



Science/ Faith



Dr. Ard Louis

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www.faraday-institute.org

www.testoffaith.com

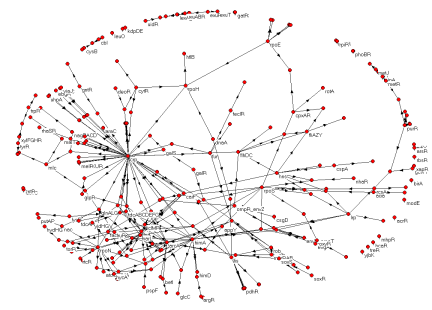
www.cis.org.uk

www.biologos.org

www.templeton.org

Outline

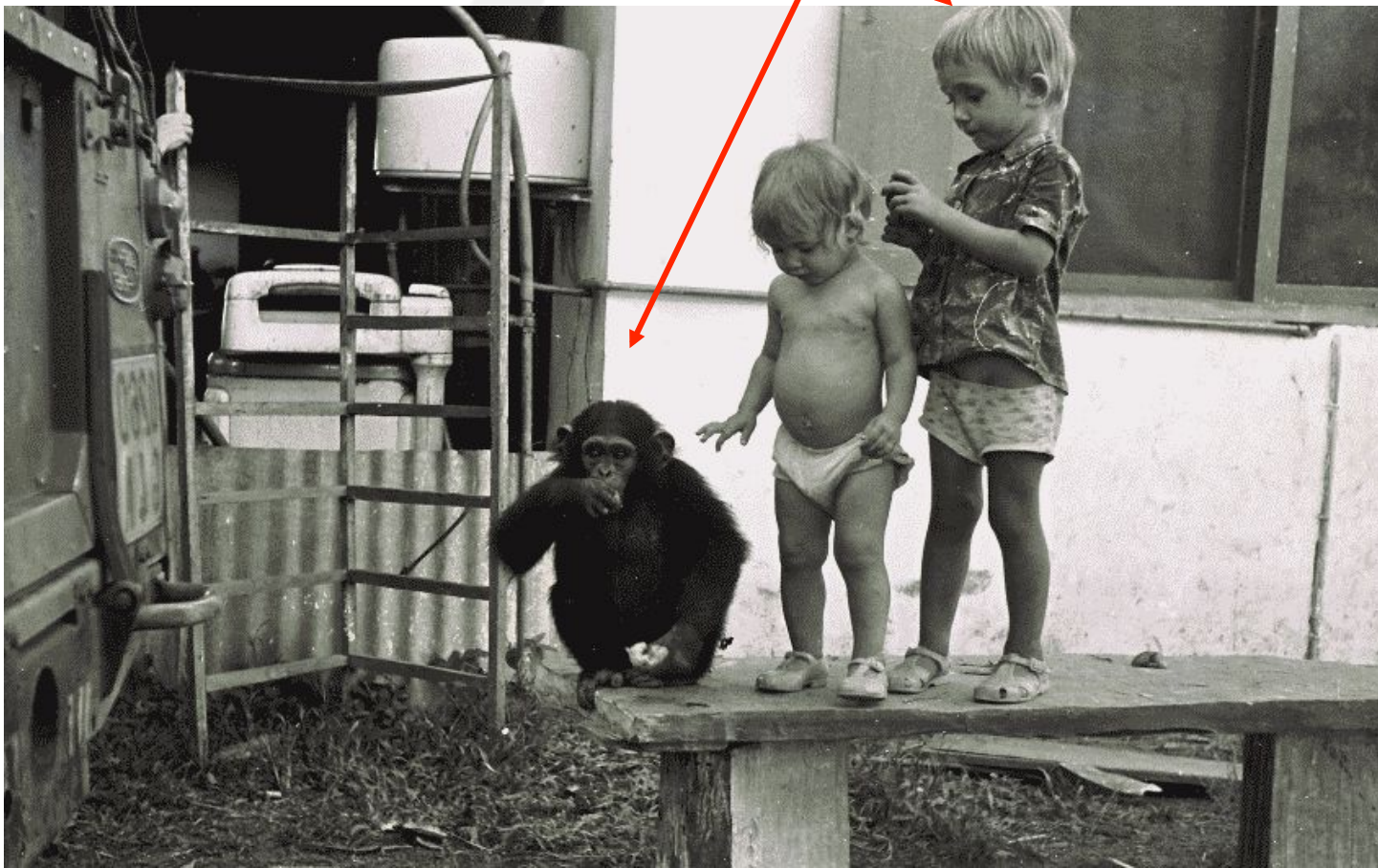
- Fun things about science
- Creation or Evolution, do we have to chose?
- God, Atheism & the Philosphers



We share 15% of our genes with E. coli
“ “ 25% “ “ “ “ yeast
“ “ 50% “ “ “ “ flies
“ “ 70% “ “ “ “ frogs
“ “ 98% “ “ “ “ chimps

Biological networks
and evolution

what makes us different?



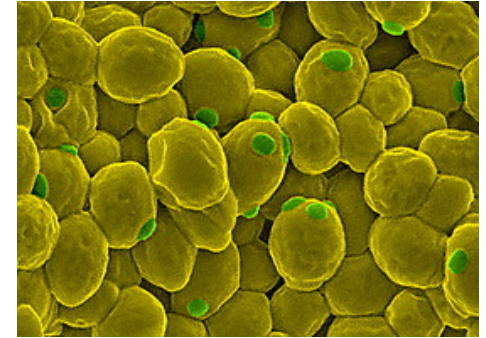
Why so few genes?



Mycoplasma genitalium (483)
(300 minimum?)



