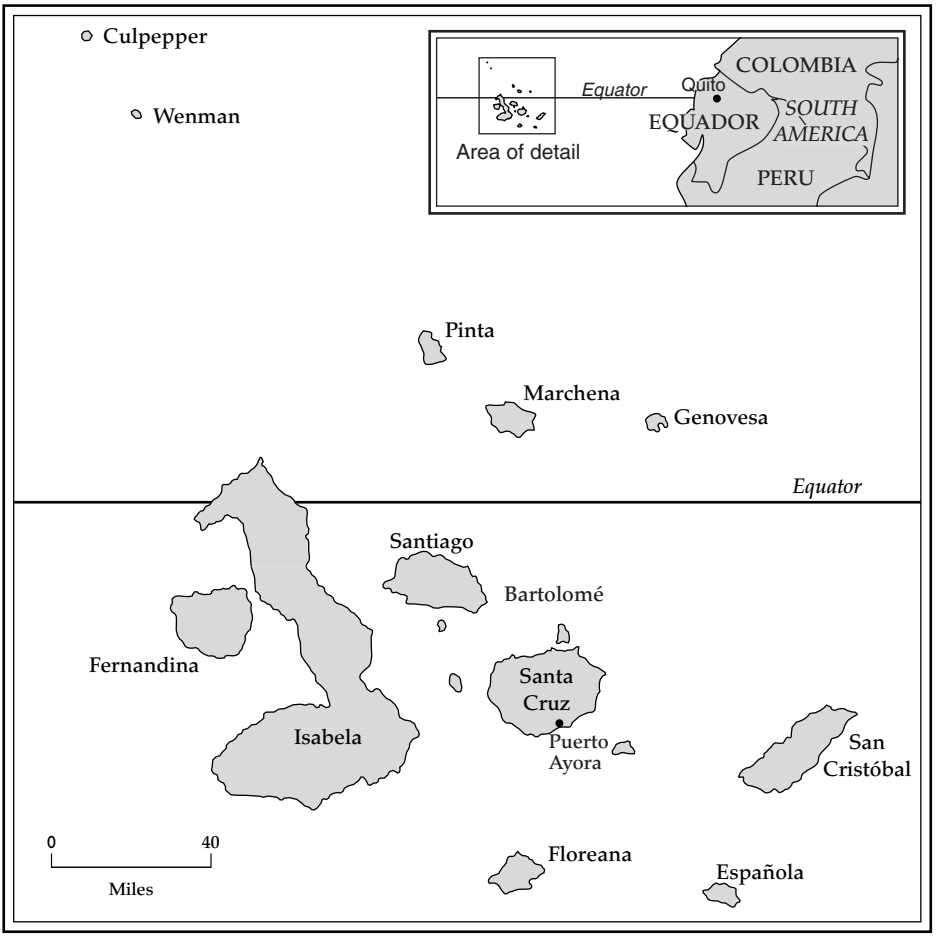


The five-year voyage of *H.M.S. Beagle*, 1831–1836. Place names are as they appear in *The Voyage of the Beagle.*
Adapted from The Voyage of the Beagle *(frontispiece), edited by L. Engel, 1962, New York: Doubleday.*

In South America, Darwin saw an abundance of new species. He was nicknamed "the Philosopher" by the *Beagle's* sailors because he was always asking questions. Darwin's questions were simple yet profound; why, he wondered, had God created so many different species? He also found fossils of very large extinct animals. In a low cliff 400 miles south of Buenos Aires, Darwin found enormous fossil bones, including a massive jawbone and tooth. He concluded that it was part of the skeleton of the great antediluvian (or pre-flood) animal the *Megatherium.* Only one other specimen of this animal had been found. What had happened to all the others? Why had God allowed the gigantic armadillos whose fossils Darwin found to become extinct yet allowed much smaller armadillos to survive? Why had God allowed some species to become totally extinct? Where on Noah's ark—a vessel reportedly smaller than the *Beagle*—would there have been space for pairs of the large animals whose fossils he found? How had there been room for all the other species that survived the flood by being taken aboard the ark? And what of the age of the fossils Darwin found? James Ussher, the Archbishop of Armagh, had calculated in 1650 that the creation of the earth began at 9 P.M. on October 22, 4004 B.C., and that all creatures were created on the following six days. Fitzroy believed the date to be accurate, but both geological and fossil evidence convinced Darwin that the earth is much older.

For Darwin, the voyage's most significant event was the *Beagle's* stay on the Galápagos, a group of islands 600 miles off the coast of South America. The Galápagos were known as the Enchanted Isles because of their rugged beauty and abundant wildlife. Contemporary photographs show many of the scenes Darwin must have seen (Moore, 1980). He was especially fascinated by the giant tortoises that the islands had been named after (*galápago* is the Spanish word for saddle horse and refers to the giant carapace of the 400-pound centenary tortoise). Nicholas Lawson, the English vice governor of the Galápagos, told Darwin that he could recognize at a glance which island a tortoise came from by looking at its shell. Tortoises from islands just fifty or sixty miles apart were clearly different. Darwin himself observed fourteen species of finches on different islands. They ate different foods and had varying beaks that allowed them to eat those foods with ease. On one island, the finches had strong, thick beaks they used to crack nuts and seeds; on another island, they had smaller beaks and fed mainly on insects; and on a third island, they had beaks that allowed them to eat mainly fruits, berries and flowers. Moore's photographs of contemporary Galápagos tortoises and finches, now known as Darwin's finches, show how striking the differences are.

Darwin wondered how these differences had developed. The islands are separated by strong ocean currents and powerful winds. Perhaps living on isolated islands with different food supplies had forced individual species to change. Perhaps species are not fixed and immutable, but are able to adapt and change. The changes must have occurred slowly, over thousands of generations, but the results were clear. In these thoughts and speculations, we see the beginning of Darwin's theory of evolution with its three fundamental assumptions: that the world is not static but is ever-changing, that the process of change is slow but continuous, and that this process results in markedly differ-



The Galápagos Islands.
(The New York Times Magazine, *November 17, 2002)*

ent manifestations. Many long and difficult years would pass before Darwin finally published his theory of evolution.

Darwin's Theory of Evolution

The voyage of the *Beagle* ended in October 1836. Darwin then began the demanding task of writing the five-volume *Zoology of the Voyage of H.M.S. Beagle,* editing his journals for publication, and organizing the vast collection of specimens he had shipped back to England from all over the world. He also had time for further study and thought. During the voyage, Darwin had observed that species can adapt and change, but he was puzzled about why they did so. What was the impetus for adaptation and change? Why should species evolve? Answers began to emerge after Darwin read a review in the *Athenaeum* of *A*

Treatise on Man and the Development of his Faculties, published in 1835 by the Belgian scientist Lambert Adolphe Jacques Quetelet (1796–1874). In this book, Quetelet summarized Thomas Robert Malthus's (1766–1834) view of population growth, first published anonymously in 1798 in his *Essay on the Principle of Population as It Affects the Future Improvement of Society.* In October 1838, Darwin read Malthus's essay with its central argument based upon two postulates Malthus considered self-evident: "That food is necessary for the existence of man, and that the passion between the sexes is necessary, and will remain nearly in its present state" (Malthus, 1798, p. 11). Malthus (1798, p. 13) concluded that the unchecked growth of population is immensely greater than the power of the earth to produce subsistence, for:

> Population, when unchecked, increases in a geometric progression:
> 1–2–4–8–16–32–64–128–256. . . .
>
> while subsistence increases only in an arithmetic progression:
> 1–2–3–4–5–6–7–8–9 . . .

Malthus allowed that postponed marriage, infant mortality, epidemic, and famine might temporarily limit population growth. But inevitably, an arithmetic progression is no match for a geometric series. Thus, Malthus predicted an increasingly severe struggle for existence. Darwin wrote in his *Notebook:* "Having read Malthus on population for amusement, it at once struck me that, under these circumstances, favorable variations would tend to be preserved and unfavorable ones to be destroyed. The result would be the formation of a new species" (Darwin, Life and Letters, I, p. 83, in Simpkins, 1974, p. 69). He came to think of such ever-increasing populations and limited resources as "a force like a hundred thousand wedges trying [to] force every kind of adapted structure into gaps in the economy of nature, or rather forming gaps by thrusting out weaker ones" (Darwin, 1839, in De Beer, Rowlands, & Skramovsky, 1967, p. 129). Here, then, was an answer to the questions and puzzles of the Galápagos. Later, in *The Origin of Species,* Darwin wrote:

> Can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. The preservation of favorable individual differences and variations, and the destruction of those which are injurious, I have called *Natural Selection* or *the Survival of the Fittest*." (Darwin, 1859, p. 61)

Darwin's theory is both elegant and encompassing. The distinguished biologist, Thomas Huxley, after hearing it outlined, chided himself, "How extremely stupid not to have thought of that" (De Beer, 1971, p. 571). Increasing numbers of any population lead to a "struggle for existence"; in this struggle, only the fittest animals survive. Animals having characteristics that allow them to adapt to a particular environment are therefore favored and are more likely to live to pass on those characteristics to their offspring. Therefore, over many generations, species change or evolve. Darwin believed the results of natural selection to be just as marked as those of the artificial selection practiced by breeders of domestic animals and plants. By 1840, Darwin was committed to

these views and even wrote an outline of the theory of evolution that he gave to his wife, instructing her to publish it in the event of his sudden death. He was, however, to delay for nearly twenty years before publishing his theory. Why did he wait so long?

One answer is that he was busy with other things. In 1838, his journal, *The Voyage of the Beagle,* was published successfully. It quickly went through two printings and a second edition in 1845. Darwin wrote in his autobiography: "The success of this my first literary child always tickles my vanity more than that of my other books" (Darwin, 1887, in Barlow, 1958, p. 116). *The Voyage of the Beagle* was a popular success because, as the editor of a modern edition said, "It is one of the greatest scientific adventure tales ever written" (Engel, 1962, p. ix). Darwin also devoted much time and effort to organizing his collection of specimens, work that was made difficult by a debilitating and mysterious illness. Darwin, who as a young man had been full of energy and vigor, now suffered constant ill health which "annihilated several years of my life" (Darwin, 1887, in Barlow, 1958, p. 122) What was the cause of his ill health? Some have speculated it was a psychosomatic manifestation of Darwin's anxiety about the consequences of publishing his theory of evolution (Colp, 1977). Saul Adler (1959) proposed another explanation. As an expert in tropical diseases, Adler recognized Darwin's symptoms as those of *Chagas's disease,* a prolonged, debilitating disease endemic to the areas of South America Darwin had visited as a young man (Engel, 1962, p. xx). In the Argentine, Darwin had been heavily bitten by Benchura beetles, 70 percent of which are vectors for the causative agent of Chagas's disease.

By the summer of 1858, Darwin was ready to present his theory in public, but one more reason for delay cropped up. Unexpectedly, in February of that year, Darwin received a letter from a British naturalist, Alfred Russel Wallace (1823–1913), asking him to look over Wallace's paper *On the Tendency of Varieties to Depart Indefinitely from the Original Type.* Wallace, too, acknowledged the influence of Malthus's essay. When Darwin read this paper, he saw that Wallace had outlined a theory of natural selection almost exactly like his own and that "it was admirably expressed and quite clear" (Darwin, 1887, in Barlow, 1958, p. 122). His first generous impulse was to withdraw and yield priority to Wallace, but Huxley, Charles Lyell (from whom Darwin had learned geology), and Joseph Hooker, the director of Kew Gardens in London, persuaded him to present his theory and Wallace's paper jointly at the July 1, 1858 meeting of the London's *Linnean Society.* This joint presentation of the theory of evolution elicited little interest. At the end of 1858, the president of the Society concluded in his annual report "that the year had not been marked by any of those striking discoveries which at once revolutionize, so to speak, the department of science on which they bear." A Professor Haughton of Dublin concluded that "all that was new in their joint presentation was false, and what was true was old." (Darwin, 1887, in Barlow, 1958, p. 122)

On November 24, 1859 Darwin published *On the Origin of Species by Means of Natural Selection, or the Preservation of Favorable Races in the Struggle for Life.* The reaction was intense; legend has it that the first printing of 1,250 copies sold out on the day of publication. In fact, all copies were ordered by booksellers anticipating a lively reaction to the book. They were correct, and Darwin's

The Great Oxford Debate on Evolution

The first major public test of Darwin's theory of evolution was at the meeting of the British Association for the Advancement of Science at Oxford in June 1860. The Sunday debate on the theory of evolution drew an audience estimated at a thousand people. Before the debate, the Bishop of Oxford, Samuel Wilberforce, nicknamed 'Soapy Sam' by his irreverent students, predicted that he would "smash Darwin." Wilberforce was a first-class controversialist and debater who also had a sense of humor. He wryly accepted the students' sobriquet ". . . since he was always in hot water and always came out of it with clean hands" (Clark, 1986, p. 154). Darwin did not attend the debate but had an able champion in Thomas Huxley. Huxley had his own nickname, "Darwin's Bulldog," due to the ferocity of his defense of science in general and evolution in particular (Desmond, 1997). Wilberforce accused Darwin of expressing sensational opinions unfounded in science and promoting heresies contrary to the Bible's divine truths. He made some effective points:

- Wilberforce was prepared to admit Darwin's theory of evolution as a working hypothesis, but not as a proven, causal explanation.
- He urged the Church and scientists such as Darwin and Huxley to find common ground.
- He asserted that whatever merits the theory might have, the gap between humans and the apes in the zoo was unbridgeable.
- He suggested that Egyptian mummies showed that humans were unchanged over thousands of years.

At the end of his presentation, Wilberforce made one of the most famous mistakes in the history of debate. He turned to Huxley and asked, "Was it through his grandfather or his grandmother that he claimed descent from a monkey?" Huxley turned to his neigh-

theory was hotly debated. Some biologists criticized his theory as a collection of unprovable and untestable hypotheses. Theologians asserted that if man and apes had a common ancestor, then man could no longer be seen as created by God in his own image. Further, if species originated through natural selection, it destroyed the ancient Galenic argument for the existence of God based upon the presence of design in nature (Chapter 1). The reaction reached a climax in a famous debate at Oxford (see box).

Continuity Darwin had made a resounding case for the continuity of species and had placed humans firmly among animals as far as physical characteristics are concerned. But what of psychological characteristics? Do we share behavioral, emotional, and cognitive characteristics with other species, or is there a discontinuity between humans and all other animals? In a later book, *The Descent of Man,* Darwin asserted that "there is no fundamental difference between man and the higher mammals in their mental faculties" (Darwin, 1871, p. 446). This topic was largely bequeathed by Darwin to his followers: George John Romanes (1848–1894), who used mainly anecdotal methods; Douglas Spalding (1840–1877), a pioneering experimentalist; and C. Lloyd Morgan (1852–1936),

bor and whispered, "The Lord hath delivered him into my hands." Huxley began his rebuttal by asserting that he had been unable to discern a new fact or new argument in the Bishop's presentation. As to the question of his ancestors:

> If, then, said I, the question is put to me "Would I rather have a miserable ape for a grandfather, or a man highly endowed by nature and possessed of great means and influence, and yet who employs these faculties and that influence for the mere purpose of introducing ridicule into a grave scientific discussion"—I would unhesitatingly affirm my preference for the ape." (Clark, 1986, pp. 155–156)

Others followed, including Fitzroy, now an Admiral, who rose from his seat brandishing his Bible over his head. The Bible, he declared, was the source of all truth. But Huxley and his allies had won the debate. When it was over, the undergraduates cheered, and for twenty-four hours Huxley believed himself the most popular man in Oxford. One cleric went home to tea and told his wife that the horrid Professor Huxley had shown that man was descended from the apes. "My dear," the good lady exclaimed, "do let us pray that it does not become widely known" (Montagu, 1977, p. 23). Other members of the clergy condemned Huxley and demanded an apology. Huxley refused to yield. Wilberforce believed he had won in a fair debate. He wrote this doggerel on his experience:

> . . . now a learn'd Professor, grave and wise,
> Stoutly maintains what I suppose were lies;
> And, while each listening sage in wonder gapes,
> Claims a proud lineage of ancestral Apes.
> Alas! cried I, if such a sage's dreams,
> Save me, ye powers, from those unhallowed themes;
> From self-degrading science keep me free,
> And from the pride that apes humility.
> (Desmond, 1997, p. 280).

Darwin's theory had prevailed. It now forms one of the great underpinnings of modern science (Degler, 1991).

whose *canon* or *principle of parsimony* became a critical methodological guide: "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale" (Morgan, 1896, p. 53). These three men were among the most important founders of comparative psychology, the division of psychology dealing with comparisons between different species (Dewsbury, 1984).

Mechanism Darwin was unable to explain the genetic mechanism underlying evolutionary change. Unfortunately, some of his successors seized upon Lamarck's doctrine of inheritance of acquired characteristics (Chapter 7) as the mechanism. According to this doctrine, offspring can inherit acquired characteristics, thus increasing the pace of evolutionary change. August Weismann (1834–1914) challenged Lamarckism and showed that such characteristics were not inherited. He docked the tails of hundreds of mice, but found no evidence that their offspring in later generations were born with altered tails. Weismann also focused attention on the germ plasm and chromosomes as the basis for inheritance. The research of Gregor Mendel (Chapter 11) in the latter decades of

the nineteenth century demonstrated the inheritance of physical characteristics in plants. His results laid the foundation for modern genetics and provided a mechanism for the evolutionary changes Darwin had described.

Darwin's Psychology Darwin's *The Descent of Man* (1871) and *The Expression of the Emotions in Man and Animals* (1872) contain much psychological material. In *Descent of Man,* Darwin used the term *evolution* for the first time and stated openly what he had only hinted in *Origin of Species:* that humans are related to other primates. Darwin had studied facial expressions associated with different emotions in humans, including his own children and the insane (Gilman, 1979). He used photographs and even attempted to record the movements of facial muscles. His work is a clear anticipation of the contemporary research of Paul Ekman (1985). Darwin visited the London Zoo to study the apes. He was especially interested in their reactions to mirrors, again a clear anticipation of the contemporary research of Gordon Gallup (1982, 1991). Darwin had humane and progressive attitudes and beliefs. In South America, he had seen slaves and been appalled by their treatment. He had also seen the disastrous consequences of a social experiment. On one of his early voyages, Fitzroy had taken three young Fuegians from their home on *Tierra del Fuego* at the tip of South America to England to educate, Christianize, and civilize them. On the voyage of the *Beagle* these young men were returned home to spread Christianity and civilization among their people. When the *Beagle* returned a year later, only one was found. He was naked, with matted hair, and had returned to his earlier ways. Fitzroy's experiment had failed.

