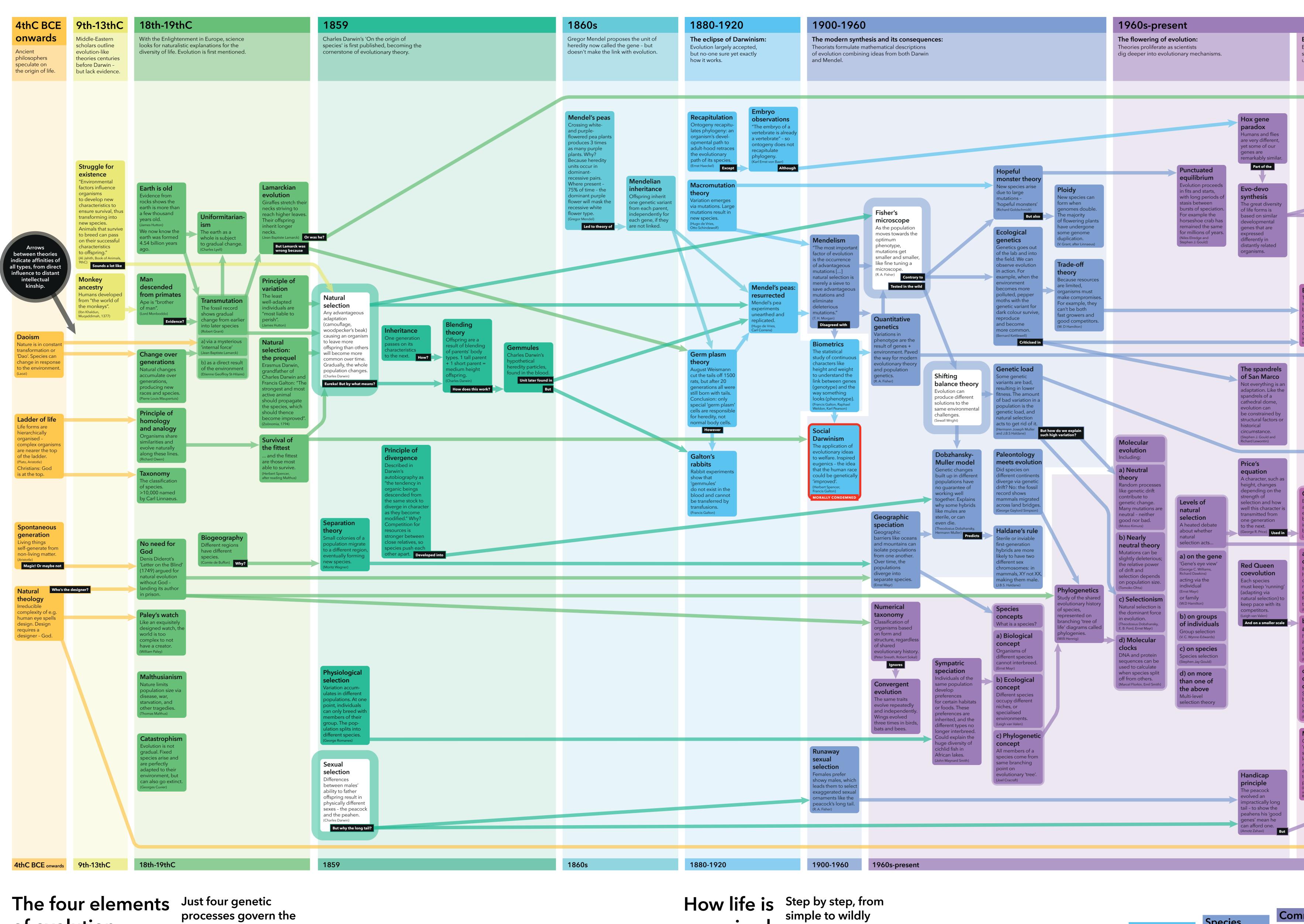
# EVOLUTION A progression of scientific thought



## The four elements of evolution

processes govern the proliferation of species

### 1.

Natural Selection

## Drift

2.

