PSYCHOLOGY

Psychology is the study of the nature, functions and phenomena of behaviour and mental experience. A definition along these lines is acceptable to most psychologists but does not command universal agreement, because the discipline tends to be interpreted differently from different theoretical perspectives, and no unified theory of psychology has emerged. According to the origins of the word, psychology is discourse about the soul – from the Greek words *psyche* (soul) and *logos* (word, discourse or reason). General dictionaries often interpret *discourse* loosely as 'study' and *soul* as 'mind', yielding a seemingly natural definition of psychology as the study of the mind. This is inadequate, however, because psychology is concerned not only with internal mental experiences but also with physical behaviour, in both humans and animals. Furthermore, many of the behavioural phenomena that are of central importance in psychology are not directly associated with mental experiences, typical examples being various reflexes and brain mechanisms. Some psychologists therefore prefer to define psychology simply as the study of behaviour, or the science of behaviour, but these definitions raise further problems. Although psychological research is necessarily based on observations of behaviour, the researcher's interest often centres on the unobservable mental experiences underlying the behaviour rather than the behaviour itself. For example, the rapid eye movements that are observed in studies of dreaming are of little intrinsic interest, but they are psychologically significant because we know that they accompany mental experiences of dreaming.

There is general agreement that behaviour and mental experience are governed by principles that we can discover and understand through research, but opinions differ about the questions that we should ask and the research methods that we should use to answer them. One of the reasons for these differences is the scope of academic psychology's subject matter, which is unmatched in breadth and diversity by any other major discipline. In addition, psychology encompasses not only academic research but also several branches of applied psychology and associated professions, including clinical and counselling psychology; educational psychology; industrial, occupational and organizational psychology; forensic and criminological psychology; and health psychology. While academic research is confined mainly to universities and research establishments, applied psychological research and professional practice take place in hospitals and clinics, counselling agencies, commercial and industrial companies, prisons and correctional institutions, government departments and private practices.

The growth of professional psychology has led to widespread confusion between psychology and various cognate disciplines, practices and professions. In particular, psychiatry and psychoanalysis are often mistaken for psychology. Psychiatry is a branch of medicine concerned with the treatment of mental disorders. Psychiatrists are medical practitioners who have chosen to specialize in psychiatry. Psychologists are not medically qualified, and most are not primarily concerned with mental disorders, although professional clinical psychologists work closely with psychiatrists in psychiatric hospitals and elsewhere treating mentally disordered patients. More confusingly still, psychoanalysts also treat people with problems of adjustment and mental disorders, but they are not necessarily qualified in either psychology or psychiatry. Psychoanalysis

includes several methods of psychotherapy based on theories of mental structure and function developed by the Austrian neurologist Sigmund Freud (1856–1939) and his followers, notably his daughter Anna Freud (1895–1982), the Austrian-born British psychoanalyst Melanie Klein (1882–1960) and the Swiss psychoanalyst Carl Gustav Jung (1875–1961). Freudian, Kleinian, Jungian and other psychoanalysts are accredited by their own professional bodies after undergoing extended training analyses. Psychoanalysis and psychiatry are entirely independent of psychology and its associated professions, although there are areas of overlap and mutual influence.

Historical background

Psychology has existed as an independent discipline for less than a century and a half, but psychological speculations, practices and research can be traced back to the records of ancient civilizations. To give just two examples, there is documentary evidence of the practice of hypnosis in ancient Egypt (Ellenberger 1970), and according to *The Histories* of Herodotus (1972 [429 BCE], part 1, book 2, paragraph 2), the pharaoh Psammetichus I (664–610 BCE) performed a crudely controlled psychological experiment to determine whether human beings have an inborn capacity for speech.

The first systematic psychological investigations were carried out in ancient Greece by the pre-Socratic philosophers of the sixth and fifth centuries BCE, before the concept of an individual soul had been conceived. Thales of Miletus (*c.*624–*c.*545 BCE) and his followers were the first to understand that the brain plays an important role in mental experience, and, in particular, that our eyes cannot see and our ears cannot hear on their own, without some form of internal representation of the light or sound patterns, because internal representation is required before any interpretation can begin. This insight paved the way for the scientific study of sensation and perception. In about 350 BCE Aristotle, in his treatise *De Anima* (Concerning the Soul), put forward the doctrine that every living body possesses an individual soul that gives it life. He classified souls in order of merit, from the lowest, the merely nutritive and reproductive souls of plants, through the sensitive souls of animals – sensitive by virtue of possessing the five classical senses of vision, hearing, smell, taste and touch that Aristotle adumbrated – to the highest, the uniquely rational souls of human beings.

