

Unequivocal Genetic Evidence for Human Evolution, and implications for Christian Faith

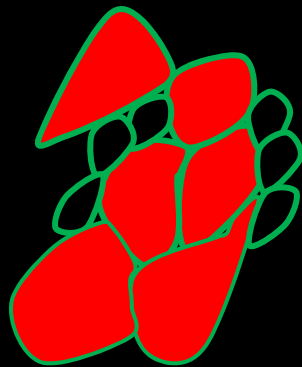
5 July 2016
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Cheek muscles, mastication

macaque

human



type II fibres

Human-specific loss of *MYH16* gene

Stedman HH *et al* (2004) *Nature* 428, 415

| | | | | | | | | | |
|-----------------|--------|-----|-----|-----|-----|-----|-----|-----|--------|
| human | ...ACC | CTC | CAT | AGC | C | GCA | CCC | CAT | TTT... |
| chimpanzee | ...ACC | CTC | CAT | AGC | ACC | GCA | CCC | CAT | TTT... |
| bonobo | ...ACC | CTC | CAT | AGC | ACC | GCA | CCC | CAT | TTT... |
| gorilla | ...ACC | CTC | CAT | AGC | ACC | GCA | CCC | CAT | TTT... |
| orang | ...ACC | CTC | CAT | AGC | ACC | GCA | CCC | CAT | TTT... |
| rhesus macaque | ...ACC | CTC | CAT | AGC | ACC | GCA | CCC | CAT | TTT... |
| pigtail macaque | ...ACC | CTC | CAT | AGC | ACC | GCA | CCC | CAT | TTT... |
| Woolley monkey | ...ACC | CTC | CAC | AGC | ACT | GTA | CCC | CAT | TTT... |

| | | | | | | | | | |
|-------|--------|-----|-----|-----|-----|-----|-----|-----|--------|
| human | ...ACC | CTC | CAT | AGC | C | GCA | CCC | CAT | TTT... |
| human | ...ACC | CTC | CAT | AGC | CGC | ACC | CCA | TTT | T... |

(new triplet phasing)



Urate oxidase pseudogene

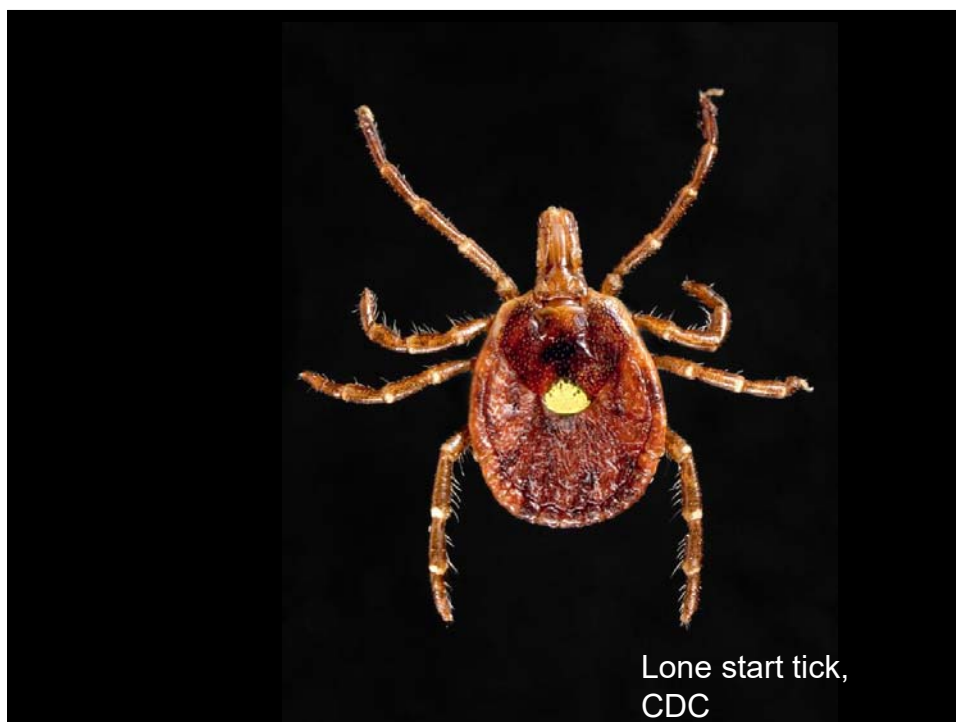
Oda M *et al* (2002) *Mol Biol Evol* 19, 640



| | |
|--------------------|--|
| human | ...ATT CAG TGA GAT GGA AAA TAT... |
| chimp | ...ATT CAG TGA GAT GGA AAA TAT... |
| gorilla | ...ATT CAG TGA GAT GGA AAA TAT... |
| orang | ...ATT CAG TGA GAT GGA AAA TAT... |
| rhesus macaque | ...ATT CAG CGA GAT GGA AAA TAT... |
| baboon | ...ATT CAG CGA GAT GGA AAA TAT... |
| owl monkey | ...ATT CAG CGA GAT GGA AAA TAT... |
| crab-eating monkey | ...ATT CAG CGA GAT GGA AAA TAT... |

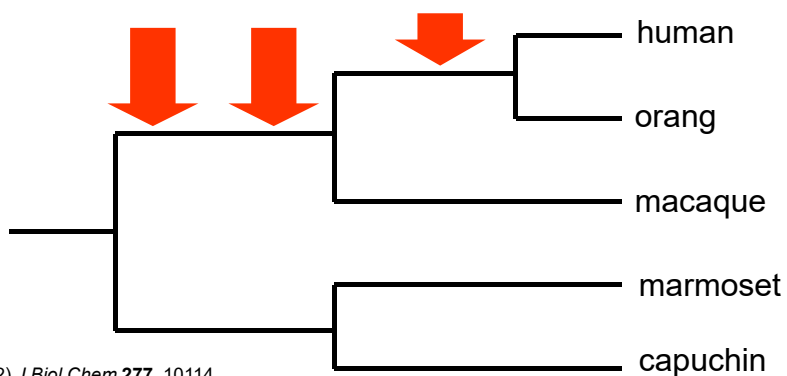


***C-to-T missense stop mutation
great apes***



α 1,3-galactosyltransferase (GGTA1)