After reading about the mental development of a child in an article by M. Taine in the journal *Mind,* Darwin reviewed the detailed record he had kept thirty-seven years earlier of the development of his son William Erasmus Darwin (1839–1914). In July 1877, Darwin published "A Biographical Sketch of an Infant" in *Mind.* For the developmental psychologist, the book provides a rich record of observations of a child by perhaps the greatest observer of nature of all time. In the twentieth century, Darwin's example of observing his own children has been taken up by a number of observers, ranging from the animal behaviorist Jane Goodall raising her son among the chimpanzees of Africa's Gombe Reserve (Goodall, 1971) to the cognitive developmental psychologist Jean Piaget studying his children's problem solving (Piaget, 1954) and the behaviorist psychologist B. F. Skinner (Chapter 13) using operant conditioning principles in raising his daughters. Darwin was also a careful observer of his own behavior. He found his use of snuff excessive and attempted to check the habit by keeping his snuffbox in the hall of his home rather than in the study. Unhappily, this attempt was largely unsuccessful.

Darwin received many honors and recognitions. He was elected a fellow of the Royal Society at the age of 29, and fifty-seven foreign learned societies elected him to honorary or corresponding memberships. But he was never honored by the British government or knighted by the British sovereign; conservative and reactionary elements in the Church of England were much too powerful to allow such recognitions. Darwin died at Down House on April 19, 1882. Twenty members of Parliament petitioned the Dean of Westminster to allow his burial in Westminster Abbey. The Dean agreed, which is less incon-

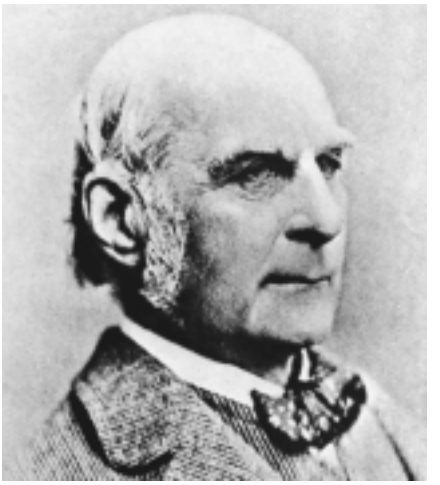
gruous than it first appears. Though Darwin thought that the word *agnostic* fitted him best, he was never bigoted or prejudiced in his views on religion and enjoyed close friendships with religious people. The Vicar of Downe, for example, was a lifelong friend of Darwin's. After Darwin's death, the Vicar erected a commemorative plaque in Darwin's honor in the graveyard of his church. Darwin was buried in Westminster Abbey, a few steps from the grave of Isaac Newton and near a commemorative plaque for Alfred Wallace. His home, Down House, is now the property of English Heritage and is open to the public. Located twenty miles south of London in the county of Kent, a short walk from the village of Downe, many of the rooms in the splendid house are furnished as they were in Darwin's time. The house also contains informative displays, selections from Darwin's collection, and beautiful gardens. No remnant of *H.M.S. Beagle* survived, and her last resting place was probably a ship's graveyard (Thompson, 1975).

Darwin's theory of evolution provided, and still provides, a framework for all the life sciences. Darwin, Freud, and Einstein are the three great "disturbers of thought" in the history of Western science. Ernst Mayr, one of the world's foremost researchers in genetic and evolutionary theory, has asserted that evolution must now be considered a fact and that there is not a single question in biology that can be answered adequately without considering evolution (Mayr, 2001). Others, such as Stephen Gould, proposed changes to the structure of evolutionary theory without challenging its centrality (Gould, 2002). For psychology, Darwin's theory of evolution raised questions about the adaptive value of consciousness and the mind's contribution to human adaptation and survival. These questions became fundamental concerns of the functionalist psychologists. An immediate expression of such concerns appears in the writings and research of the second forerunner of functionalism considered in this chapter: another nineteenth-century Englishman, and Darwin's cousin, Francis Galton.

FRANCIS GALTON (1822–1911)

Francis Galton was a man of wide interests and diverse talents who made impressive contributions to many fields of knowledge. To psychologists, Galton is best known for his development of mental tests and his research into human heredity. However, he was also a meteorologist who pioneered daily weather reports and weather maps and coined the term *anticyclone;* a student of perception who experimented with stereoscopic photographs and developed the method of composite portraiture, superimposing individual photographs to form a composite accentuating their common features; and a student of people's physical characteristics who recognized that fingerprints are unchanging and unique. (At one time, Galton had the largest collection of fingerprints in the world but did not find a single case in which all ten fingerprints from two individuals were identical; Thorwald, 1964).[1] Galton invented an early teletype

[1] In 1880, in a letter to *Nature,* a physician named Henry Faulds who was working in Japan first suggested using fingerprints to identify criminals. In 1901, London's Scotland Yard began to do so, followed by the New York City Police Department in 1906 (Cole, 2001).



Sir Francis Galton.
(Brown Brothers)

machine; he was an anthropologist and explorer. In short, Galton pursued all knowledge with energy and enthusiasm. He wanted "to know the worst of everything as well as the very best" (Galton, quoted by Newman, 1956b, p. 1170). Galton had such a passion for science that he expected that in the future delegates to scientific meetings would join in a type of pilgrimage, united by their devotion to science and the advancement of knowledge. Galton was one of the last of the gentleman scientists who combined professionalism and amateurism (Gillham, 2001); he never held an academic appointment or directed a laboratory, and his small personal library consisted mainly of autographed copies of books by his author friends (Gridgeman, 1972, p. 266). But he did have a lively intellect and endless curiosity, so his London home at 42 Rutland Garden was a favorite meeting place for scholars and scientists.

Galton's Early Life

Galton was born in Warwickshire, near Birmingham, England's second largest city. His family was well-to-do, having made its fortune during England's industrial revolution. Galton's maternal grandfather was Erasmus Darwin. His paternal grandmother was a Barclay, from the British banking family. Galton was a precocious child who learned to read at age 2½, wrote a letter at age 4, and could read any book in the English language by age 5. Terman (Chapter 10), in his biographical studies of genius, assigned to Galton an IQ of 200. At age 4, Galton summarized his achievements in this remarkable letter to his tutor and older sister Adele:

> My dear Adele:
>
> I am 4 years old and I can read any English book, I can say all the Latin Substantives and Adjectives and active verbs besides 52 lines of Latin poetry. I can

> cast up any Sum in addition and can multiply by 2, 3, 4, 5, 6, 7, 8, ____, 10, ____. I can also say the pence table. I read French a little and I know the Clock. (Galton, in Pearson, 1914, vol. 1, p. 66)

Galton had originally written the missing numbers 9 and 11 into the sequence. Apparently realizing that he had claimed too much, he scratched out one numeral with a penknife and pasted over the other with a blank piece of paper (Fancher, 1985, p. 20). Despite all this, Raymond Fancher, the author of numerous excellent scholarly works on Galton, believes that his reputation as a prodigy and genius is "substantially exaggerated" (Fancher, 1998a, p. 102). Galton's scholastic record was undistinguished. Enrolled at the age of 8 in a brutally competitive boarding school, he did poorly with the exception of mathematics. At 16, he was placed as a medical pupil at Birmingham General Hospital. Robert Watson (1968) reported that the characteristically curious Galton tested the effects of different substances by taking them himself. His intention was to work through the pharmacopoeia from A to Z, but, understandably, he stopped at the letter C after taking croton oil, a powerful purgative. Patient deaths and *postmortem* examinations filled him with horror, so he ended his medical studies and took a general degree at Cambridge.

As an adult, Galton exemplified Virginia Woolf's maxim that independent thought is often the result of independent means. His substantial inheritance allowed him to pursue whatever interests he pleased. Galton's first professional interest was exploration. In 1845 and 1846, he traveled to Egypt, the Sudan, and Syria intending to look for the source of the Nile. In 1850, Galton visited a vast area of South West Africa (present-day Namibia). He penetrated more than a thousand miles into the interior, mapped and explored the land, and made contact with the indigenous peoples: the nomadic Bushmen living under the harsh conditions of the Kalahari Desert, the cattle-worshiping Damara, the Ovambos, and the Hottentots. Galton's first book, *Tropical South Africa,* was published in 1853. He was recognized with a gold medal from the Royal Geographical Society and his election as a Fellow of the Royal Society in 1860. Galton at times gave crude and demeaning descriptions of the people he met on his travels (Fancher, 1983), but he was unusual among nineteenth-century European explorers in that he did not feel superior to the people he met. To some of his contemporaries, native people were closer to animals than to humans. Between 1810 and 1815, a 21-year-old woman of Bushman stock named Sartje Baartman was exhibited in Paris and London as the *Hottentot Venus* (Gillham, 2001).[2] A Bushman captured on an earlier expedition was exhibited in the primate section of the London Zoo until his death at the turn of the century (Kiley, 1987). But Galton was impressed by how well the people he met had adapted to their harsh desert environment and how much better they were able to survive than he was. Galton resolved to study such human adaptations further.

After returning to England from Africa, Galton found himself "rather used up in health" (Newman, 1956b, p. 1168). In 1855, he published *Art of Travel,*

[2] In April 2002, Baartman's remains were finally returned to South Africa for honorable burial.

subtitled *Shifts and Contrivances Available in Wild Countries.* He hoped the book would help future travelers, especially soldiers in the British Army, to adapt to foreign climates. At the time, British soldiers were hopelessly ill equipped for service in the tropics with their heavy woolen red coats, so Galton's advice was sorely needed. His book was published in eight editions and became an indispensable companion of nineteenth-century travelers and explorers. It is an exhaustive collection of hints, maxims, plans, descriptions, and diagrams. Galton told the reader how to use local materials to make gunpowder, ink, louse powder, pemmican, needles, glue, and a host of other things. Much of his advice is practical, indeed. Need a nutritious sandwich? Try two slices of bread and cheese sprinkled with sultana raisins. Have to cross a deep river with a horse? Hold on to his tail and splash water in his face with the right hand to steer left and with the left hand to steer right. (This hint is illustrated with a drawing of a top-hatted gentleman crossing a stream.) Want to find honey? Catch a bee, tie a feather or straw to its leg (Galton maintains that this can be done easily), throw the bee into the air, and follow it as it flies slowly to the hive. Want to stop a donkey from braying? Lash a heavy stone to the beast's tail. Before braying, a donkey lifts its tail. If the tail is weighted down, the donkey does not bray (Middleton, 1971).

Galton's Measurements of Individual Differences

After his return to England, Galton pursued his interest in human characteristics, both physical and mental. His travels had produced a fascination with the differences between people, and he was especially intrigued by the workings or functions of the human mind. One of Galton's favorite maxims was "Whenever you can, count" (Newman, 1956b, p. 1169), and count he did. At lectures, he sat facing the audience. Galton counted the number of fidgets per minute and found that children were rarely still, middle-aged persons were medium fidgets, while elderly philosophers sometimes remained rigid for minutes at a time (Newman, 1956b, p. 1169). He made a "beauty map" of Britain in which the women of London ranked first, and those of Aberdeen, Scotland last. Galton went to the English Derby, but rather than watching the horses, he studied changes in the prevalent tints of spectators' faces as the horses neared the finish.

To make more formal and controlled measurements, Galton established in 1884 an *anthropometric laboratory* at the International Health Exhibition in London "for the measurement in various ways of Human Form and Faculty" (Galton, quoted in Pearson, 1924, p. 359). In twelve months, he collected data on 9,337 individuals (Johnson, McClearn, Yven, Nagoshi, Ahern, & Cole, 1985, p. 875). In 1888, a similar laboratory was established in the science galleries of the South Kensington Museum. In those laboratories, the people of London could, for a fee of four pence for the first examination and three pence for second and later testings, have their physical and mental powers tested—making the labs the world's first *psychometric* clinics. Some 17,000 individuals were tested in Galton's laboratories in the 1880s and 1890s. As they left, they received an impressive-looking card showing their results. Some 7,500 individual data records

still exist at the Galton Laboratory in London and have been reanalyzed (Johnson et al., 1985, p. 876). A variety of physical measurements were made—height, weight, girth, fingerprints, and head size—because Galton firmly believed that large brains and strong mental powers were accommodated by a large head, long arm span, and great strength, rate of movement, visual acuity, and lung capacity. To measure mental abilities, Galton relied heavily on such physical measures as visual and auditory reaction times and the highest audible tone, since he believed that there is a consistent relationship between sensory and mental acuity. In 1888, he published a paper describing a method for quantifying this correlation. A few years later, in 1895, Galton's student Karl Pearson derived a formula that allows such relationships to be expressed mathematically as a correlation coefficient. Galton also developed a simple device, called the Galton whistle, that produced a series of whistles of different frequencies. He tested auditory acuity and found a remarkable decrease in acuity for high notes as people age. Most older people were quite unaware of this decline, and Galton took a certain delight in demonstrating it to the more haughty.

Galton also developed a series of weights arranged in a geometric series so as to produce sensations that increase arithmetically, along with a set of color, taste, and touch discrimination tests. A large proportion of the Quaker families he tested were colorblind. Galton compared men and women on these tests and concluded that men have more delicate powers of discrimination. Everyday experience, Galton suggested, confirms this conclusion:

> The tuners of pianofortes are men, and so I understand are the tasters of tea and wine, the sorters of wool and the like. These latter occupations are well-salaried, because it is of the first moment to the merchant that he should be rightly advised on the real value of what he is about to purchase or sell. If the sensitivity of women were superior to that of men, the self-interest of merchants would lead to their being almost always employed: but as the reverse is the case, the opposite supposition is likely to be the true one. (Galton, 1883, p. 30)

Galton also pointed out that most men agree that women rarely recognize a good wine or make a successful cup of tea or coffee. His conclusions and arguments were definitively sexist.

In addition to these physical tests, Galton made extensive use of questionnaires in what he termed his *psychometric studies* and *experiments.* One of his best-known studies concerned mental imagery. He asked people to recall scenes from memory—for example, the scene at the breakfast table that morning—and then to answer a series of questions about the illumination, coloring, extent, detail, reality, and persons in the scene. Most people were able to recall clear and distinct mental images, but to Galton's astonishment, he found that the great majority of scientists and mathematicians were unable to do so. Indeed, many of them thought him "fanciful" for thinking they might be able to recall such scenes. They reported that such mental imagery was as unknown to them as colors are to a blind person. Galton concluded that they had been trained to think in largely abstract terms. Others, though, were able to describe

their images in minute detail, almost as if describing a scene that lay before their eyes: chess players who could play the game blindfolded, pianists who "read" a mental score while playing, orators who followed a mental text while speaking, and a Mr. Flinders Petrie, who habitually solved arithmetic problems using a mental slide rule. Petrie would "set" the slide rule's cursor to the appropriate position and then read off the answer from the scales. Such clear mental images were rare, but Galton believed that gradations of imagery are present in all people and are in general more distinct in women than in men; this was one of the few good things the generally misogynistic Galton had to say about women.

Galton also developed and used two forms of association tests. In the first, a subject was asked to respond with an association to a stimulus word. The latency of each association was a measure of the alacrity of the subject's mind. In studying the origins of individual associations, Galton found that 40 percent derived from childhood experiences, an empirical conclusion strikingly consistent with Freud's emphasis on the importance of the early years as determinants of adult behavior (Chapter 8). In his second association test, Galton simply asked the subject to allow the mind to play freely for a brief period and then to arrest and scrutinize carefully the ideas that had been present. In such a test on himself, Galton strolled along Pall Mall, one of London's most fashionable avenues, scrutinizing everything that caught his eye and examining his associations for each object (Galton, 1883, pp. 185–203). In walking 450 yards, he saw 300 objects and found that they led to numerous associations. His mental life seemed rich and diverse. A few days later, Galton repeated the walk and found to his surprise that many of the original associations recurred. He wrote:

> The actors in my mental stage were indeed very numerous, but by no means as numerous as I had imagined. They now seemed to be something like the actors in theatres where large processions are represented, who march off one side of the stage, and, going round by the back, come on again on the other. (Galton, 1883, p. 188)

Galton was intrigued by all the phenomena of the human mind, including memory. His view of memory was very much a product of the views of the *British associationists* (Chapter 2): brain elements that are simultaneously excited become liable to be thrown into a similar state of future excitement. Galton studied various techniques for improving memory: the use of concrete imagery, the formation of strings of associations, and *mnemonics.* While some people were able to use mnemonics, Galton found them confusing and not worth the mental effort.

Abnormal mental functioning, seen in its extreme in the insane, intrigued Galton, just as it had Darwin. Galton spent much time studying the inmates of a number of asylums, including the large Hanwell Asylum near London. He observed disordered sexual behaviors and described delusions and hallucinations—patients who thought that their bodies were made of glass, that their brains had melted or disappeared, or that others had taken over their souls (Galton, 1883, p. 67). Galton commented on the "gloomy segregation" (Galton, 1883, p. 67) of the insane, with each person "walking alone buried in his own

thoughts" (Galton, 1883, p. 67). To better understand their mental world, Galton set out to make himself paranoid. He was so successful that after a while "every horse seemed to be watching, either with pricked ears or disguising its espionage" (Galton, 1883, p. 68). The road from sanity to insanity seemed alarmingly short. In a moving description, Galton pictured sanity as a tableland with unfenced precipices on all sides; any of us can fall over the sides at any time. The demarkation between sanity and insanity is faint.