E. coli (5416)



S. cerevisiae (5800)



Drosophila melanogaster
(13,500)

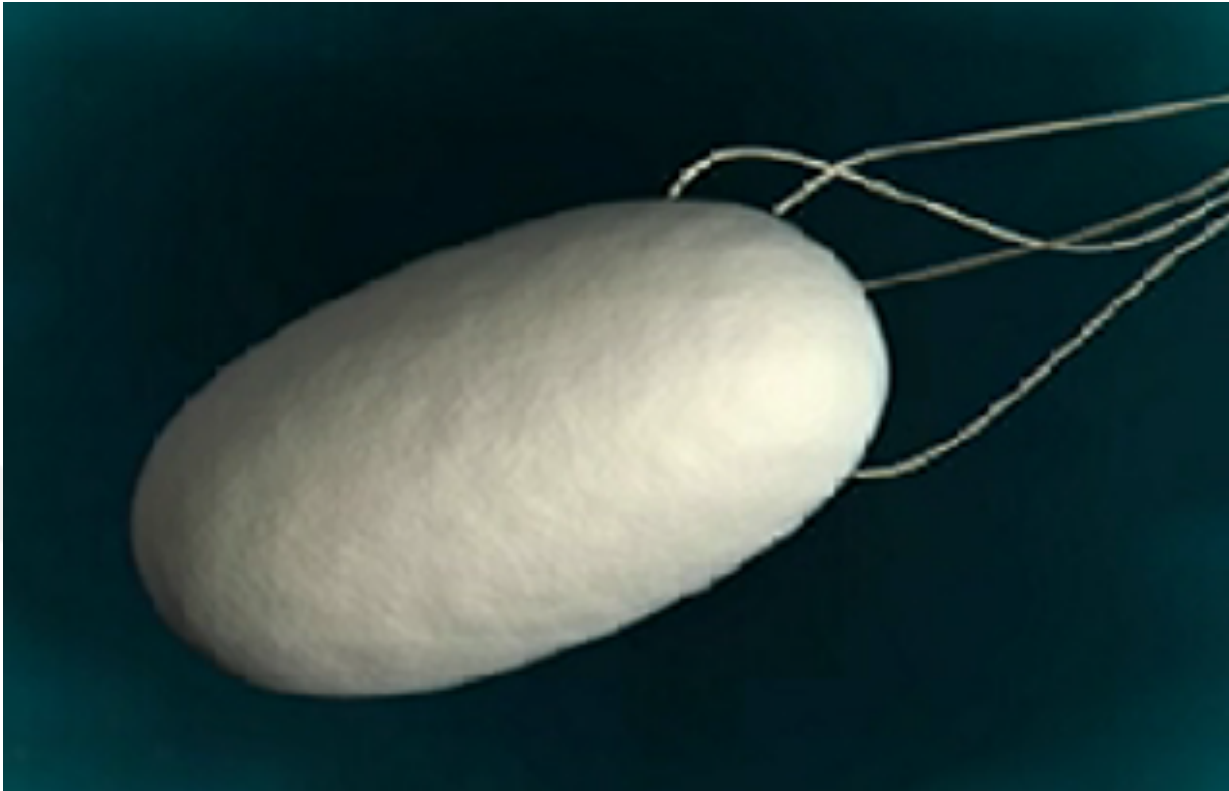


C. elegans (19,500) & *P. pacificus* (29,000)



H. sapiens (23,000)

Biological self-assembly



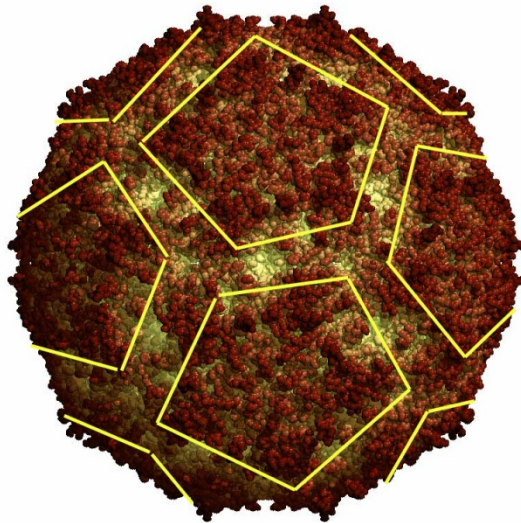
<http://www.npn.jst.go.jp/> Keiichi Namba, Osaka

- Biological systems **self-assemble** (they make themselves)
- Can we understand?
- Can we emulate? (Nanotechnology)

