

## Lecture Notes – Introduction

### Overview

- Aim: to develop a foundation as to why we should examine learning and some of the fundamental concepts of learning.
  - What is learning.
  - Overview of types of learning.
  - Assessing learning.
  - Learning in education.
  - Habituation and sensitisation.

### Learning

- Learning occurs at all ages and is a lifelong process.
  - Children and students do not have a monopoly on learning.
- Humans are not the only ones that have the capacity to learn.
- Psychologists studying learning are interested in the process and the product of changes that occurs as a result of an individuals' experience.

### What is Learning?

- Learning is an enduring change in behaviour, or in the capacity to behave in a given fashion, which results from practice or other forms of experience.
- A change in our capacity for behaviour, as a result of particular kinds of experience.
  - Just because you've learnt something, doesn't mean your behaviour changes.

### Changes in Behaviour (Not Learning)

- Fatigue.
- Changes in stimulus conditions.
- Change in physiological or motivational state of learner.
- Maturation (e.g. child too short to demonstrate they have learnt how to get the cup off the counter).

### Types of Learning

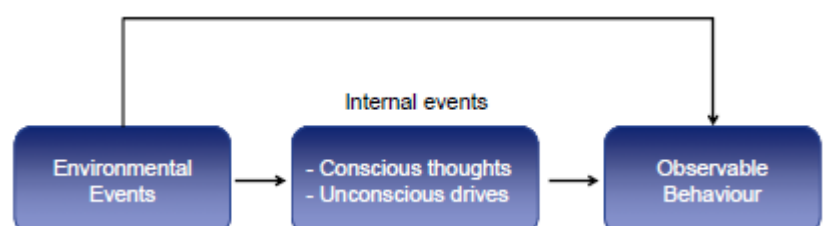
- Simple learning.
  - Habituation and sensitisation.
- Conditioning (associative learning).
  - Classical/pavlovian, instrumental, and operant conditioning.
- Complex learning.
  - Discrimination, concept, hypothesis testing, spatial, social learning.

### Key Points for the Semester

- We cannot directly see learning or other cognitive processes.
- Rather we infer it from observable behaviour.
- However:
  - How do we know what behaviour indicates learning? (Need to specify particular behaviour)
  - How do we know the absence of behaviour indicates no learning?
  - What if learning something is demonstrated by no behaviour. (E.g. don't run with scissors demonstrated by a lack of behaviour).

### Assessing Learning

- Direct observation.
- Written responses.
- Oral responses.
- Ratings by others.
- Self-reports.



## **Lecture Notes – Learning in Education**

### **Perceptual Learning Styles**

- Each have own preferential learning style.
- Are an individual's preferred ways of responding (cognitively and behaviourally) to learning tasks which change depending on the environment or context. They can affect a person's motivation and attitude to learning, and shape their performance."
- Three main styles.

### **Education Learning**

- Visual.
  - Majority of people.
  - 70% sensory receptors in eyes.
  - Seeing or reading information.
- Auditory.
  - Hear information.
- Tactile-kinaesthetic.
  - Manipulating material with hands.

### **Differentiated Instruction**

- Can we still teach a group of heterogeneous students as we do now?
- Evidence suggests that there should be some tailoring of content to match the level of the student.
- Expectation within the psychology course.
  - Increase in knowledge after each semester.
  - Increase in knowledge throughout each semester.

### **Surface vs. Deep Learning**

<b>Surface Learning</b>	<b>Deep Learning</b>
Memorise bits of information	Try to understand concepts & principles
Work hard but may not achieve	Link old and new topics
Dependent on teacher	Independent
Don't question	Ask questions
Only concerned with assessment	Enjoy learning (intrinsic motivation)
	Are efficient

### **Elaboration**

- Give meaning to information.
- Active generation of examples.
- Identify personal meaning in material.
- Additional retrieval routes for accessing information at a later stage.

### **Self-Directed Learning**

- Use principles of deep learning.
- Use reflection.
- Discuss and share knowledge with others.
- Understand and use study skills that are best for you.

### **Improving your Studying**

<b>Do</b>	<b>Do Not</b>
Study in a quiet spot	Be unrealistic
Set yourself modest targets	Punish yourself
Increase your targets	Leave it to the last minute
A public declaration	Study in odd places
Choose effective reinforcers	

## Lecture Notes – Habituation and Sensitisation

### **Elicited Behaviours**

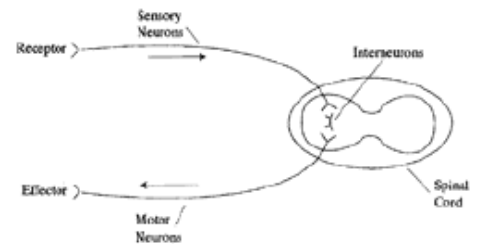
- Habituation & sensitisation only involve reflexes.
  - A behaviour that is “drawn out” of an organism by the presentation of a stimulus.
  - A behaviour that is automatic and involuntary.
    - Reflexes (sneezing, startling, salivating).
- Not to be confused with classical conditioning which involve reflexes and autonomic responses (hunger, thirst).

### **Reflexes**

- Basic form of elicited behaviour.
- Defined as a relatively simple, automatic response to a stimulus.
- Reflexes are closely tied to survival.
- Examples: startle response, orienting response, flexion response.

### **Reflex Arc**

- Simple reflexes are activated through a reflex arc.
- Defined as a neural structure that underlies many reflexes and consists of a sensory neuron, an interneuron, and a motor neuron.
- Reflex arcs allow us to respond much quicker to our environment.



### **Simple Learning**

- Habituation & sensitisation are classified as simple learning.
- No new association between two things.
- Relatively permanent changes in behaviour.
- Simple learning described as the modification of any behaviour due to the repeated administration of a specific stimulus.

### **Habituation**

- Decrease in the eliciting effect of a stimulus as a result of repeated presentations of that stimulus.
- Decrease in a reflexive response as the result of repeated presentations of a stimuli.
- Why?
  - Sensory fatigue.
  - Motor fatigue.
- Why it's not this?
  - New stimulus or more intense stimulus will reactivate original response.
- Dishabituation = when the reflex response reappears after once being habituated due to a new stimulus being presented.

### **Sensitisation**

- Increase in the eliciting effects of a stimulus as a result of prior presentations of that or some other stimulus.
- Increase in the strength of a reflexive response when a stimulus is repeated.
- Learning that the stimulus is harmful.

## Lecture Notes – Habituation and Sensitisation Evidence

### **Background**

- Habituation & sensitisation are fundamental features of how organisms adapt to their environments.
- In nearly all species and response systems.
- Don't need a brain (a simple nervous system will do).

### **Protozoa**

- Contraction (withdrawal reflex).
- In response to light or vibration.
- Will habituate with repeated presentations of light or vibration.
- Within a small time frame.

### **Aplysia (Aplysia Californica)**

- First came to attention because of large neurons (up to 1mm diameter).
- 15,000 neurons compared with 100 billion.
- Gill withdrawal reflex.
- Anatomy.
- Jet of water directed on the siphon/gill – decrease in gill withdrawal reflex over time – habituation.
- Electric shock to siphon – increase in gill withdrawal reflex over time – sensitisation.