Galton as a Hereditarian

In *Hereditary Genius,* first published in 1869, with a second edition in 1878 and an American edition in 1880, Galton reported his investigations on the relative importance of hereditary and environmental influences on our abilities and capacities. In the first sentence of the book, he stated his position in unequivocal terms: "I propose to show in this book that a man's natural abilities are derived by inheritance under exactly the same limitations as are the form and physical features of the whole organic world" (Galton, 1880, p. 1). Galton had no patience with the "fairy tale" that babies are born pretty much alike and objected "in the most unqualified manner to pretensions of natural equality" (Galton, 1880, p. 14). Humans are inherently different, and differences in such areas as mental ability are inherited and distributed on a continuum, with the frequency of each level in accordance with "the very curious theoretical law of deviation from the average" (Galton, in Newman, 1956b, p. 1181). Adolphe Quetelet, the greatest authority of the time on vital and social statistics, had proposed that law. Quetelet's aim had been to create a numerical social science, a social physics, that would bring order to social chaos (Porter, 1986). He studied the rates of birth and death and of marriage and divorce and the relationship between crime and poverty. Quetelet found order and predictability in these numbers. In a frequently quoted passage from his book *Sur l'Homme* (On Man), he concluded from his analysis of the statistics of the French criminal courts from 1826 to 1831:

> The constancy with which the same crimes repeat themselves every year with the same frequency and provoke the same punishment in the same ratios, is one of the most curious facts we learn from the statistics of the courts; I have stressed it in several papers; I have repeated every year: *There is an account paid with a terrifying regularity; that of the prisons, the galleys, and the scaffolds. This one must be reduced.* And every year the numbers confirmed my prevision in a way that I can even say: there is a tribute man pays more regularly than those owed to nature or to the Treasury; the tribute paid in crime! Sad condition of human race! We can tell beforehand how many will stain their hands with the blood of their fellow-creatures, how many will be forgers, how many poisoners, almost as one can foretell the number of births and deaths. (Quetelet, 1835, emphasis in the original, in Freudenthal, 1975, p. 237)

Quetelet also found that many physical characteristics were distributed in populations according to his law: the greater the distance from the average, the fewer the number of cases. In a regiment of 5,738 Scottish soldiers, Quetelet found an average chest size of 39.83 inches. The majority of cases clustered

round the mean, with 1,073 soldiers having 39-inch chests, and 1,079 men with 40-inch chests. At the extremes were three soldiers with chests of 33 inches and one with a chest of 48 inches. As the distance from the mean increased, the number of cases decreased. Galton found that many physical and behavioral characteristics were similarly distributed: weight and height, hair color, the spread of shots around a target, and the scores of two hundred Cambridge students taking the final examinations for an honors degree. A similar distribution occurs when ten coins are tossed one thousand times and the number of *heads* recorded on each toss:

Number of Heads	Frequency
0	2
1	7
2	43
3	104
4	204
5	251
6	221
7	113
8	49
9	5
10	1

Galton was the first person to propose that mental characteristics and capacities are similarly distributed. He suggested that the distribution of a mental characteristic such as intelligence would follow what we now term a normal curve, with most people falling close to the average and larger deviations from the average becoming increasingly infrequent. The application of the normal curve model has been of central importance to many scientific and technical fields, including psychology.

Quetelet and Galton developed the concept of the "average man" as a statistical and probabilistic concept. While the physical, social, and mental characteristics of any individual are difficult to predict, the characteristics of a population are regular, and can be described statistically. Galton invented the median and percentiles as ways of expressing the central tendency and variations in the distribution of scores. This approach was not without critics. To some it was a dehumanizing and deadly type of *social physics.* Charles Dickens described people such as Quetelet and Galton who deal in nothing but figures and averages as "addled heads." But the reaction that was most important to Galton was Darwin's. He wrote to Galton in a personal letter:

> I have only read about 50 pages of your book . . . but I must exhale myself, else something will go wrong in my inside. I do not think I ever in my life read anything more interesting and original . . . I congratulate you on producing what I am convinced will be a memorable work. (Darwin, in Pearson, 1914, plate 1)

Darwin's prediction was correct, and Galton's approach has been of great importance for all the social sciences, including psychology. Galton and his

Milestones in the History of Statistics

- Pierre-Simon Laplace (1749–1827) developed probability theory and mathematical statistics (Hald, 1998).
- Carl Friedrich Gauss (1777–1855) (Chapter 7) formulated the method of least squares and methods for determining the accuracy of observations.
- Ernst Abbe (1840–1905) used goodness of fit of assumed normal distributions.
- Francis Galton introduced the following terms to statistics—*median, bell-shaped curve, correlation, dispersion, interquartile range, regression* and *percentile.*
- Karl Pearson (1857–1936), Galton's student and first biographer, and the cofounder and editor for thirty-five years of the leading statistics journal *Biometrica,* introduced the terms *histogram, kurtosis, random sampling, random walk, skewness, standard deviation* and *variate.* He also developed the formula for the product moment correlation coefficient (Johnson & Kotz, 1997).
- Graphical analysis was widely used by psychologists at the end of the nineteenth century. Thorndike (Chapter 10) published 74 learning curves in his important monograph on instrumental learning (Thorndike, 1898a); Hall (whom we will discuss in this chapter) included 25 graphs in his *Adolescence.* Hall's graphs included ". . . a number of displays that would rival the most sophisticated graphs found in science today" (Smith, Best, Cylke, & Stubbs, 2000, p. 261).
- Student, the *pseudonym* of W. S. Gosset (1876–1937), worked for the Guinness Brewery in Dublin, Ireland on problems caused by variability in the barley and hops used to produce beer. When he published his findings, Guinness policy required that he use a *pseudonym,* thus he became "Student." He introduced small sample statistics and the Student t test.
- Ronald A. Fisher (1890–1962) developed analysis of variance, analysis techniques for small samples, the concept of the null hypothesis, and statistical significance/nonsignificance as a continuum rather than a dichotomy. ANOVAs and t tests were not introduced into psychology until the 1930s and were not widely used until the 1950s (Rucci & Tweney, 1980).

students also helped develop statistical procedures for the presentation and analysis of data.

Galton's Eminent Families

Galton gathered data on the accomplishments, honors, awards, high offices, and other marks of intellectual quality of 200 or so members of 43 families, including his own. He found high levels of intellectual achievement at above-predicted frequencies in these families. In *Hereditary Genius* (1869), Galton presented an expanded list of 977 members of 300 different families he judged to be eminent. They included judges, military commanders, literary figures, scientists, poets, musicians, painters, and academics. Since he calculated eminence to be ordinarily achieved by one person in four thousand in the normal

population, Galton's families showed a disproportionate concentration of eminence. The occurrence of such high levels of achievement in certain families was for Galton definitive proof that individuals inherit such abilities. He also reported that 31 percent of the fathers in his sample were judged to be eminent, while 48 percent of their sons were so judged. Galton concluded that "genius" is hereditary and runs in certain families, and that as family closeness to an eminent person decreases, so, too, does eminence.

Criticisms of Galton's conclusions were soon forthcoming. Ironically, the most telling came from Alphonse de Candolle (1806–1893), a Swiss scientist whose family had been one of the forty-three studied by Galton (Fancher, 1983). Candolle (1873) studied over three hundred foreign members of the French and German Academies of Science and the British Royal Society. Election as a foreigner to those prestigious societies was considered a true mark of distinction for a scientist. In studying their backgrounds, Candolle drew up a list of favorable environmental influences. Temperate climates nurtured more scientists than did hot ones; scientists who spoke the dominant scientific languages of German, French, and English enjoyed an advantage; the absence of a dogmatic and authoritarian religious establishment dispensing preconceived notions of truth and the presence of teachers promoting a spirit of free inquiry were important favorable influences; and finally, eminent scientists tended to come from countries with relatively high standards of living offering libraries, universities, and laboratories—and people with sufficient free time to make use of them (Candolle, 1873, in Fancher, 1983, pp. 343–344).

Candolle's conclusions and his claims to have a larger and more complete set of information than Galton's prompted Galton to conduct a more extensive study. Galton's new sample consisted of two hundred members of the British Royal Society, who were asked to respond to a long series of questions about their backgrounds, educations, and scientific interests. The majority agreed with Charles Darwin, who responded that his interest in science was "certainly innate." Galton summarized his findings in *English Men of Science: Their Nature and Nurture* (1874). This was Galton's first use of the phrase *nature and nurture* to describe innate versus environmental influences on development. Though Galton admitted that at times environmental influences might augment or thwart hereditary influences, he continued to insist on the supreme importance of *nature* and the dominant role of heredity as the determinant of dispositions. Galton's methodology can certainly be criticized. He relied heavily on self-reports, supplemented at times by the reports of families and friends. He paid little attention to the fact that his subjects generally came from the wealthy and aristocratic classes of England, a highly advantaged group with the best educational, occupational, and professional opportunities. He discounted these differences and attributed the performance of these men largely to their *nature.*

Nature and Nurture

In 1582, Richard Mulcaster had first used the terms *nature* and *nurture* to describe what he considered twin forces in the development of a child's mind (Teigen, 1984). By *nature,* Mulcaster meant what we now call the child's genetic inheritance, and by *nurture* all environmental conditions, including family and

school. Some thirty years later, William Shakespeare used these terms in a similar way in *The Tempest* in Prospero's description of Caliban:

> A devil, a born devil, on whose nature
> Nurture can never stick; on whom my pains,
> Humanely taken, all, all lost, quite lost.
> (Act IV, Scene 1)

But it was Galton who popularized and introduced these terms to psychology, thus beginning the *nature/nurture* debate that continues to this day. In a chapter "The History of Twins, as a Criterion of the Relative Powers of Nature and Nurture" in *Inquiries into Human Faculty and Its Development* (1883), Galton proposed a *twin-study method* to assess the relative contributions of nature and nurture. His method was based on the occurrence of two different kinds of twins. *Fraternal* or *dizygotic twins* result from the separate fertilization of two ova by two sperm. They share the same genetic similarity to each other as any brothers and sisters. *Identical* or *monozygotic twins* result when a single fertilized *ovum* splits and the two halves develop into separate *embryos.* They are genetically identical to each other. Galton collected information from 80 to 100 twin pairs. The number is uncertain, as are the details of the methods he used to compare them. His conclusion that *nature* is enormously more powerful than *nurture* was premature, but the *twin-study method* he proposed has proved to be a powerful and invaluable tool.

Galton and Eugenics

Throughout his life, Galton was fascinated by the prospect of human improvement through genetic control. In 1901, he published in *Nature* a paper in which he introduced the term *eugenics,* from the Greek word *eugenes,* meaning "well-born." With the decline of Lamarckism, *eugenics* was seen by many as the best hope for improving the human condition. Galton argued that "the possibility of improving a race or a nation depends on the power of increasing the productivity of the best stock" (Galton, 1901, p. 663). He proposed that a systematic attempt be made to improve the nation's genetic quality by

1. encouraging marriage between a selected class of men and women;
2. encouraging earlier marriage between them; and
3. providing healthy conditions for their children, including good food and housing. (Galton, 1901, p. 664)

In 1908, Galton founded the Eugenics Society of Great Britain and the following year a monthly journal, *The Eugenics Review.* That journal published sixty volumes until it ceased publication in 1968. Galton promoted *eugenics* enthusiastically and left forty-five thousand pounds in his will to endow a chair of *eugenics* at the University of London. Degler (1991) describes the enthusiastic response to eugenics:

> On the eve of the First World War, *eugenics* was a fashionable social reform on both sides of the Atlantic. The first International Congress of Eugenics, held in London in 1912, was presided over by Leonard Darwin, one of Darwin's sons, with Winston Churchill as an English vice-president, along with the American

Twins Raised Apart/Twins Raised Together

Monozygotic (identical) and dizygotic (fraternal) twins separated early in life are a fascinating experiment provided by nature. Studies of such twins raised apart or raised together provide a powerful way to assess the relative contributions of *nature* and *nurture* to development. Twins raised apart are rare, which explains why, until recently, only a small number of such studies of modest scope appeared in the psychological literature. But more recently, two impressive long-term investigations have provided a wealth of fascinating and important information about such twins.

Since 1979, an intensive study of *monozygotic* and *dizygotic* twins, separated in infancy and raised apart, has been conducted at the Minnesota Center for Twin and Adoption Research (MICTAR) at the University of Minnesota. Thomas Bouchard, Nancy Segal, David Lykken, and their colleagues have studied more than one hundred sets of raised-apart twins or triplets (Bouchard, 1984; Bouchard, Lykken, McGue, Segal, & Tellegen, 1990; Lykken, McGue, Tellegen, & Bouchard, 1992; McGue & Bouchard, 1998). Once identified, such twins travel to Minnesota where they spend approximately fifty hours undergoing intensive psychological and physiological assessments. Two or more test instruments are used in each major psychological domain and separate examiners administer reading, writing, and spelling tests; an intelligence test; the Stroop Color Word Test; the Barron-Welsh Art Scale; and life, psychiatric, and sexual history interviews (Diagnostic Interview Schedule). In addition, each twin undergoes a comprehensive mental ability test, and a battery of physiological and medical tests including detailed medical histories, electrocardiograms, chest X rays, heart stress tests, and pulmonary exams. All of the twins were separated very early in life, raised apart during their formative years, and reunited as adults. In a small number of cases, the twins met for the first time at the Minnesota Center or did not even know they were twins until they were reunited. In their results, about 70 percent of the variance in IQ was found to be associated with genetic variation. On the multiple psychological measures of personality and temperament, occupational and leisure-time interests, and social activities, identical twins raised apart are about as similar as fraternal twins raised together. The MICTAR investigators concluded that their results show strong heritability of many psychological and physiological traits.

The researchers have also found that identical twins raised apart tend to be remarkably similar not just in appearance and aptitude, but also in their idiosyncratic habits, tastes, styles, and medical histories. Two twins were accomplished and amusing raconteurs, each with a fund of amusing anecdotes and stories; Bridget and Dorothy, 39-year-old identical twins, first met at the Minnesota Center and discovered that they each wore seven rings, two bracelets on one wrist, and a watch and a bracelet on the other wrist; they had also chosen the same names for their children. They did have different dental health histories, having been raised, re-

Twins Raised Apart/Twins Raised Together (Continued)

spectively, by upper- and working-class British families.

Some of the other similarities between the MICTAR twins are equally striking. Take the "Jim twins," as they have come to be known. Jim Springer and Jim Lewis were adopted as infants into separate working-class Ohio families. Both liked math and did not like spelling at school. Both had law enforcement training and worked part-time as deputy sheriffs. Both vacationed in Florida; both drove Chevrolets. Much has been made of the fact that their lives are marked by a trail of similar names. Both had dogs named Troy. Both married and divorced women named Linda and had second marriages with women named Betty. They named their sons James Allan and James Alan, respectively. Both like mechanical drawing and carpentry. They have almost identical drinking and smoking patterns. Both chew their fingernails down to the nubs. But what investigators thought "astounding" was their similar medical histories. In addition to having hemorrhoids and identical pulse and blood pressure and sleep patterns, both had inexplicably put on ten pounds at the same time in their lives (Holden, 1980, p. 1324). The MICTAR investigators have found such personal idiosyncracies to be surprisingly concordant among identical twins raised apart. Such results strongly suggest the importance of nature or genetic variation in human affairs. A continuing part of the Minnesota research is a longitudinal study of aging twins.

A second impressive study of twins is the Swedish Adoption/Twin Study of Aging (SATSA) conducted at the Department of Environmental Hygiene of the Karolinska Institute at Stockholm in collaboration with the Center for Developmental and Health Genetics at Pennsylvania State University (Pedersen, Plomin, Nesselroade, & McClearn, 1992). That investigation uses the same powerful methodology of identical and fraternal twins, raised apart and together:

	Identical	Fraternal
Apart	46 pairs	100 pairs
Together	67 pairs	89 pairs

The Swedish twins were much older when studied than those studied at Minnesota, having an average age of 65.6 years. They had all been separated by the age of 11, with 52 percent separated by their second birthday and 82 percent by the age of 5. The twins were tested close to their homes with a battery of cognitive and intelligence tests. Heritability of general cognitive ability in these twins was estimated to be about 80 percent, even higher than estimates for younger populations, suggesting an increased influence of genetic factors later in life. Average heritabilities for verbal, spatial, perceptual, and memory tests were 58 percent, 46 percent, 58 percent and 38 percent, respectively.

The results of these two major investigations show the power of the *twin-study method* Galton pioneered and also show that genetic factors, what Galton termed *nature,* are powerful influences on individual differences in a variety of psychological, physiological, and physical traits.

> vice-presidents: Gifford Pinchot, the well-known conservationist, and Charles W. Eliot, the president of Harvard University. Even socialists Beatrice and Sydney Webb and Harold Laski counted themselves *eugenicists* (Degler, 1991, p. 43).

The terrible slaughter of World War I, in which, on an average day of trench warfare on the Western Front, 2,533 men on both sides were killed, 9,121 wounded and 1,164 missing (Manchester, 1983, p. 508) was itself a horrific *eugenic* exercise conducted by the great powers of Europe. But as the world struggled to recover from that devastation, *eugenics* seemed to promise the way to a better society. During the 1920s and 1930s, *eugenics* was influential in England, the United States, and Germany. *Eugenic* ideas and proposals were part of popular culture. On one of her visits to London, Isadora Duncan (1878–1927), the beautiful American dancer who earlier had shocked society with her free-form dances in clinging and revealing costumes, made a proposal to George Bernard Shaw (1856–1950). Duncan proposed that together they could produce a baby that, according to *eugenic* principles, would have her body and his brain. Shaw reluctantly declined Duncan's invitation, wittily pointing out that their baby was just as likely to have *his* body and *her* brain.

At the University of London, the chair of eugenics was held from 1912 to 1933 by the eminent statistician Karl Pearson. His successor was England's leading geneticist, J. B. S. Haldane (1892–1964). Haldane wrote extensively on the relation between biology, genetics, and society (Dronamraju, 1992). In his first book, *Daedalus, or Science and the Future,* published in 1923, Haldane was enthusiastic about *eugenics.* He described the *eugenics official* as a combination police officer, priest, and procurer who would arrange matches between suitable members of society. But Haldane diametrically changed his mind, and his 1938 book *Heredity and Politics* was a collection of attacks on *eugenics.* When his successor at University College was chosen, Haldane used his influence to ensure that an opponent of *eutenics,* L. S. Penrose, received the appointment.

