



# developmental psychology

a student's handbook

Margaret Harris & George Butterworth

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**Margaret Harris**

*Royal Holloway University of London, UK*

**George Butterworth**

*University of Sussex, UK*



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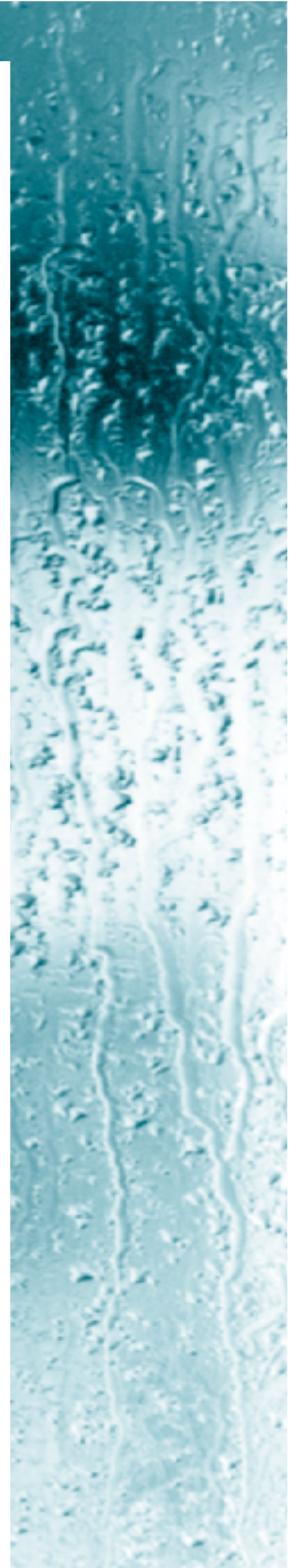
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*In memory of*  
*George Esmond Butterworth*

**1946–2000**





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## About the authors



**Margaret Harris** was educated at Northampton School for Girls and Kettering High School. She gained her BSc in Psychology at Bedford College and her PhD at Birkbeck College, University of London. Margaret lectured at Birkbeck College and then became a Senior Lecturer and subsequently a Reader at Royal Holloway University of London. Her main research interests are in language development and reading, with an emphasis on the cognitive development of deaf children. Margaret is involved in several research projects investigating the early language development of children with severe/profound deafness. Her research has looked at the development of successful communication between deaf infants and their mothers and the implications of this for early sign and oral language development. She is particularly interested in the development of visual attention between deaf infants and their mothers and how this relates to early language development.



**George Butterworth** (1946–2000) completed a D.Phil at Oxford University after which he took up a teaching post at Southampton University. This was followed by a Chair in Psychology at Stirling University. He became a Professor at Sussex University in 1991. George was an authority on infant development and the origins of thought and perception in infants. His research interests were broad, encompassing topics as varied as the origins of self-awareness in human development and evolution, and children's understanding of geographical features of the Earth. George founded both the British Infancy Research Group and the journal *Developmental Science*. He was the first president of the European Society for Developmental Psychology and a former president of the British Psychological Society, Developmental Section. He was internationally respected for his scholarship and commitment to research.

# Preface

Developmental psychology is an endlessly fascinating topic, not least because the 20th century saw such a radical transformation of our view of children. One hundred years ago nobody could have envisaged that babies are capable of learning before they are born or that, a few weeks after birth, they can do simple addition and subtraction. It would have been equally surprising to discover that four-year-olds can solve simple analogical reasoning problems. In this book we have tried to capture some of our own excitement about developmental psychology and the extraordinary achievement of human development.

There are many different ways to carve up development and whichever way one chooses is ultimately a compromise. In this book we have divided development both according to age and topic. Thus there are parts on prenatal development, infancy, the preschool years, and the school years; and chapters dealing with aspects of cognitive development and social development. In the school years part we also have separate chapters on the development of literacy and numeracy. Development does not, of course, divide up into these tidy packages, and many aspects of development could not be neatly fitted into our general plan. We had to consider two important issues.

The first issue concerns the division of development by age. Here there is a potential problem that, since development is a continuum, division according to age will be artificial. Also, there are important differences, both among children and within an individual child, in the course of development that make simple divisions according to age problematic. Children develop at different rates so children of similar ages may be at different levels in their social or cognitive functioning. Also, an individual child may be at one point in development for some abilities and at another point for other abilities. However, in spite of these problems, we wanted to emphasise that there are important features in common across development at particular ages, and we have tried to highlight these.

The second problem that we faced in planning this book was to describe the different facets of development. For the sake of simplicity, we chose to draw a broad distinction between social development and cognitive development. However, children typically develop their abilities within a social setting—at home, playgroup, or school—so that to think of cognition as separate from social development is an oversimplification. At the same time, the range and

complexity of social interactions is, in part, determined by the children's cognitive level, so one could argue that understanding social development also requires some knowledge of developing cognitive skills.

This essential intertwining of social and cognitive development is reflected on the cover, which shows a drawing by Rembrandt of a young child being helped to walk by two adults. This drawing also depicts one of the adults pointing something out to the child. This simple act of pointing captures an important and unique aspect of human development—parents show their children things in the world. As far as we can tell, although the offspring of other species may learn from adults by watching their behaviour, it is only human beings who actively seek to teach their children and point out the delights of the world.

*Margaret Harris*  
Oxford  
October 2001



## **Part 1**

# **A framework for developmental psychology**

# CHAPTER 1

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# A brief history of developmental psychology

The scientific study of children's development began about 150 years ago. Until this comparatively recent period, Western societies did not study the childhood years—from the age of about seven to adolescence—even though early childhood had long been recognised as a distinct period in the life cycle. The coming of the industrial revolution in the 19th century provided an impetus for the systematic study of childhood since it brought with it an increasing need for basic literacy and numeracy in factory workers that was eventually met by the introduction of universal primary education. This, in turn, made it important to study the children's minds so that education itself could become more effective. Other social factors such as increased wealth, better hygiene, and the progressive control of childhood diseases meant that the chances of a baby surviving childhood and growing to adulthood were greatly increased. This increase in survival rates also contributed to a greater focus on understanding development throughout childhood.

The new-found wealth of Western society also extended the period of childhood. As the age at which children began work was gradually raised, the idea of adolescence—as a distinct stage interspersed between childhood and adulthood—became increasingly important. As the 20th century progressed, ever more sophisticated skills were required as technology advanced. This was reflected in a steep rise in the school leaving age. At the beginning of the century many children began work well before the age of 10 and a minimum school leaving age—15 years—was not introduced in the UK until 1944. By the end of the century this has increased to 16 years with many children continuing school education until they were 18. As the length and scope of education advanced, adolescence became an increasingly important area of study.

Although the age range covered by developmental psychology may have increased, the overarching aim of the subject has not fundamentally changed: This is to describe and explain the nature of developmental change from its starting point to its end point. As you will discover from this handbook, developmental psychology begins before birth with the growth of the foetus. It moves on to consider birth and infancy, passing through the preschool years and entry into school, and ending with the transitions from adolescence to adulthood. A fully rounded account of development will consider many inter-related aspects of developmental change including language and cognitive

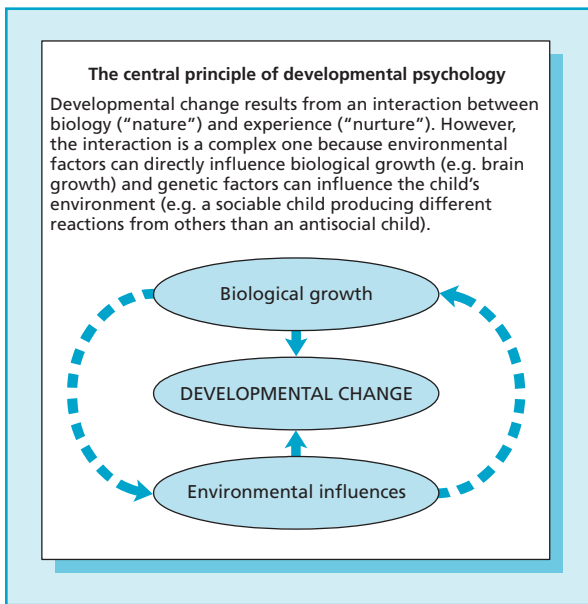
ability, motor skills, social and emotional development, and interaction with family members and peers.

