General

Need for an integrated view of development – genetic & environmental influences. For example – height 'determined' by genes – but diet & other environmental factors will have an influence. Evolutionary adaptations also influence development.

Different 'levels' of explanation available – e.g. tantrum throwing at a supermarket:

- ***Proximate*** – e.g. wrong cereal selected by mum
- ***Developmental*** – may have seen others throw tantrums and get what they want (experience)
- ***Genetic*** – may be predisposed to tantrums
- ***Comparative*** – happens across species
- ***Functional*** – selected through evolution as a way of securing parental attention

Potentially all equally valid explanations – and shows evolutionary and genetic explanations are complementary to more traditional psychological explanations of development.

Behavioural Genetics

Perspective: Genes contribute to the ***differences*** seen between individuals; shared environments contribute to ***similarities*** observed. ***Genetic effects play a key role in the development and expression of behaviour***.

However – there is a complex relationship between genes and the environment – MZ twins are not completely identical (e.g. body tissues & cell components – **Malcolm & Goodship**); different genes can underlie identical developmental outcomes.

Epigenesis - the view that development occurs as a result of interaction between genes and the environment – challenges the view that genetics is completely deterministic of development.

Book 1 Chapter 6 – Origins of Development

Heredity – **Mendel** – able to determine scientific laws that predicted the traits in pea plants based on their parents. Proposed the existence of genes – units of inheritance.

Law of segregation – two copies of genes in each parent; offspring get one copy from each parent. The alternative form of each gene is known as an ***allele*** – may be **dominant** or **recessive** (only inherited if both copies of the gene are recessive.)

Phenotype – observable characteristics of an individual – e.g. eye colour.

Genotype **–** Complete set of genes in an individual, determined at conception.

Homozygous – two identical alleles for a specific gene

Heterozygous – two different alleles

e.g. Cystic fibrosis caused by an individual having homozygous alleles for the recessive gene; if not present in parents they are heterozygous carriers (a trait may re-emerge in this way in future generations.)

Law of independent assortment – inheritance of one gene not affected by another.

Organisation of genes – **DNA molecules** (A,G,C,T), in **triplets** assembled into **chromosomes.** Many sequences of DNA are junk; **genes** are the bits of the DNA sequence that have an identified purpose. Each gene occurs at a **locus.** Humans have 46 chromosomes; 23 pairs. 22 are matching; the 23rd determines sex (XX=female, XY=male.) Red-green colour blindness is a recessive allele on the X chromosome – explains why men are more prone to this condition.

One complete set of 23 chromosomes inherited from each parent at conception – resulting in a novel combination of genes. Chromosomes = **the human genome**; mapped by 2003.

The Role of Genes – produce proteins – essential building blocks of the body. Involved in neurotransmitter functions – these send information through the nervous system. Some genes regulate the functioning of other genes in response to the environment – maybe more than involved in producing proteins (**Lawrence**.) Demonstrate that the expression of genes can vary depending on the environment (**Plomin et al**.)

Genetic Variation – mutations occur when DNA is copied – if this occurs in egg or sperm cells it may be passed to offspring. Mutations not perpetuated may be because it had fatal consequences or led to evolutionary disadvantages.

Medel's laws of inheritance have exceptions – e.g:

- Extra chromosome inherited in Down syndrome.
- Many traits have more than two alleles – e.g. ABO blood types determined by three alleles of one gene.
- Alleles not necessarily completely dominant – e.g. co-dominance - two copies of the sickle cell allele leads to the disease; but one copy leads to both normal and sickle cells in the same body.
- ***Genomic imprinting*** – where the expression of a gene depends on if it was inherited from the mother or father
- Cognitive ability is influenced by many traits/genes at the same time – i.e. it is ***polygenic***.

Human Behavioural Genetics

Family, adoption & twin studies - Three classic techniques of studying genes in development.

Family – 1st degree relatives more similar than cousins genetically. Differences between relatives can be used to assess the contribution of genes vs environment – however, environment is often shared, making separation difficult.

Adoption – better separation of genetic & environmental factors. Similarity to biological parents => genes; similarity to adoptive parents => environment.

Twin studies - MZ – genetically identical; DZ – 50% (average) identical. **Rietvald et al**, longitudinal study, 3-12 years, heritability = 75% for over activity & attention disorders.

For any characteristic, if correlation higher between MZ than DZ => genetic influences at work. Known as ***concordance rates***. Individuals are ***concordant*** if they show the characteristic; ***discordant*** otherwise.

e.g. concordance rate for schizophrenia in MZ twins 4x higher than DZ (**Tsuang et al**); more likely to be in biological parents (**Kety et al**). Complexity of stats leads **Joseph** to challenge conclusions, however.

Heritability is a statistic that describes the amount of genetic influence that can be found for a single characteristic. It is:

- A specific population stat. does not refer to individuals (e.g. **Turkheimer et al** looked at IQ in poor and rich families. Only in rich families does genetic influence show up.)
- Does not tell us if a characteristic is fixed or modifiable – only valid for the point in time the data was collected.
- Changes across the lifespan. e.g. **Plomin et al** found that general cognitive ability between parents & children increase from infancy.