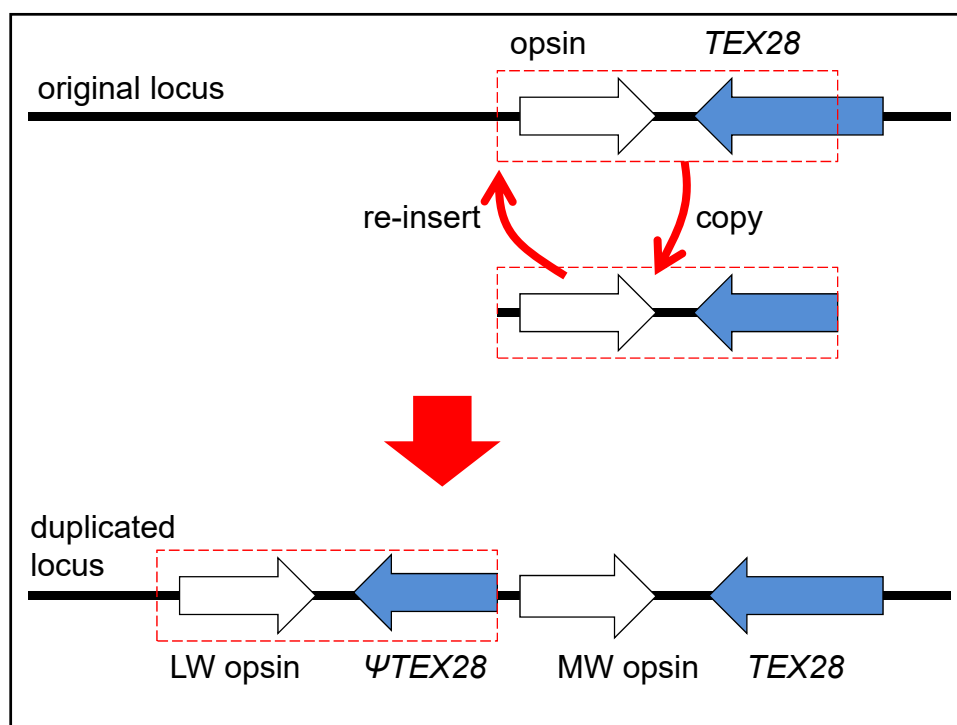
| exon | seven | nine | nine |
|----------|-------------------|------------|------------|
| human | ... AC... TAG... | ... TAG... | ... AT... |
| orang | ... AC... TAG... | ... TAG... | ... AT... |
| macaque | ... AC... TAG... | ... TAG... | ... GAT... |
| marmoset | ... GAA... TAC... | ... TAC... | ... GAT... |
| capuchin | ... GAA... TAT... | ... TAT... | ... GAT... |

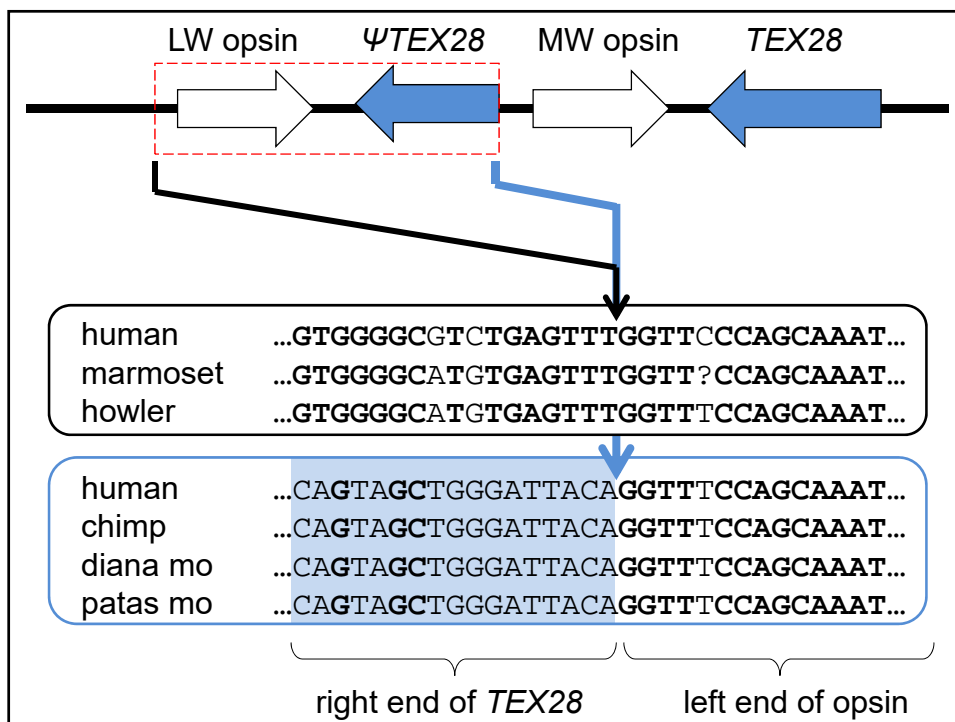
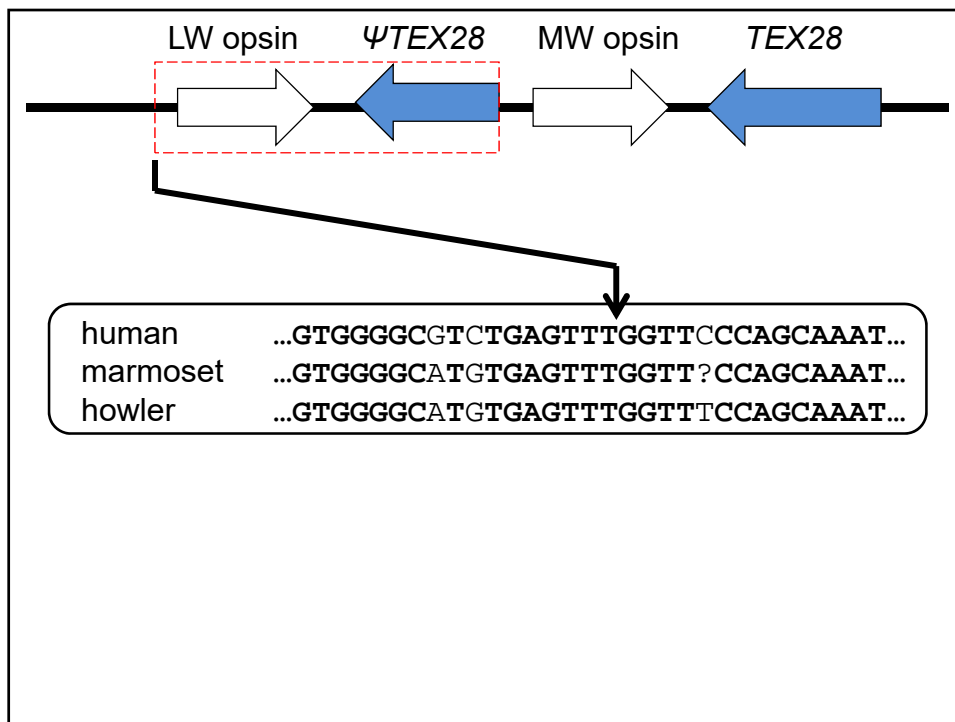