Self-assembly: how things make themselves

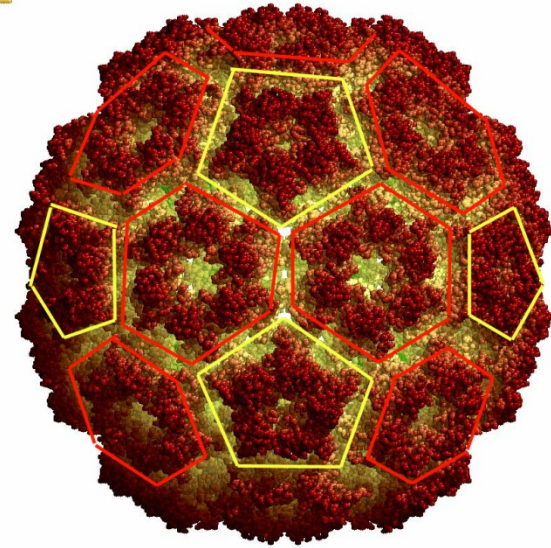
20Å

Galleria mellonella densovirus PDB_ID: 1DNV



20Å

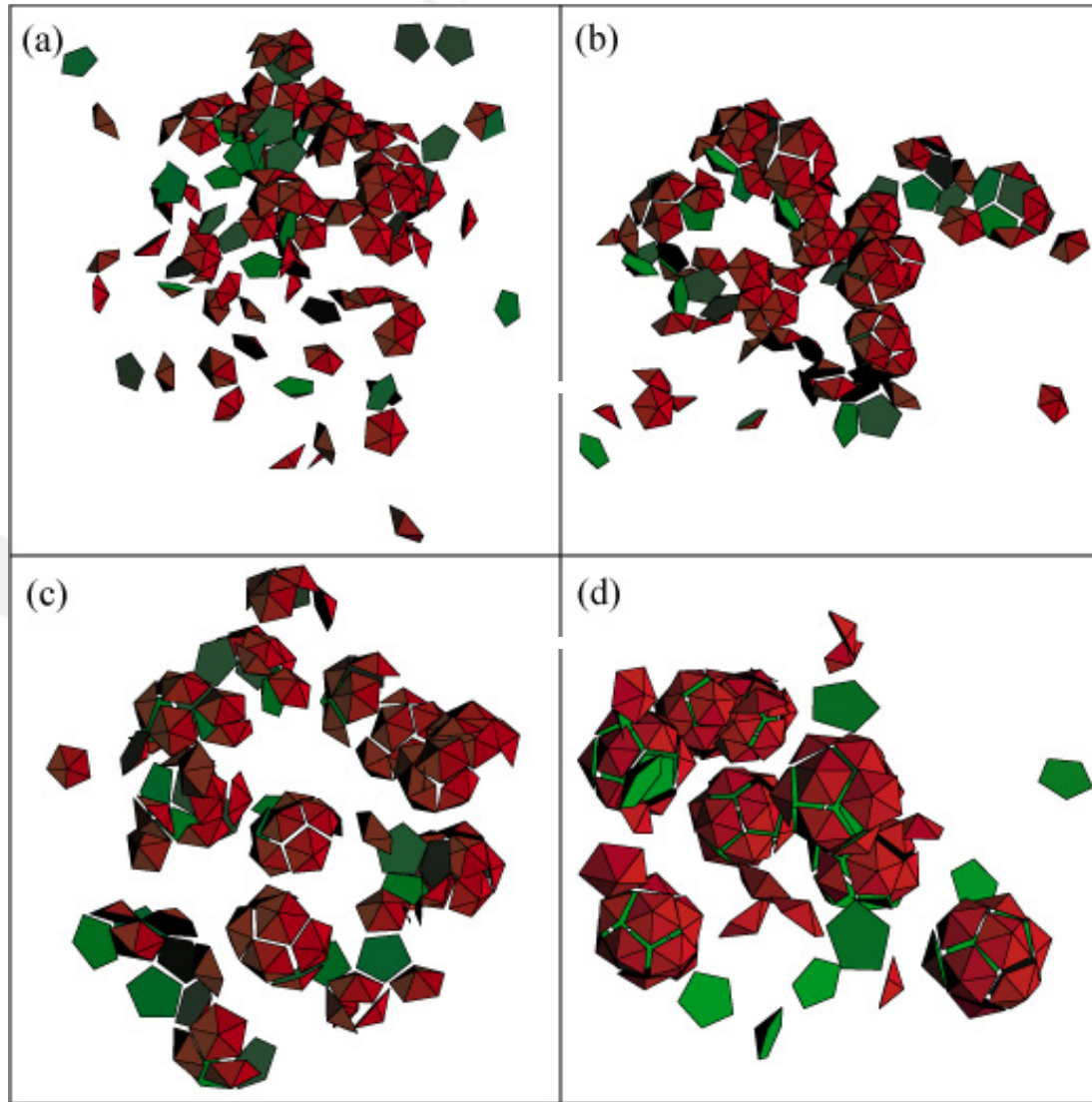
Cucumber mosaic virus PDB_ID: 1F15



viruses

- Biological objects are self-assembled
 - Can we understand?
 - Can we emulate? (nanotechnology)
 - We study one of the simplest: viruses made of identical capsomer units

“computer virus” self-assembly

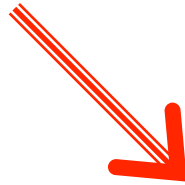
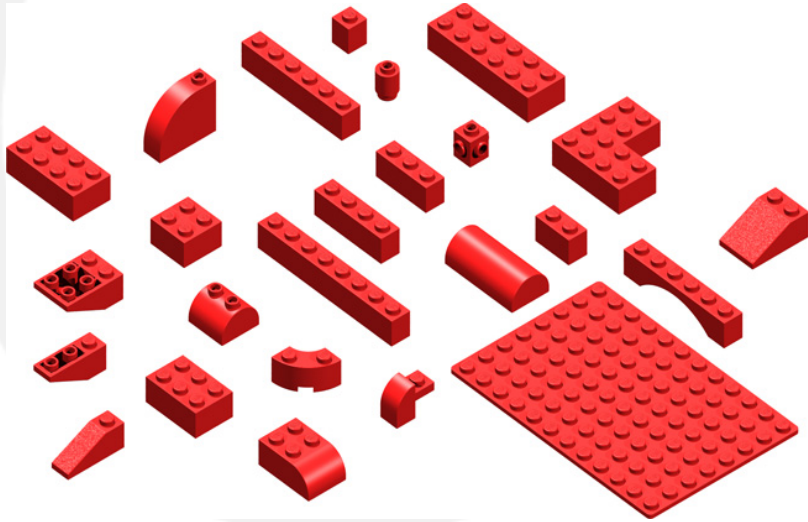


Computer viruses?

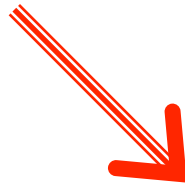
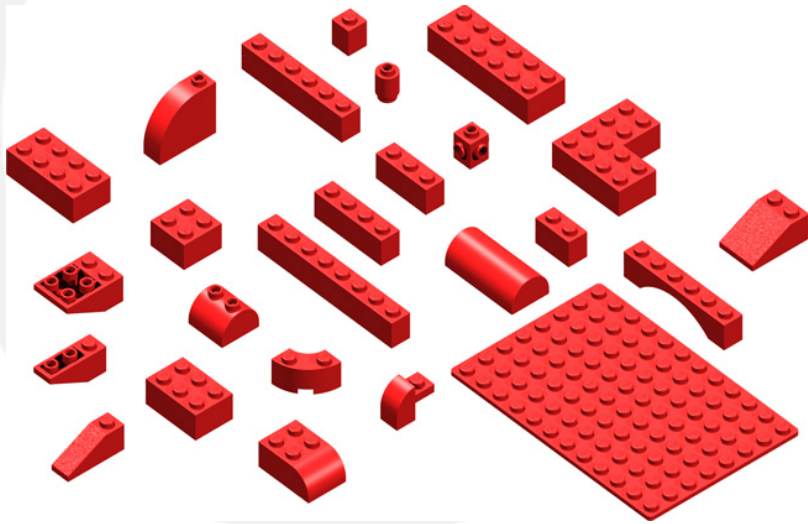
Monte-Carlo simulations: stochastic optimisation