### **Snails**

- George Humphrey (1933).
- Platform systematically jerked back and forth.
- At first – complete withdrawal into shell (reflex).
- Over time – withdrawal reflex diminished until no withdrawal at all.
- Not fatigue – new or more intense stimulus = reactivation of the withdrawal reflex.

### **Parametric Features of Habituation**

- Repetition.
  - Repeated application of a stimulus (producing a reflexive response) usually result in a decreased response (habituation).
  - This decrease usually occurs over time (fades away).
- Spontaneous recovery.
  - If the stimulus is withheld, the response tends to recover over time (spontaneous recovery).
  - e.g., aplysia = 21 days, earthworms = 4 days, rat = 42 days, human = 7 days.
  - Different from dishabituation as S.R> doesn't involve introduction of new stimulus.
- Repeated habituation.
  - If repeated series of habituation and spontaneous recovery are given – habituation becomes more rapid.
- Spacing.
  - Other things equal – the more frequent the stimulation the more rapid/pronounced is habituation.
- Strength.
  - The weaker the stimulus the faster the habituation – strong stimuli may not habituate at all – may sensitise.
- Generalisation.
  - Habituation to one stimuli may generalise.

### **Lecture Notes – Habituation and Sensitisation in Humans**

#### **Neonates**

- Research using infant reflex – orientating reflex.
- Constellation of physiological and behaviour responses (e.g. changes in HR, EEG, turning of head, etc.).
- Usually occurs when infants presented with a novel stimulus.

#### **Sokolov (1960s)**

- Orienting reflex: discrepancy between current inputs (something new) and the neuronal trace or memory of prior ones (something old).
- Magnitude of OR = difference between the trace and the current inputs at a given time.
- Discrepancy greatest when novel stimulus is introduced.
- Repeated presentations of the stimulus (novel at first) results in a decrease in the OR.
- This is habituation.
- The introduction of a different (novel) stimulus at this point should reactive the OR.
- Infants also demonstrate habituation when loud noises presented (startle reflex) over time.
- Infants can sensitise to loud noises if they are intense enough.
- Shows that infants can learn (in a simple way) in the first few days of life.

#### **Sexual Arousal**

- Physiological (reflexive) and subjective arousal decrease with repeated presentations of the same stimulus.
- No habituation (decreased arousal) if the repeated stimuli were different.
- Implications for treatment of some sexual/arousal problems.

## Panic Disorder

- Beck & Wolf (2001).
- Panic disorder = fear of internal sensations signifying danger.
- Inhaling CO<sub>2</sub> induces intense physical reactions (which lead to fear) in people with panic disorder.
- This is something that is not observed in people with social phobia or OCD.
- Can this reaction be habituated?

## The Experiment...

- Took 21 participants provided with oxygen tube delivering air with 20% CO<sub>2</sub> on trials.
  - 14 participants habituated = fear response reduced.
  - 7 participants sensitised = fear response increased.
- Not due to personality or severity factors.
- Results are promising in treatment of panic disorder (shows learning is taking place).

## More Recent Work...

- Blechert et al. (2010).
- CO<sub>2</sub> (20%) x eight breaths with inhalation of room air before and after each CO<sub>2</sub> breath.
- Panic disorder (PD), social phobia (SP), controls.
  - When analysed over the length of the experiment.
    - Habituation occurred across all groups.
  - When analysed within each inhalation.
    - PD group sensitised, and took longer to recover, then SP.
    - Controls habituated.

## Everyday Examples

- Habituation.
  - Balloons bursting at a party – startle reflex reduced over repeated burstings.
  - Party poppers – startle reflex reduced over repeated poppers.
- Sensitisation.
  - Spider on leg – startle (freak out) reflex increased over repeated detection of crawling sensations.

## Tutorial Notes – Learning Styles

### Active vs. Reflective Learners

Active	Reflective
Learn by doing: discussing, applying, explaining	Learn by thinking through quietly
“Let’s try it out and see how it works”	“Let’s think it through first”
Prefer groups	Prefer to work alone
Problem: might jump in too quickly	Problem: might never get anything done
Benefits from: study groups or buddies	Benefits from: reviewing learning at regular intervals; writing out info in own words

### Sensing vs. Intuitive Learners

Sensing	Intuitive
Like to learn facts; are good with detail, memorising and hands-on work	Like to discover possibilities and relationships; better at grasping new concepts; more comfortable with abstractions
Prefer: solving problems using well-established methods	Prefer: innovation
Dislike: complications and surprises; being tested on material not explicitly covered in class; courses with no real-life relevance	Dislike: repetition, rote learning
Are: more practical and careful	Are: faster workers and more innovative
Benefits from: use of real-life examples and applications	Benefits from: finding interpretations or theories that link facts

### Visual vs. Verbal Learners

Visual	Verbal
Remember best what they see (pictures, diagrams, demonstrations, etc.)	Remember best from words (written and spoken)
Benefits from: using diagrams, sketches, flow charts, colour coding notes	Benefits from: writing summaries in own words, group discussions, peer tutoring

### Sequential vs. Global Learners

Sequential	Global
Gain understanding in linear steps; follow some logical order	Gain understanding in large jumps (randomly until they 'get it')
Prefer: details	Prefer: the big picture
Are: logical	Are: random
Benefits from: lecture/topic outlines	Benefits from: skimming through chapters to get an overview

## Chapter 1 – Introduction

- **Behaviour** is any activity of an organism that can be observed or somehow measured. The activity may be internal or external and may or may not be visible to others. **Learning** is a relatively permanent change in behaviour that results from some type of experience. For example, reading this text is an example of a behaviour, and any lasting change in your behaviour as a result of reading this text (e.g., a change in your ability to speak knowledgeably about the subject matter) is an example of learning. Note that the change in behaviour does not have to be immediate, and in some circumstances the change might not become evident until long after the experience has occurred.
- Two fundamental forms of learning: **classical** and **operant conditioning**. Although these will be discussed in more detail later, a brief description of each is useful at this point. At its most basic level, **classical conditioning** (also known as **Pavlovian** or **respondent conditioning**) is the process by which certain inborn behaviours come to be elicited in new circumstances. The behaviours involved are often what the average person regards as reflexive or “involuntary,” such as sneezing in response to dust or salivating in response to food. A familiar example of classical conditioning, which is often presented in introductory psychology textbooks, is that of a dog learning to salivate in response to a bell that was previously followed by food. This process can be diagrammed as follows:
  - Bell: Food -> *Salivation*
  - Bell -> *Salivation*
- Classical conditioning underlies many of our emotional responses and contributes to the development of our likes and dislikes. It can also lead to the development of debilitating fears and powerful feelings of sexual attraction.