In England, class-based discrimination in education and employment was common. In the United States, segregation and sterilization of the mentally retarded and restrictive immigration laws were often "justified" as *scientific eugenics* (Chapter 11). In Germany, the Kaiser Wilhelm Institute for Anthropology, Human Heredity, and Eugenics was established in 1927 (Weindling, 1985) as a national *eugenics* institute. With the rise of the Nazis, mass deportations and murders of European Jews and gypsies were justified as necessary to preserve the purity of the "Aryan race." On January 20, 1942, fifteen senior officials of the Gestapo, government, and Nazi party, eight of whom held Ph.D.s, met in conference in a huge, gray, stucco palace overlooking a lake in the elegant Berlin suburb of Wannsee. Over a lavish lunch lubricated with cognac, they planned Hitler's "final solution to the Jewish question." Under the direction of Adolf Eichmann and S.S. Chief Reinhard Heydrich, the group reviewed the technical details of killing, liquidating, and exterminating Jews (Schmemann, 1987, p. 23; Wyden, 1992, pp. 125–128; Stein, 1988). The Wannsee Conference led directly to the deaths of 6 million people in Nazi concentration camps over the next three years. Thus, *eugenics* came to have the worst possible reputation. Haldane wrote:

> The appalling results of false beliefs on human genetics are exemplified in the recent history of Europe. Perhaps the most important thing which human geneticists can do for society at the moment is to emphasize how little they yet know. (Haldane, 1965, p. xci)

Haldane's warning has not always been heeded. In 1993, the official New China News Agency reported legislation "On Eugenics and Health Protection" which had been submitted to the National People's Congress. *Eugenic* techniques of sterilization and marriage bans were to be used in China to "avoid new births of inferior quality and heighten the standards of the whole population." The aim was to prevent the birth of as many as 10 million "inferior" people each year. With a population of 1.2 billion, or 22 percent of the world's population, the People's Congress asserted that such *eugenic* measures were vital to China's national interest (*Washington Post* report, *Columbus Dispatch,* December 22, 1993, p. 3A). Gregory Stock, who heads the program on medicine, technology, and society at UCLA's School of Medicine, proposed in his book *Redesigning Humans: Our Invisible Genetic Future* (2002) that we make genetic modifications to eggs, sperm, and embryos that can be passed on to future generations.

Raymond Cattell, the author or coauthor of some five hundred publications in psychology, proposed in *Beyondism* (1987) that economic incentives such as tax relief or cash payments be used to encourage the socially successful to have large families, at the same time reducing the birth rate of the poor through a yet to be invented *antiaphrodisiac* (Cattell, 1987, p. 1). Cattell's aim was to provide "a helping hand to evolution" (Jahoda, 1989, p. 816). While acknowledging past abuses of eugenics Daniel Kevles (1987) asked if *eugenics* must always be a dirty word. He argued that eugenics and the conservation of natural resources are similar propositions. Both can be practiced foolishly so as to abuse individual rights, but both can also be practiced wisely.

Galton's Inquiries into Human Faculties

In 1872, Galton published a paper entitled *Statistical Inquiries into the Efficacy of Prayer* that is remarkable not only for its controversial subject matter, but for its clear advocacy of the importance of control groups. Galton wrote:

> The principles are broad and simple. We must gather cases for statistical comparison, in which the same subject is keenly pursued by two classes similar in their physical but opposite in their spiritual state; the one class being spiritual, the other materialistic. Prudent, pious people must be compared with prudent, materialistic people . . . We Simply look for the final result—whether those who pray attain their objects more Frequently than those who do not pray, but who live in all other respects under similar conditions. (Galton, 1872, p. 126)

The inclusion of control groups became common practice in methodologically sound research performed by the first generations of psychologists (Dehue, 2000).

In his book *Inquiries into Human Faculty and Development,* originally published in 1883 with a revised edition in 1907, Galton examined a number of different human faculties, including the faculty for prayer. Given that so many

people pray, Galton asked why. Are prayers efficacious? Do they have any effect? He believed that such questions could be answered using statistical techniques. Simply stated, the question is: Are prayers answered, or are they not? Galton considered the longevity of people who were publicly prayed for and of those who were not so fortunate. The sovereigns of England were the subjects of much prayer; every English schoolchild began each school day with a prayer that God grant Queen Victoria "in health long life to live." Queen Victoria (1819–1901) died at age 81, so in her case the prayers certainly appeared to have been effective. But was this generally true? Galton cited a study by Dr. Guy, who had compared the longevity of the kings and queens of England with that of other aristocratic and upper classes of people. Dr. Guy found that the sovereigns, with an average life span of 64 years, were the shortest-lived of all these groups. Prayer had apparently not been beneficial. However, Guy also found that clergymen were second only to the country gentry in longevity. Was that because they spent so much of their time in prayer? No, said Galton, it was not, but rather was a result of "the easy country life and family repose of much of the clergy" (Galton, 1883, p. 282). Galton studied insurance claims filed with Lloyds of London by people who clearly were about God's business (missionaries) and people who clearly were not (slave traders). There was no evidence that the missionaries' voyages were safer. Insurance companies paid attention to the class of the ship and the experience of the crew, but ignored completely whether the success of the voyage was prayed for. This and similar evidence led Galton to conclude that the question of the efficacy of prayer was at best still open. To provide a definitive answer, Galton proposed that Parliament pass a law requiring all the churches of England to hold services only on alternate Sundays. By comparing the course of history and the nation's welfare on weeks which began with or without church services, a test of prayer could be made. Predictably, his proposal was never taken up. In alternate weeks, Galton prayed to an idol he mounted on his mantelpiece and ignored it completely. He found no difference in the quality of his life. Galton's proposals and studies were roundly criticized. He was accused of weakening people's faith, assailing religion, and tampering in areas where science did not belong. Such criticisms were effective, and it is significant that his chapters "Theocratic Intervention" and "Objective Efficacy of Prayer" were the only two omitted from the second edition of the *Inquiries.*

Galton's Far-Reaching Interests

Inquiries contains much information about animals, one of Galton's wide interests. He tested animal sensory acuities by walking through the streets of London and the London Zoo with a whistle hidden in his walking stick. When he sounded the whistle, dogs would turn and look around, and animals in the zoo would often come to the front of their cages. Galton's knowledge of the countryside led him to speculate about the cuckoo. Cuckoos, like cowbirds in the United States, lay their eggs in the nests of other birds, leaving their young to be reared by the host species. Why doesn't the cuckoo adopt the song and habits of its parents and nest mates? It does not, Galton answered, because the bird's heredity controls such behaviors.

For his many contributions to science, Galton was knighted Sir Francis in 1909. He died on January 17, 1911, remaining socially and professionally active until his last days. Galton was truly a Renaissance man living in the age of Queen Victoria. His hereditarian position is still important in contemporary psychology. The biographical and twin-study methods he developed are still used to investigate the relative contributions of *nature* and *nurture* to human behavior. Our focus will now move to the United States, for it was there that psychology first developed as a science and profession.

JAMES MCKEEN CATTELL (1860–1944)

We encountered Cattell in Chapter 4 as one of the first students to receive a Ph.D. degree with Wilhelm Wundt. In September 1886, Cattell was appointed to a position as a fellow-commoner at St. John's College, Cambridge. In England he met Galton, whom he would later describe as "the greatest man I have ever known" (Cattell, 1929, in Sokal, p. 222). Galton's intense interest in human capacities and behavior had great appeal to Cattell, as did his drive to observe and measure. During an earlier fellowship at Johns Hopkins University with G. Stanley Hall, Cattell studied the effects of various drugs by taking them himself, just as Galton had done at Cambridge. Until that time he had never used wines, spirits, coffee, or tobacco—his father had promised him $1,000 if he did not smoke until he was 21—and the effects were dramatic. His first cup of coffee reduced his pulse rate to forty-eight beats per minute, and as he drank a bottle of wine, his handwriting showed dramatic change. Under the influence of hashish, he wrote musical compositions apparently grander than those of Bach, and verse more beautiful than Shelley's; unhappily, the verse turned out to be

In the Spring,
The birds sing.

Cattell remained intensely curious about his own behavior and reactions throughout his life and never neglected an opportunity to collect data. In his address as President of the International Congress of Psychology (Cattell, 1929), he presented curves showing his own times walking and running a mile each day for many months, heart rate measurements after each mile of many three-mile runs, and practice curves for learning to type and to play bridge, chess, billiards, and tennis. The similarities to Galton are striking.

In 1888, Cattell returned to the United States as a professor of psychology at the University of Pennsylvania. He established a laboratory there and used Galtonian measures with students taking the laboratory course in psychology. In a paper entitled *Mental Tests and Measurements* published in 1890 in *Mind,* Cattell described the following ten tests and used the term *mental test* for the first time:

Dynamometer Pressure

Rate of Movement

Sensation-Areas

Pressure causing Pain

Psychology Finds a Home in the United States

The last decades of the nineteenth century saw developments in the United States resulting in greater educational opportunities and increased support for science and learning. One result was that American science, including psychology, began its march to the dominant position it still holds in the world. Those decades followed the catastrophe of the Civil War years, from 1861 to 1865. In *Trial by Fire: A People's History of the Civil War and Reconstruction,* Page Smith writes:

> The Civil War was an event too vast to comprehend, an event that on both sides at once rose to mythic proportions—for the South it became the "Lost Cause," the story of innocence besmirched, of chivalry betrayed; for the North the story of treason vanquished and overweening pride humbled . . . It was a necessary war, an unnecessary war; a cleansing by fire; a war to preserve the Union; a war to free the slaves; both; neither; a corruption of the spirit; an act of aggression by the capitalist North against the agrarian South; and on and on. (Smith, 1982, p. 992)

But even during the terrible War years, the Congress of the United States enacted progressive and far-sighted legislation that changed the country forever. Menand (2001) lists some of the achievements of that wartime Congress:

> That Congress was one of the most active in American history. It supported scientific training and research; it established the first system of national taxation, and created the first significant national currency; it made possible the construction of public universities and the completion of the transcontinental railway; it turned the federal government into the legislative engine of social and economic progress. (Menand, 2001, pp. ix–x)

The legislation for public universities was passed in 1858, but President Buchanan vetoed it. More successful was an act sponsored by Senator Justin Morrill that President Lincoln signed on July 2, 1862. That legislation's goal was to make higher education available to all young people in the United States who had the desire and ability to profit

Least Noticeable Difference in Weight

Reaction-Time for Sound

Time for Naming Colours

Bi-Section of a 50-cm. Line

Judgment of 10 Seconds Time

Number of Letters Remembered on One Hearing

Cattell pointed out that "the series begins with determinations rather bodily than mental, and proceeds through psychophysical to more purely mental measurements"; these tests, Cattell asserted, would allow psychology to "attain the certainty and exactness of the physical sciences" (Cattell, 1890, p. 373).

In 1891, Cattell moved to Columbia College in New York City as a professor of experimental psychology. His salary of $2,500 per year was twice his salary at Pennsylvania (Sokal, 1981, p. 330). He established a laboratory and used his mental tests with students taking the laboratory course in psychology and gave it to one hundred volunteers from each year's freshman class; this came to be known as the "Freshman Test," though it had nothing to do with

Psychology Finds a Home in the United States (Continued)

from a college education. In the words of the act, it was designed

> to promote the liberal and practical education of the industrial classes primarily in the areas of agriculture and mechanics.

Grants of 30,000 acres of federal land for each member of Congress were made to the states. Proceeds from the land sales were to be invested in "safe stocks to yield not less than 5 percent." Those funds would finance the new people's universities and pay their students' fees. Not all states chose to exercise this land grant option. But in those that did, we see today universities with either the words *Agriculture and Mechanics* (A & M) or *State* in their names. Their land grant heritage is uniquely American. For their students, land grant universities were a path to a better life, to the American dream. One student recalled: "The classrooms were bare, the chairs and desks of the plainest. But as against that were the students. We knew it as a Gospel truth that this plain College was for each of us a passport to a higher and enabled life" (Jennings, 1989). Others saw research and learning as the new American frontier, one that would replace the Western frontier. In 1893, the American historian Frederick Jackson Turner proclaimed that on this new frontier, "The test tube and the microscope were needed rather than the ax and rifle" (*Time,* June 10, 1996, p. 67). The first generation of American psychologists saw themselves as working on that frontier, many of them in the recently established land grant universities. In 1929, Cattell, in his Presidential Address to the Ninth International Congress of Psychology at Yale, gave a picturesque description of psychology fifty years earlier: "In so far as psychologists are concerned, America was then like Heaven, for there was not a damned soul there" (Cattell, 1929, p. 335). In contrast, Cattell saw psychology in America in 1929 as fully populated.

admission to the university. Cattell's tests were a culmination of attempts to assess psychological processes using physical measurements. Griesbach had made such attempts previously in Germany (Chapter 6) and Galton had done the same in England. By 1901, it was clear that this program of *anthropometric* testing had failed. The final blow was delivered by one of Cattell's students, Clark Wissler, who used Pearson's correlation techniques to measure the strength of the relationship between scores on different tests (Wissler, 1901). Wissler found almost no correlation between scores on one set of Cattell's tests and any other; he also found no correlation between a student's overall academic performance and his test scores. He and many other psychologists concluded that what was needed were psychological tests of complex mental processes. The tests developed by Alfred Binet, Lewis Terman, and many others (Chapter 11) appeared to provide such measures. They superseded Cattell's *anthropometric* measures, so his method of testing was abandoned.

Cattell's Other Research

In an 1895 paper published in *Science,* Cattell reported the results of experiments in which he asked students about distances on campus, the weather a

week before, the dates of important historical events, and the content of a lecture given the previous week. Recall was often disconcertingly poor. In the case of the lecture, students often recalled fanciful and extraordinary material that the lecturer had not presented. Cattell concluded that our memories are often much less reliable than we think.

Cattell also conducted experimental research on judgments of relative rank. First he produced a series of two hundred shades of gray, which changed in subtle steps from black to white. Students were asked to order them on the basis of brightness, and their rankings were compared with photometric brightness measurements. The students' rankings and photometric measures correlated well. Cattell then used a similar procedure to establish relative rankings of scientists. For psychologists, for example, Cattell (1903) first prepared a list of contemporary psychologists and then asked leading psychologists to rank the listed individuals. It is one thing to rank shades of gray and quite another to rank one's contemporaries. Discreetly, Cattell did not publish the psychologists' rankings until 1929, when he made them available in conjunction with his presidential address to the Ninth International Congress of Psychology (Cattell, 1929). His "top ten" psychologists in 1903 were

James

Cattell

Münsterberg

Hall

Baldwin

Titchener

Royce

Ladd

Dewey

Jastrow

Cattell published similar rankings of other scientists in *American Men of Science* (1906). In the Galtonian tradition, he also studied the family backgrounds and educations of the men he ranked. Cattell's conclusion was that a person who aimed to become a scientist had the best chance if he had a professor or a clergyman for a father; Cattell himself had both. Given such studies and his Galtonian heritage, it is no surprise that Cattell was a *eugenicist.* He argued forcefully for the importance of inheritance and proposed that "incentives be given to the best elements of all the people to intermarry and have large families" (Cattell, 1909, in Sokal, 1971, p. 360). Cattell had seven children and offered each of them $1,000 if they married the child of a college professor. None of his children attended public schools, but they were instead educated at home by tutors, often Cattell's graduate students, working under his supervision. All seven of Cattell's children became either scientists or science editors, with McKeen and Psyche Cattell following their father into psychology.

Psyche Cattell (1893–1989)

The life and career of Psyche Cattell provide a poignant example of the many difficulties faced by the first generation of women in psychology. In her case there is an especially sad irony in that much of her work has been credited to her father, James McKeen Cattell, or to the unrelated Raymond B. Cattell (Sokal, 1991, p. 72). After being educated at home, Psyche Cattell first worked for her father on the statistical analysis for his *American Men of Science.* After undergraduate studies at Cornell, Psyche Cattell earned Master's (1925) and Doctoral (1927) degrees in Education from Radcliffe College. In the 1920s, Psyche Cattell used data from the Harvard Growth Study to compare measures of intelligence and to follow variations in intelligence across time. Her position was that of a statistical consultant, analyzing data that others collected. In the 1930s, Cattell developed an intelligence test for infants as young as 3 months. Her test was published in 1940 and was widely used. From 1939 to 1963, Psyche Cattell worked as a staff member and then Director of the Lancaster Guidance Clinic in Lancaster, Pennsylvania. There she pioneered high-quality early childhood education. Based upon her experience in Lancaster, and as one of the first unmarried women to adopt two children, Psyche Cattell wrote *Raising Children with Love and Limits,* published in 1972. That popular book was a reaction to what she considered the permissiveness of Benjamin Spock's best-selling *Baby and Child Care.*

Despite her family lineage, her distinguished academic record, and her important contributions, Psyche Cattell never held an academic position. She was one of many women in psychology who faced discrimination and prejudice (Scarborough & Furumoto, 1987; Schiebinger, 1989).

More than fifty students took Ph.D. degrees with Cattell during his twenty-six years at Columbia University. Three of the best known were Edward Lee Thorndike, whose experiments on cats' instrumental learning and whose work in education are still widely quoted (Chapter 10); Robert S. Woodworth, a prominent experimental psychologist who succeeded Cattell as head of the Department of Psychology at Columbia (Chapter 10); and Edward K. Strong, a well-known industrial and vocational psychologist who developed the *Strong Vocational Interest Test.* Despite Cattell's reputation as a difficult, prickly, and aggressive personality (Sokal, 1971), his students were warm and appreciative in their recollections of him (Conklin et al., 1944). Woodworth, for example, remembered Cattell as a man at whose home "the latch-string seemed to be always out for his colleagues" (Woodworth, 1944b, p. 9).

The Controversial Cattell

At Columbia, Cattell was a leading advocate of faculty governance and a frequent critic of Columbia's administration, trustees, and president. He considered them autocratic and untrustworthy. His opinion of Columbia's president Nicholas Murray Butler is illustrated by the anecdote Cattell told about one of his daughters: "I once incited one of my children to call her doll Mr. President,

on the esoteric grounds that he would lie in any position in which he was placed" (Sokal, 1981, p. 332). In 1917, Cattell's career at Columbia came to an abrupt end when he was dismissed from the faculty for his vehement opposition to American involvement in World War I. In May 1917, one of his sons, Owen Cattell, was arrested and convicted of distributing literature opposing conscription. In August, Cattell wrote an open letter to Congress supporting his son and protesting the government's decision to send conscripts to fight in Europe. His letter caused a storm of controversy. In announcing Cattell's dismissal and denial of his pension, President Butler of Columbia stressed that with America at war:

> What had been tolerated before becomes intolerable now. What had been wrongheaded was now sedition. What had been folly was now treason. There is and will be no place in Columbia University for any person who opposes or counsels opposition to the effective enforcement of the laws of the United States, or who acts, writes, or speaks of treason. The separation of any such person from Columbia University will be as speedy as the discovery of his offense (P. Smith, 1985, vol. 7, p. 551).