<http://www-thphys.physics.ox.ac.uk/user/lainjohnson/>

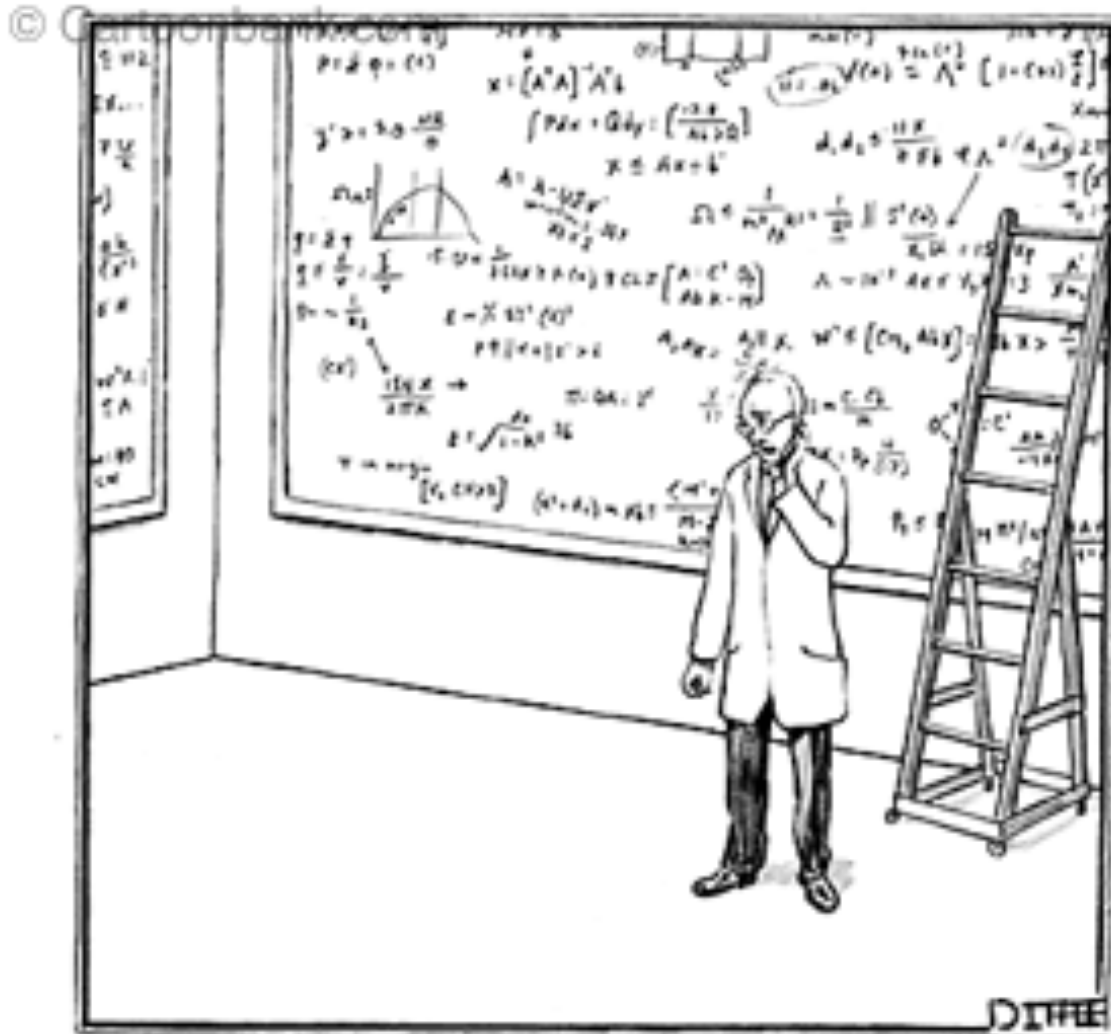
Self-assembly with legos?



Science is fun :-)



Science is fun!



"I just figured out why we've never had girlfriends."



Paul Dirac
1902-1984

Antimatter

Quantum Mechanics + Relativity = antimatter

$$H\psi(\mathbf{x}, t) = i\hbar \frac{\partial \psi}{\partial t}(\mathbf{x}, t)$$

Schrödinger equation (Quantum Mechanics)

$$E = \sqrt{(mc^2)^2 + \sum_{j=1}^3 (p_j c)^2}$$

Energy-Momentum (Special Relativity)

$$= \left(\alpha_0 mc^2 + \sum_{j=1}^3 \alpha_j p_j c \right) \psi(\mathbf{x}, t) = i\hbar \frac{\partial \psi}{\partial t}(\mathbf{x}, t)$$

Dirac Equation (1928)

$$\psi(\mathbf{x}, t) \equiv \begin{bmatrix} \psi_1(\mathbf{x}, t) \\ \psi_2(\mathbf{x}, t) \\ \psi_3(\mathbf{x}, t) \\ \psi_4(\mathbf{x}, t) \end{bmatrix}$$