Scientific explanations of development have one central principle: Developmental changes occur both as a result of growth and through the interaction of the child with the environment. Characterising the dynamic principles that underlie growth, self-organisation and increasing complexity are of fundamental importance in developmental explanation. Development involves changes that occur over time yet, despite change, there is also stability and continuity with the past as new aspects of self, behaviour, and knowledge are formed. How new ways of acting and new knowledge emerge from the interaction between elements of earlier levels of understanding and new experience is of central concern to many developmental theories.

Two major strands of influence can be discerned in developmental psychology. These reflect a concern with growth, on the one hand, and with the impact of environmental influences on the other. Concerns with developmental growth take some of their inspiration from the biology of growth and evolution, whereas other aspects of explanation—those concerned with the impact of the environment on the child—consider the ways in which different cultures and different patterns of childhood experience channel development. From this

dual perspective we can see that the explanation of human development requires us not only to understand human nature—because development is a natural phenomenon—but also to consider the diverse effects that a particular society and a particular set of experiences have upon the developing child. Development is as much a matter of the child acquiring a culture as it is a process of biological growth. Contemporary theories of development make the connection between nature and culture, albeit with varying emphases and, of course, with various degrees of success.

In a recent review, Cairns (1998) argues that the biological roots of developmental psychology are the strongest. He identifies two core ideas in 19th-century biology that shaped the newly emerging science of developmental psychology. These are the developmental principle outlined by Karl Ernst von Baer (1792–1876) and the evolutionary theory of Charles Darwin (1809–1882).



## The developmental principle

Von Baer, whose work is relatively unknown today to developmental psychologists, was a pioneer of comparative embryology. He was born in Estonia, where he began his career as a biologist. Later he moved to Russia before returning to Estonia at the end of his career.

Von Baer proposed that development proceeds in successive stages, from the more general to the more specific and from an initial state of relative homogeneity to one of increasing differentiation (Cairns, 1998). Von Baer's view of development was revolutionary when it was first advanced even

though the notion of successive stages is widely accepted within modern developmental psychology. In order to understand the revolutionary nature of his views we need to understand the prevailing view of development that von Baer rejected.

When von Baer began his research, **preformationism** was part of the accepted view of development. In essence, preformationism claims that developmental transformations (such as those observed in the embryo) are illusory because the essential characteristics of an individual are fully predetermined at the outset of development. What changes is the size and inter-relation of parts within an organism but the essential properties are preset and predetermined. In other words, according to preformationism, development fails to bring about any new or novel properties. On this view, the course of development through childhood and into adulthood is fully specified at birth.

An alternative to preformationism in the 19th century was **recapitulationism**. The essential idea behind recapitulationism is that, in the embryonic period, organisms pass through the adult form of all species from which they have evolved (see Figure 1.1). Haeckel famously captured the essence of recapitulationism as “ontogeny recapitulates phylogeny”, that is, the development of the individual re-enacts the development of the species. On this view, embryonic development could be seen as a “fast-forward replay of evolutionary history” (Cairns, 1998). Such a view inevitably leads to the conclusion that novel features can only be added in the terminal phase of development—what Haeckel (1874/1906) labelled the “biogenetic law”.

Von Baer rejected both preformationism and recapitulationism. He showed, in his own research on embryological development in different species, that the embryos of related species are very similar to one another in their early stages of development as Haeckel had demonstrated (see Figure 1.1). However, von Baer found on closer observation that there were species-typical differences early in the course of development as well as in the final stages. (See Chapter 4, Development from Conception to Birth, for evidence about the early development of the human embryo.) Von Baer thus saw development as a continuing process of differentiation of organisation in which novel developments could occur at any point in development—on this basis he rejected Haeckel’s biogenetic law.

#### Preformationism

- The essential characteristics of an organism are fully determined at the onset of development.
- Observed developmental transformations are illusory.
- The only real changes are the size and inter-relation of the parts within the organism.
- Development fails to bring about novel properties.
- Development follows a predetermined course.

#### Recapitulationism

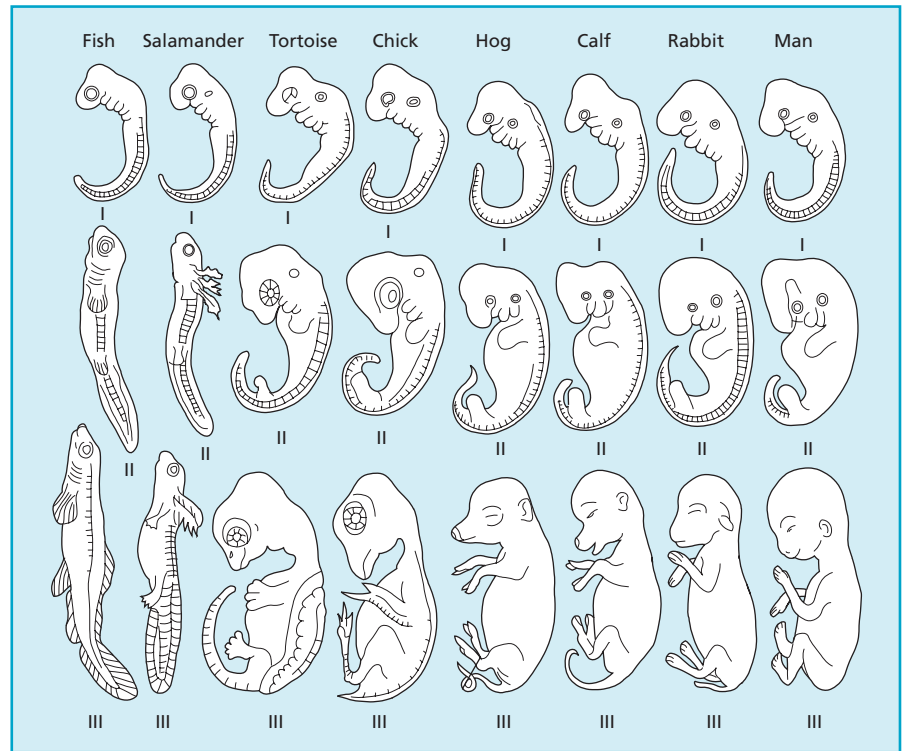
- The development of the individual re-enacts the development of the species.
- During the embryonic period organisms pass through the adult form of the species from which they evolved.
- Novel features can only be added in the last phase of development.

#### KEY TERMS

**Preformationism:** The now discredited theory of development that all essential properties of an individual are preset at birth.

**Recapitulationism:** The now discredited theory of development claiming that, during the embryonic period, an organism passes through the adult forms of species from which it has evolved.

**FIG.1.1** Embryos of different species at three comparable stages of development.



#### Von Baer's approach

- Rejected preformationism and recapitulationism.
- Development proceeds in successive stages.
- Development proceeds from the more general to the more specific.
- Development proceeds from relative homogeneity to increasing differentiation.
- Novel developments can occur at any point in development.

Although von Baer's work was not widely accepted in the 19th century—in part because he also espoused views of evolution that were counter to those of Darwin (see the next section, *The Evolution of Development*)—it did have a direct influence on developmental psychology in the following century. Von Baer's work was applauded by Herbert Spencer in his influential book, *A System of Synthetic Philosophy* (1886) and this, in turn, inspired the theorising of James Mark Baldwin. Baldwin's writing was an important influence on Jean Piaget (see *The Emergence of Developmental Psychology*, later in this chapter).

## The evolution of development

Charles Darwin is often credited with establishing the scientific approach to developmental psychology. He was once described as having conquered developmental psychology in a single sweep. Darwin was particularly interested in the innate capacity for emotional expression and its subsequent early development. He closely observed the development of his own infant son, Doddy, who was born in 1840 (although Darwin did not publish his observations until 1877). Darwin studied emotions in Doddy between the second and fourth month of life and found definite evidence for anger, fear, surprise, and happiness. Darwin recorded some lovely observations. For

example, he writes: “When about ten weeks old, he [Doddy] was given some rather cold milk and he kept a slight frown on his forehead all the time that he was sucking, so that he looked like a grown up person made cross.” In another observation he says “When nearly four months old, and perhaps much earlier, there could be no doubt from the manner in which the blood gushed into his whole face and scalp, that he easily got into a violent passion.”

Darwin’s observations on babies below two months of age are rather few but contemporary research suggests that newborn babies can perform seven facial expressions that are usually regarded as species specific and universal (happiness, sadness, surprise, interest, disgust, fear, and anger). It is nowadays claimed that these facial expressions can be reliably observed during standard hospital assessment procedures for newborns (Field, Healy, Goldstein, & Guthertz, 1990). (See Chapter 4, Development from Conception to Birth, for more information about the facial expressions of newborn babies.)