Genetic variants linked to advantageous traits (such as height, resistance to disease) cause an organisms to leave more offspring

### The change in a genetic variant from one generation to the next due to chance - and not to natural selection

3. Mutation

Genes undergo accidental changes - or mutations caused by radiation, viruses, or simple copying errors

Migration

The process by which genes or gene variants transfer from one population to another

## organised

DNA

blocks of most

nolecules in a single

human cell would be

about 2 metres long.

complex

Genome Gene All an organism's DNA Unit of heredity that Four nucleotides codes for proteins or The human genome is made up of 6 billion DNA that form the building RNA within an organism bases split into 24 hromosomes. It contains about 25,000 genes. Not all parts of a gene living organisms have to be on the same stretch of DNA or even on the same chromosome. Stretched out, the DNA

Chromosome A threadlike structure containing the DNA molecule and supporting proteins Human chromosome number 1 contains 220 million nucleotides.

The smallest unit of life. Most cells have one or two copies of each chromosome Some ants have only one of each chromosome in their cells, while some plants have 12.

Organism

Collections of cells that collaborate to form a larger entity such as an animal or plant

## Population

Groups of organisms living in the same area that can interbreed

## Species

Many definitions exist. One is 'a group of organisms that can interbreed and create viable offspring'

There are estimated to be nearly 9 million species on earth, of which only just over 1 million (about 15%) have been named.

Populations of different species that live in the same area and interact via competition, predation and parasitism

Community

Ecosystem

A dynamic complex of

different biological

communities - plants,

animals and microbes

in interaction with the

The billions of bacteria

living in your gut form their own ecosystem.

Recent research suggests

human gut ecosystems

form into three main

types dominated by

particular species.

surrounding environment

"Nothing in biology makes sense except in the light of evolution." (Theodosius Dobzhansky, 1973)