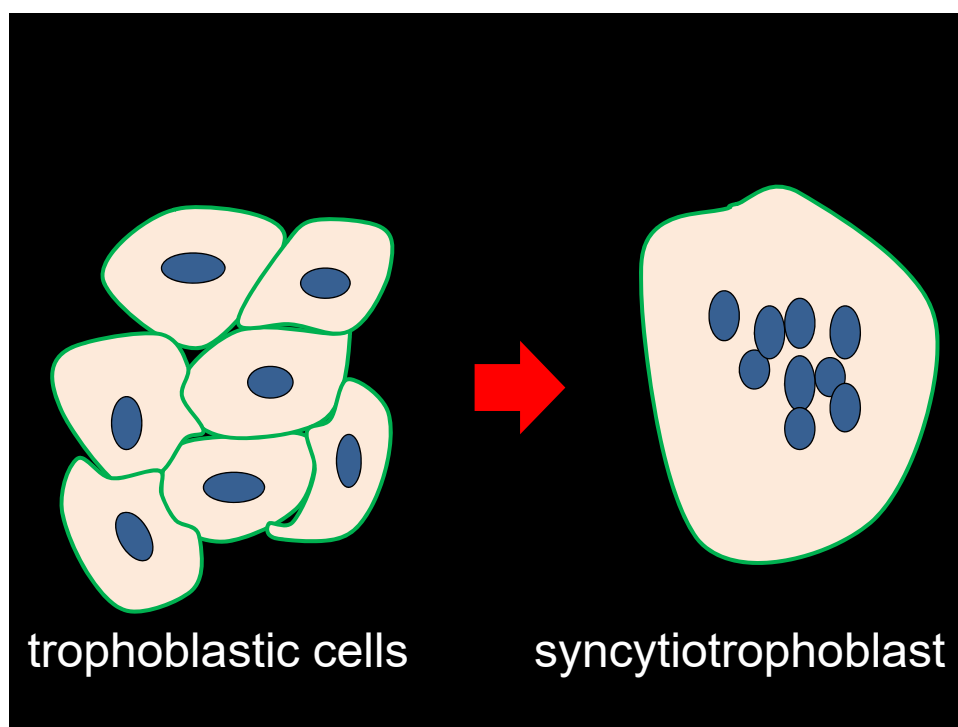
Koike C et al (2002) *J Biol Chem* 277, 10114

1-base deletion, Old World primates

| | |
|----------|--|
| human | ... AAAAAGGAAGAGAGGAG ACCAAAGGAAGGAAAAT... |
| orang | ... AAAAAGGAAGAGAGGAG ACCAAAGAAAGGAAAAT... |
| macaque | ... AAGA GGAAGAGAGGAG ACCAAAGAAAGGAAGAT... |
| marmoset | ... AAAAAGGAAGAGAGGAGGA ACAAAGAAAGGAAGAC... |
| howler | ... AAAAAGGAAAAGAAGAGGA ACAAAGAAAGGAAGAC... |
| capuchin | ... AAAAAGGAAGAGAGGAGGA ACAAAGAAAGGAAGAT... |
| lemur | ... AAAAAAGAAGAGAAAAGGA ACAAAGGAAGGAAGAT... |
| loris | ... AAAAAGGAAGAAAAAGGA ACAAAGAGAGAAAGAT... |







ERV-WE1 *env* gene

| | |
|------------|---|
| human | ...CAATTATCTTG CAAC [ERVWE1] CAAC CATG... |
| chimpanzee | ...CAATTATCTTG CAAC [ERVWE1] CAAC CATG... |
| gorilla | ...CAATTATCTTG CAAC [ERVWE1] CAAC CATG... |
| orang | ...CAATTATCTTG CAGC [ERVWE1] CAAT CATG... |
| gibbon | ...CAATTATCTTG CAAC [ERVWE1] CAAC CATG... |

| | |
|--------------|-------------------------------------|
| NWM sp | ...CAATTATCTTG CAAC CATG... |
| NWM sp | ...CAATTATCTTG CAAC CATG... |
| prosimian sp | ...CCACCATCTTG CAAAC CATG... |
| dog | ...CAACCATCTTG CAAAC CATG... |