Cattell sued the university and was awarded damages of $42,000 but was never reinstated and never again held an academic position. Rather he turned to publishing and analysis of the scientific enterprise.

Cattell as an Editor and Publisher

After his dismissal from Columbia, Cattell turned to editing and publishing. In 1894, he established with James Mark Baldwin of Princeton the *Psychological Review.* He edited the review in alternate years until 1904. Cattell also had a long association with the journal *Science.* Founded in 1880, *Science* had been supported financially by Thomas Edison and Alexander Graham Bell, but despite this auspicious backing, the magazine lost large sums of money and ceased publication in 1894 (Kohlstedt, 1980). Cattell bought the rights to the defunct magazine for $25, and in January 1895 he published the first of a "new series" of *Science.* Early in 1896, he had the good fortune to score a journalistic coup with a paper describing X rays. Wilhelm Roentgen had discovered X rays in November 1895, and a German journal article published in December of that year described them. Hugo Münsterberg wrote a description of Roentgen's discovery that Cattell published in *Science* on January 31, 1896. X rays were exciting and controversial—the eminent British physicist Lord Kelvin had predicted they would prove to be a hoax—so the first English-language description was an important paper. In 1900, Cattell forged an agreement with the American Association for the Advancement of Science (AAAS), making *Science* the official journal of the Association. Cattell agreed to provide each AAAS member with a subscription to *Science,* for which the AAAS would pay him $2. The agreement was mutually beneficial, for Cattell gained a guaranteed circulation and a source of papers for publication, while the AAAS could attract members by providing them with a subscription to *Science.* In 1944, the AAAS bought the rights to *Science* from Cattell. When the final payment was made in 1954, $270,000 had been paid to Cattell's heirs (Boffey, 1971). At one time or another,

Cattell published seven journals, including *Popular Science Monthly, American Men of Science* and *The American Naturalist.* He was psychology and science's first great publisher, promoter, and businessman.

Cattell's Involvement in Professional Affairs

Cattell was one of the founding members of the American Psychological Association (APA) in 1892; a member of the APA's council from the beginning; the association's third secretary in 1894; and its president in 1895. In 1901, Cattell was the first psychologist admitted to the National Academy of Sciences; he was president of the American Association for the Advancement of Science in 1924 and presided at the Ninth International Congress of Psychology held at New Haven in 1929. In 1921, Cattell established the Psychological Corporation to apply psychological knowledge to industry and education. The corporation was a success and is still active in marketing such psychological tests as the Wechsler Adult Intelligence Scale (WAIS), the Wechsler Intelligence Scale for Children (WISC), the Thematic Apperception Test (TAT), and the Beck Depression Scale.

Cattell died in 1944. His was a rich and diverse professional life, very different from that of his contemporary Titchener. He was an important figure in the transition from the Victorian England of Darwin and Galton to the American psychologists James and Hall. It seems appropriate to describe Cattell's life and career as truly Galtonian.

WILLIAM JAMES (1842–1910)

During the late nineteenth and early twentieth centuries, William James was widely recognized as America's foremost psychologist. In Cattell's 1903 ranking, James was the most distinguished contemporary psychologist, but even more impressive, *all* Cattell's rankers placed James first. James also had an international reputation; many in Europe regarded him as the pope of American psychology. Who was William James, and how did he come to have such a distinguished reputation?

James's Early Life

James was the child of a wealthy and cultivated Irish-American family. He was born January 11, 1842, in the Astor House, the busiest and most luxurious hotel in New York City. One of James's biographers, Gay Wilson Allen, described his early years as a "transatlantic infancy" (Allen, 1967, chapter 2). James made a trip to Europe in 1843, the first of many such journeys and tours. He attended schools in the United States, England, France, and Switzerland, encouraged by parents who took an active interest in their children's education. James was truly cosmopolitan, speaking French, German, and Italian fluently and feeling thoroughly at home anywhere in Europe. Later in life, he claimed to know every important European psychologist and philosopher.

As a young man, James met many of the great people of his time. In the United States, Ralph Waldo Emerson, Henry Thoreau, and William Thackeray,

among others, visited his home; in England, Thomas Carlyle, Alfred Lord Tennyson, and John Stuart Mill (Chapter 2) were frequent visitors. James grew up in a liberal, enlightened, stimulating environment. On their many tours abroad, the James family always traveled in high style; on a trip to England they lived in a house adjoining Windsor's Great Park, next door to the Duchess of Kent and within sight of the Queen's Windsor Castle. James had three brothers and one sister, Alice, with whom he had an especially affectionate relationship. In her biography of Alice James, Jean Strouse (1980) described her as a brilliant woman whose family did not allow her to build a career as a writer. Rather, she was expected to fulfill what they saw as her destiny: to marry and have children. Alice James was unable to meet those demands. In a poignant diary entry, she asked:

> When will women begin to have the first glimmer that above all other loyalties is the loyalty to Truth, i.e. to yourself, that husband, children, friends and country are as nothing to that. (*Alice James Diary,* November 19, 1889, in Bartlett, 1992, p. 556).

Alice James had a long series of illnesses characterized by serious neurasthenic[3] symptoms and died in 1892 at the age of 44. Her death was a devastating blow to William James. Henry James, Jr., the writer, was another son in this extraordinary family. Unlike Henry, who always wanted to be a writer, William's career plans were vague. In 1861, he studied art, having shown a talent for painting and drawing from an early age. One of his fellow apprentices who went on to a successful artistic career recalled that: "James had the promise of being a remarkable, perhaps a great painter" (La Farge, 1910, p. 8). But after a few months he abandoned art, perhaps because his father did not approve of an artistic career, or perhaps because he had trouble with his eyes. Nevertheless, Leary (1992, p. 152) has argued that James's artistic sensibility and experience were critically important to the development of his psychological and philosophical thought. On April 13, 1861, Fort Sumter surrendered to the Confederate forces. President Lincoln called for seventy-five thousand volunteers to join the Union forces, but James did not respond. Instead, he enrolled in the Lawrence Scientific School at Harvard. His first major was chemistry, but James hated the subject itself and especially the associated laboratories. He switched to a general program in natural history. In 1865, James went with Louis Agassiz as an unpaid research assistant on a collecting trip to the Amazon. Agassiz was a Harvard luminary, a famed biologist, geologist, and paleontologist. The founder and director of Harvard's Museum of Comparative Zoology, Agassiz was an active proponent of the view that God had created all forms of life as separate, immutable, fixed species. He believed that the study of nature was the study of God's work and thought of himself as God's mirror on the universe (Lurie, 1989). Agassiz considered Darwin's theory of evolution to be wrong, unscientific, and sacrilegious. He described himself as a man determined to disprove Darwin. Though Agassiz was a genial professor much loved by his stu-

[3] *neurasthenia,* n. Nervous debilitation and exhaustion, as from overwork or prolonged mental strain, characterized by vague complaints of a physical nature in the absence of objective and physical causes. (RHDEL, p. 960)

dents, for James the expedition was far from successful. He was terribly seasick on the voyage to South America and developed a severe stomach disorder that delayed his departure for the interior. James had to remain in Rio de Janeiro with the dull job of preserving and classifying specimens the expedition sent back. He was very homesick, and though he found the sights of Rio intoxicating, he was still more of an artist than a scientist, and his first impulse was to sketch the things he saw. When he finally joined the expedition on the Amazon, James loved the beauty and abundance of the plant and animal life and found the Brazilian Indians impressive. In a letter home, James asked: "Is it race or is it circumstances that makes these people so refined and well-bred? No gentleman of Europe has better manners, and yet these are peasants" (Menand, 2001, p. 136). But James hated Brazil's ferocious insects and debilitating climate. He also became disillusioned with Agassiz, whom he came to regard as a great teacher of scientific observation but a man with fixed and rigid views. James left the expedition in December 1865 and sailed home, convinced that the life of a systematic collector was not for him. His interests were more speculative—he characterized them as "lightweight"—but they allowed him to make major contributions to psychology and philosophy.

James returned to Harvard to study medicine. But his embrace of medicine was tepid at best:

> I embraced the medical profession a couple of months ago. My first impressions are that there is much humbug therein, and that, with the exception of surgery of which something positive is sometimes accomplished, a doctor does more by the moral effect of his presence on the patient and family, than by anything else. He also extracts money from them (James, 1864, in Allen, 1967, p. 98).

In 1867 and 1868, James interrupted his medical studies in a way that must seem inconceivable to today's harried medical or premedical students. He read Darwin, traveled to Europe, and visited the laboratories of Fechner, von Helmholtz, Wundt and Du Bois-Reymond. He received an M.D. degree in 1869, firmly resolved never to practice medicine—a resolution he kept for the rest of his life. As a medical student, James was plagued by numerous illnesses—back pains, eye troubles, insomnia. The drugs that were prescribed for him gave him little relief. James quoted with approval a quip by a former dean of the Harvard Medical School: "If the whole *materia medica,* excepting only opium and ether as now used, was sunk to the bottom of the sea, it would be all the better for mankind and all the worse for the fishes" (Holmes, 1853, in Allen, 1967, p. 99). James believed that his illnesses and exhausting bouts of anxiety and depression were psychological (Myers, 1986). He was far from the "adorable genius" of some depictions. At the age of 28, in 1870, James recorded a crisis in his diary and contemplated suicide. He decided to accept the view of Charles Renouvier that we have free will since we can sustain a thought because we choose to, when we might have other thoughts instead (Myers, 1986). James was later to label such assertions "pragmatic," and he found them most encouraging. He recorded in his *Diary* that he had decided to assume that he had free will in Renouvier's sense and that his first act of free will would be to believe in free will. James also resolved that for the rest of his life he would take the mind seriously.

James Enters Psychology

In 1872, James was offered a position as an instructor in physiology and anatomy at Harvard at an annual salary of $600. Melvin Maddocks described Harvard at the time as "unimaginably small and humble" (Maddocks, 1986, p. 140), but under the presidency of James's former chemistry professor, Charles William Eliot, Harvard was about to enter its golden age. James procrastinated for a year before accepting, and then in 1874 offered his first Harvard course on the relationship between physiology and psychology. James had taken courses in physiology but not in psychology for the simple reason that none were offered at Harvard. Where, then, did he learn his psychology? From studying his own consciousness and observing the behaviors of people around him; he was self-taught. In his characteristically charming way, James once recalled that the first lecture on psychology he ever heard was the first lecture he himself gave to his students (Menand, 2001, p. 94). In 1875, James used $300 from the Harvard Corporation to set up an improvised demonstration laboratory that allowed students to observe some of the experiments he described in his lectures. (Maddocks, 1986, p. 150). His courses were a success, and in 1876 James was appointed to the rank of assistant professor at a salary of $1,200 a year.

In 1882, James took a leave of absence from Harvard and traveled to Europe, renewing his contacts with many European psychologists, philosophers, and physiologists. Returning to Harvard, he was appointed a professor of philosophy in 1885 and a professor of psychology in 1889. It appears that these promotions were based almost entirely on his obvious promise and brilliant teaching reputation rather than his research contributions. However, James was well-known in Europe and in 1889 was invited to preside at the opening session of the International Congress of Psychology held in Paris. James reported after the Congress that he had been greatly encouraged by the sight of 120 men actively interested in psychology. However, his views of some of those men and of others he met in Europe were not always positive. In a letter to Stumpf (Chapter 6), James (1887) described Wundt as "the model of a German Professor" but as "the finished example of how much mere education can do for a man." Müller he described as "brutal," and Fechner he considered a man whose careful work in psychophysics would produce "just nothing" (James, 1890, vol. I, p. 534). In a letter to the Harvard historian George Santayana, James described Ebbinghaus as one of the Europeans' "best," and "the good and sharp-nosed Stumpf the most profound and philosophical of all the writers," to whom he owed much (James, 1888, in Perry, 1935, vol. II, p. 60).

James's *Principles of Psychology*

James's successful teaching career at Harvard and the recognition he received in Europe increased his self-confidence and sense of well-being. But he was still unable to assert complete independence from his father. In 1876, when James was 34, his father informed him that he had just met William's future wife, Alice Howe Gibbons, a Boston schoolteacher (Allen, 1967, p. 214). It was up to him to meet, court, and marry Miss Gibbons, which William James dutifully did in 1878. James was fortunate in his father's choice, for his wife shared many of his interests and was untiring in her devotion to him. Some 1,400 letters from James

to his wife have been published (Bjork, 1988). They show the strength of his love for Alice. Also in 1878, James signed a contract with the publisher Henry Holt for a book on psychology. James hoped to write the book in two years and began it on his honeymoon, but it actually took twelve years to complete. For James, writing was a painstaking task, requiring constant revision and reworking. In a letter to his publisher accompanying the final manuscript, James described the *Principles* and himself as: "A loathsome, distended, timified, bloated, dropsical mass, testifying to nothing but two facts: first, that there is no such thing as a science of psychology and second that W.J. is an incapable" (James, 1890, in Murphy & Kovach, 1972, p. 195). He was wrong on both counts.

Published in 1890, the two-volume, 1,393-page *Principles of Psychology* was an immediate success, and it is often cited as a classic among classics. Much of the writing seems so effortless that it is hard to remember that great emotional turmoil and sheer hard work went into the book. With an eye to a major commercial success, Henry Holt in 1892 published a 478-page abridgement entitled *Psychology: A Briefer Course.* It was a popular success. For many years, James's two books were the standard psychological texts not only in the United States but also in England, France, Italy, and Germany. They were even translated into Russian. A whole generation of psychologists learned from these books, referring to them affectionately as "the James" (*Principles*) and "the Jimmy" (*Briefer Course*) (Allport, 1961, p. xiv). Ralph Barton Perry recalled their impact:

> The *Principles of Psychology* was successful in a sense that is unusual for a book of science—it was widely read, not only by other psychologists, or by students of psychology, but by people who were under no obligation to read it. It was read because it was readable, and it was read by people of all sorts, often because of the very qualities which condemned it in the eyes of some professional psychologists. It was a tolerant, curious book; and because its author saw so wide a range of possibilities, and was so promiscuously hospitable to them, almost any later development in psychology can trace a line of ancestry there. (Perry, 1948, p. 196)

In a collection of *Reflections on the Principles of Psychology* published to mark the book's centennial (Johnson & Henley, 1990), Rand Evans described the *Principles* as "probably the most significant psychological treatise ever written in America" (Evans, 1990, p. 11). William Dember called the *Principles* "a marvel and still a source of joy and puzzlement to psychologists struggling with the core issues of our discipline" (Dember, 1992, p. 741). In 1990, the recently founded American Psychological Society devoted an issue of its flagship journal *Psychological Science* to a centennial celebration of James and the *Principles* (Estes, 1990). Peter Gray wrote in the Preface to his leading contemporary *Introductory Psychology* text:

> One of my dearest aims has been to achieve some small measure of the personal touch that William James accomplished so masterfully in the *Principles of Psychology*—the book that still stands in my mind, as far and away the best introduction to psychology ever written (Gray, 2002, p. xv).

To such justified praise, perhaps one *caveat* should be added. Read the psychology in James, but ignore the outdated material on brain and sensory function presented in the early chapters of the book.

These two books established James as America's foremost psychologist. He was also a superb lecturer, famous for his brilliant style, striking metaphors, and lively presentation. James delighted in questions—he was one of the few Harvard professors at the time who allowed students to ask questions—and it was said that students were able to see his mind at work while he was framing his answers. One of the great joys of university teaching is following the careers and achievements of former students. One of James's most famous students was Theodore Roosevelt. James was also interested in addressing a wide audience. He developed a series of lectures for teachers which grew into his popular book *Talks to Teachers,* published in 1899. This book is practical and down-to-earth, a delightfully written collection of hints and advice for the teacher.

James was not suited by temperament or inclination to be a research worker; he was a gentleman psychologist. For him the results of laboratory investigations in psychology were simply not commensurate with the effort involved. James described Wundt's method of introspection and precise laboratory investigation as "a method which taxes patience to the utmost, and could hardly have arisen in a country whose natives could be bored." Similarly, what he termed the "brass-instrument" and "algebraic-formula filled psychology" of Fechner filled him with horror (James, 1890, vol. I, p. 549). For James, laboratory research was a psychological tool to regard with suspicion. His forte was broad thoughts and insights. Given such views, it comes as no surprise that following the success of his books James withdrew from experimental research and, as we have seen (Chapter 5), sought a successor to head the psychological laboratory at Harvard. In 1892, he chose Hugo Münsterberg, a 28-year-old German psychologist trained in orthodox introspective methodology by the master himself, Wilhelm Wundt.

James as an Eclectic

During the 1890s, James became increasingly interested in mind-body relationships and psychical phenomena. Since he had a long history of psychosomatic illness, he was interested both personally and professionally in what were called "mind cures." He took claims for such cures seriously, investigating them scientifically and even defending their advocates against orthodox medical practitioners. This, of course, did not endear him to his medical colleagues. James believed that psychologists must study the whole realm of psychological experience, including psychical experiences. He was a founding member of the American Psychical Association and president of the British Society for Psychical Research (Pate, 2000, p. 1142). James studied automatic handwriting, telepathy, clairvoyance, fortune-tellers, and a famous Boston medium, Mrs. Piper. His conclusion was that in Piper's case, some external will to communicate probably was there, but he rejected many of her claims. In searching for facts in this tremendously difficult area of psychological inquiry, James was both skeptical and open-minded. He was also interested in the effects of religious experiences on human consciousness. He defined such experiences very broadly as ones in which some sort of energy flows into consciousness. Such an energy flow could occur in both conventional and unconventional religious settings. His book *Varieties of Religious Experience* (1902) was very popular. The

original publisher reprinted the book 38 times over the next 33 years. With little effort, contemporary reviewers of the work located 29 more printings from 13 other publishers (Gorsuch & Spilka, 1987, p. 773), and James's book is still used today both as a text and reference book. James was also fascinated by the possibility of life after death and promised that after death he would return to the world of the living if he could possibly manage it.