Electrons

Positrons (antimatter) discovered 1932

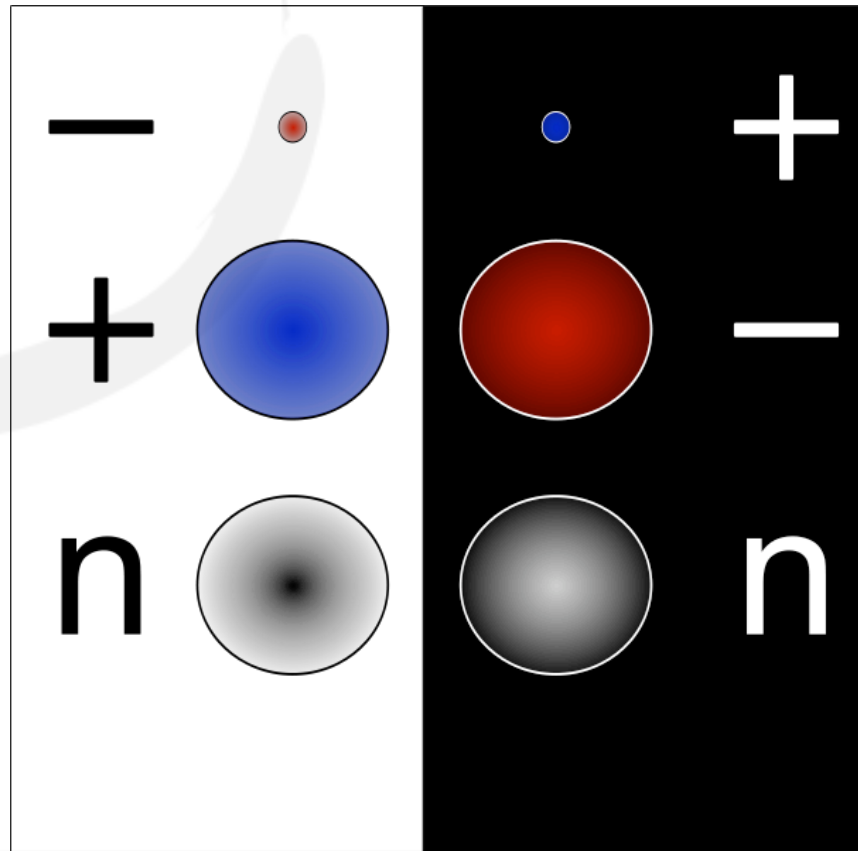
Unreasonable effectiveness of mathematics, a wonderful gift which we neither understand nor deserve (E. Wigner (1960))

See also: "The applicability of mathematics as a philosophical problem", Mark Steiner HUP (1998);



Paul Dirac
1902-1984

Antimatter



Unreasonable effectiveness of mathematics, a wonderful gift which we neither understand nor deserve (E. Wigner (1960))

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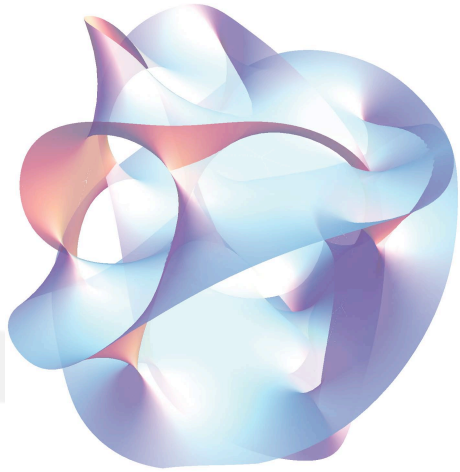
Science and Beauty



A Scientist does not study nature because it is useful; he studies it because he delights in it, and he delights in it because it is beautiful. If nature were not beautiful, it would not be worth knowing, and if nature were not worth knowing, life would not be worth living.

Dirac: the laws of nature should be expressed in beautiful equations.

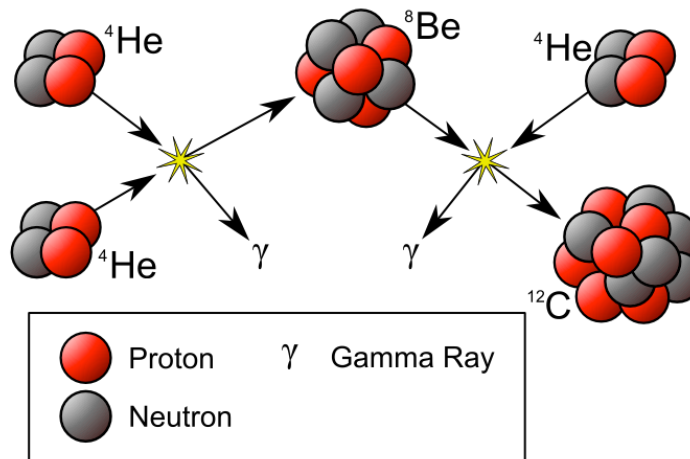
Many Universes & Unreasonable Effectiveness of Mathematics: Science or Philosophy?



10^{500} “false vacua” in Calabi-Yau Manifolds
String Landscape ...

We are made of stardust

H → C through a resonance

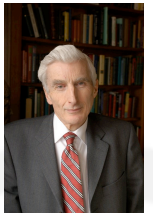


- “A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics .. and biology”
- His atheism was “deeply shaken”