Darwin’s studies of his infant son were intended to help him understand the evolution of innate forms of human communication. As we shall see, many basic developmental concepts, such as the idea that development can be understood as the progressive adaptation of the child to the environment, can be traced directly to Darwin and the influence of evolutionary theory. Another of Darwin’s contributions was to introduce systematic methods to the study of development. The philosophical or anecdotal speculations of earlier theorists, such as Locke and Rousseau (see Fundamental Questions in Developmental Psychology, later in this chapter), were replaced by actual observations of developing children and this set the discipline on a scientific path.

The major biological foundations of developmental psychology were laid in the period between the publication of Darwin’s theory of evolution in 1859 and the first decades of the 20th century. Darwin’s theory of evolution located humans firmly in nature and made possible scientific questions about continuities and discontinuities between human beings and animals. Another effect of the Darwinian revolution was that people became curious about the biological origins of human nature. Evolutionary explanation led naturally to an emphasis on changes that occur as a function of time, both in the extremely long time scale of evolution and over the individual lifespan. Darwin’s books on *The Origin of Species* (1859), *The Descent of Man* (1871), and *The Expression of Emotions in Men and Animals* (1872) raised questions about the origins of the human mind in the evolutionary past. They posed the challenging problem of the relation between individual development (**ontogeny**) and the evolution of the species (**phylogeny**).

Darwin’s theory was vigorously popularised by the 19th-century embryologist, Ernst Haeckel, (1834–1919) who, as we have already noted, was impressed by the similar form taken by the embryos of many different species at certain times in their development. Somewhat paradoxically, given the major impact of Darwin on biology, the influence of Darwinism on the founding of



Darwin and his son Doddy. Reprinted by permission of the Syndics of Cambridge University Library.

#### KEY TERMS

**Ontogeny:** The development of an individual organism during its lifetime.

**Phylogeny:** The evolutionary history of a species.

developmental psychology has sometimes been interpreted as a negative factor (Charlesworth, 1992; Morss, 1990). Haeckel's principle of recapitulation encouraged the false idea that there exists a hierarchy of organisms in nature with humans at the top and other organisms arranged in strict sequence below—the so-called “scala naturae”. This hierarchical view also encouraged the false idea that development (ontogeny) is a simple cumulative increase in capacities, rather than the complex, dynamic, and non-linear pattern of change that it has proved to be. It seems a little unfair to blame Darwin rather than Haeckel, however, since Darwin himself was never sure of the bases of heredity. In fact, when Darwin speculated on developmental questions he was characteristically cautious, insisting that his hypotheses were provisional but that they might be useful even if incomplete or wrong (Darwin, 1896/1967).

Today, it is no longer believed that “ontogeny recapitulates phylogeny” as Haeckel had argued. The more sophisticated view of the resemblance between different mammalian embryos is that the similarities reflect biological structures we still hold in common with our remote ancestors (Gould, 1977). Thus, there is no simple translation from the evolutionary past into present-day development. Nevertheless, clear stage-like changes in biological form led to the idea that other aspects of biological growth, such as cognitive and social development in humans, may also show distinct age-related stages in organisation.

## The emergence of developmental psychology

The emergence of an independent developmental psychology is traditionally dated to 1882, with the publication of a book by the German physiologist, Wilhelm Preyer, entitled *The Mind of the Child* (1882/1888). This book was based on his observations of his own daughter and described her development from birth to two and a half years. Preyer insisted on proper scientific procedures, writing every observation down and noting the emergence of many abilities. He was particularly impressed by the importance of the extended period of curiosity evident in human infant development.

Wilhelm Preyer's work was translated into English in 1888, one of a burgeoning series of publications by then amounting to 48 full-scale empirical studies of children that had been carried out in Europe and the United States. The growing importance of developmental psychology as an independent discipline in the 1890s can be seen in the establishment of the first specialist scientific journals. *L'Annee Psychologique* was founded in 1894 by Binet and, in the USA, G. Stanley Hall (whose work we discuss later in this section) founded *Pedagogical Seminary* in 1891. In the same decade, the first research institutes devoted to the study of child development were set up at the Sorbonne and at Clark University. There was even a new term coined for this new field of study—paidoskopie. As Cairns (1998) points out, it is perhaps fortunate that this label did not survive even though the study of child development continued to go from strength to strength as the 20th century began.

Among other famous pioneers was Alfred Binet (1857–1911) who was working on experimental studies of thinking in young children in France. He is best known for developing the first intelligence test although, as Siegler



The French psychologist  
Alfred Binet (1857–1911).

(1992) has noted, “it is ironic that Binet’s contribution should be so strongly associated with reducing intelligence to a single number, the IQ score, when the recurring theme of his research was the remarkable diversity of intelligence” (p. 175). As Cairns (1998) points out, the IQ test that Binet devised with Simon was primarily intended to provide a guide about how children might “learn to learn” rather than a system for classifying children according to intellectual level.

Binet had been critical of diagnoses of mental deficiency made by medical practitioners responsible for placing mentally retarded (learning disabled) children in special schools in Paris. The thrust of Binet’s criticism was that no single sign of mental deficiency could reliably differentiate mentally retarded from normal children: In fact the same child might carry a different diagnosis, depending on which physician had made it. The urgent practical need for a valid and reliable test of intelligence led Binet to construct the **Binet–Simon scale**, which was published in 1905. Its main early application was to provide guidelines on the relative intellectual abilities and educational potential of mentally retarded children but his work was soon to find much wider application in education and training. Binet and Simon developed tests that were based on norms of performance for a given age and this soon led to the idea of a child’s *mental age* as distinct from *chronological age* (see the box overleaf). Ten years later the idea of intelligence testing for children was well established outside France. In 1916, the now famous Stanford revision of Binet’s test (known as the **Stanford–Binet test**) was published in the USA and, in Britain, Cyril Burt was developing a battery of reasoning tests for children that was inspired by Binet’s techniques.

The importance of the Binet–Simon scale has rather overshadowed Binet’s wider contribution to developmental psychology but he also made important advances in the study of children’s cognition. Siegler (1992), in evaluating Binet’s contribution to developmental psychology, suggests that he was an important pioneer in generating a unified theory of cognition and cognitive development. Binet’s work was also very influential in making careful measurement a basic part of modern psychology. His intelligence scale laid the foundations for the extensive psychometric tests that are now widely used as a key aspect of assessment in education, clinical psychology, and other applied fields.

Among the most important, yet perhaps least well known, of the founders of present-day developmental psychology was the American, James Mark Baldwin (1861–1934). Baldwin made a major intellectual and administrative contribution to setting up scientific psychology. He was the founding editor of the first scientific psychology journal, *The Psychological Review* (1895), and was later editor of the important journal, *Psychological Bulletin*, and also one of the first presidents of the American Psychological Association (1897). He was influential in many ways in the new science of psychology, including establishing an international group of scholars who contributed to a four-volume *Dictionary of Philosophy and Psychology* (Baldwin, 1905). In 1903 a survey ranked Baldwin in the top five contributors to international research (Broughton & Freeman-Moir, 1982).

One of Baldwin’s most important contributions to the founding of developmental psychology was made in the period from 1903 to 1908 when he was professor of philosophy and psychology at Johns Hopkins University. He

#### KEY TERMS

**Binet–Simon scale:** The first intelligence test developed by Alfred Binet, which contained a series of tasks of increasing difficulty. Performance on the scale could be compared with age norms to determine mental age.

**Stanford–Binet test:** The best-known US intelligence test. A revision of the Binet–Simon scale.



James Mark Baldwin (1861–1934). Courtesy of the Department of Psychology, Indiana University. Reprinted with permission.

## Mental age and IQ

The concept of mental age, which was first used by Binet, is best illustrated with some examples. Suppose that a child of exactly eight years of age is able to solve items in a test that are normally solved by children of the same age but is not able to solve items normally solved by older children. That child would be considered to have a mental age of eight years. However, if the same child consistently succeeded on test items normally solved by 10-year-olds, he or she would clearly be functioning intellectually at a mental age level that was above chronological age. In this case the child would be considered to have a mental age of 10 years. A child who is only able to solve items normally solved by younger children would have a mental age lower than chronological age.