From about AD 400, for over a thousand years, the intellectual life of Europe was dominated by a form of Christian theology in which the individual soul played a central role, but religious dogma encouraged people to concentrate on saving their souls rather than studying them. Little of psychological significance emerged from the Dark Ages (up to about AD 1000) and later Middle Ages, with a few notable exceptions, such as the *Confessions* of St Augustine of Hippo (354–430), containing the earliest psychological analysis of the stream of consciousness.

The first important postmedieval thinker was the French philosopher René Descartes (1596–1650). He was also the first to wrestle with a major problem arising from the fact that mental experiences, including thoughts, sensations and emotions, belong to a separate, immaterial domain of existence from physical behaviour and bodily processes. The problem, later called the mind–body problem, was that of explaining how a physical cause can have a mental effect, as when stepping on a flame with a naked foot causes pain, and conversely how an immaterial mental cause, such as a thought or a desire, can move a limb in the physical domain. Descartes believed the human body to be a machine that operates according to ordinary physical laws. His deep problem was how the material and immaterial domains interact, and modern discussions of consciousness in psychology still debate focus on variations of this problem (see Dennett 1991).

In the late seventeenth century, after the introduction of the microscope and relaxation of the Church's objection to post-mortem examinations, knowledge of anatomy and physiology gradually accumulated, and the eighteenth century was marked by a rationalistic outlook that encouraged systematic empirical studies of the brain and nervous system. In 1780 the Italian physiologist Luigi Galvani (1737–98) discovered that the severed leg of a frog moves when an electrical current is passed through it. This provided the first clue that the nervous system is driven by electrical impulses, a fundamental discovery from which the physiology of the nervous system began to unfold.

During the early decades of the nineteenth century, the prevailing currents of philosophy

and biology eventually converged towards the emergence of an independent discipline of psychology. In 1846, the physiologist Ernst Heinrich Weber (1795–1878) published experimental evidence relating the psychological magnitude of sensations to the physical intensity of stimuli, and in 1860 the philosopher-mystic Gustav Theodor Fechner (1801–87) enunciated a fundamental psychophysical law relating sensation to stimulus intensity that laid the foundations of modern psychophysics. But Weber regarded psychophysics as a contribution to physiology, and Fechner regarded it as a clarification of the mind–body problem and thus a contribution to philosophy. It fell to the German physiologist Wilhelm Max Wundt (1832–1920) to establish psychology as a new and separate discipline in its own right. He began the preface of his *Grundzüge der physiologischen Psychologie* (Principles of Physiological Psychology, 1873) with the sentence: 'The book that I herewith offer to the public attempts to mark out a new domain of science', and in 1879 he founded the world's first dedicated psychological laboratory, the *Institut für experimentelle Psychologie* in Leipzig.

What emerges from this brief historical summary is that psychology has existed as an independent discipline only since 1873 (or perhaps 1879, the date preferred by most historians of psychology), but its roots go much deeper. Although it is a relatively young discipline, and the various branches of applied psychology are even younger, psychological thought has been in evidence throughout recorded history. That is what the German psychologist Hermann Ebbinghaus meant by his cryptic and widely misunderstood remark that 'psychology has a long past but a short history' (1922 [1908]: 1). For more information about the history of psychology, see Freedheim (2003).

Subject matter

The oldest area of psychological research is the study of sensation and perception. Sensation is the 'raw' experience resulting from stimulation of a sense organ, and perception is the interpretation of sensation in relation to its presumed external stimulus, following information processing and interpretation. Although this distinction was first made in the eighteenth century and is entrenched in modern psychology, it has become increasingly difficult to defend in the light of advancing understanding of perception. Taking vision as an example, we now know that a great deal of information processing takes place in the retina of the eye, as soon as light reaches the visual receptors, therefore 'raw' visual sensation without any information processing is impossible. Research into sensation and perception deals with such topics as shape perception, colour perception, movement perception, depth perception, hearing, sound localization, the chemical senses (taste and smell), the skin and body senses, psychophysics and perceptual illusions (see Schiffman 2001).