Bonnaud *et al* (2005) *Retrovirology* 2, 57



stop mutation, (at least) Old World primates



F C A I X E K L

| | | | | | | | | | |
|------------|--------|-----|-----|-----|-----|-----|-----|-----|--------|
| human | ...TTC | TGT | GCC | ATC | TGA | GAA | AAG | CTA | GAA... |
| chimp | ...TTC | TGT | GCC | ATC | TGA | GAA | AAG | CTA | GAA... |
| macaque | ...TTC | TGT | GCC | ATC | TGA | GAA | AAG | CTA | GAC... |
| galago | ...TTC | TGT | GCC | ATC | CGG | GAA | AAG | CTG | GAC... |
| guinea pig | ...TTT | TGC | ACC | ATC | CGT | GAA | AAG | CTG | AAC... |
| rat | ...TTC | TGT | GAC | ATC | CGT | GAG | AAG | CTG | GAC... |
| mouse | ...TTC | TGT | GAC | ATC | CGC | GAG | AAG | CTG | GAC... |
| squirrel | ...TTC | TGC | GCC | ATC | CGG | GAA | AAG | CTG | GAC... |

F C I R E K L



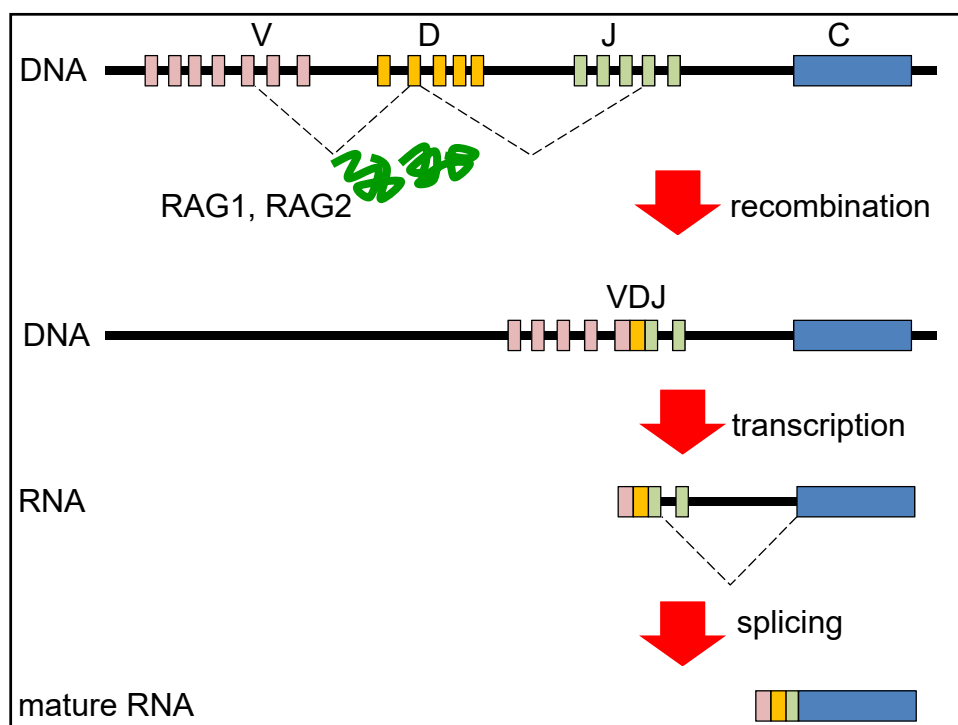
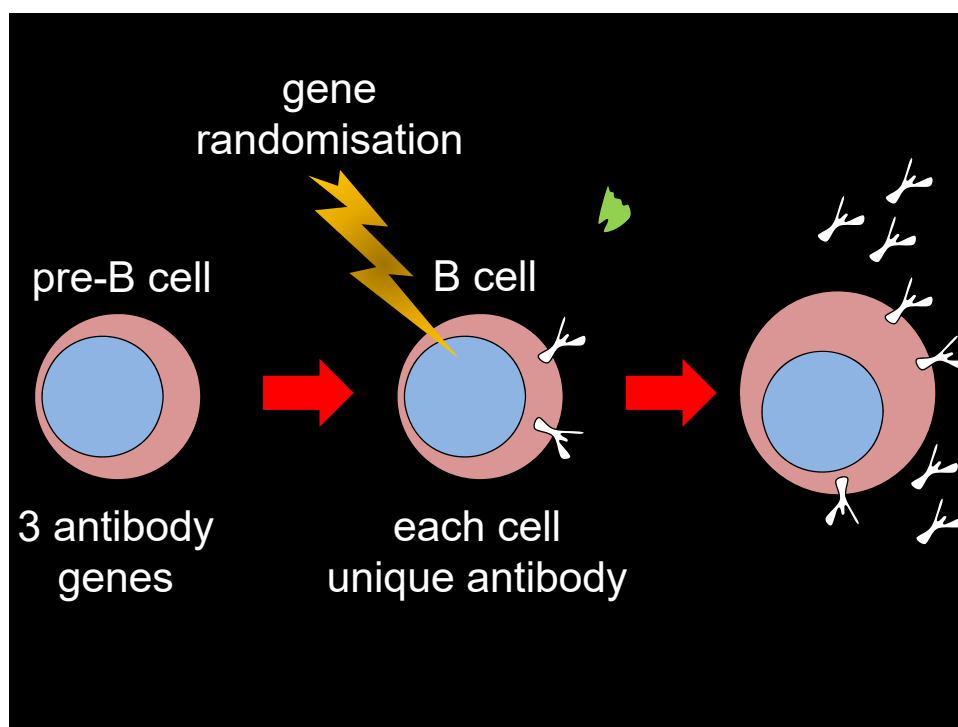
Vitellogenin (egg yolk protein) gene *VIT1*, exon 3