Sir Fred Hoyle,
Cambridge U

Fine Tuning and the Anthropic Principle

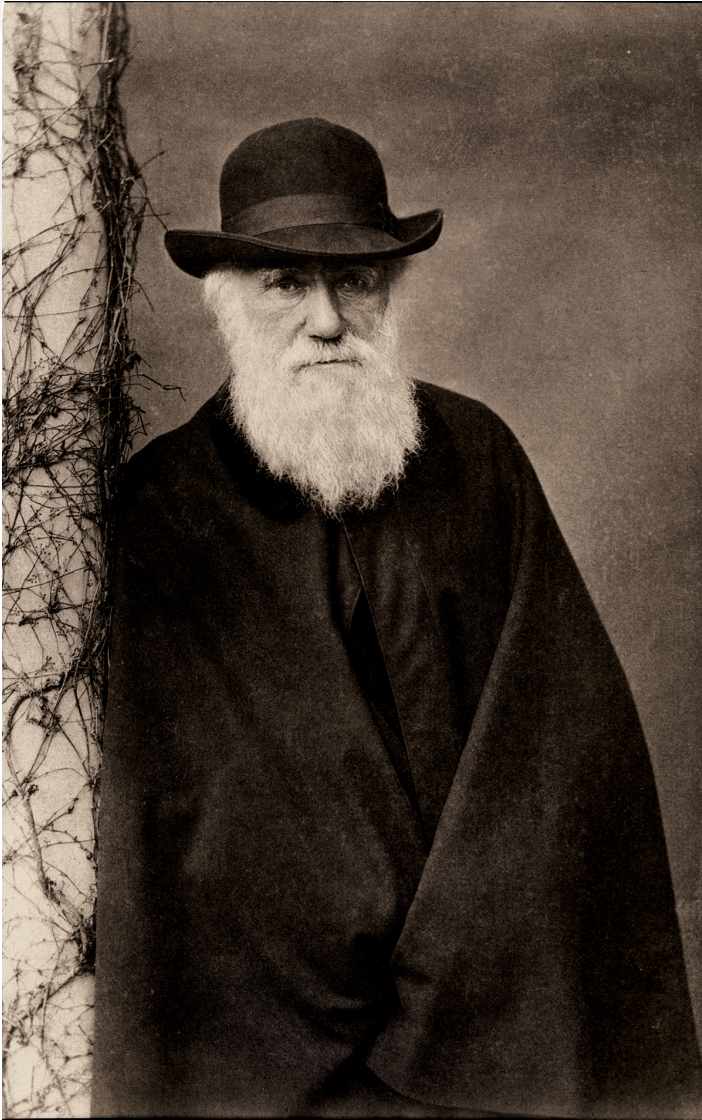
- *Fine tuning is not a proof of God, but seems more consistent with theism than atheism*
- *Note the difference with “God of the gaps”*
- *We seem to have three choices'... We can dismiss it as **happenstance**, we can acclaim it as the workings of **providence**, or (my preference) we can conjecture that our universe is a specially favoured domain in a still vaster **multiverse**.' If this multiverse contained every possible set of laws and conditions, then the existence of our own world with its particular characteristics would be inevitable.*
 - *Sir Martin Rees (just 6 numbers) --*
- *John Leslie firing squad argument*



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- Fun things about science
- Creation or Evolution, do we have to chose?
- God, Atheism & the Philosphers

Evolution and its discontents

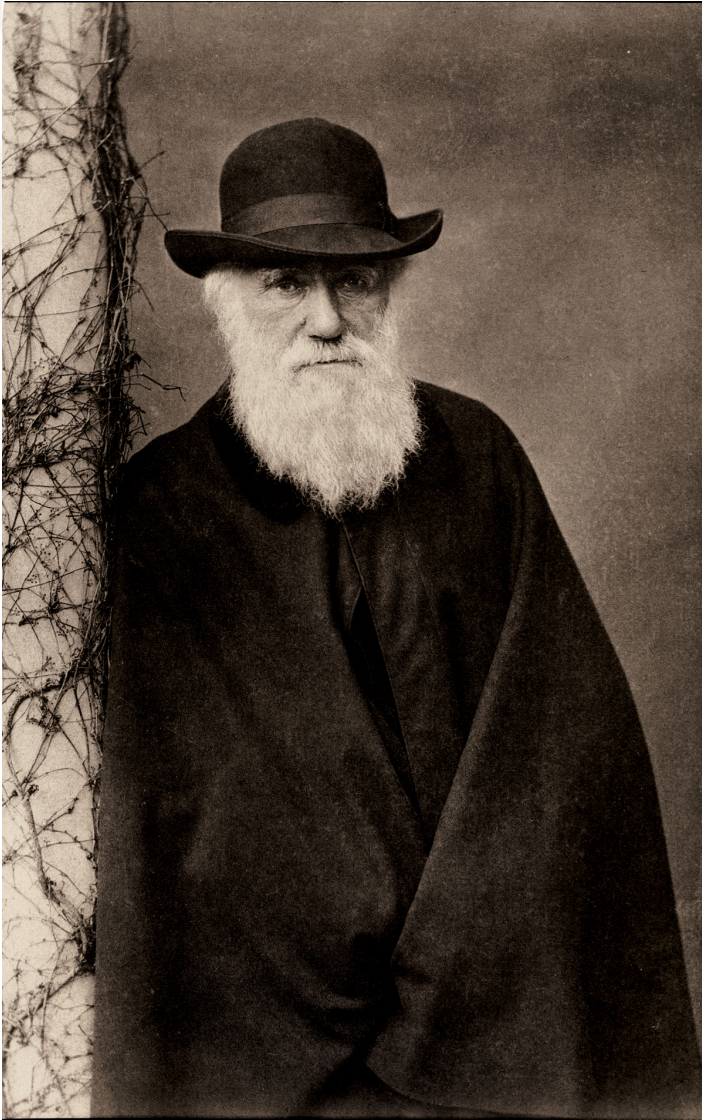


Charles Robert Darwin:
(12 February 1809 – 19 April 1882)
1859 publishes “Origin of Species”

Darwin “had the luck to please everybody who had an axe to grind”
--George Bernard Shaw

Does where we come from
determine who we are and how
we should then live?