The psychologist William Stern (1871–1938) devised the formula for calculating the **intelligence quotient** (IQ) which defines intelligence relative to age:

$$\text{IQ} = \frac{\text{Mental age}}{\text{Chronological age}} \times 100$$

In the example we have just considered, the eight-year-old with a mental age of 10 years would be credited with an IQ of:  $10/8 \times 100 = 125$ . Similarly a 12-year-old with a 15-year-old mental age would also have an IQ of 125 ( $15/12 \times 100 = 125$ ) because he or she would have the same relative standing in relation to age peers. A child who has a mental age that is the same as his/her chronological age is considered to be of average intelligence. This is because, on average, intellectual development in the population proceeds at the same rate as chronological age. Children of average intelligence have an IQ of 100.

published the first of a three-volume series entitled *Genetic Logic* (1915), a difficult work on the development of thinking in children. In this series Baldwin set out the foundations of a theory of the progressive development of knowledge in childhood. He proposed that development proceeds in a series of distinct stages that begin at birth, with innate motor reflexes, and progresses to the acquisition of language and logical thought. He proposed that moving through successive stages of development depends on feedback from the stimulating environment. In Baldwin's terminology the essential mechanisms for development were **assimilation** (incorporation of effects of the environment into the organism) leading to **accommodation** (plastic change) of the organism—concepts that form a central part of Piaget's theory of cognitive development (see Chapter 2, Developmental Psychology in the 20th Century). Baldwin emphasised that the child is as much a product of social experience as of biological growth.

From 1912 Baldwin lived in France, making periodic visits to the University of Geneva in Switzerland. He established a warm friendship with the child psychologist Edouard Claparede. Baldwin's books were translated into French and they became a major influence on a famous student of Claparede, Jean Piaget (1896–1980), whose theory of development will be considered in detail at various places in this book. Cairns (1992) offers a sympathetic review of Baldwin's many contributions to developmental psychology and its contemporary relevance; and Paul Harris (1997) discusses Piaget's relationship with Binet and Baldwin.

### KEY TERMS

#### Intelligence quotient (IQ):

The ratio of mental age, defined by an intelligence test, to chronological age, with a score of 100 representing "average IQ".

**Assimilation:** Process by which new information is "taken in" and incorporated into existing schemas.

**Accommodation:** The modification of a previous scheme, or creation of a new one, when required.

Across the Atlantic, G. Stanley Hall (1844–1924) played an important role in establishing the new science of psychology. There has been some debate about Hall's contribution to developmental psychology which has often been considered to be fundamentally flawed. Hall took up Haeckel's biogenetic law that "ontogeny recapitulates phylogeny", which supposed that the course of human development involves a repetition of the ancestral, evolutionary timetable (see The Developmental Principle, earlier in this chapter). This led, for example, to his thoroughly mistaken idea that children love to swing in trees because they recapitulate their monkey ancestry; or that the child has a primitive "savage" mind (or conversely, that the savage mind is childlike). He even argued that there is a scale of mental abilities with children (and women) at the bottom and men at the top!

In other respects, if the recapitulatory aspect is overlooked, Hall's comparative observations are of interest. For example, his student Chamberlain noted that the period of growth to maturity in mammals, as measured by fusion of the skeletal structure, is relatively a much longer proportion of the lifespan in humans than in most other species. For example, the dormouse with a lifespan of four to five years reaches adulthood in about three months (5% of the lifespan), the rabbit with a lifespan of eight years reaches adulthood in eight to nine months (8.5% of the lifespan), whereas man with an average lifespan of 75 years reaches adulthood at 25 years (33% of the lifespan), in common with the elephant who lives to be 100 years and reaches adulthood at 33 years. Such a comparative perspective does provide an important framework for interpreting the transition from adolescence to adulthood in humans, where the physiological onset of puberty may occur as early as 10 or 11 years, but there is still quite a long developmental period before full physical maturity is reached.

It has been suggested that Hall lacked a systematic programme of thought, being loosely eclectic and borrowing from various methodological and intellectual traditions (Dixon, 1990). It is certainly possible that Hall's enthusiasm for recapitulation theory seriously undermined the potential positive contribution of the comparative method to developmental psychology. One of his severest critics at the time, Edward Lee Thorndike, pointed out that no one would mistake the human embryo at any stage for an adult fish. Rather, structures may sometimes be similar because they are necessarily formed in a particular way. For example, a four-chambered heart is most economically constructed by twice subdividing a single chamber.

Perhaps Hall's most important contribution to developmental psychology was as an importer and translator of research and theorising that was being carried out beyond the USA. He helped to bring Preyer's book, *The Mind of the Child* (1882/1888), to a wider audience in America and, as the President of Clark University in the USA, he was responsible for inviting Sigmund Freud to the United States in 1909 and thus promoted Freud's psychoanalytic ideas. The Freudian influence is perhaps most clearly seen in theories of social and

#### Baldwin's approach

- Progressive development of knowledge in childhood.
- Development proceeds in a series of distinct stages.
- The stages begin at birth with innate motor reflexes.
- The stages progress to the acquisition of language and logical thought.
- Progress through successive stages depends on feedback from the environment.
- Mechanisms for development involve incorporation of environmental effects (assimilation) and plastic change (accommodation).
- A child is a product of both social experience and biological growth.

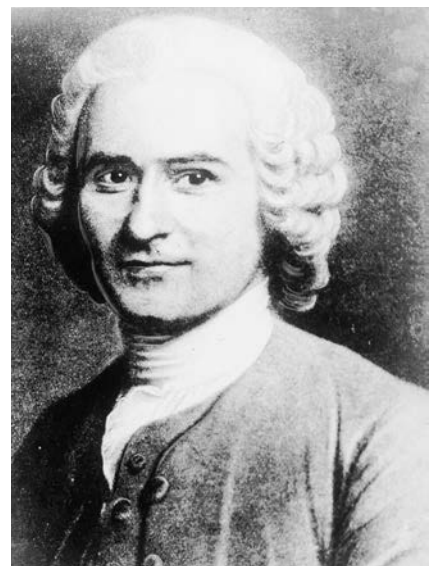
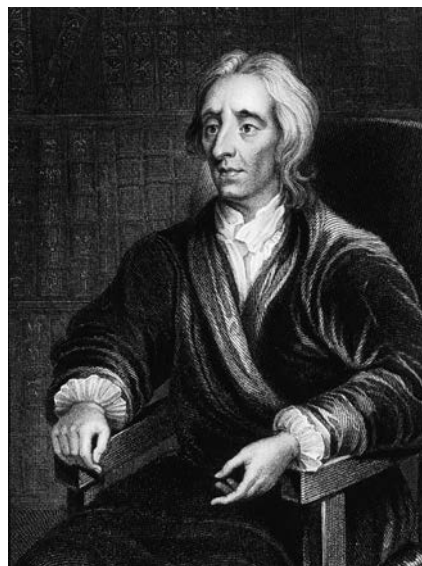
emotional development, especially in research concerning attachment between parent and child. We will be considering contemporary ideas influenced by Freudian theory, especially the work of John Bowlby, later in this handbook (see Chapter 2, Developmental Psychology in the 20th Century, and Chapter 6, Early Social Development).

## Fundamental questions in developmental psychology

Throughout the period when developmental psychology was establishing itself as an independent discipline several fundamental questions emerged (Cairns, 1998). We have already discussed the relation between evolution and development which was a major issue for debate in this early period. Arguments for and against recapitulation continued until this view was discredited by Gould in 1977. Another topic with a long history but a less clear resolution is the nature–nurture problem.

It was Francis Galton who first labelled the “nature–nurture” problem. Galton, who was a cousin of Charles Darwin, was impressed by the fact that genius tended to run in families. This suggested to Galton that there was a strong inherited component in intellectual ability and he argued for this view in his book, *Hereditary Genius* (1869).

The essential debate between nature (inherited factors) and nurture (upbringing) concerns the extent to which a person’s behaviour and characteristics are the product of inborn (genetically determined) potential or of experience. Historically, extreme views have been expressed on both sides of this debate. The 17th-century English philosopher, John Locke (1632–1704), thought the child was born a “tabula rasa” (blank slate), whose every characteristic would be moulded by experience. On this view, the newborn has no psychological structure and is extremely malleable to the effects of the environment (Bremner, 1994). Locke’s environmentalist view tends to deny that



Left: The 17th-century English philosopher John Locke (1632–1704). Copyright © Popperfoto.  
Right: The 18th-century Swiss philosopher Jean-Jacques Rousseau (1712–1778). Copyright © Popperfoto.

innate factors make any important contribution to psychological development. Instead, Locke placed great emphasis on learning as a way of explaining how children's knowledge and understanding develop with age.