Brawand D *et al* (2008). *PLoS Biology* 6, 0507


| | | | |
|-----------|-----------------|------------------------------|---------|
| human | ...TATGAAAGTACA | TTTCTAGTGTATTTCCACA | ACAGT.. |
| dog | ...TAAGAAAGGATA | TTTCTGATGGACGGCCACA | ATCAT.. |
| armadillo | ...TATGGAAGTATA | TTTCCAGTGGACTGCTACA | ACAGT.. |
| chicken | ...TATGAAAGCATA | TTTTTCAGTGGTATTCCAGAGAAGGA.. | |



*shared deletion mutations
dating from a eutherian ancestor?*




2 amino acid deletion, vertebrate ancestor?



| | | |
|------------|---|------------------|
| human | ...KIFQLEIGEIVYKPNAS | KEERKRWQATLDK... |
| mouse | ...KIFQLEIGEIVYKHPNAS | KEERKRWQATLDK... |
| platypus | ...KIFQLEIGEAYKPNAS | KEERKRWQATLDK... |
| chicken | ...RIFQMEIGEIVYKNPDAT | KEERKRWQLTLDK... |
| frog | ...RIFQLEIGELYKNLSAT | KEEKKRWQATLDN... |
| zebrafish | ...KIFQDEIGEIVYQKPNPS | REERRRWRSTLDK... |
| shark | ...RIFQDEIGEIVYKNSNSS | KEERKRWQSMLDK... |
| lancelet | ...SLIVREMAQVHSWAKTANVKKQIVDAESKLDK... | |
| sea urchin | ...KIIVREEMAGVHKWEASENVKQYIVDAERRLNI... | |

RAG1 protein, zinc finger H2 domain

3 amino acid deletion, vertebrate ancestor?



| | | |
|------------|--|---|
| human | ...HKTLAHVPEIIERD | GSIGAWASEGNE SGNK ... |
| mouse | ...HKTLAHVPEIIERD | GSIGAWASEGNE SGNK ... |
| platypus | ...HKTLAHVPEIIERD | GSIGAWASEGNE SGNK ... |
| chicken | ...HKTLAHVPEIIERD | GSIGAWASEGNE SGNK ... |
| frog | ...HKTLAHVPEIIERD | GSIGAWASEGNE SGNK ... |
| zebrafish | ...HKTLAHVPEIVERD | GSIGAWASEGNE SGNK ... |
| shark | ...HKTLAHVPEIIERD | GSIGAWASEGNE SGNK ... |
| lancelet | ...HKVIEHVQELIEHPSGVGSVGSALSSEGNEAGNK... | |
| sea urchin | ...HKIFEHTQEAMLS | EDGPGSIGILS SEG EAANK... |

RAG1 protein

zinc finger H2 domain

CTD
catalytic E

Huang S, Tao X, Yuan S et al (2016). Discovery of an active RAG transposon illuminates the origins of V(D)J recombination. *Cell* 166, 1

Theology

‘Rightly approached, science will become a benefactor to the faith of our time. A careful contemplation of scientific discovery can bring us to a broader and deeper love of creation’

‘...evolutionary theory is a potential gift for theology. Honestly confronted, evolution causes a shift in how we think about creation, not a loss of faith.’

Rolnick 2015, *Origins* 3, (7),104

1 Reading *Genesis*

‘You cannot put good questions and expect fruitful answers from a text apart from a grasp of the kind of material it is in the first place; misjudge the genre and you may skew many of the things you try to do with the text.’

Genesis is ‘derived from a genre of Near Eastern creation myths’

Moberly W in Barton SC and Wilkinson D, *Reading Genesis after Darwin* (OUP, 2009), 5;
Louth in Barton and Wilkinson, 41

Genre

- Dorian gray mouse
- the gospels (Burridge)
- *Genesis 1-3*

Harlow (2010) After Adam: reading Genesis in an age of evolutionary science. *PSCF* 62, 179

Genesis as ANE creation story

- garden paradise
- Adam/ Adapa
- from dust/ clay
- to cultivate the land
- plant that gives immortality
- acquiring wisdom – becoming like God/ gods
- serpent
- nakedness a symbol of primitive life
- lost immortality

- flood

Harlow (2010) After Adam. *PSCF* 62, 179

Genesis as *distinctive* creation story

- God of supreme authority
- sun, moon, stars mere lights
- sea monsters mere creatures

- goodness of creation

- humanity
- from breath (not blood) of the divine
- God's image – not just a slave/ afterthought
- God's image – not just the king
- sinful



Worship of the moon-god, Wiki, public domain

Genesis 1 is a

‘mockery of the gods and a radical de-divinisation of creation.

‘... a polemic against the surrounding religions.

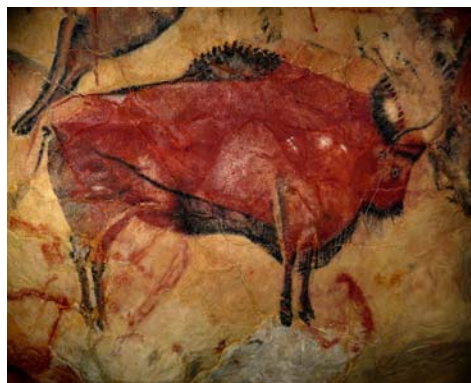
‘Man is also de-divinised by the creation story

‘... man is neither God nor divine and has nothing divine in him.’

Konig A (1982) *Here Am I*, 103

Models of *Genesis*

How to relate Adam to neolithic farmer?