James as a Philosopher

During the last decade of his life and career, James turned away from psychology toward philosophy and established a reputation as America's best-known philosopher since Emerson. In *Pragmatism* (1907) and *The Meaning of Truth* (1909), James presented a practical, down-to-earth pragmatic philosophy he had described in a letter to Theodore Flournoy in 1907 as a "philosophy without humbug" (James, 1907, in Allen, 1967, chapter 23). This philosophy was well-suited to the spirit of the times in the United States. It has been said that, "Giraffes get longer necks—Americans get pragmatism" (Romano, 2001, p. 58). The central tenet of pragmatism is that pragmatic criteria may be applied in establishing truth. Beliefs do not work because they are true; they are true because they work. If, for a particular person, a belief in God works—that is, if it produces practical benefits in terms of happiness, personal adjustment, and psychological health—then for that person, the existence of God is a pragmatic truth. If a person believes that bathing in a particular mineral bath—something James himself did—will relieve back pain, and it does, then that is a truth for that person. However, such beliefs or truths are not absolute and should not be imposed on others. Because each person's system of beliefs must be established using pragmatic criteria, pragmatic philosophy is an individual and relative system. The pragmatist judges all beliefs by their consequences in action: the statement that John is six feet tall means nothing more than that a one-foot rule can be turned end-over-end six times alongside John; the statement can be defined operationally. James believed that pragmatic criteria can resolve the seemingly eternal clash between rationalism and empiricism. James believed rationalists to be intellectual, idealistic, optimistic, religious, free-willed—in summary, "tender-minded," and empiricists to be sensationalistic, naturalistic, pessimistic, irreligious, fatalistic—in summary, "tough-minded." James is describing a personality typology. Typologies such as introversion/extroversion, dominant/submissive, and liberal/authoritarian, with their descriptions of ideal personality types, have been common in psychological studies of personality. However, no other psychologists have come up with such a perfect summary description as James's "tender-" and "tough-minded" characterizations.

As we have seen, the work that established James's reputation was the *Principles,* and it is to that book that we turn in considering his specific contributions to the development of psychology.

James as a Psychologist

James defined psychology as "the science of Mental Life, both of its phenomena and their conditions" (James, 1890, vol. I, p. 1). Those phenomena included

feelings, desires, cognitions, habits, memories, reasoning, and decisions. James studied them by informal introspective analysis of his own conscious experience. James opposed the Wundt-Titchener approach to the study of consciousness; he outlined his objections in a forceful and convincing paper entitled *Some Omissions of Introspective Psychology* (James, 1884). According to James, Wundt and Titchener assumed consciousness to be a synthesis of basic elements and so searched for its elements. James believed that this structuralist approach was unnecessarily restrictive, sterile, and artificial. It robbed psychology of most of the phenomena of consciousness James found important and interesting. James compared the structuralists' approach to that of a person who assumes that a house is a synthesis or agglutination of bricks and sets out to learn about the house by studying each brick. As the French mathematician Jules Henri Poincare (1854–1912) asserted, a house is a heap of stones; but a heap of stones is *not* a house. James proposed an analytical approach that studies the functions of consciousness and analyzes its characteristics; that studies how the mind works rather than its structure. James's powerful critique provoked this angry response from Titchener: "James's influence both in philosophy and psychology appears to me to be getting positively unwholesome. His credulity and his appeals to emotion are surely the reverse of scientific" (Titchener, 1898 letter to Cattell, in Menand, 2001, p. 370).

For James, the outstanding feature of human consciousness is that it is adaptive; that is, it allows us to adapt and adjust to our environment. Consciousness also has a number of other characteristics (James, 1890, vol. I, p. 225):

1. It is personal. My consciousness is mine alone; it is individual, not part of a general consciousness or group mind. My thoughts are mine, and yours are yours.
2. It is ever-changing. We are constantly seeing, hearing, reasoning, willing, recollecting, and longing, so consciousness is not static but is a stream.
3. It is continuous. Consciousness is not chopped up into bits or *quanta* for the convenience of introspectionist psychologists. It is a continuous stream.
4. It is selective. We are born into a world that James described in a famous metaphor as "one great blooming, buzzing confusion" (James, 1890, vol. I. p. 488) in which "sounds, sights, touches, and pains form probably one unanalyzed bloom of confusion" (James, 1890, vol. I, p. 496). If this confusion is analyzed, consciousness becomes selective.

Given such characteristics, James believed that the structuralists' attempts to develop general laws or principles of consciousness, to freeze consciousness and find its elements, were doomed to fail.

James made another major contribution to psychology with his formulation of a theory of emotion. This theory has come to be called the James-Lange theory since the Danish physiologist Carl Lange formulated a very similar hypothesis at about the same time. James first described the theory in a paper published in 1884 in the journal *Mind*. According to this theory, the nervous system makes certain innate or reflex adjustments to external stimuli, and it is the perception of these changes that constitutes the emotion. In the presence of emotional stimulation, our heart rate increases, we breathe more rapidly, we perspire, and we label the perception of these changes "emotion." To quote

James's famous examples, we see a bear, certain physiological responses occur, and we experience fear; we lose our fortune, other changes occur, and we feel sad. James wrote:

> My theory . . . is that the bodily changes follow directly the perception of the exciting fact, and that our feeling of the same changes as they occur IS the emotion. Common-sense says, we lose our fortune, are sorry and weep; we meet a bear, are frightened and run; we are insulted by a rival, are angry and strike. The hypothesis here to be defined says that this order or sequence is incorrect, that the one mental state is not immediately induced by the other, that the bodily manifestations must first be interposed between, and that the more rational statement is that we feel sorry because we cry, angry because we strike, afraid because we tremble, and not that we cry, strike, or tremble because we are sorry, angry, or fearful as the case may be. (James, 1890, vol. II, pp. 449–450)

Physiological changes are the *mind-stuff* that constitute emotions. A direct corollary of such a view of emotion is that arousing the physiological changes associated with a particular emotion should give rise to the emotion itself, and James pointed out that this is often the case. Giving way to grief or anger makes the emotion more intense; sobbing makes sorrow more acute; we work ourselves up to a climax in a rage. On the other hand, controlling the physiological response by, for example, counting to ten in the face of provocation, or whistling to keep up our courage, in turn affects the emotions of anger and fear. In the two years preceding the formulation of his theory of emotion, James had lost both of his parents. Perhaps his awareness of his own response to those losses and the ways in which he had been able to control his grief influenced his formulation of this theory.

One way to attempt to control undesirable emotions would be to learn to control the physiological changes that accompany them, an approach many modern clinicians have adopted. Thus one might be trained to relax in the presence of a fear-eliciting situation such as taking an exam, riding in an elevator, or taking radiation treatment. If one can counter the physiological responses through relaxation, one can often overcome fear. In an even more direct approach, modern *biofeedback* techniques can be used to develop some control over these physiological changes.

James's theory of emotion was, and still is, highly regarded by psychologists, but it has been less appealing to physiologists. In 1927, Walter B. Cannon (1871–1945) cited several pieces of evidence he considered to conflict with the James-Lange theory. First, emotions continue even though awareness of internal bodily changes is reduced or even eliminated. Cannon cited the case of a woman with a broken neck who received no sensations from the viscera below her neck, yet continued to experience a full range of emotions. Second, many different emotions share a common set of visceral reactions. Where does the specificity come from? When we are angry, happy, or fearful, our heart rate speeds up, blood pressure increases, and so forth, yet these are clearly different emotional experiences. Attempts to associate discrete bodily reactions with different emotions are generally unsuccessful. Third, visceral reaction times are relatively slow, whereas emotional reactions are often immediate. How can responses in a relatively "sluggish" system cause rapid emotional responses? Finally, Cannon pointed out that when we produce visceral changes artificially—for example, by

adrenaline, which causes an increased heart rate and similar responses—people report that they feel "as if" they were afraid but that the emotion is not the "real thing." While all these points are well taken, the James-Lange theory has survived. It is still presented in most introductory psychology texts, and the famous examples of seeing a bear and losing a fortune are familiar to many psychology students. Finally, some contemporary evidence supports the James-Lange theory. Paul Ekman and his colleagues elicited different emotions by constructing facial prototypes and by reliving past emotional experiences. Activity of the autonomic nervous system not only distinguished between positive and negative emotions, but also among negative emotions. Their results show surprising differentiation of autonomic responses—a differentiation that is basic to the James-Lange theory of emotion (Ekman, Levenson, & Friesen, 1983).

The most often quoted chapter of the *Principles* was undoubtedly Chapter IV of Volume 1, the chapter on habit. According to James, the nervous system has the property of plasticity and can be modified by experience. Habits are established when pathways form between nerve centers in the brain. If a habit requires a series of actions A, B, C, D, etc., "concatenated" discharges occur in the nerve centers underlying these actions, and these discharges become associated. James stressed that many well-rehearsed habits are performed in an almost reflex manner and quoted with approval the statement of the Duke of Wellington that habit is ten times nature. Thus soldiers must be drilled over and over again to obey commands. James told the story of a prankster who, seeing a discharged veteran carrying home his dinner, suddenly called out, "Attention!" The veteran instantly brought his hands down and lost his mutton and potatoes in the gutter; the habit had become second nature. The great task of all forms of education is to make the nervous system an ally instead of an enemy. For James, habit is a pervasive force of great importance:

> Thus the enormous fly-wheel of society, its most precious conservative agent. It alone is what keeps us all within the bounds of ordinance, and saves the children of fortune from the envious uprisings of the poor. It alone prevents the hardest and most repulsive walks of life from being deserted by those brought up to tread therein. It keeps the fisherman and the deckhand at sea through the winter; it holds the miner in his darkness, and nails the countryman to his log-cabin and his lonely farm through all the months of snow; it protects us from invasion by the natives of the desert and the frozen zone. It dooms us all to fight out the battle of life upon lines of our nurture or our early choice. (James, 1890, vol. I, p. 121)

James believed that most habits are formed by *nurture* early in life and that by the age of 30 in most people are "set like plaster," an ancient but effective metaphor. As we settle into new habits, we come to them with a stock of old habits that may block or facilitate the new ones. Given such a position, principles of habit formation and maintenance are of central importance for psychology. Their formulation was to be a primary concern of psychologists for many decades in the twentieth century.

James hoped that once psychologists understood how habits are formed and maintained, they would be able to apply their knowledge to the creation of a better world, a world in which people would be trained in the habit of working together to eliminate such common scourges as war, pestilence,

famine, and ugliness. James presented his views in 1910 in a widely acclaimed speech in San Francisco entitled *The Moral Equivalent of War.* He recognized the appeal of war—the challenge, excitement, and camaraderie—and the value of such martial virtues as courage, loyalty, self-sacrifice, and bravery. James believed that the activities of everyday life give few outlets for those qualities. While making a living, holding a job or establishing a career, and supporting a family require courage and tenacity, they encourage few heroic qualities. James speculated that the unexpressed martial qualities accumulate like water behind a dam until they burst out in violent and destructive behavior, often in war. Given the terrible destructive power of twentieth-century war, James saw a compelling need for a "moral equivalent of war" that would provide an outlet for those impulses. He proposed that young people be drafted in service to the nation not only as soldiers but also to serve the needs of the society as a whole. Such work, he believed, would have exemplary effects for both poor and disadvantaged people, who would have the opportunity to work in dignity and learn useful skills, and for the "gilded youth of the upper classes," who would learn about society's foundations and the difficult lives of others. James described his aim in a September 1906 letter to H. G. Wells: "To cure the moral flabbiness born of the exclusive worship of the bitch-goddess success. That—with the squalid cash interpretation put on the word *success*—is our national disease" (Bartlett, 1992, p. 545).

While his speech *The Moral Equivalent of War* was the academic highlight of his time in California, James had one other memorable experience. As he was leaving Cambridge for California, a prescient colleague had joked: "I hope they'll treat you to a little bit of an earthquake while you're there. It's a pity you shouldn't have that local experience" (Charles Bakewell, quoted by P. Smith, volume 7, 1985, p. 107). The year 1906 was the year of the great San Francisco Earthquake. On the morning of April 18, 1906, James's Palo Alto hotel room began to shake and sway, the furniture fell down, and the whole building moved. Always the psychologist, James reported:

> Here's Bakewell's earthquake after all. It went crescendo and reached fortissimo in less than half a minute, and the room was shaken like a rat by a terrier . . . it was to my mind absolutely an *entity* that had been waiting all this time holding back its activity, but at last saying, "Now, *go* it!" All the while no fear, only admiration for the way a wooden house could prove its elasticity, and glee over the vividness of the manner in which such an "abstract" idea as "earthquake" could verify itself into sensible reality. (James letter to Fanny Morse, in P. Smith, 1985, vol. 7, p. 107)

James's glee turned to horror when he traveled to San Francisco the next day and saw the devastated city consumed by fires and explosions. The streets were full of homeless people who impressed James with their order and courage. Even the criminals had been made solemn by the disaster.

In the *Principles,* James considered not only how a habit is formed, but a related question: how the habit is retained or remembered—the question of memory. James devoted a chapter of his *Principles* to memory, which he defined as "knowledge of an event or fact, of which meantime we have not been thinking, with the additional consciousness that we have thought or experienced it before" (James, 1890, vol. I, p. 648). Memory allows a previous event or fact to be

restored to consciousness after a period of time and thus to be recollected, reproduced, or recalled. Memory retains some of our past experiences. James believed that events and facts leave paths—vestiges or traces—between nerve centers in the brain. When these paths are excited, a particular memory results.

James held that the strength of a person's memory depends on the quality of the structure of the brain, an innate physiological characteristic unaffected by experience. No amount of trying can improve this native capacity for memory. Experience acts to affect the number of paths underlying a particular memory; the more paths that are involved, the prompter and more secure the memory. James believed that it might be possible to improve memory by improving one's habitual methods of recording facts so as to increase the number of brain paths involved. Systematically linking facts or events together might improve memory. James further argued that such linkages might be possible with similar material but were most unlikely with dissimilar material such as, for example, English prose and chemical formulas. His views contradicted proponents of the most influential educational doctrine of the time, the *formal discipline* doctrine. According to this view, we can exercise and develop the mind to improve a general intellectual faculty that we can then use in a variety of tasks. The conflict between these different views of memory was so clear that it stimulated James to conduct research on the effects of memorizing one type of material on one's ability to memorize a second type. First James memorized 158 lines of Victor Hugo's poem *Satyr,* finding that he could memorize it at the rate of one line every 50 seconds; next he memorized the entire first book of Milton's *Paradise Lost,* and then returned to the *Satyr* and learned an additional 158 lines. In this second memorization, his learning rate dropped to a line every 57 seconds. James attributed his difficulty to the intervening memorization of *Paradise Lost.* He persuaded a number of friends to make similar tests, and their results were similar. James did meet one clergyman who had developed a very functional ability to memorize sermons: as a young man, he had needed three days to commit an hour-long sermon to memory, then two days, then one, then half a day, and finally one slow "adhesive" reading. In general, though, James concluded that the doctrine of *formal discipline* was invalid.

Despite these contributions, James's reputation, and his acknowledged influence on the development of psychology—in 1970, a poll of one thousand APA members ranked James as the sixth most important influence on the development of psychology (Wright, 1970)—in 2002, in a ranking of the "top twentieth-century psychologists" based upon journal citations, introductory psychology citations, and a survey of 1,725 American Psychological Society members, James ranked fourteenth (Dittman, 2002, p. 29). He remains something of a paradox. James was never committed to psychology. In a letter to his brother Henry, he expressed a desire to be known as a philosopher rather than a psychologist. Allen (1967) reported that when Harvard awarded James an LL.D. degree in 1903, he feared that he would be introduced as William James, psychologist, and was greatly relieved when he was introduced as a philosopher. James did not found a school of psychology and in fact regarded the schools of others as premature, ill-considered, and harmful influences on the development of psychology. There were no Jamesians in the sense that there had been Wundtians and were later to be Freudians, Hullians, and Skinnerians.

James had a very small group of students, but their number included Leta Hollingsworth, James Angell, Edward Lee Thorndike, and Robert Woodworth. James enjoyed warm relationships with many of his undergraduate students. When Gertrude Stein took one of his courses at Radcliffe, she showed up for the final examination, but after reading the questions she wrote in her blue answer book: "Dear Professor James, I am sorry, but really I do not feel like taking an examination paper in philosophy today." Then she left, and the next day received this answer: "Dear Miss Stein, I understand perfectly how you feel. I often feel like that myself." With the reply was the highest mark James awarded (Maddocks, 1986, p. 150).

In 1890, against the admonitions of Harvard's president, James admitted Mary Whiton Calkins to his graduate program in psychology. Working under both James and Münsterberg at Harvard, Calkins conducted several independent experiments in which paired-associate items were used to investigate the effects of modality, primacy, recency, and frequency upon memory. Frequency was by far the strongest influence, but Calkins also observed other basic phenomena of memory, including the effect of distracting activities on the recency effect (Madigan & O'Hara, 1992). Calkins completed all the requirements for a Ph.D. at Harvard, outperforming all the male candidates on the qualifying examination. James, Münsterberg, and the philosopher Josiah Royce enthusiastically recommended award of the doctoral degree, but the degree was denied. Despite this disappointment, Calkins was appointed an Associate Professor at Wellesley College and a Professor in 1898. In 1902, Calkins declined the offer of a doctorate from Radcliffe College. In 1905—the year after James's second term—Calkins was elected the first woman president of the APA (Furumoto, 1979). Calkins went on to outline an influential *self-psychology* in which the subject matter of psychology was the *self,* not the study of the mind or behavior (Wentworth, 1999, p. 119). In 1930, a petition to the university from Harvard degree holders to award Calkins a Ph.D. was rejected (Madigan & O'Hara, 1992, p. 173). Discrimination and prejudice still ruled. Harvard granted its first doctoral degree to a woman in 1963 (Hightower, 2002).

James was not a research psychologist and is not remembered for any outstanding research contributions. He was active in the professional affairs of psychology and served as president of the APA in 1894 and again in 1904, but unlike G. Stanley Hall, the only other person elected president of the APA twice, he did not found any psychological institutions. James's reputation rests on his writings, especially his *Principles of Psychology.* Even with his writings, it is difficult to assess to what degree James's reputation is due to the content of his works and to what degree it is due to his brilliant writing style. As in his lectures, his metaphors and vivid examples are often remembered long after the substantive points they illustrate. The stream of consciousness; habit as the great flywheel of society; the blooming, buzzing confusion of the infant's world; the moral equivalent of war; tender-minded and tough-minded personalities—many of these vivid metaphors and phrases have become part of everyday language.