In sharp contrast to Locke, the views of the 18th-century Swiss philosopher, Jean-Jacques Rousseau (1712–1778), were more inclined to a “natural” theory of human development. In his famous book, *Emile* (1762/1974), Rousseau argued that children should be treated as children rather than as miniature adults. He divided development into discrete, sequential stages, beginning with an animalistic stage from birth to about five years, followed by a dawning self-consciousness in middle childhood, rationality at around twelve years, and social conscience arising at puberty. He considered that children are innately “good”, requiring little by way of moral guidance or constraint for normal development, and that they grow according to “nature’s plan”. Rousseau’s account emphasised the child’s “natural” propensities and minimised the effects of upbringing or experience.

This kind of view of the inherent goodness of children famously found expression in Wordsworth’s poem “Ode: Intimations of immortality” published in 1807. Wordsworth describes the newborn child as:

*...trailing clouds of glory do we come  
from God who is our home:  
Heaven lies about us in our infancy!*

Wordsworth sees the effects of experience as largely bad:

*shades of the prison house begin to close  
upon the growing boy*

Rousseau’s influential views help to explain why the behaviour of so-called “feral children” attracted such great interest in the 18th and 19th centuries. It was thought that the behaviour of children, who had apparently been raised in the wild, might help to define the animalistic “natural” human stage and to explore the limits of socialisation of human nature. The box overleaf reviews a number of these anecdotal accounts of feral children. They provide a fascinating insight into changing views of development.

Rousseau’s views were also an important inspiration in education. The most influential of his followers was Johann Pestalozzi whose views had worldwide impact on educational practice. Pestalozzi, who opened a school in 1799 where he was able to test his ideas about education, argued that teaching methods should be adapted to the natural development of the child. His school was attended by pupils from all over Europe and Friedrich Froebel, who founded kindergarten education, was a teacher there for four years and greatly inspired by Pestalozzi’s ideas.

Very general views of “nurture” and “nature”—for example those of Locke and Rousseau—and anecdotal evidence about feral children set the stage for prolonged and misguided debates about the relative contributions of “nature and nurture” to development. Contemporary developmental psychologists prefer to avoid such dichotomous approaches to explanation in favour of “interactive” or “dialectical” accounts that attempt to capture more adequately the complex, dynamic interplay of factors contributing to development.

## Feral children

The word “feral” is normally used to refer to animals that were once domesticated but who have returned to the wild. In the case of feral children, the term has come to refer to children who were discovered in the wild and brought back to civilisation. There have been many reports of feral children whose survival and upbringing has often been attributed to animals. Candland (1994) notes that the great naturalist and taxonomist, Linnaeus (1707–1778), listed nine cases that he classified under the taxonomic category “Primates, Man and Apes”, as “*Loco ferus*”: four-footed, non-speaking, and hairy. These include a wolf boy from Hesse (1344), a bear boy from Lithuania (1661), and a sheep boy from Ireland (1672). The study of such children was thought to have both political and educational significance for they might reveal the nature of the uncivilised mind and how best to educate and instruct children. It was assumed that the relative importance of nature and nurture in human development might thus be elucidated.

Among the most famous cases is that of Victor, the Wildboy. Victor was captured in 1799 as a boy when he was aged 11 or 12 years. He was found wandering naked in the woods near Aveyron, France. Victor was eventually taken to Paris, about a year later, where his presence aroused much interest among people expecting to have their first glimpse of a “wild and noble savage” just as described by Rousseau. Instead, what they found was a disturbed child, who was incapable of speech, of maintaining attention and who spent his time rocking backwards and forwards. Victor came into the care of Dr Jean-Marc-Gaspard Itard, a physician working at the asylum in Bicetre (near Paris) with Phillipe Pinel, the man who was among the first to advocate the humane treatment of the insane. Pinel considered Victor to be incurably mentally retarded. However, Itard thought that Victor may simply have been showing effects of lack of socialisation and set about to educate Victor over a period of five years. Itard attempted to teach Victor to speak but eventually had to acknowledge failure. Victor was able to speak only three words at the time he died at the age of 40 years.

In addition to Victor, Candland (1994) analyses four famous cases of feral children. “Wild Peter” was a boy aged about 12 years who was discovered in Hameln, Germany in 1724, living off raw vegetables and birds which he caught and dismembered. Peter eventually became a guest of King George I of England, to be studied as a scientific curiosity. “Kaspar Hauser” was discovered in Nuremberg, Germany in 1828 aged 16 years. It is reported that he was brought up in a cell with little opportunity for movement or the learning of speech. However, it was claimed that he eventually acquired language by learning from an adoptive sibling.

The “Wolf Children”, Kamala and Amala, were discovered in 1920 by the Reverend J.A.L. Singh, in Midnapore, India. They were aged eight years and eighteen months respectively and were apparently living with wolves. Dr Singh and his wife, who brought up

Dr Itard and Victor.  
Reproduced from  
J.-M.-G. Itard (1932), *The  
wild boy of Aveyron*.  
Translated by G.  
Humphrey and M.  
Humphrey. New  
York: Century.



the girls in their orphanage, described them as typically moving around on all fours and eating food from a dish by mouth, like a dog. Sadly, Amala died a year after entering the orphanage but Kamala lived to the age of 17 years. Gesell (1941) describes how Kamala eventually came to walk upright, to talk in short sentences and to become socialised to the extent that, at the age of 15 years, she was able to pick out her own clothes from the wash, help care for the babies in the orphanage, and make appropriate use of the toilet facilities. Gesell estimated that her mental and language development at the time of her death was equivalent to that of a three and a half year-old child.

Candland (1994) comes to the conclusion that Rousseau's romantic idea of man's original animal nature receives little support from the study of feral children. Indeed, cases of feral children do not provide an answer to the question of how much of human nature is to be attributed to nature and how much to children's exposure to the social, educational, or political environment. Rather, what psychologists now realise is that many different factors contributed to the behaviour of feral children. These include both social factors—lack of normal parenting and contact with other humans—and inherent disabilities such as deafness, the inability to speak (dysarthria), and mental retardation that may have been responsible for "animal" behaviours, such as quadrupedal gait. These cases also cast doubt on the use of anecdotal evidence in developmental science. It is extremely difficult to prove that any of these "feral" children were actually raised by animals and not simply abandoned by their parents because they had disabilities apparent from an early age.



Kamala and Amala sleep overlapping one another. Reproduced with permission from J.A.L. Singh and R.M. Zingg (1939), *Wolf-children and feral man*. New York: Harper & Brothers Publishers. Courtesy of the Centennial Museum.

Another contemporary issue of concern that has its roots in the early days of developmental psychology concerns the timing and plasticity of development—an issue that also relates to the studies of feral children. By the beginning of the 19th century, when ideas about the importance of education were being developed by Pestalozzi, the prevailing view was that development was the product of both innate predispositions and experience. However, there remained considerable debate about *when* in development the effects of experience were most potent; and also about the related question of when development ends. G. Stanley Hall argued that the most important influences of experience occurred in adolescence. In his view, early experience had little effect since evolutionary forces laid down the path of development from birth until puberty. Freud took the opposite view, arguing that the most potent effects of experience were in infancy: Patterns of thought and behaviour that were laid down in infancy determined patterns of adult behaviour. Freud argued that these patterns were so resistant to change that psychoanalytic intervention was necessary to alter a maladaptive pattern. Baldwin's view differed from both Freud and Hall in that he argued for personality development as a continuing process throughout the lifespan. This view of continuing change from birth to

adolescence came to be the dominant one in developmental psychology as Baldwin's ideas were expanded into a comprehensive theory of developmental change by Piaget.

## Conclusion and summary

Developmental psychology is concerned with age-related changes in experience and behaviour. The aims of the discipline are to describe the changes that take place in children's abilities and to explain why they occur. Both of these are very difficult tasks, and the last 150 years have seen increasing sophistication both in the ways that developmental changes are observed and in the kinds of explanation that are offered to account for these changes.

Many of the fundamental questions in developmental psychology—such as the comparative contributions of genes and experience to individual differences in development—have their origins in philosophy, but the scientific study of children was founded upon the insights of evolutionary biology in the 19th century and in particular the work of Karl Ernst von Baer and Charles Darwin. Von Baer's work was concerned with the development of the embryo and his most important contribution was to discredit the recapitulationist view that, in embryonic development, organisms pass through the adult form of all the species that have been ancestral to them during their evolution. First, he demonstrated that the embryo of a higher animal is never like that of a lower animal, and second, that development is a continuous process of differentiation and organisation, with development proceeding in successive stages, from the more general to the more specific. Von Baer concluded that developmental processes demand rigorous study in their own right and cannot be derived from analogies to evolution. This view of embryological development was extrapolated to development after birth by James Mark Baldwin and his successors, including Jean Piaget.