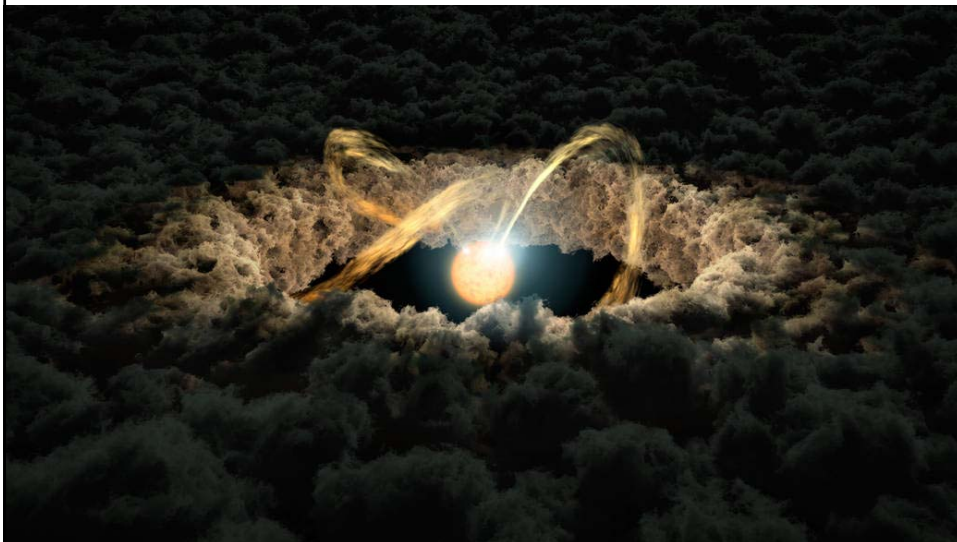
Cave of Altimera, Spain, public domain

How to relate theology of Genesis to our neo-pagan age



Narcissus, Caravaggio, public domain

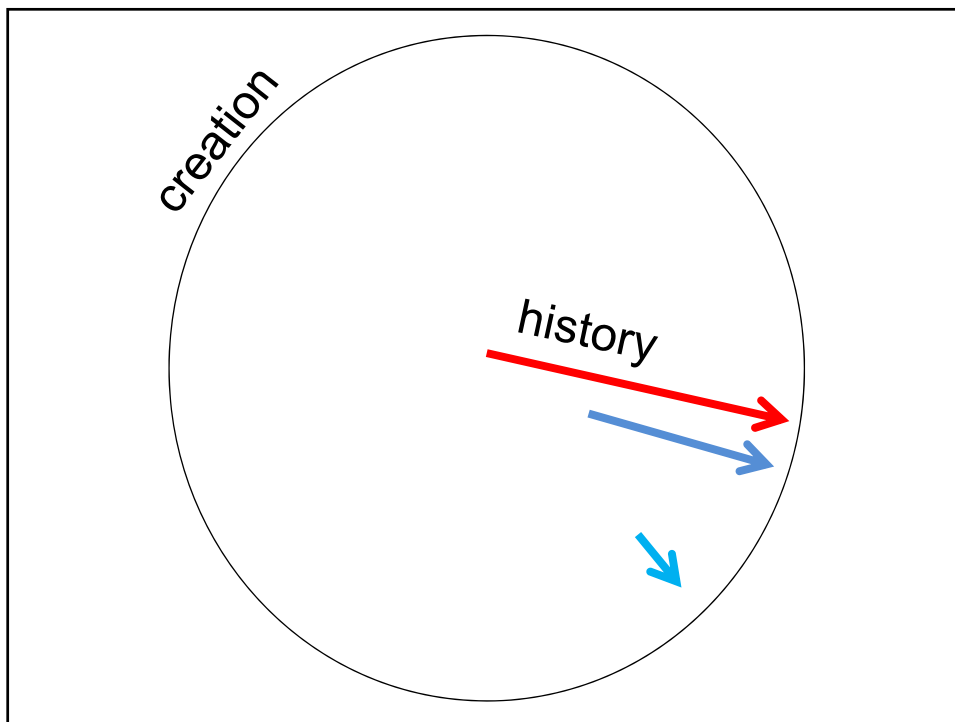
2 Creation



Light echoes used to study protoplanetary disc, NASA

The giving of being

...not the transformation of one form of matter into another



Category of creation

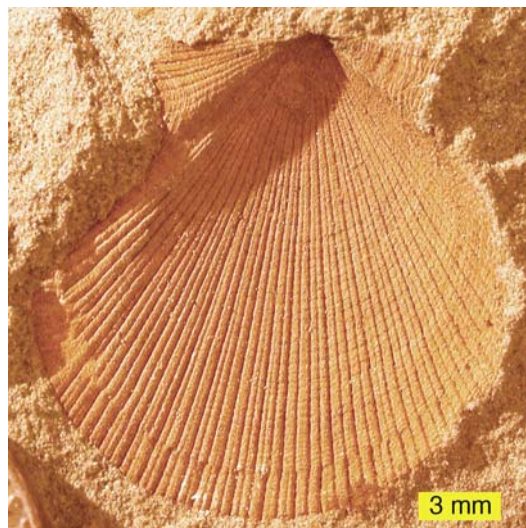
- all physical reality
- humanity
- Israel
- the church
- each individual

- art
- sculpture
- music
- architecture
- raising our children



Category of history

- cosmic
- terrestrial
- biological
- primate
- civilisation
- Roman empire
- baroque music
- SPCA
- labour movement
- university