Enclose universal expension       Wey sea? biolisty during the design of t			2000 procept
Eukonander generation and ender surder Annohogie generation and ender surder Annohogie generation surder Annohogie generation su	Free lution and the state		2000-present
Ethology Internet water description and the standard description and the standard description description description description description description description description descriptio	Evolutionary concepts expand into the study of behaviour with implications for	Evolutionary biology turns its collective head to this fascinating	Science mines the genome for answers to a wide range
Exclanding Sex ratio Sex ratio <br< td=""><td></td><td></td><td>The study of inherited, but non-genetic, changes to the expression of genes. Lamarck may have been more right than we thought.</td></br<>			The study of inherited, but non-genetic, changes to the expression of genes. Lamarck may have been more right than we thought.
Why do organisms have sex?       Why do organisms have sex?       Why do organisms have sex?       Why do organisms have sex?         a) Red Queen paratic paratic sex relativities genes, making it coart to addition to participan attacket untifiche genes, making it coart to addition to happen faster, genes, allowing for motifiches organism to the same organism frome phone, based to antiget organism to the same organism frome phone, based to antiget organism to the same organism frome phone, small dis- tore security and the same organism frome phone, small the male male swatts the male male swatts because the male male swatts the male m	The study of animal instinct and behaviour: social dominance, tool manufacture, and transmission of cultural traits. (Konrad Lorenz,	sex ratios Why most species have a near-1:1 sex ratio, but some insects and reptiles have many more males or females. (W. D. Hamilton) Two-fold cost of sex A sexual organism only passes on half its genes to its offspring.	Functional GenomicsWhat do different genes do? For example, the OCA2 gene encodes a protein involved in producing a pigment that affects hair and eye colour.Juseful forDarwinian medicine Dased on personal genomic profiles.Senomics of plasticity How can some individuals adapt to different
Game theory         Economic models applied to the volution of behaviour, including human behaviour. Journal of the same volution to harm the other conditionary principles apply to social behaviour in organisms from ant to apper to site wolution and to see the mates. There is to for formation, for soxample, some female spiclers set their mates. There is to for formation and the result of farming. Conflict Times. Guilf Tueson.       Nating system. Form some plants, snais).       Nating system from some plants, snais).       b) Reciprocal altruins         Illiscate times. Guilf Tueson.       Evolutionary principles apply to social behaviour in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       b) One set them the other in the same organism (some plants, snais).       c) Separate male and female sexes: mame and female s		organisms have sex? a) Red Queen parasite hypothesis Sex reshuffles genes, making it easier to adapt to pathogen attacks - until the pathogens bite back.	without being genetically distinct? Tree of Life web project All the world's living diversity, now chronicled online at tolweb.org/tree/. But can we
<ul> <li>b) Pecificit</li> <li>in organisms from ants to apes to slime moulds.</li> <li>islime moulds.</li> <li>islime moulds.</li> <li>ible trivers. Generit Barker)</li> <li>b) Reciprocal altruism</li> <li>if you scratch mine, the evolutionary adaptations affecting our psychological makeup.</li> <li>c) Parent-offspring conflict</li> <li>Sibling competition between selfish offspring can take it out of parents.</li> <li>it out of parents.</li> <li>Controvers.stat. toopset.</li> <li>Controvers.stat. toopset.</li> <li>b) Reciprocal altruism</li> <li>it c: 0 wilson)</li> <li>it c: 0 wilson)<td>Economic models applied to the evolution of behaviour, including human behaviour. (John Maynard-Smith)</td><td>Robertson effect Sex reshuffles genes, allowing for two beneficial mutations to co-occur, and evolution to happen faster.</td><td><b>biology</b> The holistic application of evolutionary theory to all levels of a system – from molecules up</td></li></ul>	Economic models applied to the evolution of behaviour, including human behaviour. (John Maynard-Smith)	Robertson effect Sex reshuffles genes, allowing for two beneficial mutations to co-occur, and evolution to happen faster.	<b>biology</b> The holistic application of evolutionary theory to all levels of a system – from molecules up
family. (Robert Trivers) c) Parent- offspring conflict Sibling competition between selfish offspring can take it out of parents. (Robert Trivers) Memetics Cultural ideas or 'memes' (concepts, stories, tunes) are a lot like genes: they replicate, mutate and are subject evolutionary adaptations affecting our psychological makeup. CONTROVERSIAL TODAY How many partners? - Most birds pair bond for life because raising young is hard work. But cheating is still common. - In most mammals the male mates with many females because reproduction is	<ul> <li>in organisms from ants to apes to slime moulds.</li> <li>(E. O. Wilson)</li> <li>(E. O. Wilson)</li> <li>(Robert Trivers, Geoff Parker)</li> <li>b) Reciprocal altruism</li> <li>I'll scratch your back if you scratch mine,</li> </ul>	<ul> <li>systems</li> <li>a) Male and female in the same organism (some plants, snails).</li> <li>b) One sex then the other: when a dominant female clownfish dies, a male changes sex to replace her.</li> </ul>	
stories, tunes) are a the male mates with many females because replicate, mutate and are subject reproduction is	family. (Robert Trivers) c) Parent- offspring conflict Sibling competition between selfish offspring can take it out of parents. (Robert Trivers) Memetics Cultural ideas or	(mammals). But How many partners? - Most birds pair bond for life because raising young is hard work. But cheating is still common.	
hard for her. (Luigi Cavalli-Sforza and Marcus Feldman, Richard Dawkins) Intelligent design Natural theology	stories, tunes) are a lot like genes: they replicate, mutate and are subject to selective pressure. (Luigi Cavalli-Sforza and Marcus Feldman,	the male mates with many females because reproduction is easy for him, but hard for her.	design Natural theology
pretending to be science. Creationism dies hard. (Michael Behe) 2000-present			science. Creationism dies hard. (Michael Behe)

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