Darwin's views on evolution also had an important influence on developmental psychology, especially his writings on the evolution of the emotions and intelligence. He also carried out pioneering observations of his own children. Cairns (1998) notes that Darwin's contribution to developmental psychology has been the subject of debate. He argues that an assessment of Darwin's contribution depends heavily on the particular aspects of development that are considered. Perhaps the most important general contribution of Darwin's writing was to emphasise the importance of a comparative approach in which the development of human infants is set within the wider context of development in other species. Comparisons between human development and abilities and those present in the great apes—especially chimpanzees—have become an important part of modern developmental psychology and we use comparative evidence at various points in this handbook in order to determine the unique aspects of human development.

By the end of the 19th century developmental psychology was well established as a scientific discipline in Europe and the United States. Cairns (1998) argues that developmental studies flourished despite the powerful influence of traditional psychological laboratories—such as that of Thorndike—which took a rather narrow view of learning and animal behaviour. Both in Europe and the United States a number of journals dedicated to developmental psychology were

founded and specialist research institutes and professional organisations were established.

By the 1920s various distinct schools of developmental psychology had begun to emerge, each emphasising a different aspect of nature or nurture. The field had become fragmented and a synthesis was needed so that the complex interaction of biological and social factors could be more adequately understood. This work of synthesis was mainly accomplished by the “grand” theories of the middle 20th century that are described in the next chapter.

## Further reading

- Cairns, R.B. (1998). The making of developmental psychology. In R.M. Lerner (Eds.), *Handbook of child psychology: Vol. 1. Theoretical models of human development* (W. Damon, Gen. Ed.; pp. 25–105). New York: Wiley. This chapter in the authoritative *Handbook of child psychology* provides a detailed account of the early influences on developmental psychology in the 19th century and traces the changes that have occurred through the 20th century.
- Candland, D.K. (1994). *Feral children and clever animals: Reflections on human nature*. Oxford, UK: Oxford University Press. This is a very readable book that gives detailed accounts of the studies of feral children that we describe briefly in this chapter.
- Harris, P.L. (1997). Piaget in Paris: From “autism” to logic. *Human Development*, 40, 109–123. This paper describes the development of Piaget’s views about children’s thinking. It is quite a difficult paper and is intended for advanced undergraduates.
- Parke, R.D., Ornstein, P.A., Reiser, J., & Zahn-Waxler, C. (Eds.). (1994). *A century of developmental psychology*. Washington DC: American Psychological Association. This edited book contains chapters written by active researchers in developmental psychology who reflect on the history of psychology and the influence that earlier research has had on the development of their own ideas.

# CHAPTER 2

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# Developmental psychology in the 20th century

## 2

The empirical basis of modern developmental psychology was established in the early part of the 20th century. During this time there was still great concern with the nature–nurture debate (see Fundamental Questions in Developmental Psychology in Chapter 1), with theories tending to advocate one or the other factor as the over-riding influence on development. The period coincided with an intense interest in theories of learning based on the work of the Russian physiologist, Ivan Pavlov. Pavlov’s now famous studies of learning in dogs established that some types of learning take place through the association of stimuli and responses, under conditions of reward and punishment. For example, in his studies of “classical conditioning” Pavlov showed that a hungry animal will readily learn that a signal, such as a bell, regularly predicts the arrival of food. As a result the dog will soon salivate in anticipation of food whenever the bell sounds. What has happened is that the dog has learned to associate the bell with food and the normal (unconditioned) response of salivation to food has become associated with (conditioned to) the sound of the bell.

## Learning or maturation: The rise of opposing schools

This focus on the laws of learning led to the rise of a school of psychology known as **behaviourism**, whose major figure was John Watson (1878–1958). Watson had distinct ideas about child development based on “learning” theory. He was very interested, for example, in whether infants naturally showed fear of animals or whether such fears were learned (see the box on the next page). He concluded that these fears were learned.

Watson believed so strongly in the potential of children to learn through experience that he wrote:

*Give me a dozen healthy infants, well formed and my own specified world to bring them up in and I’ll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and yes, even beggar man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors.*

(Watson, 1930, p. 104)

### KEY TERM

**Behaviourism:** An approach in psychology, defining it as the study of behaviour, and focusing objectively on observable actions. Reference to internal mental activity is rejected.



John Watson (1878–1958).  
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History of American  
Psychology/The University of  
Akron.

## Watson's studies of childhood fears

In his book, *Psychology from the Standpoint of a Behaviorist* (1919), Watson reported a study of three children who were introduced to novel birds and animals over a period of several days. In one case, Watson presented a six-month-old baby called Thorne with a black cat, a pigeon, a rabbit, and, later on, with a whole series of animals at the local zoo including a camel and a zebra. He studied Thorne's reaction to their presence in a number of different conditions and found that, even in the dark, she did not display fear on any occasion although she was very interested in all the animals and looked at them intently. She also reached out to touch the smaller animals.

Having shown that children did not have any innate fear of animals, Watson went on to study the acquisition of irrational fears through learning. He reports the case of a six-month-old baby who had a small dog tossed into her pram. (How this came about Watson does not reveal.) The baby became terrified and subsequently showed a fear reaction not only to dogs but also to rapidly moving toy animals. At 18 months the unfortunate baby was tested by having a tame white mouse placed on the floor near her. She responded by crying and rushing into her father's arms.

A similar—and more famous—study was carried out on the baby, “Little Albert”, and reported by Watson and Raynor (1920). They showed that, after Albert was frightened while playing with a furry toy, he also learned to be afraid of other furry objects (such as a beard) and animals.

As this quotation vividly illustrates, “nature” took rather a back seat to “nurture” in Watson's explanation of the causes of development. He believed, for example, that whether a person is left handed or right handed was a function of early training rather than of genetic factors—a view that has now largely been discredited. Watson's views were partly based on inherent American optimism and partly on an extreme view of the extent of human plasticity. That is, the developing child was considered to be extremely malleable and highly susceptible to the effects of environmental influences.

Learning theory approaches to development continued to exercise great influence, especially in the USA, until quite recently. They still find useful application in dealing with some developmental problems, such as bed-

wetting, or fears and phobias, where techniques based on the laws of conditioning first described by Pavlov, and developed by Watson, have been applied. However, the contemporary influence of learning theories on development is rather limited by comparison to other more recent schools of thought.

The diametric opposite to an extreme learning theory approach was the maturational school, led by Arnold Gesell (1880–1961). Gesell originally trained as a teacher and then pursued his doctoral studies under G. Stanley Hall (see *The Emergence of Developmental Psychology*, in Chapter 1) in developmental psychology. Then, while director of

### Behaviourist approach (Watson)

- Studied the acquisition of irrational fears through learning.
- Believed strongly in the potential of the child to learn through experience.
- An environmentalist viewpoint; “nurture” rather than “nature”.
- An extreme view of human plasticity.
- The developing child is extremely malleable and susceptible to the effects of environmental influences.

the Yale University Clinic of Child Development, he qualified in medicine. He made pioneering observational studies of infants and young children using 35 mm films in his photographic observation dome. Thelen (1984) says that Gesell shared Darwin's commitment to the naturalistic method of observation of children and that his theory was deeply rooted in biology. His main idea was that the time-locked processes of biological growth are particularly important for the appearance of various motor and perceptual abilities in early development.

Links with embryological theories can also be found in the pioneering research of Myrtle McGraw during the 1920s and 1930s. McGraw attempted to establish whether principles derived from animal embryology might also apply to the growth of human behaviour. She became famous for a study of motor development in identical twins, in which one of the pair received additional stimulation of various motor responses, while the other served as the normal developmental control. Despite additional practice, the rate of motor development in the pair remained closely correlated and this was widely believed at the time to support a maturationalist theory of development (Bergenn, Dalton, & Lipsitt, 1994).

Contemporary evaluations of Gesell and McGraw acknowledge that their theories were not simply maturationalist but, unlike the environmentalists, such as Watson, and Gesell and McGraw, tended to emphasise "nature" at the expense of "nurture" as a cause of development. The rather nativist view of Gesell—and his insistence upon the importance of evolution in shaping the course of development—is illustrated by the following quotation which stands in stark contrast to the earlier quotation from Watson:

*The child grows. The capacities and, to no small extent, the directions of growth are the end products of ages of evolution.*

*(Gesell, Ilg, & Bullis, 1949, p. 44)*

As a comparison of the views of Watson and Gesell reveals, the middle period in the founding of developmental psychology produced a polarisation between extreme environmentalism—somewhat similar to Locke's view (see Fundamental Questions in Developmental Psychology, in Chapter 1) of the child as a "tabula rasa" on which experience would have a major effect—and an extreme maturationist view. The influence of **maturation** was most strongly espoused by those interested in such aspects of development as hand-eye co-ordination and the acquisition of motor skills, like walking, which seemed to proceed according to a strict biological timetable. (It should be noted, however, that Gesell recognised the significant individual variation in the age at which children reached particular developmental milestones.)