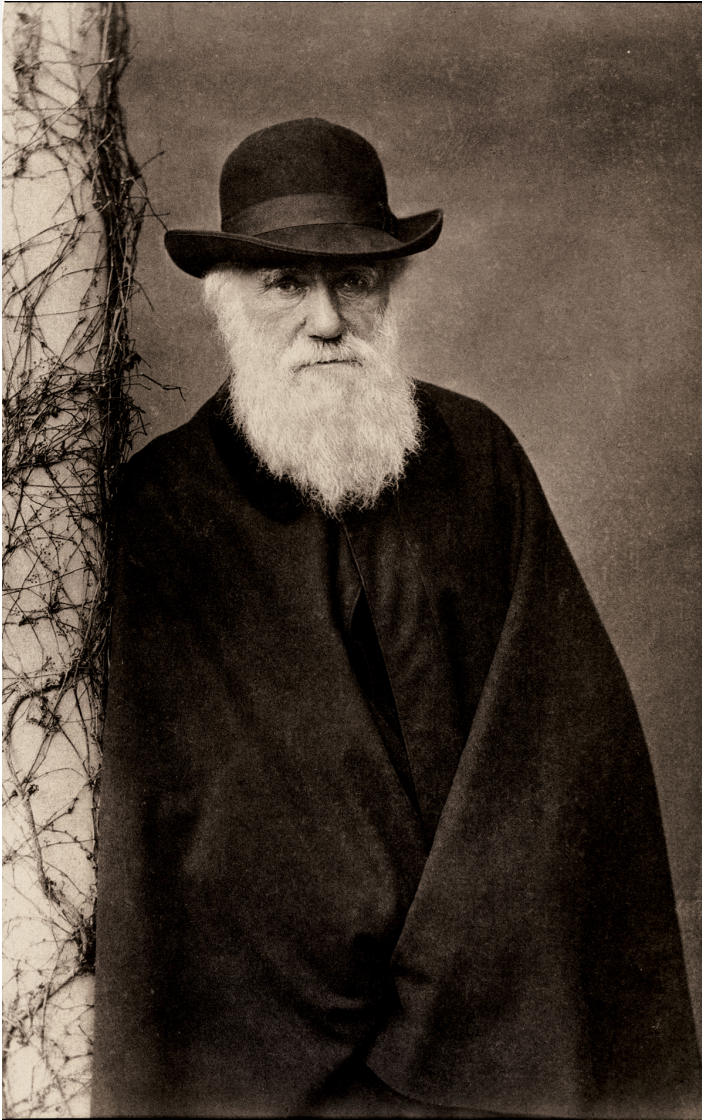
Evolution and its discontents



Charles Robert Darwin:
(12 February 1809 – 19 April 1882)
1859 publishes “Origin of Species”

Gallup:
42-47% of US (much higher among evangelicals)
“God created human beings pretty much in their present form at one time within the last 10,000 years or so.”

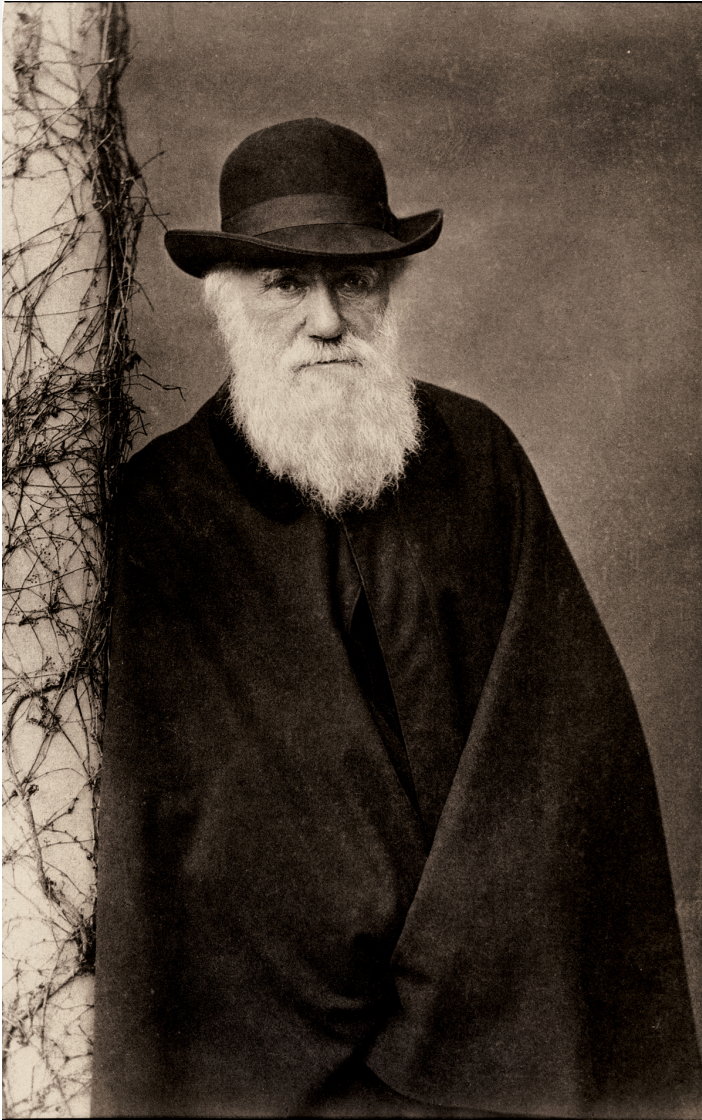
Evolution and its discontents



Charles Robert Darwin:
(12 February 1809 – 19 April 1882)
1859 publishes “Origin of Species”

- University of Wageningen (Netherlands) poll of 415 staff and 215 academics (2009):
 - 38% don't think variation and natural selection is sufficient to explain life on earth

Evolution and its discontents



Charles Robert Darwin:
(12 February 1809 – 19 April 1882)
1859 publishes “Origin of Species”

ComRes/Theos poll of UK, (2009)

- *Evolution alone is not enough to explain the complex structures of some living things, so the intervention of a designer is needed at key stages*
 - 14% definitely true
 - 37% probably true
 - ~ 51% favourable of ID

<http://www.theosthinktank.co.uk>

“Rescuing Darwin” by Nick Spencer and Denis Alexander

2009: ComRes/Theos poll

“ Either way, it appears that, in the country of Darwin’s birth, a century and a half after the publication of his masterwork, only about one in four people would qualify as confirmed Darwinians, with at least as many being actively hostile towards Darwinian evolution, and an even larger portion being inclined towards Darwinism but distinctly unsure about its merits.”

“In much the same way as earlier generations encountered evolution through a particularly ugly form of Social Darwinism, and not surprisingly then rejected it, many today, it seems, associate it with an amoral, materialist, hopeless, selfish outlook on life, which they are extremely reluctant to countersign and which turns them firmly against the theory.”

