Genetic and Evolution

Charles Darwin - Theory of evolution

Natural Selection is a theory developed through his observations of the fitness of species characteristics to its environment

Natural selection and fitness

Animals that have certain traits that get an advantage

Evolution is a slow process

Fitness - organisms that are going to survive

not good enough that you survive, must pass traits on

Survival Adaptation

obtain food for yourself

physical traits

camo

all these adaptation make your chance greater for survival

Reproductive adaptation

passing on genes to the next generations

some genes less useful, but are needed for reproduction

make animals more desirable to the opposite sex

example: abs, plumage of peacocks

Intrasexual

are then passed on with greater frequency due to their association with greater mating sucess

when males fight with other males to win over the female

pressure on males to succeed

not always a physical deal - example: Satin bird

Intersexual Selection

in this process, if members of one sex are attracted to certain qualities in mates

example: brilliant plumagem, signs of good health, or even intelligence

female can select the winner

which one has the best genes/traits

Evolution of Modern Humans

first brain cell: 700 mya

cell moving towards heat or light

starts getting collection of brain cell to work together and produce basic brain function

first brain cell: 250 mya

first primate brain: 7 mya

humans and chimpanzees share common ancestors about 7 million years ago

modern humans are relatively recent in geological record

substantial physiological and cognitive changes compared to earlier species

Australopithecus: Our distant ancestor

irst primate to show distinctly human characteristics

walk on two legs, chimpanzee walk on 2 but not very well

spending a lot of time on the ground than in trees on 2 legs

how smart, overall: as a modern chimpanzee

judged by tool use and tool making

chimpanzee can use tools but do not make them

australopithecus, could also not make them, but could use them

Hominids: the earliest humans

homo habilis (handy human) manufacture simple stone tools

homo erectus (upright human) around on earth longer than we have been around

neanderthals - better stone tools and higher intelligence

Evolution of Modern Humans

adaptations to a changing environment

bipedalism

change in diet -> smaller facial muscles and teeth

not just focusing on meat but now fruit

allows cooking to soften the meal, we don't have big teeth = everything gets smaller

smaller facial muscles and teeth -> greater range of vocalization -> language

By **kateleschyshyn**

cheatography.com/kateleschyshyn/

Published 30th October, 2022.
Last updated 30th October, 2022.

Evolution of Modern Humans (cont)

small changes to mouth, more room for vocal track

produce language

cognitive ability

better tool making ability

social organization -> culture

from early to modern humans, brain size and cognitive ability increases

genetics

every cell in an organisms body contains the genetic blueprint for that organism

human body -> cell -> chromosomes -> DNA -> Gene

gene -> protein -> expression

genotype - blueprint examples: blue eyes, plans is housed the gene themselves

phenotype - the physical expressions of the genotype example: person has blue eyes

complex things break down to simple ideas

four basic bases, which are linked to each other

adenine bonds with thymine

cytosine bonds with quanine

Gene to protein

the sequence of bases in gene determines which amino acids are used to build the specified protein

sequences of bases code for specific amino acids

bases -> amino acids -> proteins

amino acids to protein

amino acids

linked together by a peptide bond

a polypeptide amino acids chain forms a protein

proteins are required to maintain cell function

proteins typically degrade within days

DNA ->mRNA -> Amino acid chain

transcription and traslation

mRNA leaves nucleus and moves to endoplasmic reticulum

translates into different amino acids that need to be built

ribosomes move along translates the mRNA and codes for amino acids

codon codes for a specific amino acid

amino acids are chained together to make protein

golgi body is packaged into vesicles and transported into different parts of the cell

Genetic techniques

introduce or remove genes of an embryo

knock in / knock out : Fur colour in mice, gene for genetic disorder,

knock in : mouse that is supposed to have white fur, introduce genes for black fur

knock out : turn off gene

genetic disorder, develop treatment, common practice in neuroscience

Animals model for human disorders

the mammalian brain is structurally similar across species

animals models used to mimic human diseases such as Alzheimer's and Parkinson's

introduce a gene into a rat then you can test treatment and you are not dealing with human subjects

Genetic techniques

"maze bright" and "maze dull rats"

selective breeding

maze bright = rats that picked up learning the maze well

maze dull = rats that did not learn it well

only breed maze bright

generation later keep smart rat together and non-smart together

The human genome project

completed in 2003

human genetic code contains less than 30,000 genes

4 bases that make it all up

to what degree are human abilites genetically determined vs. linked environement

genetics vs. what are you doing

Identical twins

studying genetic disorders in identical twins

monozygotic

share the same genetic code

identical twins raised apart share many of the same physical and personality traits

individuals experiences

measures data of identical twins who were raised apart and live in different enviro-nment

can it be explained by genes or enviro-nment

you tend to see the same traits in this twin which is a strong genetic link

behavioural genetics are used to study genetic influence on a host of different behaviours

strong influence of genetics but does not answer the whole story: learning disabilites, mental disabilites

Epigenetics

how a person experience can effect their gene

genes can explain variation between certain traits behaviours but not all

epigenetic drift - differences

when you observe the twin boys at a genetic level they are almost identical as well

older in lifem you start to see differences. similarity start to become epigenetic drift because the different experinces they are having in life

Epigenetic mechanisms

having their effects in this process

DNA transcription

histone modification - DNA does not get transcribed like it should. results in the protein that was not intended

DNA modification

they all represent how the plan can be changed

critical during development when genes have to turn on and off at a precise interval

silent genes to let it develop into a mature gene

Environmental effects on the genome

diseases linked to environmental exposure are difficult to track

different people respond differently

person may not have a genetically exposed to lung cancer but if they take up smoking