These sharply polarised views of nature versus nurture, although out of date now, were important because they led to distinct fashions in child rearing and education each based on the rival views. The environmentalists emphasised habit training as a means of teaching children, for example, in toilet

#### Maturational approach (Gesell/McGraw)

- Used the naturalistic method of observation.
- The approach is rooted in biology.
- Time-locked processes of biological growth are particularly important for the appearance of motor and perceptual abilities (Gesell).
- Studies with identical twins revealed that motor development rate was similar regardless of practice (McGraw).
- Nativist viewpoint; emphasised "nature" rather than "nurture".

#### KEY TERM

**Maturation:** A sequence of physical growth characteristics, strongly influenced by genetic inheritance, that unfold as individuals grow older; common to all members of a species.

training or the acquisition of basic skills like reading and writing. Maturationists emphasised the biological need for the child to be “ready” for particular types of experience before learning could occur.

The extreme maturationist or environmentalist accounts of development that dominated the early part of the 20th century were succeeded by theories that attempted a post-Darwinian synthesis of “nature” and “nurture”. We will introduce the major themes and influences in mid-20th century developmental psychology by considering the work of three eminent developmental psychologists, Jean Piaget, Lev Vygotsky, and John Bowlby. All three offered very broad theories concerned respectively with intellectual, social, and emotional development. The similarities and differences between these theories illustrate many of the key issues of controversy within developmental psychology.

## Jean Piaget (1896–1980)

Jean Piaget has had the most profound influence on our understanding of development. He lived such a long and productive life that he straddled the whole of the modern history of developmental psychology, almost from its foundations to the late 20th century. Piaget began his studies in Neuchâtel—a Swiss canton—where he was studied philosophy (including logic) and scientific methodology at senior school. Even at this early age he was interested in biology and the way in which organisms adapted to their environment through experience. In 1907, at the precocious age of 11 years, Piaget published his first paper “On sighting an albino sparrow”. The curator of the local natural history museum was so impressed by the paper that Piaget became his part-time and unpaid assistant, and, on Saturday afternoons, he collected and catalogued the

molluscs of the Swiss lakes. At university, Piaget studied Biology and Philosophy and, in 1918, he was awarded a doctorate for his work on the special adaptations evolved by the molluscs in the shallow waters of the Swiss lakes.

In the same year, Piaget left Neuchâtel for Zurich where he studied experimental psychology. He also attended lectures given by Jung and other psychoanalysts and he studied the writings of Sigmund Freud. In the following year, 1919, Piaget left for Paris where, as Paul Harris (1997) notes, he first came into contact with experimental studies of children: Although Binet had died in 1911, his influence was still strong and his approach to the study of children continued. Freud had also worked in Paris at the end of the previous century and, by the time that Piaget arrived, psychoanalytic theory was becoming accepted within the academic community. Another important figure, James Mark Baldwin, was in exile in Paris when Piaget arrived. Paul Harris (1997) has argued that the ideas of all three figures—Binet, Freud, and Baldwin—made important contributions to the

The Swiss psychologist Jean Piaget (1896–1980).  
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development of Piaget's own theory about the way that children's thinking develops over time.

In Paris, Piaget continued with his study of logic and the philosophy of science as well as psychology. He also conducted clinical interviews with psychiatric patients. Piaget began his experimental study of children when Simon—Binet's collaborator (see *The Emergence of Developmental Psychology*, in Chapter 1)—invited him to make use of Binet's laboratory. Piaget's first task was to standardise Burt's tests of reasoning on a sample of French children (P.L. Harris, 1997). Piaget's approach was characteristic of the one that he adopted in much of his later research: He employed the clinical method (see *Carrying Out Research in Developmental Psychology*, in Chapter 3), using probing questions to uncover what the children understood. Piaget was especially interested in the errors that children made and the possibility that these could be explained as internally consistent rather than random. According to Harris, this search for a systematic pattern in the production of children's errors stemmed from Piaget's strong background in logic (see the following box for an example of Piaget's early research in Binet's laboratory, which illustrates his approach).

#### Initial work of Piaget

- Influenced by the work of Binet, Freud, and Baldwin.
- Relied upon the clinical method, using probing questions to uncover what children understood.
- Was interested in the errors children made and the possibility that these were not random.
- Searched for a systematic pattern in the production of children's errors.
- Worked towards a logical, internally consistent explanation of children's errors.

### Piaget's early studies of children's thinking

Piaget's early search for a logical—internally consistent—explanation of children's errors is very evident in his investigation of Burt's transitive reasoning problems such as: *Edith is fairer than Suzanne. Edith is darker than Lily. Who is darkest, Edith, Suzanne, or Lily?* The correct answer is *Suzanne* but children cannot usually solve such problems until the age of 11. The younger children who Piaget tested often said "Lily" who is, of course, the fairest of the three.

Piaget was able to account for the children's apparently illogical conclusion that Lily was the darkest rather than the fairest by getting to the heart of the children's own logic. He realised that the children were treating the relational terms, "fairer" and "darker", as meaning "fair" and "dark", respectively (that is, they were treating the terms as categorical rather than relational). This meant that the children interpreted *Edith is fairer than Suzanne* to mean that both Edith and Suzanne were fair, whereas they interpreted *Edith is darker than Lily* to mean that both were dark. Thus, on this interpretation, Lily is the darkest because she is the only one who is completely dark and Suzanne is fairest because she is the only one who is completely fair. Edith, who is both fair and dark, is seen as intermediate in complexion. Paradoxically, this interpretation leads to exactly the opposite conclusion to the correct one.

In 1921 Piaget returned to Switzerland—this time to the Institut Jean-Jacques Rousseau in Geneva where he was appointed as director of studies. By then Piaget had completed many hours of clinical interviews with children and he continued this practice in Geneva. Piaget remained in Geneva for the rest of his life, developing a theory of how knowledge is acquired, which he called

**Developments of Piaget's initial work**

- Studied how knowledge is acquired and developed the theory of “genetic epistemology”.
- Studied thought and language in preschoolers and early school-age children.
- Believed that intelligence arises progressively in the baby's repetitive activities.
- Described how concepts of space, time, causes, and physical objects arise in development.
- Investigated the beginnings of fantasy and symbolism in infancy.
- Outlined a theory that states that the precursors of thinking and language lie in the elementary actions, perceptions, and imitations of babies.

“genetic epistemology”. His first books were about thinking and language in preschool and early school-age children: *The Language and Thought of the Child* (1923/1926) and *Judgement and Reasoning in the Child* (1924/1926). These were widely influential and much to his surprise were acclaimed the world over.

In 1923 Piaget married Valentine Chatenay and in collaboration they studied the development from birth of their own three children, Jacqueline, Lucienne, and Laurent. Their observations on the origins of thought and language in infancy formed the basis for three of Piaget's most influential books: *The Origins of Intelligence in Children* (1936/1952), which describes how intelligence progressively arises in the baby's repetitive

activities, *The Construction of Reality in the Child* (1937/1954), which describes how elementary concepts of space, time, causes, and physical objects arise in development, and *Play Dreams and Imitation in Childhood* (1945/1962) which describes the beginnings of fantasy and symbolism in infancy. In this trilogy Piaget outlined his theory that the precursors of thinking and language lie in the elementary actions, perceptions, and imitations of babies.

Many other influential books were to follow, especially those which had an impact on educational theory and practice in mathematics and science teaching, such as *The Child's Conception of Number* (1941/1952: with Szeminska) and *The Child's Conception of Geometry* (1948/1960: with Inhelder and Szeminska).

In some of his later works, such as *Biology and Knowledge* (1971), Piaget outlined his theory of the relation between evolution and the acquisition of knowledge as a biological process. Piaget is sometimes unjustly accused of recapitulationism (see *The Evolution of Development*, in Chapter 1) because he tried to draw parallels between evolution and developmental theory. He argued that acquiring knowledge can be thought of as an evolutionary process in the sense that knowledge is adaptive: More adequate knowledge allows children to deal with their environment more effectively. Piaget also argued

that how children acquire knowledge, particularly scientific ideas, may show important parallels with the historic progress of science; but there is no suggestion that the sequence of stages in acquiring knowledge recapitulates the history of ideas (for an extensive discussion of recapitulationism and Piagetian theory see Butterworth, Rutkowska, & Scaife, 1985).