Another important area of psychological research focuses on biological aspects of behaviour, including behaviour genetics, studies of the brain and nervous system, states of consciousness including sleep and dreaming, and the psychological effects of drugs (see Carlson 2002). Neuropsychology is the study of disorders of the brain and nervous system, and their effects on behaviour and mental experience. Significant developments in the neurosciences and genetics from the late twentieth century onwards have led to rapid advances in some of these fields. In particular, non-invasive methods of brain imaging have generated new information about how the brain works. Functional magnetic resonance imaging (fMRI) provides a real-time dynamic picture of activity in specific brain regions during mental activities, and it has greatly facilitated brain research.

One of the most active areas of psychological research is cognitive psychology, the study of information processing, including memory, attention, imagery, language, thinking and problem-solving (see Eysenck and Keane 2000). The hybrid field of cognitive neuropsychology occupies the interface between cognitive psychology and neuropsychology, and is concerned with impaired cognitive functioning in brain-damaged patients, and implications for normal functioning. For example, competing theories of reading can be tested by studying errors made by brain-damaged patients. It turns out that people with a certain type of reading impairment, usually called surface dyslexia, can read only by translating each letter into its corresponding sound and have great difficulty reading words with irregular spellings, such as *yacht*. On the other hand, people with deep dyslexia or phonological dyslexia can read only by whole-word recognition and cannot easily translate letters into sounds.

They have great difficulty reading simple non-words such as *lak*, and they also make characteristic semantic errors, such as misreading the word *dinner* as 'food'. This shows that at least two quite distinct mechanisms are involved in reading, and that different forms of dyslexia are caused by different types of neurological impairment.

In psychology, learning is interpreted as any change in behaviour brought about by experience, and all mental and behavioural characteristics that are not wholly innate are learned in this sense. An active area of research focuses on learning and skills (see Schwartz *et al.* 2001). The basic principles of learning are similar in human and non-human species, and research in this area is often performed on rats, pigeons and other animals. A simple but important form of learning, called classical conditioning, was discovered around the turn of the century by the Russian physiologist Ivan Petrovich Pavlov. Pavlov found that a stimulus that does not ordinarily cause a dog to salivate, such as the sound of a bell, if repeatedly presented just before a small amount of dried meat powder is squirted into the dog's mouth, will eventually elicit salivation on its own. A slightly different mechanism, called instrumental or operant conditioning, was discovered in the 1930s by the US psychologist Burrhus F. Skinner, who argued that it explained all learned behaviour. It is based on the law of effect, according to which any behaviour that is rewarded will tend to be repeated, and it formed the linch-pin of the behaviourist movement that dominated psychology in the 1940s and 1950s.

Research into motivation and emotion is devoted to studying the psychological processes that energize or drive behaviour and the affective mental states that accompany or follow certain experiences (see Reeve 2000). Emotional states often have motivational effects, and the two are also linked through sharing brain structures, notably the limbic system on the inner surface of the temporal lobes surrounding the brainstem. Sources of motivation include the physiological drives of hunger, thirst and sex, and various forms of social motivation, such as the need for achievement and the need for affiliation. The US psychologists Paul Ekman and Wallace Friesen (1971) identified six 'primary' emotions – happiness, sadness, disgust, fear, anger and surprise – associated with facial expressions that appear to be innate. The evidence for innateness is that these expressions appear soon after birth, even in congenitally blind and deaf infants who could not have learned them from others, and are expressed and interpreted similarly even in isolated cultures. Research into emotion has also been influenced by the surprisingly tenacious cognitive-appraisal theory of the US psychologist Stanley Schachter (1964), according to which physiological arousal forms the basis of every emotion, the specific emotion depending only on the person's interpretation of the cause of the arousal.