### Notation for Conditioning Diagrams

- In this text, you will encounter many diagrams of conditioning procedures. In these diagrams, a colon separating two events indicates that the events occur in sequence. For example, the term “Bell: Food” means that the sound of a bell is followed by the presentation of food. An arrow between two events also indicates that they occur in sequence, but with an emphasis on the fact that the first event *produces* or *causes* the second. For example, “Food -> *Salivation*” means that the presentation of food causes the dog to salivate. Thus, with respect to a standard classical conditioning procedure, the term: “Bell: Food -> *Salivation*” means that the bell is presented just before the food, and the food in turns causes salivation. This is followed by: “Bell -> *Salivation*” which indicates that the presentation of the bell itself now causes the dog to salivate (because of the bell’s previous pairing with food). For clarity, the behaviour that is being conditioned is italicised (which is often called the “**target behaviour**”).
- In contrast to classical conditioning, **operant conditioning** involves the strengthening or weakening of a behaviour as a result of its consequences. The behaviours involved are often those that the average person regards as goal-directed or “voluntary.” A common experimental example is that of a rat that has learned to press a lever (the behaviour) to obtain food (the consequence), the future effect of which is an increase in the rat’s tendency to press the lever. This can be diagrammed as follows:
  - *Lever press* -> Food pellet
  - Future effect: Likelihood of level pressing increases
- Because the lever press produced a food pellet, the rat is subsequently more likely to press the lever again. In other words, the consequence of the behaviour (the food pellet) has served to strengthen future occurrences of that behaviour. Many of the behaviours that concern us each day are motivated by such consequences; we hit the remote button to turn on a favourite television show, compliment a loved one because it produces a smile, and study diligently to obtain a passing grade. The consequences can be either immediate, as in the first two examples, or delayed, as in the last example – though the effect of delayed consequences on behaviour can involve certain complexities.
- Although the text concentrates on classical and operant conditioning, other types of behavioural processes are also discussed. For example, in **observational learning** the act of observing someone else’s behaviour facilitates the occurrence of similar behaviour in oneself. Certain types of largely inherited (non-learned) behaviour patterns, such as **fixed action patterns**, are also discussed, as is the effect of inherited dispositions in either facilitating or inhibiting certain types of learning.

## Chapter 1 – Introduction – Historical Background

### Aristotle: Empiricism and the Laws of Association

- Aristotle was a Greek philosopher who lived between 384 and 322 B.C. Aristotle's teacher, Plato, believed that everything we know is inborn (which he conceived of as "residing in our soul"); thus, learning is simply a process of inner reflection to uncover the knowledge that already exists within. Aristotle, however, disagreed with Plato and argued that knowledge is not inborn but instead is acquired through experience.
- Aristotle's disagreement with Plato is an early example of the classic debate between nativism and empiricism, or nature and nurture. The **nativist (nature)** perspective assumes that a person's abilities and tendencies are largely inborn, whereas the **empiricist (nurture)** perspective assumes that a person's abilities and tendencies are mostly learned. Plato is thus an early example of a nativist and Aristotle is an early example of an empiricist.
- Aristotle also suggested that ideas come to be connected or associated with each other via four laws of association (well, actually three, but he also hinted at a fourth that later philosophers expanded upon).
  - **1. The Law of Similarity.** According to this law, events that are similar to each other are readily associated with each other. For example, cars and trucks are readily associated because they are similar in appearance (wheels, doors, headlights, etc.) and function (both are used to carry passengers and materials along roadways). These similarities enable us to learn to view cars and trucks as instances of a larger category of objects known as automobiles.
  - **2. The Law of Contrast.** According to this law, events that are opposite from each other are readily associated. For example, on a word association test the word *black* often brings to mind the word *white*, and the word *tall* often brings to mind the word *short*. Likewise, the sight of your unwashed car reminds you of how nice it would look if you washed it, and an evening of studying reminds you of how enjoyable it would be to spend the evening not studying.
  - **3. The Law of Contiguity.** This law states that events that occur in close proximity to each other are readily associated (**contiguity** means "closeness"). For example, a child quickly learns to associate thunder and lightning because the sound of thunder soon follows the flash of lightning. Thunder and lightning are also perceived as coming from the same direction. Imagine how difficult it would be to associate thunder and lightning if the thunder occurred several minutes after the lightning flash and came from a different direction.
  - **4. The Law of Frequency.** In addition to the three preceding laws, Aristotle mentioned a supplement to the law of contiguity, which is that the more frequently two items occur together, the more strongly they are associated. You will more strongly associate a friend with a certain perfume the more frequently you smell that perfume upon meeting her. Likewise, you will more strongly associate a term (such as the law of frequency) with its definition the more frequently you practice saying that definition whenever you see the term (as when using flash cards to help memorise basic terminology).
- Aristotle's laws of association are not merely of historical interest. As you will read later, the laws of contiguity and frequency are still considered important aspects of learning. After all, how well could a dog learn to salivate to the sound of a bell if the bell preceded the presentation of food by several minutes, or if there was only one pairing of bell and food?

### Descartes: Mind-Body Dualism and the Reflex

- René Descartes is the French philosopher who wrote the famous line "I think, therefore I am." In Descartes' time, many people assumed that human behaviour was governed entirely by free will or "reason." Descartes disputed this notion and proposed a **dualistic model of human nature**. On the one hand, he claimed, we have a body that functions like a machine and produces involuntary, reflexive behaviours in response to external stimulation (such as sneezing in response to dust). On the other hand, we have a mind that has free will and produces behaviours that we regard as voluntary (such as choosing what to eat for dinner). Thus, Descartes' notion of **mind-body dualism** proposes that some human behaviours are reflexes that are automatically elicited by external stimulation, while other behaviours are freely chosen and controlled by the mind. Descartes also believed that only humans possess free will, while the behaviour of nonhuman animals is entirely reflexive.
- Descartes' dualistic view of human nature was a major step in the scientific study of learning and behaviour because it suggested that at least some behaviours – namely, reflexive behaviours – are mechanistic and could therefore be scientifically investigated. It also suggested that the study of animal behaviour might yield useful information about the reflexive aspects of human behaviour.

### The British Empiricists

- Although Descartes believed that the human mind has free will, he also assumed, like Plato, that some of the ideas contained within it (e.g., the concepts of time and space) are inborn. By contrast, a group of British philosophers,



known as the **British empiricists**, maintained that almost all knowledge is a function of experience. For example, one of the major proponents of British empiricism, John Locke, proposed that a newborn's mind is a **blank slate** upon which environmental experiences are written. The British empiricists also believed that the conscious mind is composed of a finite set of basic elements (specific colours, sounds, smells, etc.) that are combined through the principles of association into complex sensations and thought patterns – a sort of psychological version of the notion that all physical matter consists of various combinations of the basic elements.

### Structuralism: The Experimental Study of Human Consciousness

- The British empiricists did not conduct any experiments to test their notion that the mind is composed of basic elements; their conclusions were instead based upon logical reasoning and the subjective examination of their own conscious experience. Realising the deficiencies in this approach, the German philosopher Wilhelm Wundt proposed using the scientific method to investigate the issue. This approach was strongly promoted by an American student of his, Edward Titchener, and became known as structuralism. **Structuralism** assumes that it is possible to determine the structure of the mind by identifying the basic elements that compose it.
- Structuralists made great use of the method of **introspection**, in which the subject in an experiment attempts to accurately describe his or her conscious thoughts, emotions, and sensations. To get a feel for how difficult this is, try to describe your conscious experience as you listen to the ticking of a clock (and just saying, "I'm bored" doesn't cut it). One thing you might report is that the ticks seem to have a certain rhythm, with a series of two or three clicks being clustered together. You might also report a slight feeling of tension (is it pleasant or unpleasant?) that builds or decreases during each series of ticks. As you can see, an accurate report of what we introspectively observe can be quite difficult.
- Although this approach to psychology died out by the early 1900s, its emphasis on systematic observation helped establish psychology as a scientific discipline. More importantly, its extreme emphasis on conscious experience as the proper subject matter for psychology resulted in a great deal of frustration and dissatisfaction – which eventually led to the later establishment of a more objective approach to psychology, known as behaviourism.