Piaget's technical vocabulary, which he adopted from James Mark Baldwin (see *The Emergence of Developmental Psychology*, in Chapter 1), is biological. Two key concepts are *assimilation* and *accommodation* (see page 10). Assimilation refers to the taking in of new information by the structures of the mind.

**Later work of Piaget**

- Outlined a theory of the relationship between evolution and the acquisition of knowledge as a biological process.
- Acquiring knowledge is an evolutionary process in the sense that knowledge is adaptive, and having more adequate knowledge allows children to deal more effectively with their environment.
- How children acquire knowledge may show parallels with the historic progress of science.
- Unjustly accused of recapitulationism because of drawing parallels between evolution and developmental theory.

Previous experience is organised in schemas—a structured organisation of past experience—and new information is either assimilated to an existing schema or, if it is inconsistent in some way with an existing schema, accommodation ensues so that the schema is modified to incorporate the new information. Thus, equilibrium is achieved through accommodation, as the organism adapts to, or incorporates the effects of, the environment. The notion of **equilibration** is also based on the idea of achieving a natural balance between the individual and the world, just as there is a balance of the forces that sustain life in nature.

Piaget's model of development is of a self-regulating interaction—between the child and the physical and social environment—that gives rise to new forms of knowledge. His theory is analogous to the formation by natural selection of new species in evolution, where new forms of life arise from pre-existing ones under the influence of pressures from the environment. In evolution, only those species that can adapt to the new environment survive. By analogy, new forms of knowledge arise in development because they are better adapted to the demands of the environment than the forms they replace.

Piaget described four major stages of development (each with sub-stages) that extend from infancy to adulthood. These are the **sensorimotor**, the **preoperational**, the **concrete operational**, and the **formal operational stages** of intellectual development. The ages associated with each stage are averages and may vary considerably from child to child and from culture to culture but they occur in an invariant order. Piaget believed that the first three stages are universal, whereas he thought stage IV to be characteristic of some adult thinking only in advanced, technological societies. We discuss each of these four stages in detail later in this book.

Piaget's ideas on the development of thinking have had a profound influence on 20th-century developmental psychology. Some idea of his impact can be gained from the fact that developmental researchers cite Piaget more frequently than any other psychologist, save Sigmund Freud. Piaget's description of the developing mental powers of the child has inspired many followers and has also provoked much constructive criticism with which we will become more closely acquainted in subsequent chapters. Even though he died in 1980, work in the Piagetian tradition continues and there is little doubt that Piaget's theory will exercise great influence for many years to come. (For a more extensive account of Piaget's influence on psychology, biology, philosophy, and cybernetics see Boden, 1994.)

Piaget's overall commitment to **genetic epistemology** continues to attract many followers, although many of the details of his theory have, by now, been quite heavily criticised. There are two main ways in which the general theory has changed under the pressure of modern evidence. First, much contemporary research has demonstrated that babies are much more competent than Piaget had assumed. In particular, babies are much more able to perceive reality than Piaget's own observations had led him to believe. This evidence alters the status of perception in the overall process of intellectual development (see Infants' Perception of Objects: An Alternative to Piaget, in Chapter 5). A second area of criticism concerns Piaget's idea that all knowledge, whatever its specific nature, can be fitted to one general stage theory. It has been argued that knowledge acquisition may be better understood as domain-specific, that is, pertaining to particular areas of knowledge, rather than as a process that operates regardless

### KEY TERMS

**Equilibration:** Using the processes of accommodation and assimilation to produce a state of equilibrium between existing schemas and new experiences.

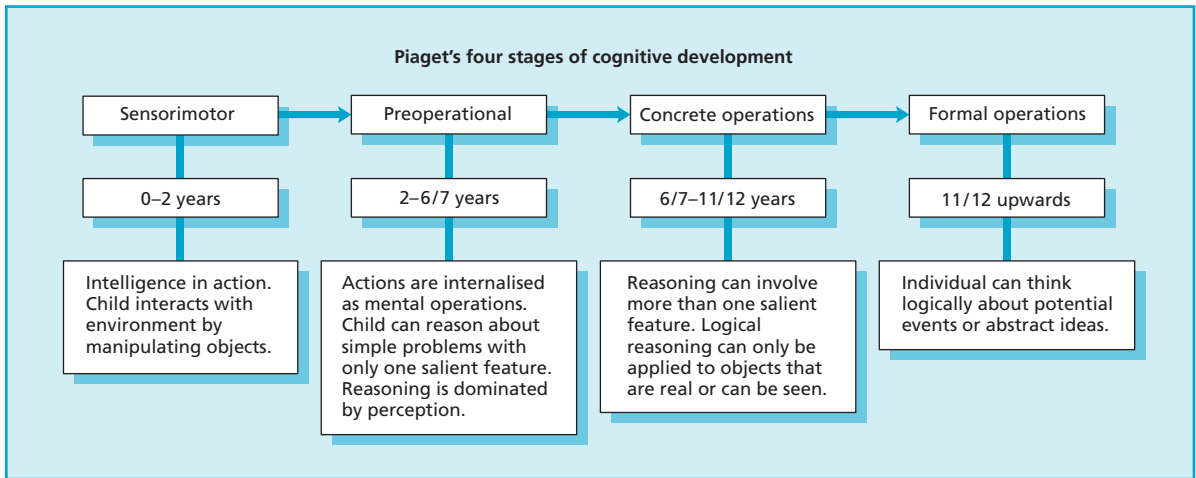
**Sensorimotor stage:** Piaget's first stage in the process of adaptation, from birth to about two years, in which infants co-ordinate sensory perceptions and motor abilities to acquire knowledge of the world.

**Preoperational stage:** Piaget's second stage of cognitive development involving internalisation of forms of actions that the infant has already mastered. The key feature of this stage, which lasts from two to six or seven years, is that the child is able to focus only on one salient feature of a problem at a time and is dominated by the immediate appearance of things.

**Concrete operational stage:** Piaget's third developmental stage in which children begin to use logical rules to solve problems. They can deal with more than one salient feature of a problem at a time and are no longer dominated by appearance. However, they are not yet able to deal with abstract problems. This stage lasts from the ages of six or seven to eleven or twelve.

**Formal operational stage:** The final stage in Piaget's theory, from 11 or 12 onwards, in which the child becomes able to consider all possible combinations in relation to the whole problem and to reason about an entirely hypothetical situation.

**Genetic epistemology:** The critical study of the validity, methods, and scope of genetics.



of the content of what is to be known. (For a discussion of the difference between domain-specific and general approaches to the development of cognition see Karmiloff-Smith, 1992.)

## Lev Semeonovich Vygotsky (1896–1934)



The Russian psychologist Lev Semeonovich Vygotsky (1896–1934).

Piaget was mainly concerned to explain the development of intelligence and reasoning in humans from its biological roots. Lev Semeonovich Vygotsky, by contrast, was most concerned to show how culture influences the course of development. Culture is used as a broad term to describe the customs of a particular people at a particular time and their collective intellectual, material, scientific, and artistic achievements over historical time.

Lev Vygotsky, a Russian Jew, was born in the same year as Piaget. Although less well known than Piaget, because he died at the early age of 38, years before his work was published in the West, he too has had great influence on the shaping of developmental psychology. Little is known of his early years except that he was the second of eight children, his father was a bank official, and that Vygotsky's home was at Gomel, a small town about 400 miles south-west of Moscow (Kozulin, 1990; Valsiner, 1988).

Vygotsky studied literature and cultural history at Moscow University where he graduated in 1917, the same year as the October Soviet Revolution. From 1917 he taught literature and psychology at the teacher training college in Gomel. He founded a literary journal and carried out literary research that was eventually published in his book, *The Psychology of Art* (Vygotsky, 1971). He was also working on ideas in psychology and presented a paper on the relation between Pavlovian conditioned reflexes and consciousness at the Psycho-Neurological Congress in Leningrad, in 1924. As a result of the impression these ideas made on his fellow psychologists, Vygotsky was invited to join the Institute of Psychology in Moscow in the same year.

In line with the prevailing Marxist theory of the time, Vygotsky saw culture and social organisation, and the historical forces that shape society, as having an important influence upon the development of the child's mind. Paradoxically, Vygotsky's revolutionary work fell foul of Stalin and his writings were suppressed in Russia. His early death from tuberculosis meant that he did