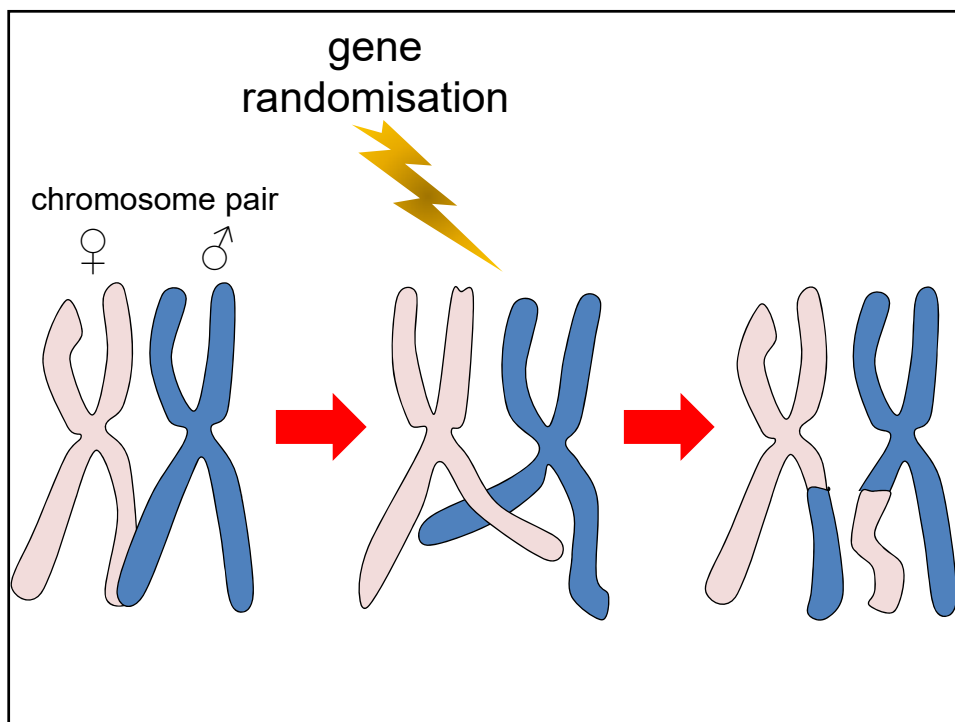
3 Just chance?

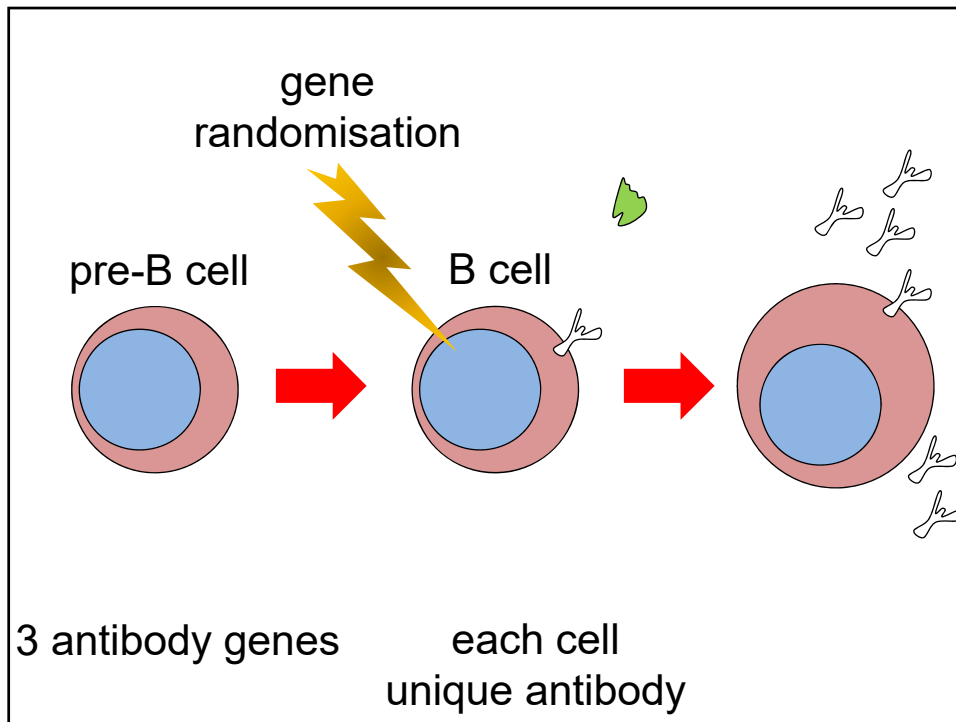
life involves the interplay of

- randomness *and* lawfulness,
- spontaneity *and* predictability,
- chaos *and* order,
- chance *and* necessity.

Christians recognise these features as God's twin gifts to creation of

- *freedom and consistency.*





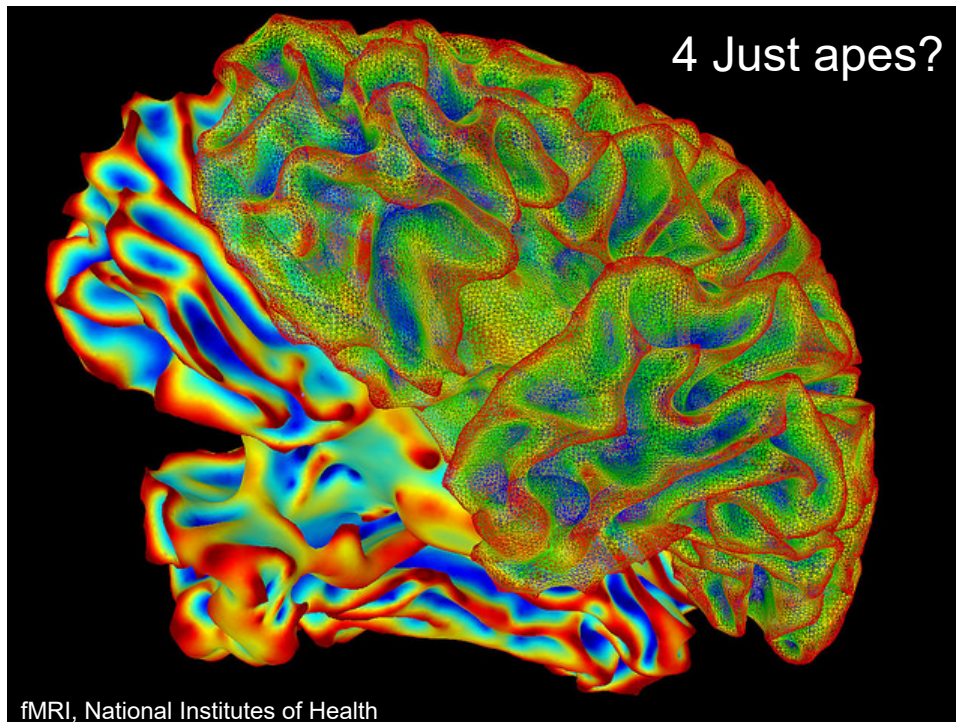
The interplay of chance and necessity is typical of histories