### Functionalism: The Study of the Adaptive Mind

- William James, often regarded as the founder of American psychology, helped establish the approach to psychology known as functionalism. **Functionalism** assumes that the mind evolved to help us adapt to the world around us and that the focus of psychology should be the study of those adaptive processes. This proposition was partially derived from Darwin's theory of evolution, which proposes that adaptive characteristics that enable a species to survive and reproduce tend to increase in frequency across generations while nonadaptive characteristics tend to die out. Thus, according to a functionalist perspective, characteristics that are highly typical of a species, such as the characteristic of consciousness in humans, must have some type of adaptive value.
- Based on such reasoning, functionalists believed that psychologists should not study the structure of the mind, but instead study the adaptive significance of the mind. Learning, as an adaptive process, was therefore a topic of great interest to the functionalists. Moreover, although functionalists still made use of introspection and still emphasised the analysis of conscious experience (in this manner, being similar to the structuralists), they were not opposed to the study of animal behaviour. Like Darwin, they believed that humans evolved in the same manner as other animals and that much of what we learn from studying animals might therefore be of direct relevance to humans. Not surprisingly, two of the most important figures in the early history of behaviourism, E. L. Thorndike and John B. Watson, were students of functionalist psychologists.

### The Theory of Evolution: Humans as Animals

- As we have seen, the theory of evolution had a significant influence on the development of behaviourism, which continues today. Charles Darwin published the theory of evolution in 1859 in his book, *On the Origin of Species by Means of Natural Selection* (often simply called *The Origin of Species*). It describes how species, including humans, change across generations in response to environmental pressures. The basis of this theory is the principle of **natural selection**, which is the concept that individuals or species that are capable of adapting to environmental pressures are more likely to reproduce and pass along their adaptive characteristics than those that cannot adapt.
- There are three main components to the principle of natural selection. The first is that *traits vary, both within a species* (e.g., some dogs are larger than other dogs) *and between species* (e.g., humans have a slower metabolism than hummingbirds). The second is that *many traits are heritable*, meaning that they have a genetic basis and can be inherited by offspring. The third component of natural selection is that *organisms must compete for limited resources* (bearing in mind, however, that being an effective competitor might sometimes involve cooperation as much as conflict).

- Now let us put all three ideas together. Some individuals will acquire more resources than others based on certain inherited traits that give them an advantage. These individuals are therefore better able to survive – which is commonly referred to as “survival of the fittest.” However, the real driving force behind evolution is not survival of the fittest but the *reproductive advantage held by those individuals possessing traits that are best suited to the environment*. In other words, successful individuals are more likely to have offspring who, when they inherit the successful traits from their parents, are also more likely to survive and have offspring. As this process continues through succeeding generations, the proportion of individuals possessing the successful traits increases while the proportion of individuals possessing the unsuccessful traits decreases. Eventually, the changed population might differ so much from the original population that it becomes a new species.
- Thus, an **evolutionary adaptation** is an adaptive trait that evolves as a result of natural selection. We usually think of such adaptations as physical characteristics (e.g., the trunk of an elephant), but adaptations can also be behaviours. For example, if you inadvertently place your hand over a flame, a *flexion response* will cause you automatically to pull your hand away from the damaging fire even before you consciously feel pain. You can imagine how an inborn reflex like this would help an individual live long enough to reproduce, compared to an individual who lacked such reflexes.
- A particularly important evolutionary adaptation is the ability to learn. From an evolutionary perspective, the ability to learn evolved because it conferred significant survival advantages on those who had this ability. Thus, the distinction between nature and nurture can be seen as highly simplistic, since the ability to learn (nurture) is itself inherited (nature).
- In this text, you will learn about features of learning that are common across a variety of species, which suggests that the ancestors of these species faced similar environmental pressures that resulted in the evolution of similar features. Nevertheless, you will also learn about certain between-species differences in learning ability.
- As noted, Darwin’s theory of evolution had a strong effect on the early development of behaviourism, especially through its influence on the functionalist school of psychology out of which behaviourism developed. It continues to have an effect through the increased attention given these days to the role of genetic factors in learning, and through the recent establishment of “evolutionary psychology” as a major area of study within psychology.

### Behaviourism: The Study of Observable Behaviour

- In 1913, a flamboyant young psychologist by the name of John B. Watson published a paper titled “Psychology as the Behaviourist Views It.” In it, he lamented the lack of progress achieved by experimental psychologists up to that time, particularly the lack of findings that had any practical significance. A major difficulty, Watson believed, was the then-current emphasis on the study of conscious experience, especially as promoted by the structuralists. In particular, the method of introspection was proving to be highly unreliable. Researchers frequently failed to replicate each other’s findings, which often led to bitter squabbles.
- The difficulty, of course, is that we are unable to directly observe another person’s thoughts and feelings. We therefore have to make an **inference** that the person’s verbal reports about those thoughts and feelings are accurate. It is also the case that many of the questions being tackled by the structuralists were essentially unanswerable, such as whether sound has the quality of “extension in space” and whether there is a difference in “texture” between an imagined perception of an object and the actual perception of the object. In a very real sense, experimental psychology seemed to be drowning in a sea of vaguely perceived images and difficult-to-describe mental events. Moreover, the notion that the proper subject matter of psychology was the study of consciousness was so strongly entrenched that it affected even those who studied animal behaviour.
- Watson reasoned that the only solution to this dilemma was to make psychology a purely “objective science” based solely on the study of directly observable behaviour and the environmental events that surround it. All reference to internal processes, such as thoughts and feelings, were to be stricken from analysis. By objectifying psychology in this manner, Watson hoped that psychology could then join the ranks of the *natural sciences* – biology, chemistry, and physics – which had traditionally emphasised the study of observable phenomena.
- Thus, as originally defined by Watson, **behaviourism** is a natural science approach to psychology that focuses on the study of environmental influences on observable behaviour.
- Watson also believed strongly in the value of animal research. In keeping with his functionalist background – in turn following from Darwin’s theory of evolution – he believed that the principles governing the behaviour of non-human species might also be relevant to the behaviour of humans. Thus, traditional behavioural research is often conducted using nonhuman animals, primarily rats and pigeons. The results obtained from such research are often highly applicable to human behaviour.
- It is worth noting that Watson was not the first psychologist to recommend a more objective, natural science approach to psychology. He simply reflected a growing sentiment among many researchers at that time that such a

move was necessary. Watson's arguments, however, were the most clearly stated and therefore had a strong effect. Thus, while his 1913 paper (which later became known as the "Behaviourist Manifesto") did not have an immediate impact, its influence slowly grew until, by the 1920s, the behaviourist revolution was well under way.