Research into personality and intelligence is devoted to trying to delineate and explain the ways in which people differ psychologically from one another (see Sternberg and Ruzgis 1994). Personality differences have been studied extensively, and by the late 1980s a consensus had emerged that just five factors constitute the fundamental dimensions of human personality. The so-called Big Five are extraversion (characterized by traits such as sociability and assertiveness), agreeableness (kindness, generosity), conscientiousness (thoroughness, reliability), neuroticism (nervousness, moodiness) and openness to experience or intellect (imagination, creativity). Differences in intelligence have been studied ever since the French psychologists Alfred Binet and Théodore Simon constructed the first standardized IQ test in 1905. IQ tests measure general intelligence, but there is some controversy over whether intelligence is a unitary attribute. Research has consistently shown that people who are good at some kinds of thinking and problem-solving tend to be good at others, and vice versa, but different people have different intellectual strengths and weaknesses, and some psychologists therefore prefer to think in terms of multiple intelligences or abilities. In the early 1990s, research began into a previously neglected ability called emotional intelligence, encompassing the capacity to monitor one's own and other people's emotions, to discriminate between different emotions and label them appropriately, and to use emotional information to guide thinking and behaviour.

Developmental psychology is concerned with psychological attributes of infants, older children, adolescents, adults and old people, and more generally with psychological changes across the life-span (see Berk 2004). Research into cognitive development has been strongly influenced by the work of the Swiss psychologist Jean

Piaget, who showed that thinking develops through a series of predictable stages. At first, infants manifest egocentrism, neglecting to differentiate subjective from objective aspects of experience and failing to understand that objects temporarily hidden from view continue to exist. Children below about 7 years of age, before the stage of concrete operations, are usually unable to master internal representations of physical objects and to solve problems involving conservation, such as understanding that the number of objects in a group stays the same if they are rearranged, or that a quantity of liquid stays the same if it is poured into a differently shaped jug. Only during the stage of formal operations, from about 12 years, do children generally become proficient at manipulating abstract concepts as well as mental representations of physical objects.

Social psychology is devoted to social behaviour in all its forms, including social attitudes, compliance, conformity, obedience to authority and attribution processes (see Brehm *et al.* 2002). Attitudes are evaluative responses to other people, objects or abstract ideas. Sophisticated techniques have been developed for measuring them, and a great deal is now known about attitude change and persuasion. The persuasive influence of a message depends on certain well-documented characteristics of the source, message, recipient and channel of communication (face-to-face communication, films, television, radio, Internet, telephone, print media). Conformity, compliance and obedience to authority are distinct but related social influence processes. Conformity involves yielding to social pressure in the absence of any explicit request to yield; compliance is yielding to explicit requests from another person or other people; obedience is yielding to orders or instructions from someone in a position of authority. Attribution theory seeks to explain how people perceive, infer and ascribe causes to their own and other people's behaviour. Research has established that we tend to attribute another person's behaviour to internal dispositional causes rather than external situational causes if the behaviour seems different from how other people would behave in the same situation but characteristic of that person's behaviour in similar and dissimilar situations in the past. If the behaviour seems similar to that of others in the same situation but uncharacteristic of the particular person's past behaviour in similar and different situations, then we are likely to attribute it to external causes. Social psychology also exists as a field of research in sociology, where many of the same phenomena are studied but there tends to be more emphasis on non-experimental approaches.

Abnormal psychology is concerned with the classification, aetiology (causation), diagnosis, treatment and prevention of mental disorders and disabilities, and it underpins the profession of clinical psychology. The classes of mental disorders in the internationally recognized *Diagnostic and Statistical Manual of Mental Disorders* of the American Psychiatric Association (1994) include the following, among others: schizophrenia and other psychotic disorders (including paranoid schizophrenia); mood disorders (including depression and mania); anxiety disorders (including obsessive-compulsive disorder, posttraumatic stress disorder and the phobic disorders); sexual disorders (including the sexual dysfunctions); eating disorders (including anorexia nervosa and bulimia nervosa); personality disorders (including antisocial personality disorder); and disorders of infancy and childhood (including autistic disorder, attention-deficit/hyperactivity disorder and mental retardation).

The fundamental aim of basic psychological research is to understand and explain behaviour and mental experience, but the various branches of applied psychology are driven by more practical aims. They are concerned with applications of psychology to problems of everyday life. Applied psychology relies partly on basic research and partly on applied research specifically designed to answer practical questions. In clinical psychology, the research findings are applied to the treatment and management of mental disorders. In educational psychology, research into problems of learning, adjustment and behaviour is applied to providing practical help to teachers, parents and children with learning or behaviour problems. In industrial, occupational and organizational psychology, research is applied to improving the well-being and efficiency of working people. In forensic and criminological psychology, the goals are to deal more effectively with crime and punishment.