After a twelve-year struggle with a weak heart, James died of a heart attack in the summer of 1910. In one of many posthumous tributes to James, Bertrand Russell described him as "the most eminent, and probably the most

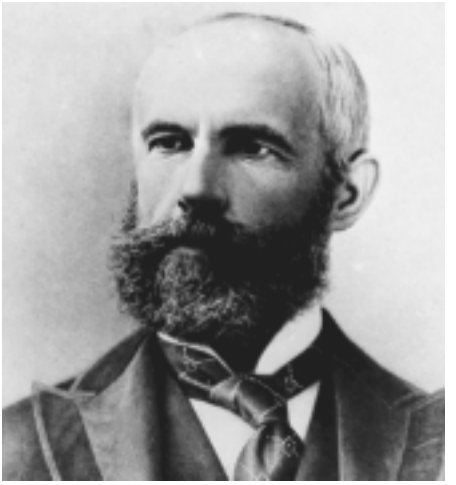
widely known of contemporary philosophers" and stated that "the high value of his work on psychology is widely admitted" (Russell, 1910, cited by Allen, 1967, p. 494). Few would dispute Russell's judgment today.

GRANVILLE STANLEY HALL (1844–1924)

G. Stanley Hall was an influential pioneer in American psychology. He was James's contemporary, but the two men were very different in their backgrounds, approach, contributions, and relationships to other psychologists (Ross, 1972; Bringmann, Bringmann, & Early, 1992). Unlike the patrician James, Hall was born into a family of New England farmers. On his mother's side, he could trace his "roots" back eight generations to one of the signers of the Mayflower Compact; on his father's side, he could go back nine generations to John Hall, who left England in 1630 and settled in Massachusetts. Hall's mother was a pious, hardworking woman. She had been a schoolteacher and was intensely interested in the development of her children. For many years she kept detailed records of their progress. Perhaps one can see in his mother's interest the seed of Hall's professional interest in developmental psychology. Hall's father, who had also been a schoolteacher for ten terms in various towns, was elected to the state legislature on the "Know Nothing" ticket. He served from 1855 to 1856 but earned his living primarily as a farmer. Hall later described him as the best of fathers and a creative person who invented a machine for sowing carrots, but also as a man whose life was full of disappointments.

Hall grew up in the country, near the village of Ashfield, Massachusetts, in touch with a fascinating world of animals and plants—very different from the cosmopolitan world of James's childhood. Hall retained an interest in animals all his life, and he always made a point of exploring the zoo in any new city he

G. Stanley Hall.
(National Library of Medicine)



visited. We can imagine a cameo of James and Hall in a new city: James visits the art galleries and museums; Hall goes to the zoo. On rainy days, the young Hall would often visit Ashfield, watching the cobblers, tanners, wool carders, and saddle and basket makers at work and eavesdropping on the gossip of the old men—gossip he later described as one of the foreschools of psychology. From his Puritan family heritage, Hall derived an admiration for hard work, a belief in duty and obligation, and a powerful respect for education as a way of improving oneself.

After finishing school in 1860, Hall, at the age of 16, was employed as a village schoolteacher; he instructed a number of his former classmates, boys who were often bigger and stronger than he was. In 1862, he enrolled for one year in Williston Seminary and then at Williams College, which he attended as an undergraduate from 1863 to 1867. Hall did well at Williams, and after his graduation, he entered the Union Theological Seminary in New York City. Hall was fascinated and thrilled by the big city and spent much of his time exploring its wonders: the theaters, musical events, concerts, shows, the sights and sounds of Harlem. Hall attended a séance and even paid $5 to have his "bumps" read at Fowler and Wells's phrenological emporium (Chapter 3). With all this activity, it is not surprising that Hall's theological studies suffered. After preaching his trial sermon before the faculty and students of the seminary, Hall was called to the president's study for the customary critique. When Hall entered, President Skinner knelt and prayed that Hall might be shown the true light and saved from mortal errors of doctrine. He then excused Hall without a word (Hall, 1924; Ross, 1972).

Hall's Professional Education

In 1869, Hall left for Europe, having borrowed $1,000 to cover his expenses. He traveled widely, visiting universities and taking an occasional course, including one with the physiologist Du Bois-Reymond (Chapter 3) at the University of Berlin. Hall returned home in 1870, resumed his theological studies, and received his degree from Union Theological Seminary but was not ordained. He accepted a position at a large midwestern state university. As a last formality, the university's president asked Hall for a letter giving details of his experience overseas and the courses he proposed to teach. When Hall replied that he planned to teach a course defending evolutionary thinking, his appointment was abruptly canceled. He was forced to earn a living as a private tutor for the wealthy Seligman family in New York City before finally securing an appointment to the faculty of Antioch College in Yellow Springs, Ohio. At that time, Antioch was a struggling Unitarian college. Hall spent four years there teaching courses on religion, rhetoric, English literature, and philosophy. In addition, he offered occasional courses to black students at the nearby Wilberforce University. During these years, Hall read the first edition of Wundt's *Physiological Psychology* and decided to resign his position, travel to Leipzig, and study experimental psychology with Wundt.

In 1876, on his way to Europe, Hall stopped in Cambridge, Massachusetts, enrolled as a graduate student, and accepted a position as an English instructor at Harvard University. He quickly found the position involved endless

recitations and grading of sophomore themes. However, he did take graduate courses with James and worked in the laboratory of the Harvard physiologist Henry Pickering Bowditch (1840–1911). Hall also worked in a small laboratory James had established "under the stairways of the Agassiz Museum" (Hall 1923, p. 218). His dissertation was on *The Perception of Space.* Hall reviewed the role of muscle cues in space perception, the classic problem George Berkeley originally addressed (Chapter 2). The dissertation was primarily based upon library research, but it did include a number of experiments. In 1878, Hall was awarded the first Ph.D. ever awarded by Harvard's philosophy department. His degree was also the first American doctoral degree on a psychological topic (Bringmann, Bringmann & Early, 1992, p. 284).

In 1878, shortly after receiving his degree, Hall left for Leipzig. Jesse Seligman, his generous former employer, paid for the trip. At the time, Wundt's laboratory was barely organized, and Hall seems to have profited most from his contact with his fellow students, including Emil Kraepelin and Oswald Külpe (Chapter 6). He also met Gustav Fechner, at the time a very old man and almost blind but still assiduously preparing his final book on psychophysics. Hall spent his second year in Berlin working in Hermann von Helmholtz's laboratory on a number of his research projects, including the famous ones that measured the nervous impulse speed.

Hall's Early Academic Career

Hall returned to America in 1880, thoroughly familiar with German psychology but with a new bride, in debt and with no prospects of an academic appointment. Fortunately, President Eliot of Harvard asked him to give a series of twelve public lectures on education under the auspices of the university. Hall spent the summer preparing the lectures, which were a popular success. He was invited to give a similar series of lectures at the recently founded Johns Hopkins University in Baltimore. His lectures there were also a success, and Hall was offered a position as a lecturer. In 1884, he was given a five-year appointment at Johns Hopkins University as a professor of psychology and pedagogy at an annual salary of $4,000. The only opposition to his appointment came from the professor of physiology, who felt that in studying sensory functions, Hall would encroach on his department's territory; and from the professor of philosophy, who questioned Hall's teaching Aristotle and Plato in English translation.

Dan Coit Gilman, the president of Johns Hopkins, was determined to make his university an outstanding center of graduate education in the United States. He believed in the importance of research for graduate students and so established research laboratories, including one for Hall in 1883—the first formal laboratory for psychological research in the United States (Hulse & Green, 1986). Another of Gilman's innovations was the establishment of fellowships for graduate students. These fellowships attracted some excellent graduate students, including John Dewey (Chapter 10) and James McKeen Cattell. Hall, like James, saw one of his former undergraduate students, Woodrow Wilson, elected President of the United States.

Hall and the *American Journal of Psychology*

Hall was one of the great founders of psychology departments, laboratories, institutes, and journals and an organizer of American psychologists. While at Johns Hopkins, he founded the first of his journals, the *American Journal of Psychology,* through a misunderstanding. One afternoon in 1887, Hall received a call from a wealthy stranger who said that he had heard about the new department at the university and felt it should have a research journal. He gave Hall a check for $500 to start a journal and intimated that additional financial support would be forthcoming. In the journal's first number, Hall promised in the preface that "controversy as far as possible will be excluded" (Hall, 1888, p. 4), but he included a critical and skeptical critique of psychic research (Hall, 1888, pp. 128–146). From then on, no further funds were forthcoming, for spiritualism and psychic phenomena were the donor's main interests. This loss was a severe blow to Hall, who had to make up a deficit of $1,000 from his savings. The *American Journal of Psychology* was the first English-language journal to be devoted exclusively to psychology, the earlier journal *Mind* being largely philosophical. Hall's journal was open to research from all psychologists and to published papers on a wide range of topics, including the first English translations of papers on psychoanalysis by Freud and Jung. The first volume included papers on the estimation of star magnitudes, the relation of neurology to psychology, dreams, insistent and fixed ideas, the legibility of small letters, paranoia, and the winter roosting of crows. It reflected Hall's wide-ranging interests and enthusiasms. However, it was not to all psychologists' liking. Cattell described Hall's editorial work as a disgrace, and a major motive in his founding of the *Psychological Review* with James Mark Baldwin was to provide an alternative journal. Hall edited the *American Journal of Psychology* and supported it with $10,000 of his own money before selling it in 1921 to Titchener and Karl Dallenbach.

Hall and Clark University

In April 1888, Hall was surprised by an invitation to become the president of a new university to be established in Worcester, forty miles west of Boston—Clark University. This university was founded in 1887 by Jonas Gilman Clark, who, having made his fortune in California selling mining tools and equipment, had decided to establish a university modeled on Johns Hopkins in his hometown. His aim was to provide the superior university education he himself had not had. Clark's original gift was $1 million. When Hall was approached, the university had neither a campus nor a faculty. Clark commissioned Hall to visit Europe, study European universities, discuss the concept of the new university with European academicians, and recruit senior professors. Hall spread the word with great enthusiasm, visiting most of the European countries and Russia. However, Clark vetoed his attempts to recruit three European professors in the first of what was to be a long series of misunderstandings and disagreements.

Clark University opened in October 1889 with Hall as its president. The university offered five academic departments: mathematics, chemistry, biology, physics, and psychology. Clark's fortune was $20 million, but he badly

underestimated the cost of founding and supporting a university. Income from student fees fell far short of expenses, since only graduate students were admitted and graduate education is always expensive. Jonas Clark found it difficult to maintain a sympathetic and supportive relationship with Hall, the faculty and students, and even the board of trustees. He withdrew from the situation, becoming secretive about his plans for the future and especially about any bequests he planned to make. Finally, the *Worcester Telegram* accused the university of cruelty to animals in experiments allegedly being conducted in the biology department. On March 9, 1890, a *Telegram article carried seven headlines including:*

Dogs Vivisected

Scientific Torture at Clark University

Helpless Animals are Killed by Inches

Cruelty is Reduced to a Fine Art

Dumb Victims Writhe Under the Cruel Knife

The Docents of Clark were accused in later articles of using "Devilish Devices" to torture animals (Dewsbury, 1990, pp. 319–320). There was not a shred of evidence to support such charges. After an official investigation by the Massachusetts Society for the Prevention of Cruelty to Animals, the university was exonerated.

A final blow fell at the end of that first terrible year when Hall caught diphtheria, went to the country to recuperate, and while there learned that his wife and child had been killed in an accident. Despite these misfortunes, the indomitable Hall carried on, but in 1892, as prospects of continued support from Jonas Clark appeared ever more dim, the faculty Hall had recruited called for his resignation. The university's trustees supported Hall, but the same year, President William Rainey Harper of the University of Chicago visited Clark University and made attractive offers to many of the faculty members, including Hall. Hall refused to join what he called a "Standard Oil institution"—a reference to the source of the University of Chicago's financial backing—but by the end of the 1892 academic year, two-thirds of the faculty members and 70 percent of the graduate students left for Chicago. In his autobiography some thirty years later, Hall's bitterness over what he called this "act of wreckage" was still clear. He compared Harper's behavior to that of a "housekeeper who steals in at the back door to engage servants" (Hall, 1924, p. 296) and termed the flight of much of the faculty "the hegira" (Hall, 1924, p. 296).

In the following years, Hall and the remaining faculty members carried on. Having been through the fire together, they were intensely loyal to the university. During the twenty-one years following Harper's raid, not a single original faculty member resigned. Undergraduates were admitted for the first time in 1902, and slowly the financial picture improved. Hall remained at Clark for thirty-one years.

Despite the chaos and uncertainties of those years, Hall was able to continue in his role as the founder of psychological institutions. In 1891, he established with his own money the *Pedagogicial Seminary,* later the *Journal of Genetic Psychology,* to publish scientific reports on children. Hall is considered the "bellwether of the child study movement" (Fagan, 1992, p. 238).

Hall and the American Psychological Association

Hall was also instrumental in founding the American Psychological Association. The first organizational meeting for the new association was held in Hall's study on July 8, 1892. The psychologists present, in addition to Hall, included Fullerton, Jastrow, James, Ladd, Cattell, and Baldwin (Fernberger, 1932, p. 2). At that meeting, twenty-six additional psychologists were invited to become charter members of the APA, including Dewey, Scripture, Witmer, Wolfe, Münsterberg, and Titchener (Fernberger, 1932, p. 4). Hall was definitely the leader. He issued the invitations, acted as host, and was, as Cattell later acknowledged, "our Socrates and midwife" (Cattell, 1929, p. 9). Annual dues were set at $3. Hall was elected the first president of the APA, and Joseph Jastrow, an active experimental psychologist, became its first secretary. The group also accepted an invitation to hold its first annual meeting at the University of Pennsylvania. The meeting was held on December 27, 1892 in the chapel, now a classroom in the department of history. The psychologists attending that first annual meeting of APA and their institutional affiliations were:

W. H. Burnham, B. I. Gilman, E. H. Griffin, G. S Hall, W. O. Krohn, E. C. Stanford (Clark)

W. James, H. Münsterberg, J. Nichols, J. Royce (Harvard)

J. McKeen Cattell, J. H. Hyslop (Columbia)

E. Cowles, W. Noyes (McLean Hospital)

G. S. Fullteron, L. Witmer (University of Pennsylvania)

J. M. Baldwin, J. G. Hume (University of Toronto)

G. T. Ladd, E. W. Scripture (Yale)

E. B. Delabarre (Brown)

E. A. Pace (Catholic University)

E. B. Titchener (Cornell)

W. S. Bryan (Indiana)

G. T. W. Patrick (Iowa)

T. W. Mills (McGill)

J. Dewey (Michigan)

H. K. Wolfe (Nebraska)

A. T. Ormond (Princeton)

F. Angell (Stanford)

J. Jastrow (Wisconsin)

(Hilgard, 1987, p. 739, after Dennis & Boring, 1952)

Hall's 1892 presidential address to APA, *History and Prospects of Experimental Psychology in America,* was never published. But his enthusiasm and vigorous advocacy of psychology are clear in an article he published in 1894:

> It [psychology] is already represented in two score of the best institutions. It has already a voluminous literature; several hundred standard, new experiments. It studies the instincts of animals from the highest to the lowest. It studies the myths, customs, and beliefs of primitive man. It devotes itself to the study of sanity and nervous diseases and has already begun to introduce new methods and utilize new results. It has transformed and shaped the problems of logic and ethics; is slowly rewriting the whole history of philosophy and, in the opinion of many of its more sanguine devotees, is showing itself not only to be the long-hoped-for, long-delayed science of man, to which all other sciences are bringing their ripest and best thoughts, but is introducing a period that will be known hereafter as the psychological era of scientific thought even more than a few recent decades have been marked by evolution. (Hall, 1894, quoted by Woodworth, 1943, pp. 17–18)

At this stage of his career, Hall considered himself one of the "sanguine devotees" of psychology. With his enthusiasm, formidable organizational abilities, and compelling lecturing style, he was able to contribute much to the development of psychology.

The establishment of the APA was an important step for psychology. It marked a coming of age of the new discipline, and APA's annual meetings gave psychologists an opportunity to present and discuss their work (Evans, Staudt-Sexton, & Cadwallader, 1992). APA was also the first learned society in America to extend full membership to women (Rossiter, 1982). In 1894, Cattell nominated Christine-Ladd Franklin (Chapter 5) and Mary Whiton Calkins (this chapter) for membership, and both were elected as members of APA (Sokal, 1992, p. 115). In recent decades, the growth in the APA's membership has been spectacular as psychology developed as a science and a profession (Capshew, 1999).

Year	Members	Year	Members
1892	31	1950	9,500
1900	127	1960	19,200
1910	228	1970	30,652
1920	393	1980	50,933
1930	1,113	1990	77,545
1940	3,100	2000	83,096

(Fernberger, 1943; APA membership directories for 1950, 1960, 1970, 1980, 1990, 2000)

In 1893, the APA's budget was $63; APA's current budget is now close to $40 million. In 2000, APA's net worth was $39.5 million; due to a marked decline in revenues and the value of its investments, APA's nett worth in 2001 fell to $33.3 million (Koocher, 2002).

Hall as a Developmental Psychologist

In addition to these organizational contributions to psychology, Hall did significant research and wrote a number of important books. Hall published papers

on hypnotism, moral and religious training, optical illusions, and reaction-time measurements of attention. He was eclectic, a man of many and ever-changing interests. To some, however, he was a dabbler, a man with many enthusiasms but little depth, an eclectic with his feet firmly anchored in midair.