## **Chapter 1 – Introduction – Five Schools of Behaviourism**

- Many people mistakenly believe that behaviourism is a monolithic entity, with Watson's views being the same views held by other behaviourists. In fact, there are several schools of behaviourism, each based on a somewhat different set of assumptions about how best to study environmental influences on behaviour. In this section, we describe five of these schools, beginning with Watson's original brand of behaviourism, which is sometimes referred to as methodological behaviourism.

### **Watson's Methodological Behaviourism**

- One of the most extreme versions of behaviourism is the one originally proposed by Watson. **Methodological behaviourism** asserts that, for methodological reasons, psychologists should study only those behaviours that can be directly observed. Subjectively perceived activities, such as thinking, are methodologically too difficult to assess to be of much use in a scientific analysis of behaviour. Such activities can be included for analysis only if they can, in some way, be directly measured. Watson, for example, hypothesised that thinking involves minute movements of the vocal cords in the larynx – and he enjoyed goading his critics by referring to his own thoughts as "laryngeal activity". If this were true, and if such movements could be precisely measured, then the act of thinking could be subjected to scientific analysis. (As it turns out, laryngeal activity is not a reliable measure of thinking.)
- It is important to emphasise that Watson's behavioristics proposal to ignore thoughts and feelings in scientific analysis was not simply an attempt to dehumanise people or to pretend that thoughts and feelings do not exist; rather, it was in part a logical response to a crisis. If the discipline of psychology was to survive, it would need to break free from the extreme mentalism of the time and adopt a much different perspective. Watson's behavioristics call to arms, though extreme, accomplished just that.
- From a theoretical perspective, Watson's specific view of learning was rather mechanistic. Drawing from Pavlov's work on classical conditioning, he came to believe that all learning involves the development of a simple connection between an environmental event (the "stimulus") and a specific behaviour (the "response"). Watson's theory of learning is therefore regarded as a type of **stimulus-response (S-R) theory**, in which a connection is formed between a specific stimulus and a specific response. Complex behaviour is presumed to involve extremely long chains of these S-R connections.
- Over time, Watson also became something of an extremist regarding the nature-nurture issue. In his original 1913 article, he had emphasised the influence of both heredity and environment on behaviour. In fact, he was one of the first individuals to systematically study innate behaviour patterns in animals. Later, however, following extensive observations of human infants, he came to the conclusion that humans inherit only a few fundamental reflexes along with three basic emotions: love, rage, and fear. Everything else, he believed, is learned. This led Watson, in 1930, to make one of his most famous claims:
  - 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.
- Unfortunately, many textbooks quote only this passage and omit the very next sentence, which reads, "I am going beyond my facts, but so have the advocates of the contrary and they have been doing it for many thousands of years". And this was precisely Watson's point: The supposition that a person's abilities are largely inherited has been strongly promoted throughout history. Watson was one of the first to issue a strong challenge to this assumption, arguing instead that there is at least as much evidence suggesting that human abilities are mostly learned. For this reason, Watson's behavioural model became quite popular among the reformists of his day who were attempting to combat racism.
- As we previously noted, many people mistakenly equate behaviourism with Watson's rather extreme version. In fact, few behaviourists were this extreme; instead, they developed approaches that were considerably more moderate. One of the most influential of these was Hull's neobehaviourism.

### **Hull's Neobehaviourism**

- A major challenge to methodological behaviourism came from Clark Hull, who claimed that Watson's rejection of unobservable events was scientifically unsound. Hull noted that both physicists and chemists make inferences about

events they have never directly observed but that can nevertheless be *operationalised* (i.e., defined in such a way that they can be measured). For example, gravity cannot be directly observed, but its effect on falling objects can be precisely measured. Hull believed that it might likewise be useful for psychologists to infer the existence of internal events that might *mediate* (form a connection) between the environment and behaviour.

- The mediating events that Hull incorporated into his theory consisted largely of physiological-type reactions, for example, a “hunger drive” that can be operationalised as number of hours of food deprivation. Such mediating events are formally called **intervening variables**, meaning that they intervene between a cause (such as food deprivation) and an effect (such as speed of running toward food). Thus, Hull’s **neobehaviourism** utilises intervening variables, in the form of hypothesised physiological processes, to help explain behaviour.

- It is important to note that Hull’s use of intervening variables did not mean that he advocated a return to mentalism. Like Watson, he strongly opposed the use of introspection as a scientific tool, believing that subjective experiences are too vague and unreliable to be of much use. Thus, whether the organism actually experienced a feeling of hunger was of no concern to him. What did concern him was whether the **concept of hunger**, as defined in some measurable way (such as number of hours of food deprivation), was scientifically useful and led to testable hypotheses.

- Hull’s theory was also an S-R theory because it assumed that learning consists of the establishment of connections between specific stimuli and specific responses. Thus, like Watson, he viewed behaviour in a very mechanistic, stimulus-response fashion. Lest this seem dehumanising, recognise that it is not far removed from some modern-day cognitive approaches, which view humans as analogous to computers that process bits of information from the environment (input) to produce responses (output). This is actually quite similar to Hull’s model of behaviour. In fact, some versions of modern-day cognitive psychology can even be considered outgrowths of Hull’s neobehaviourism.

- Hull was the most influential experimental psychologist of the 1940s and 1950s. Unfortunately, many aspects of his theory were very difficult to test. The theory was also highly mathematical and grew increasingly complex as equations were expanded and modified. Some of these modifications were forced on Hull by his critics, the most famous of whom was Edward C. Tolman.

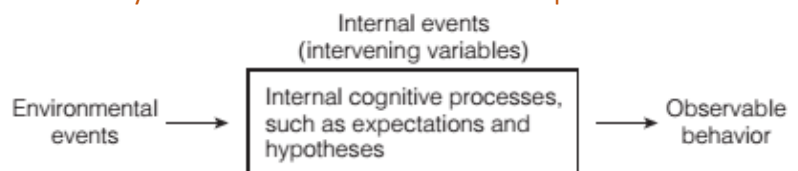
### Tolman’s Cognitive Behaviourism

- Hull’s S-R theory of learning is often categorised as a “molecular” theory insofar as it assumed that specific S-R connections are the building blocks of behaviour in the same way that molecules are the building blocks of matter. Edward Tolman disagreed with this approach and believed that it would be more useful to analyse behaviour on a “molar” (i.e., broader) level.

- For example, he felt that we can understand a rat’s behaviour in a maze more accurately as a goal-directed attempt to obtain food than as a long chain of discrete stimulus-response connections that, in machine-like fashion, lead to food. This molar approach to learning is similar to the gestalt approach to perception, from which Tolman drew much of his inspiration. To the gestalt psychologists, perception is not simply the summation of different bits of conscious experience but is instead a “holistic” process resulting in an organised, coherent, perceptual experience. We perceive a house as more than just a combination of bricks and boards; it is bricks and boards plus something more. As the classic gestalt saying goes, “the whole is more than the sum of the parts.” Similarly, for Tolman, behaviour is more than just a chain of discrete responses attached to discrete stimuli. It is instead an overall pattern of behaviour directed toward particular outcomes, and it can be properly analysed only on that level.