Research methods

The breadth of psychology's subject matter is matched by a wide diversity of research methods,

including experiments, quasi-experiments, correlational methods, case studies and passive-observational studies. Controlled experimentation is often regarded as the most powerful method, because it allows hypotheses about cause–effect relationships to be tested rigorously. Its defining features are manipulation of a conjectured cause, called the independent variable, and control of extraneous variables that might also influence the behaviour under investigation, called the dependent variable. Control of extraneous variables is usually achieved by random allocation of research participants or subjects to groups that are treated identically apart from the manipulation of the independent variable. This ensures that pre-existing differences between participants and other extraneous variables are distributed according to the laws of probability, enabling statistical methods to be used to evaluate any observed effect for its significance in relation to chance. A typical example of a simple experiment is a study of eyewitness testimony (Loftus 1979) in which participants viewed a video recording of two cars colliding. Half the participants were randomly assigned to a treatment condition in which they were asked how fast the cars were going when they 'smashed into each other', and the rest were asked how fast the cars were going when they 'hit each other'. Participants in the first group estimated the speed to be 7 miles per hour faster, on average, than those in the second, and a week later, 32 per cent of those exposed to the word *smashed* had developed false memories of broken glass in the video, compared to only 14 per cent of those exposed to the word *hit*.

Many legitimate research problems do not lend themselves to experimental research, because independent variables cannot be manipulated or extraneous variables controlled, and in such cases other research methods are used. Various quasi-experimental designs are used to answer questions about cause–effect relationships without full manipulation or control. Correlational research focuses on the relationship between variables, such as extraversion and cigarette smoking, birth order and self-esteem, or gender and verbal ability. Case studies, involving detailed investigations of individuals, are especially common in clinical psychology. Passive-observational studies are sometimes used to record human or animal behaviour without influencing it. Passive-observational and other non-experimental research sometimes yields data that are not susceptible to statistical analysis. In social psychology, in particular, qualitative research methods based on analysis of purely verbal data are increasingly popular. For more information on research methods in psychology, see Graziano and Raulin (2004).

Emerging issues

Psychology is constantly evolving, and new areas of research and professional practice continue to emerge. For example, a new interdisciplinary research field called social cognitive neuroscience was launched at a conference in Los Angeles in 2001. It is devoted to studying behaviour and mental experience at the social, cognitive and neural levels, focusing on brain mechanisms underlying social and cognitive processes. Research in social cognitive neuroscience typically involves brain imaging and neuropsychological methods to investigate social psychological phenomena, with cognitive psychology bridging the neural and the social levels of analysis.

Cognitive science, an interdisciplinary enterprise embracing cognitive psychology, anthropology, computer science, artificial intelligence, linguistics and philosophy, has introduced new ways of studying language, learning, perception, thinking, problem-solving and above all knowledge representation. Within this field, neural networks have attracted a great deal of research attention since the 1980s. Neural networks are theoretical (or occasionally actual) systems of interconnected artificial nerve cells constituting a neurocomputer designed to simulate the operation of the human brain. Many connectionists (neural network theorists) believe that mental experiences arise from the interaction of many interconnected computing units, each in a specified state of activation, and each having the capacity to affect others by either excitatory or inhibitory connections, the entire system being activated by a stimulus that affects a subset of the units, activation then propagating through the network until an equilibrium state of minimum energy is attained.

Developments within the various branches of applied psychology include the emergence of new fields of research and professional practice. Within the broader area of forensic and criminological psychology, investigative psychology is an emerging field in which psychological principles are applied to the investigation of crimes and

the apprehension of criminals. It includes criminal profiling, in which the behaviour and circumstances associated with serious crimes are studied in an effort to identify the probable characteristics of perpetrators, especially serial murders or rapists. Within the general area of health psychology, there has been rapid growth in psychoendocrinology, devoted to the study of the interactions between hormones, behaviour and mental experience, and psychoneuroimmunology, focusing on the interactions between psychological phenomena, the nervous system and the immune system, including especially effects of psychological stress on immune responses.

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