The influence of genes on development

Selective breeding in animals

Tryon – maze bright / maze dull rats selectively bred over 21 generations – almost no overlap in abilities after 8 generations. **Searle** argued later that breeding for intelligence was not shown – rather, emotionality – maze bright rats less anxious. Maze running likely to be a polygenic trait – multiple genes involved.

Cooper & Zubek – demonstrated experience could interact with genetic influences by raising maze bright & dull rats in a poor or good environment. Maze dull in good environment as good as maze bright rats at maturity – good early environment can overcome genetic effects.

Gene defects in humans

Inheritance of PKU consistent with it being a single gene. Parents of PKU children don't usually suffer – therefore, a recessive allele causes. Is a genetic condition, as the presence of the allele is necessary and sufficient to cause it to occur. Altering the environment is used as a treatment – low phenylalanine diet in early childhood limits the development of PKU associated learning difficulties.

Huntington disease – dominant allele condition. At least one parent must have it for it to develop,

Williams Syndrome (WS) – multiple gene (16+) condition, associated with learning disorders and short stature. Exact number of missing genes varies between individuals – but **Karmiloff-Smith** points out individuals with identical gene deletions can show very different outcomes – impact from environment during development is therefore a factor.

Developmental perspective on genetic influence

Developmental plasticity – reorganisation of neural pathways during development – e.g. in WS similar individuals with different outcomes exhibit this.

Environmental interactions

Environment can produce a genetic influence. **Plomin et al** also show mother-child interactions, TV viewing, life events (environment) can also be a product of genetic influence.

Shared / non-shared environments – genetically unrelated adoptive siblings show a low but significant correlation on measures such as cognitive ability in childhood. In later adolescence the correlation is zero. Shared environments therefore become less important over time.

Evolutionary Developmental Psychology

Evolutionary Psychology

Answers questions of psychology at a ***functional*** level.

Evolution has three principles – ***variation*** (between individuals); ***heredity*** (variation is inherited); ***selection*** (good traits get passed on; bad ones die out)

EEA – The environment of our ancestors shaped the psychological mechanisms we have today. We are now adapted for an environment in which we no longer live – the hunter-gather era 10,000 years ago – because of 'civilisation' emerging.

Developmental perspective

Bjorklund & Pellegrini – the use of natural selection principles to explain contemporary human development. Involves study of genetic & environmental mechanisms that underlie universal development of social and cognitive competency.

Counters the view that genetics alone can explain development. Variation in human environments requires great cognitive and behavioural flexibility.

Controversial – **Rose & Rose / Kurzban** – argue the approach lacks empirical rigour or applicable outcomes. It relies on a predictive approach to verify.

The point of childhood is?

Greary & Bjorklund argue that the downside of a prolonged childhood (risk of death) must have an evolutionary advantage. Natural selection results in social and cognitive traits that support survival at all stages of development.

Adaptive behavioural mechanisms – examples have:

Immediate functional benefits
Immaturity can be beneficial to development
A preparation for adulthood

The sucking reflex, lost as you get older.
Play – process must confer adaptive benefits as there is no 'point' to play itself
Egocentric bias of children (**Ratner**) – better learning outcomes fostered
Poor meta-cognition – (**Bandura**) – allows children to take part in a wider range of activities without being put off by lack of ability – allows more challenging tasks to be undertaken and practiced
Low working memory capacity in young children – complexity of stimulation received lower, making subsequent analysis easier – e.g. **Kersten and Earles** – adults learning an artificial grammar demonstrates the beneficial effects of processing information in small chunks on learning.

Evolved psychological mechanisms

Natural selection driven adaptations are referred to as domain-specific adaptations – provide solutions to specific problems in the EEA.

Length of childhood related to complexity of a species social world (**Joffe**.)

Reciprocity & Symmetry in relationships is required – extended juvenile period helps these develop.
Outcome of reciprocity/symmetry is friendship – therefore, those with most similar phenotypes should form friendships – **Humphreys and Smith** provides support.

g-factor – evolved to help solve a range of non-recurrent problems in the EEA (the g-factor is a generalised factor of intelligence common to all intellectual tasks.)

Role of culture

Can criticise evolutionary psychology on the grounds it suggests biological basis for some behaviours despite evidence of learning. Countered by **Pinker** – learning not a gas or force field – it is innate machinery designed to do the learning.

Cultural and genetic evolution is interlinked – e.g. evolution of the teddy bear (**Hinde and Barden**). Over time, bears have become less bear-like and more human baby-like. Older children chose more baby-like bears, no such preference in younger ones. **Morris** concludes that it must be adult preference that is being reflected.

One application – teaching of maths on the basis of differences between boys & girls – competition v collaboration (**Greary**).