- Although Tolman disagreed with much of Hull’s theorising, he did agree that intervening variables may be useful in a theory of learning (in fact, it was Tolman who first suggested this). However, while Hull’s intervening variables were physiological-type processes like hunger and fatigue, Tolman’s were more mentalistic. The Tolmanian rat, as well as the Tolmanian person, was not simply motivated by drives and habits but also had “expectations” and “hypotheses.” Thus, Tolman’s **cognitive**

**behaviourism** (sometimes called “purposive behaviourism”) utilises intervening variables, usually in the form of hypothesised cognitive processes, to help explain behaviour.



- Tolman’s most famous intervening variable is the **cognitive map**, which is a mental representation of one’s spatial surroundings. Evidence for this concept was provided by a study on “latent learning” by Tolman and Honzik. This experiment was conducted in an attempt to disprove Hull’s notion that behaviour must be rewarded for learning to take place; that is, in the absence of some type of reward, nothing can be learned. To test this notion, Tolman and Honzik trained three groups of rats on a complex maze task. The rats in a continuous-reward group always found food when they reached the goal box, but the rats in the two other groups found no food when they reached the goal box (they were simply removed from the maze and then fed several hours later). Training proceeded at the rate



of one trial per day for 10 consecutive days. As expected, the rewarded group learned to run quickly to the goal box, whereas the two nonrewarded groups took much longer to do so.

- Following this initial phase of training, on day 11 the rats in one of the nonrewarded groups also began receiving food when they reached the goal box. According to Hull, the rats in that group should only then have started to learn their way through the maze, which would have been demonstrated by a gradual improvement in their performance. What Tolman and Honzik found instead was a dramatic improvement in the rats' performance on the very next trial

- Tolman interpreted these results as indicating that the initially nonrewarded rats had in fact learned the maze during the first 10 trials of the experiment, and that they had learned it at least as well as the group that had been receiving food. He would later interpret these findings as indicating that the rats had developed a "cognitive map" of the maze during the early trials, which became apparent only when they began to receive food in the goal box. Thus, this experiment is regarded as a classic demonstration of **latent learning**, in which learning occurs despite the absence of any observable indication of learning and only becomes apparent at a later time. The experiment is also regarded as demonstrating the distinction between *learning* and *performance*, because learning was apparently taking place even when the subjects showed no evidence of learning in their performance at that time.

- Although Tolman believed that it was useful to incorporate cognitive variables into his theory, he remained in many ways a standard behaviourist. Like Hull and Watson, he believed that introspective reports of thoughts and feelings are so unreliable as to be of little scientific value. He maintained that his own theoretical inferences about cognitive processes were based entirely on direct observations of behaviour and were thus objectively based. Tolman once even apologised for the "shameful necessity" of having to discuss conscious experience in a textbook he was writing – a reflection perhaps of how frustrated psychologists had been by the old introspectionist approach. Like other behaviourists, Tolman also believed strongly in the usefulness of animal research for discovering basic processes of learning, and almost all of his research was conducted with rats.

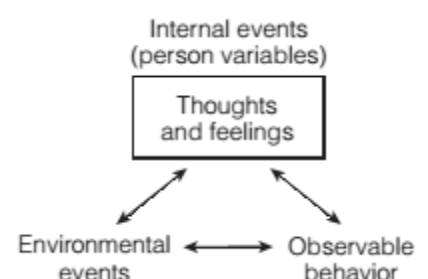
- Much of Tolman's research was directly aimed at challenging Hull's theory of learning. Hull responded by modifying his theory, in increasingly complex ways, to account for many of Tolman's findings. As a result, Tolman's cognitive behaviourism never achieved the same popularity during his lifetime as Hull's nonbehavioral approach. With the growth of cognitive psychology, however, many of Tolman's research methods and concepts have been adopted by modern researchers. Cognitive behaviourism is now a flourishing field of study, and the study of cognitive processes in non-human animals is now known as "animal cognition" or "comparative cognition".

### Bandura's Social Learning Theory

- If Tolman's use of cognitive concepts seems to represent a partial return to mentalism, Albert Bandura's social learning theory is an even stronger step in that direction. The roots of social learning theory can be partly traced to Hull's neobehaviourism in that Bandura had considerable exposure to Hullian theorists during his graduate training. In fact, the term **social learning theory** was first used by followers of Hull who were attempting to apply Hullian concepts to human social behaviour, particularly the process of imitation. Bandura was very much interested in imitation, which he referred to as **observational learning**, and he eventually became the dominant researcher in the field. His most famous investigations concern the effect of observational learning on aggressive behaviour.

- Although Bandura's interests were partially influenced by Hullian psychologists, his interpretation of the learning process is more closely aligned with Tolman. Like Tolman, Bandura focuses on broad behaviour patterns (i.e., he uses a molar approach) and strongly emphasises the distinction between learning and performance. Unlike Tolman, however, he views internal events as more than just theoretically useful; they are seen as actual events occurring within us that strongly influence our behaviour. This means that, unlike the other behaviourists we have discussed, Bandura does not dismiss the value of introspectively observed thoughts and feelings in explaining behaviour. Thus, **social learning theory** (also called **cognitive social learning theory** or **social-cognitive theory**) strongly emphasises the importance of observational learning and cognitive variables in explaining human behaviour.

- Bandura also has a distinct view of determinism (the notion that each behaviour has a cause). **Reciprocal determinism** is the assumption that environmental events, observable behaviour, and "person variables" (including thoughts and feelings) reciprocally influence each other. Thus, according to Bandura, how we think and behave can influence our environment – through the environments we choose to be in as well as how we perceive those environments – as much as the environment influences how we think and behave. And behaviour can influence our thoughts and feelings ("I'm stammering, therefore I must be anxious") as much as our thoughts and feelings can influence our behaviour. This can be contrasted with the other models we've discussed in which environment causes behaviour, and internal events, if included, serve only a mediational role (Environment -> Internal events -> Behaviour).



- Social learning theory has stimulated a considerable amount of research, particularly in the area of observational learning. It has also stimulated the development of **cognitive-behaviour therapy**, in which psychological disorders are treated by altering both environmental variables and cognitive processes. For example, a cognitive-behavioural treatment for an irrational fear of spiders might involve some type of safe exposure to spiders (an environmental manipulation) along with instructions to replace fearful thoughts with certain types of calming thoughts (a cognitive manipulation). Cognitive-behavioural treatments have become quite popular in recent years. Social learning theory (along with its cousin, animal cognition) has become a dominant force in behavioural psychology and is rivalled by only one other school of thought – B. F. Skinner's radical behaviourism.

### Skinner's Radical Behaviourism

- From Watson to Bandura, we see a steady increase in the use of internal events to help explain behaviour. Not everyone has agreed with this trend. Burrhus Frederic Skinner argued for a return to a stricter form of behaviourism. Skinner's version of behaviourism, known as **radical behaviourism**, emphasises the influence of the environment on observable (overt) behaviour, rejects the use of internal events to explain behaviour, and views thoughts and feelings as behaviours that themselves need to be explained. Thus, unlike Watson's methodological behaviourism, radical behaviourism does not completely reject the inclusion of internal events in a science of behaviour; it merely rejects the use of these events as explanations for behaviour.