‘Chance, necessity and time is the substance of story’

Haight J in Conway Morris S (2008) *The Deep structure of Biology* (Templeton Press)

‘Random seeking leads to non-random finding’

Steane A (2015) *Faithful to Science* (OUP)



Genes are necessary but not sufficient for the development of a human person.

‘Most, possibly all, human neurocognitive skills are shaped by culture and many are culturally inherited but the parallels between mind reading and print reading are extraordinary...’

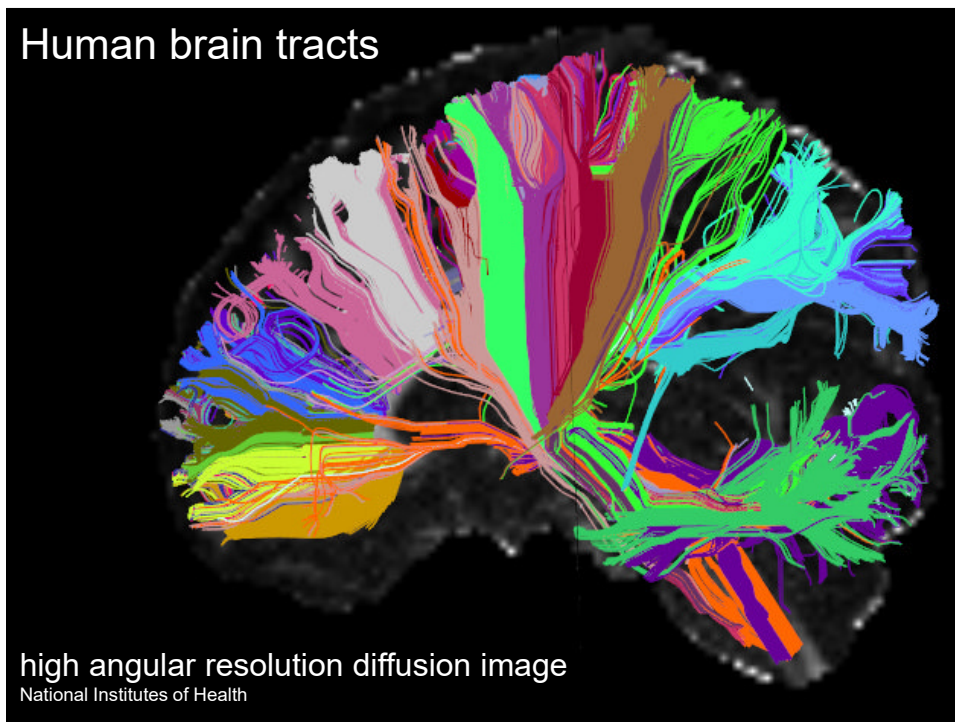
Heyes CM and Frith CD (2014) The cultural evolution of mind reading. *Science* **344**, 1357

Interactive communication

- language
- Theory of Mind
- mental representations of time, motion, space, musical pitch, colour
- attention, learning, memory

Korman J, Voiklis J and Malle BF (2015). The social life of cognition. *Cognition* 135, 30

Human brain tracts



Neglect

White matter development mediated through bonding and attachment



Bick J, Zhu T, Stamoulis C *et al* (2015). Effect of early institutionalization and foster care on long-term white matter development. *JAMA Pediatr* **169**, 211

Neglect

Specific structural (sMRI) and functional consequences on specific CNs structures and circuits

- hippocampus↓
- amygdala↑
- anterior cingulate cortex, caudate nuclei↓

Nemeroff CB (2016). Paradise lost: the neurobiological and clinical consequences of child abuse and neglect. *Neuron* **89**, 892

Neglect

Head circumference is reduced in children raised in neglectful conditions

mediated through lack of bonding and attachment?
psychological deprivation

Miller BS, Spratt EG, Himes JH *et al* (2015). Growth failure associated with early neglect. *J Pediatr Endocr Met* **28**, 111; Van Ijzendoorn M *et al* (2007). Plasticity in height, weight, and head circumference ... *J Dev Behav Pediatr* **28**,334

‘If a group of human infants managed to survive on a desert island, in a cruel *Lord of the Flies*-like experiment, they would be no more likely to develop a theory of mind and become explicit mind readers than to develop a writing system and become literate print readers.’

Heyes and Frith, 1243091-5

...bade 'foster-mothers and nurses to suckle and bathe and wash the children, but in no ways to prattle or speak with them; for he would have learnt whether they would speak the Hebrew language (which had been the first), or Greek, or Latin, or Arabic, or perchance the tongue of their parents of whom they had been born. But he laboured in vain, for the children could not live without clappings of the hands, and gestures, and gladness of countenance, and blandishments.'

Friar Salimbene



'Umuntu ngumuntu ngabantu'

'Eternal life is knowing you the only true God,
and knowing Christ whom you sent.'

John 17:3