In 1883, Hall began his most valuable studies. He developed a number of questionnaires for Boston kindergarten children. The children were asked about their conceptions of nature, including animals, plants, stars, and the sun and the moon; their own bodies; their ideas of number; stories they knew and games they played; things they could do; and their notions of religion, immortality, and death. Hall tried to establish empirically the "contents of children's minds" (Hall, 1893). He found that 80 percent of these Boston children did not know what a beehive was, while 50 percent could not describe a frog.[4] Even more interesting is the narrative account Hall gave of his findings:

> Many children half-believe the doll feels cold or blows, that it pains flowers to tear or burn them, or that in summer when the tree is alive it makes it ache to pound or chop it. Children who are accounted dull in school are more apt to be imaginative and animistic. The chief field of such fond and secret childish fancies is the sky. About three-fourths of all questioned thought the world a plane, and many described it as round like a dollar, while the sky is like a flattened bowl over it. Some thought the sun went down at night into the ground or just behind certain houses, and went across, on, or under the ground to go up or out of, or off the water in the morning; but 48 percent thought that at night it goes or God takes it up higher out of sight. He takes it into heaven, and perhaps puts it to bed, and even takes off its clothes and puts them on in the morning, or again it lies under the trees, where the angels mind it. (Hall, 1893, pp. 36–37)

By 1915, Hall and his coworkers had developed 194 questionnaires on such topics as anger, play, crying and laughter, fears, humor, affection, prayer, envy, jealousy, and dreams. The questionnaires produced a wealth of information that Hall presented in his monumental 1,373-page *Adolescence* (1904). Hall was the first psychologist to describe adolescence as a distinct stage in the life cycle. His description of the *Sturm and Drang* (storm and stress) of adolescence was echoed in many later works. This book is often said to mark the formal beginning of child or developmental psychology. In 1910, Hall organized the Child Study Institute at Clark University, including a Pedagogical Museum housing a collection of objects from all over the world relating to children and child rearing.

Hall's theoretical orientation was that of a genetic psychologist, and he stressed the importance of genetics and evolution in human and animal development (Hall, 1911a). He recalled: "As soon as I heard it in my youth, I think I must have been almost hypnotized by the word *evolution,* which was music to my ears and seemed to fit my mouth better than any other" (Hall, 1924, p. 357). Hall considered psychological questions within a framework of evolutionary theory and sought an understanding of the adaptive value of behavior and consciousness. He developed a version of *recapitulation theory* which sees the developing child as *recapitulating* the development of the human species.

[4] One of my grandsons to whom this book is dedicated, when told at the age of 3 that we were going to wash *two* cars, asked "Do we have *two* hoses?"

Storm and Stress: The Hall-Mead Imbroglio

Hall was the first psychologist, but not the first person, to describe adolescence as a turbulent time. Aristotle stated that youth "are heated by Nature as drunken men by wine." Socrates characterized youth as inclined "to contradict their parents" and "tyrannize their teachers." In the eighteenth century, Goethe and other German writers depicted the *Sturm und Drang* (storm and stress) of youth (Arnett, 1999). In *Adolescence,* Hall described adolescence as characterized by storm and stress; a developmental stage in which the young person challenges parental authority and control and is often moody and prone to reckless and antisocial behavior. Hall acknowledged the mediating effects of parental and cultural influences. He saw adolescent storm and stress as more prevalent in the United States of his time due to urbanization and the failure of home, school, and religious organizations to respond to the needs of adolescents (Arnett, 1999, p. 318).

Despite this nuanced view, Hall's critics characterized his view that the storm and stress of adolescence was both inevitable and universal. Margaret Mead, in her best-selling book *Coming of Age in Samoa* (1928) described the adolescents of the South Pacific island of Samoa as passing through adolescence without stress or turmoil. Mead reported none of the adolescent behaviors Hall described. She depicted Samoan society as relaxed, sexually free, egalitarian, and permissive. Mead attributed the storm and stress of American adolescence to cultural forces. Her book was published in sixteen languages. Since its publication, *Coming of Age in Samoa* has been required reading for college courses in Anthropology.

In 1983, Derek Freeman published *Margaret Mead and Samoa: The Making and Unmaking of an Anthropological Myth.* An Australian anthropologist, Freeman had extensive field experience on Samoa and was competent in the native language. Mead had spent eight months on the island and had at best an imperfect command of the language. Freeman asserted that Mead's account of Samoan culture and character was "fundamentally in error" (p.xii); Mead had diminished "the aggression, violence, and rivalry of Samoan life and exaggerated the degree of sexual freedom of adolescent girls" (p.278). Freeman reported that Samoan adolescents lead lives filled with difficulties and conflicts, just as their counterparts do in Western societies. Such difficulties, argued Freeman, are rooted in biology, just as Hall had claimed.

Freeman's book ignited a furious controversy with numerous reviews, critiques, and rebuttals in both the professional literature—the *American Anthropologist* devoted a special section to the controversy (December 1983)—and in the media—the *New York Times* featured Freeman's book on its front page (January 31, 1983). Martin Orans's book *Not Even Wrong: Margaret Mead, Derek Freeman, and the Samoans* (1996) gives a comprehensive and fair review of this imbroglio. Orans evaluated Mead's contention that Samoan adolescence was less stressful than its counterpart in the United States and concluded: "Clearly, she did not have adequate data for either place to make such a claim, and her theoretical conjectures, however plausible, are a house of cards completely lacking in verification" (Orans, 1996, p. 156). Freeman (1999) further claimed that Mead was the victim of a "fateful hoax" by the Samoans.

Recapitulation theory was formulated in 1866 by Ernst Haeckel, a German anatomist. Haeckel believed that embryological development recapitulates the developmental history of the species; in Haeckel's euphonious phrase, "ontogeny recapitulates phylogeny" (K. S. Thompson, 1988). In human intrauterine development, the fetus was believed to go through stages very much like fish, reptiles, and nonprimate mammals before becoming recognizably human. Hall extended this theory to child development: a child first crawls on all fours and then walks upright. Children's play, art, and social behavior were seen as recapitulations of earlier stages of human development.

Hall wrote many articles on children and adolescents for the popular magazines of the time. Among them are the following: *How and When to Be Frank with Boys* in the *Ladies Home Journal,* 1907; *Must Your Child Lie?* in *Appleton's Magazine,* 1908; *The Boy That Your Boy Plays With* in *The Circle,* 1908; *The Awkward Age* in *Appleton's,* 1908; and *The Budding Girl* in *Appleton's,* 1909.

As Hall grew older, his interests moved to the last third of life. In 1922, he published another major work, *Senescence,* describing the psychology of the later years. Interest in aging was unusual for the time, and Hall's work was both pioneering and, for many years, unique. Children have been studied extensively by psychologists, but until very recently, older people have hardly been studied at all. Why? Possibly, as Sidney Pressey speculated, "because as adults we have all been children and so feel that we understand them; perhaps subconsciously we do not expect ever to be old, and so have less interest in older people" (Pressey, 1976, p. 7).

Hall and *Eugenics*

Given Hall's theoretical position, we should not be surprised that he was interested in *eugenics.* He was in fact an enthusiastic proponent of eugenic controls and bequeathed $300,000 to Clark University with instructions that a chair of genetic psychology be established (Rosenzweig, 1984). Hall was a firm believer in "higher" and "lower" human races (Hall, 1903, 1905a, 1905b). He believed the "Negro races" to be at an earlier stage of human development (Hall, 1906b), dependent on the "higher" white races for their development and supervision (Hall, 1911c). Hall saw it as his responsibility to educate black students, and more black psychologists received their doctorates from Hall during the early decades of this century than from any other adviser (Guthrie, 1976).

Hall's Students

Hall was the most active teacher of graduate students during the first decades of American psychology. Robert Watson (1968) reported that by 1893, eleven of the fourteen American Ph.D. degrees in psychology had been granted under Hall's supervision. By 1898, the number had increased to thirty of fifty-four. Hall was an inspirational teacher. Lewis Terman (Chapter 11) stated: "For me, Clark University meant briefly three things, freedom to work as I pleased, unlimited library facilities, and Hall's Monday evening seminar." Arnold Gesell earned his Ph.D. with Hall in 1906. He continued Hall's developmental studies and summarized them in *Infant and Child in the Culture of Today* (1943) and *The*

First Five Years of Life (1954). Hall considered the great themes of life: the influence of the childhood years, adolescence, aging, insanity, religion, sex, death, and immortality. It is not surprising that students found their studies with this brilliant, far-ranging man stimulating and memorable.

The Clark Conference

Hall also organized the first opportunity for most American psychologists to meet Sigmund Freud and hear him lecture (Evans & Koelsch, 1985). Hall had seen sexual interests in the children he studied and so was more sympathetic to Freud's views than were many of his contemporaries. He was convinced that "sex plays a leading role in life's drama" (Hall, 1924, p. 570); he had established a weekly course on sex at Clark in 1904; and in 1907, Hall was the first to propose teaching sex education in the schools (Hall, 1911b; Ross, 1972, p. 384). His lectures on sex attracted large, enthusiastic audiences, but it proved impossible to keep "outsiders" out, and so the lectures were abandoned. Hall, as he wrote in his autobiography, welcomed Freud's views:

> Human life has its night as well as its day side and the Freudian mechanisms enable us to explore the vast regions of the psychic life below the conscious surfaces. Nothing since Aristotle's categories has gone deeper or, in my opinion, is destined to have such far-reaching influence and results. (Hall, 1924, pp. 11–12)

Clark University's twentieth anniversary was to be celebrated in 1909 with a series of conferences sponsored by the university's academic departments. Hall invited two foreign *savants* to the psychology conference: Wundt, representing experimental psychology, and Freud, representing clinical psychology. In December 1908, Hall offered Wundt a fee of $750 and an honorary degree. Wundt declined, citing his age, his reluctance to travel, and his plans to participate in that year's celebration of the anniversary of the founding of the University of Leipzig. The biologist Jacques Loeb (Chapter 12) also declined, citing a prior commitment. Hall then invited Ebbinghaus, who accepted, but died in late February 1909. William Stern of Breslau finally accepted and attended the conference. Hall's first invitation to Freud included an offer of a fee of $400. Freud declined, citing the demands of his practice and the loss of professional income he would suffer by being away from Vienna at his busiest time of year. Hall reissued the invitation under the same terms offered to Wundt—$750 and the award of an honorary degree. Encouraged by Jung, who saw the conference as an opportunity to present psychoanalysis in America, Freud accepted (Evans & Koelsch, 1985).

Freud traveled to America with two of his colleagues, Sandor Ferenczi of Prague and Carl Jung of Zurich. Before boarding the ocean liner *George Washington,* the three men had lunch in Bremen. Freud fainted during the lunch—due, he said, to the wine, but perhaps also due to the anxiety Jung's presence was beginning to elicit. Their Atlantic crossing went well. Freud later recalled that he first became aware of his growing fame when he saw a cabin boy reading one of his books. Freud's party arrived in the United States on August 29, 1909. Two other psychoanalysts, A. A. Brill and Ernest Jones, met them in New York Harbor, and together they spent four days touring the city: Central Park, Chinatown, the Jewish ghetto, the Metropolitan Museum, Columbia Univer-

sity, and Coney Island, where they all took a ride through the tunnel of love. They then traveled to Worcester, where Freud and Jung were Hall's houseguests and the rest of the visitors stayed in a Worcester hotel. Freud and Jung found both Hall's standard of living and Clark University impressive.

The lectures given at the Clark Conference and the circumstances surrounding the visit to America have been thoroughly described by Saul Rosenzweig in *Freud, Jung, and Hall the King-Maker: The Historic Expedition to America* (*1909*) (Rosenzweig, 1992). Forty American psychologists were among the 175 people attending the conference. Hall presided and arranged the order of the lectures. Freud gave lectures on five subjects:

> The origins of psychoanalysis, with special reference to the contributions of Breuer and the case of Anna O.
>
> The failure of hypnosis as a treatment and the need for active, conscious exploration of the patient's memories and history
>
> The use of free association, dream analysis, and the significance of such everyday phenomena as slips of the tongue
>
> The development of sexuality, and, most controversial, the reality and importance of infant sexuality
>
> Societal and cultural aspects of sexuality

Jung presented three lectures, two on the word association technique and one on problems in the mental life of a 4-year-old child.

The conference lectures, especially Freud gave, were reported on and discussed in the daily papers and in an article in *The Nation* (Cromer & Anderson, 1970). Freud and his ideas received little criticism and much praise. The *Boston Transcript* reported "an enthusiastic reaction to Freud's lectures." Even the previously unremittingly hostile *Worcester Telegram* was positive; it only expressed regret that "the lectures were not given in English so that they could be taken in by more people" (Doorley, 1982, p. 75).

The audiences were eager and responsive, but Freud's views were unacceptable to some people. An eminent physician, Dr. Weir Mitchell, called Freud "a dirty, filthy man" (Doorley, 1982, p. 75). Titchener left the conference early, and a dean from the University of Toronto wrote: "An ordinary reader would gather that Freud advocates free love, removal of all restraints and a relapse into savagery" (quoted by Jones, 1955, p. 59). Others were more supportive. James was gravely ill but courageously spent one night with Hall and his guests, and attended one day's lectures. "I want to see what Freud is like," he said before the first one. Freud said of his meeting James:

> Another event at this time which made a lasting impression on me was a meeting with William James the philosopher. I shall never forget one little scene that occurred as we were on a walk together. He stopped suddenly, handed me a bag he was carrying and asked me to walk on, saying that he would catch up with me as soon as he had got through an attack of *angina pectoris* which was just coming on. He died of that disease a year later; and I have always wished that I might be as fearless as he was in the face of approaching death. (Freud, quoted by Rosenzweig, 1992, p. 171)

As the day's lectures ended, Jones remembered that "James, with his arm around my shoulder, said, 'the future of psychology belongs to your work.' " (Jones, 1955, p. 57) However, James did have some reservations and wrote to a friend:

> I hope that Freud and his pupils will push their ideas to their utmost limits, so that we may learn more what they are. They can't fail to throw light on human nature, but I must confess that he made on me personally the impression of a man obsessed with fixed ideas. I can make nothing in my own case with his dream theories, and obviously "symbolism" is a most dangerous method. (James letter to Theodore Flourney, September 28, 1909, in Rosenzweig, 1992, p. 174).

At the end of the conference, the European visitors were awarded honorary degrees: Jung in education and social hygiene, and Freud a doctor of laws in psychology. The *Worcester Gazette* reported that Freud was cited as "the founder of a school of phychology [*sic*] already rich in new methods and achievements; a leader today among students of the phychology [*sic*] of sex, and of psychotherapy and analysis" (Cromer & Anderson, 1970, p. 350). Freud was deeply grateful for the recognition he had received. Freud, Jung, Ferenczi, and Brill left Worcester on September 12. They traveled to Niagara Falls before embarking for Europe on board the Kaiser Wilhelm der Grosse Freud wrote a seven-page letter to his oldest daughter Mathilde, remarking that the whole trip had been highly interesting and very meaningful to our work, and a great success, but he was very glad that he did not have to live in America (Clark, 1980b).

Hall arranged for the conference lectures to be published in April 1910 in the *American Journal of Psychology,* thus enlarging the audience. For a number of years, Hall was an ardent supporter of Freud and an advocate of psychoanalysis. At one time, he went so far as to propose universal psychoanalysis. In *Educational Problems,* Hall said of Freud:

> [He] has brought more unity and insight into the very nature and operations of the soul, and the mechanisms of the conscience, than any other in our generation. It marks the end of the old and the dawn of a new era. It is the most triumphant vindication of the genetic mode of conceiving the mind. (Hall, 1911d, vol. I, p. 445)

Later, as was often the case with Hall, his enthusiasm for Freud cooled, but his organization of the Clark Conference was a major contribution to the development of psychology. As Dorothy Ross said in the first lines of the preface to her biography of Hall: "G. Stanley Hall is remembered best, perhaps, for bringing Sigmund Freud and Carl Gustav Jung to America in 1909 to lecture to an influential group of psychologists and scholars at Clark University" (Ross, 1972, p. xiii). On October 2, 1999, Clark University dedicated on its campus a larger-than-life bronze sculpture of Freud to commemorate his visit.

Hall's *Life and Confessions*

Toward the end of his life, Hall seems to have been a rather bitter and disenchanted man. His autobiography, *Life and Confessions of a Psychologist* (1924), is

a remarkably honest and open account of his life, but it has a bitter and defensive tone. In it he described (Hall, 1924, pp. 9–21) what he considered to be impediments to the progress of psychology, including the James-Lange theory of emotion, dubbed by Hall "the sorry because we cry theory"; the classical introspectionist psychology of Titchener and mental testing (Chapter 11); psychophysics, descriptions of mind-body parallelisms or interactions, and the controversy between structuralism and functionalism, all of which he thought were absurd; and extreme behaviorism, which he also found unsatisfactory (Chapter 13). Hall was unable to accept many developments in psychology and became increasingly disenchanted with the field, but one final honor came his way. In 1924, just months before his death, he was reelected president of the APA, becoming second only to James in holding the presidency twice.

CONCLUSION

A common concern with function characterizes the men discussed in this chapter. For Darwin, different structures and behaviors allow animals to adapt to a particular environment. Through natural selection, the frequency of such structures and behaviors changes, and the species evolves. Galton extended Darwin's concepts to the study of human consciousness. He asked: How do such mental functions as memory, association formation, attention, and prayer work? What do they accomplish? Galton tried to answer these questions with careful observations inside and outside his London clinics. Cattell also studied and measured mental functions. He measured reaction times and a number of other physical responses before concluding that they did not in fact provide the measures of mental functions he sought. Another approach was needed: psychological measures or psychometric assessments of mental functions. James's recurrent concern was human consciousness. How do we remember, attend, learn, feel emotions, and have religious experiences? With such questions, James created a broader, more lively psychology and challenged restrictive approaches to consciousness. Hall pioneered studies of children, adolescents, and older people—laying the foundation for today's life-span developmental psychology. Hall was a genetic psychologist, and his fundamental questions always concerned adaptive value and significance.

Cattell and Hall founded, edited, and contributed to the first psychology journals. They were both active in the APA. The psychology departments they headed—Cattell at Columbia University and Hall at Clark University—provided an education in psychology for many students. James's *Principles of Psychology* quickly became *the* textbook of psychology. Generations of students, some of whom were stimulated to become psychologists themselves, studied this classic.

Following the theoretical approaches of Darwin and Galton, Cattell, James, and Hall established a functionalist approach to psychology in the United States. Many of their interests and research topics were taken up by the functionalist psychologists discussed in the next chapter. Through them, Cattell, James, and Hall continue to influence contemporary psychology.