### Skinner's View of Internal Events

- Skinner viewed internal events, such as sensing, thinking, and feeling, as "covert" or private behaviours that are subject to the same laws of learning as "overt" or publicly observable behaviours. Thus, internal events can be included in an analysis of behaviour, but only as more behaviour that needs to be explained. For example, whereas a social learning theorist might say that a student studies because she expects that studying will result in a high mark, Skinner would say that both the act of studying and the thoughts about achieving a high mark by studying are the result of some experience, such as a history of doing well on exams when the student did study.

- For several reasons, Skinner was loath to consider internal events as explanations for behaviour. First, he agreed with Watson's concern that, since we do not have direct access to the internal events of others, we must rely on their verbal reports of such events, which are often unreliable. Skinner further noted that such unreliability is to be expected, given the manner in which people learn to label their internal events. Specifically, young children need to be taught by their caretakers to describe their internal experiences. Because these caretakers (usually parents) cannot directly observe internal events in their children, they must infer their occurrence from the children's observable behaviours.

- Consider, for example, the task of teaching a young boy to correctly label the feeling of pain. The parent must wait until the child is displaying some observable behaviour that typically accompanies pain, such as crying in response to a stubbed toe. Based on this behaviour, the parent then infers that the child is experiencing pain and says something like, "My, your toe must really hurt!" After a few experiences like this, the child will himself begin using the word hurt to describe what he is feeling in such circumstances.

- Pain is probably one of the easier feelings to teach, given that the observable behaviours accompanying it are usually quite distinct (although even here, there may be considerable variability across individuals in the intensity of sensation required before something is called painful). Consider how much more difficult it is to teach a child to accurately describe more subtle emotions such as contentment or discomfort, for which the observable behaviours are often much less distinct. Because the parents have less reliable information on which to base their inferences about such states, the labels they provide to the child may only approximate the child's actual feelings. As a result of these experiences, the labels people use to describe their feelings may often be only crude approximations of what they actually feel. For this reason, Skinner was uninterested in using a person's description of an internal emotional state as an explanation for behaviour; he was, however, quite interested in how people come to label their internal states.

- A second problem with using internal events to explain behaviour is that it is often difficult to determine the actual relationship of thoughts and feelings to behaviour. Take, for example, the act of providing help in an emergency. Do you provide help because you feel concern for the person involved? Or do you provide help and feel concerned at the same time, with no necessary link between the two? After all, people often take action in an emergency quite quickly, without reflecting upon how they feel. Or do your feelings of concern for someone sometimes arise *after* you have tried to help them? Lest this notion seem strange to you, consider that people's "feelings" can often be altered by manipulating their overt behaviour. For example, people can often be induced to change their opinion about a certain issue – such as whether capital punishment should be abolished – by asking them to write an essay promoting a different point of view. If they do not already hold a strong opinion about that issue and do not feel that

they are being forced to write the essay, many people will alter their opinion to be consistent with what they have written. In similar fashion, the concern you feel for others might sometimes result from, or at least be strengthened by, the act of helping them.

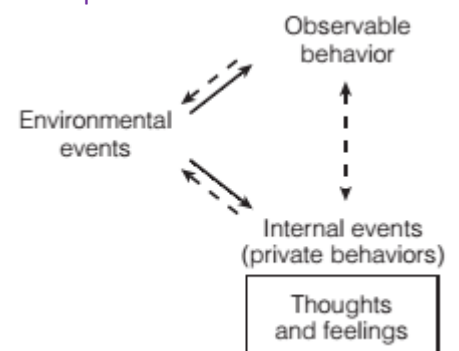
- A third difficulty with using internal events to explain behaviour is that we do not have any means of directly changing these internal events. Our only means of changing both covert behaviour and overt behaviour is to change some aspect of the environment. For example, if I instruct a client to think calm, relaxing thoughts whenever he or she is in an anxiety-arousing situation, and this effectively reduces the anxiety, a radical behaviourist would say that the effective treatment is not the calm, relaxing thoughts but the instructions I have given the person about thinking calm, relaxing thoughts. And since exposing the client to these instructions is really a manipulation of the client's environment, then it is really a change in the environment that is ultimately responsible for reducing the level of anxiety. Therefore, if changing the environment is the only manner in which behaviour can be influenced, then why not emphasise the environment as the ultimate cause of behaviour?

- A fourth problem with using internal events to explain behaviour is that (as with explanations based on instinct) such explanations are sometimes only pseudo-explanations. For example, if I say that I "feel like going to the movies," am I really referring to a bodily condition of some sort? Or am I simply making a prediction about my future behaviour? In other words, I am simply saying that I am quite likely to go to the movies under these particular circumstances, given that nothing prevents me from doing so. Thus, my "feeling" statement is really a statement about potential behaviour more than about a bodily feeling. For this reason, saying that I am going to the movies because I "feel like going to the movies," or studying because I "feel like studying," is really no explanation at all.

- For reasons such as these, Skinner rejected internal events as explanations for behaviour; instead, he focused on the environment as the ultimate cause of both observable behaviour (overt behaviour) and internal events (covert behaviour). But neither did he believe that we are helpless pawns of our environment. He assumed that once we understand the manner in which the environment affects us, we can then change the environment so it will exert a more beneficial influence on our behaviour. We can refer to this process as **countercontrol**, which is the deliberate manipulation of environmental events to alter their impact on our behaviour. Nevertheless, in Skinner's view, even such acts of countercontrol can ultimately be traced to environmental influence. Consider, for example, Jamie, who decides to improve her study habits by rearranging her study environment. At first glance, Jamie's decision (the thoughts she has had about this issue) seems to be the cause of the improvement in her study habits. On the other hand, Jamie would not have made this decision unless she had first been exposed to information about its usefulness. The source of this information is an environmental influence and is, in Skinner's view, the ultimate cause of the improvement in Jamie's study habits.

- As for the notion of free will, radical behaviourists are, by definition, interested in the principles by which the environment determines behaviour; hence, the notion that a behaviour has been freely chosen is not an assumption they would make. They are, however, quite interested in why people might perceive that a behaviour has been freely chosen. One possibility is that our behaviour seems to be freely chosen when the controlling variables are subtle and not easily identified. As previously noted, there is a good deal of evidence suggesting that behaviour can be subtly influenced in ways we are not aware of. Skinner also pointed out that we are especially likely to perceive a *lack of freedom* when behaviour is being controlled through the use of aversive consequences. It is for reasons such as this that Skinner strongly argued that society should "engineer" the environment to maximise the use of positive reinforcement (which is perceived as less constraining) and minimise the use of punishment.

- In general, Skinner seems to agree with some aspects of Bandura's notion of reciprocal determinism, in the sense that environmental events, internal events, and observable behaviour can be viewed as interacting with each other. Like Bandura (and Tolman), he also analysed behaviour from a molar, rather than a molecular (S-R), perspective. Where Skinner differs, however, is in his assumption that the environment (in combination with genes) ultimately determines both observable behaviour and internal events.



### Skinner's View of Genetic Factors

- What about the role of genetic influences on behaviour? In discussing these various schools of behaviourism, we have focused on the role of the environment; but we have done so simply because that is what behaviourists generally do – they study the effects of environmental experiences on behaviour. Traditionally, they leave it to other disciplines, such as ethology or evolutionary psychology, to study the role of genetic influences. But this does not mean that behaviourists discount the role of heredity. As noted earlier, Darwin's theory of evolution played a strong role in the establishment of behaviourism, and many behaviourists recognise that heredity can profoundly influence

animal and human behaviour. Skinner, in fact, repeatedly acknowledged that behaviour was fundamentally the result of the interaction between genes and the environment. And far from being dismayed by research indicating genetic limitations on operant conditioning, he was fascinated by it and even initiated some early research along these lines.

- Skinner also noted that operant conditioning bears a striking resemblance to the evolutionary principle of natural selection. According to the principle of natural selection, members of a species that inherit certain adaptive characteristics are more likely to survive and propagate, thereby passing those characteristics on to their offspring. Thus, over many generations, the frequency of those adaptive characteristics within the population increases and becomes well established. In similar fashion, in operant conditioning, behaviours that lead to reinforcing consequences are more likely to be repeated, whereas those that do not lead to reinforcing consequences are less likely to be repeated. In other words, operant conditioning is sort of a mini-evolution in which an organism's behaviours that are adaptive (that lead to reinforcers) increase in frequency while behaviours that are nonadaptive (that do not lead to reinforcers) decrease in frequency. The processes of natural selection and operant conditioning are therefore quite similar. The basic difference is that natural selection is concerned with the evolution of inherited characteristics within a species, whereas operant conditioning is concerned with the evolution of learned behaviour patterns within an individual.

- Although Skinner was more accepting of the potential effects of heredity on behaviour than was Watson, he nevertheless remained wary about placing too much emphasis on such factors. Genetic factors are largely unmodifiable, and to assume that a behaviour pattern has a strong genetic basis is to assume also that little can be done to alter it (except perhaps through some type of physiological intervention). When dealing with maladaptive characteristics such as learning difficulties or aggressive tendencies in children, this assumption can have serious implications. Think about it: If you had a son who was having difficulty in math, would you want his teacher to be a strong empiricist (who emphasises the role of experience in determining behaviour) or a strong nativist (who emphasises the role of genetics and heredity)? Almost certainly, you would want a teacher who is a strong empiricist and who believes the child's math problems are the result of poor learning experiences, which can therefore potentially be corrected by providing better experiences. Thus, a strong empiricist approach, such as that exemplified by Skinner and other behaviourists, tends to be more optimistic about the possibility of changing behaviour for the better. Behaviourists nevertheless have a growing appreciation for the influence of genetic factors on learning and behaviour, and recent years have seen a significant increase in research in this area.

### Behaviour Analysis and Applied Behaviour Analysis

- More so than other behaviourists, Skinner was careful to distinguish between the philosophical, scientific, and applied aspects of his approach. **Radical behaviourism** refers to the philosophical aspect of Skinner's approach that we have just been discussing, that is, the set of assumptions upon which Skinner's behavioural science is based. The term **behaviour analysis** (sometimes called the **experimental analysis of behaviour**) is the basic science that grew out of radical behaviourism. Behaviour analysts have especially concentrated on researching the various principles of operant conditioning.

- Like Watson, Skinner was concerned that the principles discovered through basic research should have practical application. In this regard, he did not disappoint. His work directly led to the establishment of **applied behaviour analysis**, a technology of behaviour in which basic principles of behaviour are applied to analysing and solving real-world problems. These applications range from treating or managing clients with clinical disorders (such as depression and schizophrenia), to improving educational practices and athletic performance, to promoting health-related behaviours and reducing pollution. Applied behaviour analysis (often abbreviated as ABA) is particularly well established as the treatment of choice for children with developmental and intellectual disabilities, especially autism, and many applied behaviour analysts work in this field. Applied behaviour analysis is also sometimes referred to as **behaviour modification** or **behaviour therapy**, although the latter term tends to include cognitive-behavioural approaches to treatment more so than would be found in applied behaviour analysis.

- After taking a course on learning and behaviour, some students become intensely interested in pursuing a career in applied behaviours analysis. Fortunately, there is a growing demand for individuals with training in applied behaviour analysis, as well as a growing number of programs available to provide such training. Internationally recognised certification exams have also been established to ensure that applied behaviours analysts are highly trained and meet a common set of standards. Individuals with graduate degrees and intensive training in applied behaviours analysis are eligible to become Board Certified Behaviour Analysts (BCBAs). BCBAs conduct behavioural assessments and design, deliver, and supervise behavioural interventions. Individuals with bachelor's degrees and training in applied behaviours analysis (either during or following their degree) are eligible to become Board Certified



Assistant Behaviour Analysts (BCaBAs). BCaBAs can carry out many of the same functions as BCBA's, but do so under the supervision of a BCBA.

### **Chapter 1 – Introduction – Summary**

- This text introduces the basic principles of learning and behaviour. It particularly emphasises the principles of classical conditioning, in which reflexive behaviours come to be elicited in new situations, and operant conditioning, in which the strength of a behaviour is influenced by its consequences.
- Individuals of historical significance in the study of learning include Aristotle, who assumed that knowledge is gained largely from experience (as opposed to being inborn) and believed that learning is based on four laws of association: similarity, contrast, contiguity, and frequency. Descartes proposed that involuntary behaviours, which occur in both humans and animals, are automatically elicited by external stimulation, whereas voluntary behaviours, which occur only in humans, are controlled by free will. The British empiricists argued that all knowledge is a function of experience, and they strongly emphasised the laws of association in their study of learning. Structuralists, such as Titchener, assumed that the mind is composed of a finite number of basic elements that can be discovered using the method of introspection. Darwin's theory of evolution proposed the notion that adaptive characteristics, including the ability to learn, evolve through the process of natural selection. This influenced the functionalists, such as William James, who believed that psychologists should study the adaptive processes of the mind. Functionalism led to the establishment of behaviourism, with its emphasis on the study of publicly observable behaviour and the environmental events that influence it.
- There are several schools of behaviourism. Watson's methodological behaviourism rejects all references to internal events that cannot be directly observed. Hull's neobehaviourism includes references to hypothetical internal events, usually of a physiological nature (such as fatigue or hunger), that mediate between the environment and behaviour. Tolman's cognitive behaviourism utilises hypothesised intervening variables that are mentalistic in nature, such as expectations and cognitive maps. This approach led to Bandura's social learning theory, which emphasises the importance of observational learning and cognitive variables in learning, as well as the notion that internal events, environment, and observable behaviour reciprocally interact with each other. By contrast, Skinner's radical behaviourism views internal events as private behaviours subject to the same laws of learning as publicly observable behaviours. Skinner's perspective emphasises the influence of the environment on behaviour but does not discount the influence of genetic factors. The science that has grown out of radical behaviourism is called behaviour analysis, which in turn has led to applied behaviour analysis, in which basic principles of behaviour are applied to solving real-world problems.