Quotes are from Rescuing Darwin, by Nick Spencer and Denis Alexander
<http://www.theosthinktank.co.uk>

Intermezzo: Defining Evolution

1) Evolution as Natural History

- the earth is old (+/- 4.5 Billion years)
- more complex life forms followed from simpler life forms

2) Evolution as a mechanism for the emergence of biological complexity

- generated by mutations and natural selection
- (note: most Christians agree that God created this mechanism)

3) Evolution as a “big picture” worldview (scientism)

George Gaylord Simpson:

"Man is the result of a purposeless and materialistic process that did not have him in mind. He was not planned. He is a state of matter, a form of life, a sort of animal, and a species of the Order Primates, akin nearly or remotely to all of life and indeed to all that is material."

or Richard Dawkins:

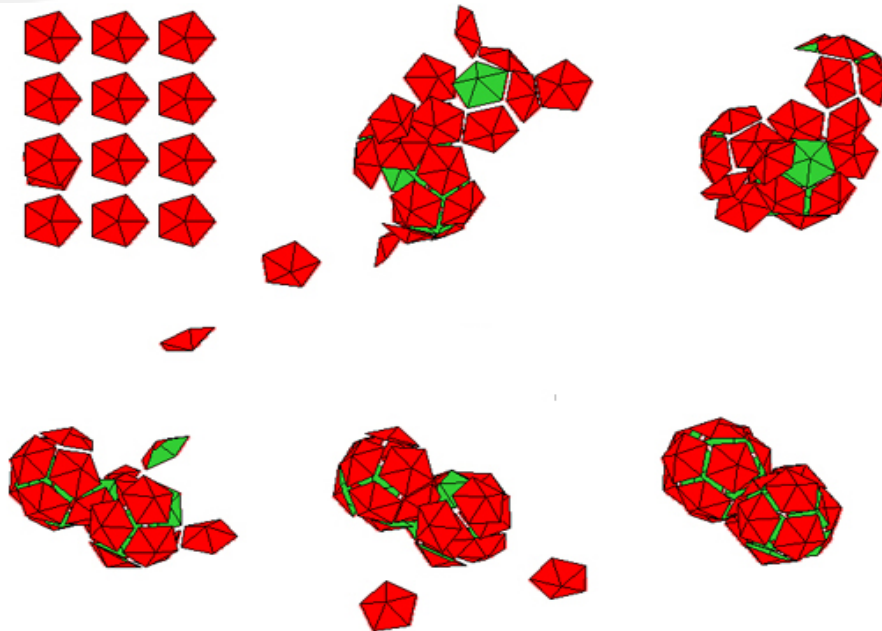
"Darwin made it possible to be an intellectually fulfilled atheist."

Christian approaches to emergence of biological complexity

- **Young Earth Creation Science**
 - Earth is about 10,000 years old
 - Genesis 1,2 are historical in the modern sense
 - mainly in the last 50 years
- **Progressive Creationism**
 - Earth is old
 - Complexity came about through miracles
 - Varied views on exegesis of Genesis
- **Theistic Evolution/Biologos**
 - Earth is old
 - Complexity came about through normal processes of God
 - Genesis 1,2 are theological (framework view --prose poem)
- **Intelligent Design**
 - All the above views are strictly 'creationists' and believe in intelligent design
 - Capital ID is a more recent movement, could be YECS, PE, or TE.

Language: Random or stochastic?

- Random mutations and natural selection...(chance and necessity -- Monod)
- Stochastic optimisation
 - e.g. used to price your stock portfolio



Gene language, emergence & meaning?

[Genes] swarm in huge colonies, safe inside gigantic lumbering robots, sealed off from the outside world, communicating with it by tortuous indirect routes, manipulating it by remote control. They are in you and me; they created us, body and mind; and their preservation is the ultimate rationale for our existence.

v.s.

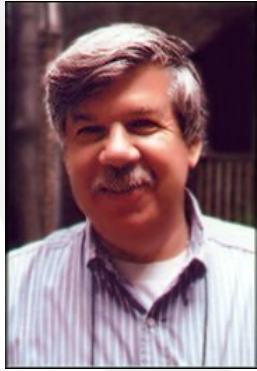
[Genes] are trapped in huge colonies, locked inside highly intelligent beings, moulded by the outside world, communicating with it by complex processes, through which, blindly, as if by magic, function emerges. They are in you and me; we are the system that allows their code to be read; and their preservation is totally dependent on the joy that we experience in reproducing ourselves. We are the ultimate rationale for their existence.



Denis Noble --
*The Music of Life:
Biology Beyond the
Genome* (OUP 2006)



Contingency v.s. “deep structures”: Re-run the tape of evolution?



“Wind back the tape of life to the early days of the Burgess Shale; let it play again from an identical starting point, and the chance becomes vanishingly small that anything like human intelligence would grace the replay.” In evolution, there is no direction, no progression. **Humanity is dethroned from its exalted view of its own importance**

S.J. Gould: “*Wonderful Life*”; (W.W. Norton 1989)

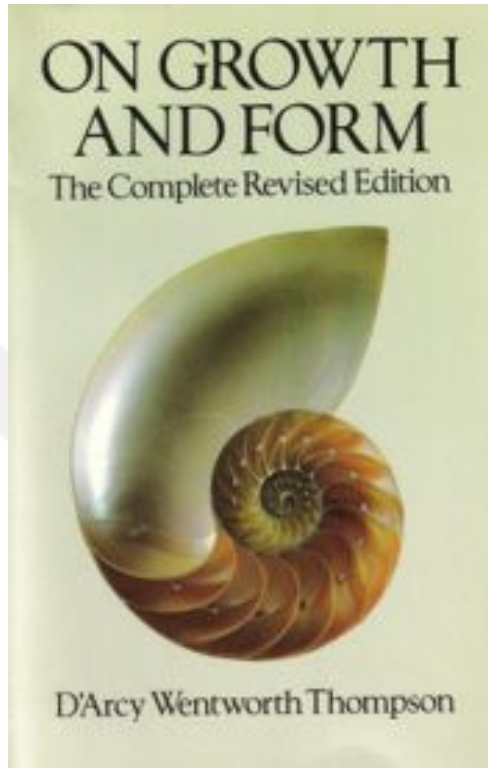


When you examine the tapestry of evolution you see the same patterns emerging over and over again. Gould's idea of rerunning the tape of life is not hypothetical; it's happening all around us. And the result is well known to biologists — evolutionary convergence. When convergence is the rule, you can rerun the tape of life as often as you like and the outcome will be much the same.

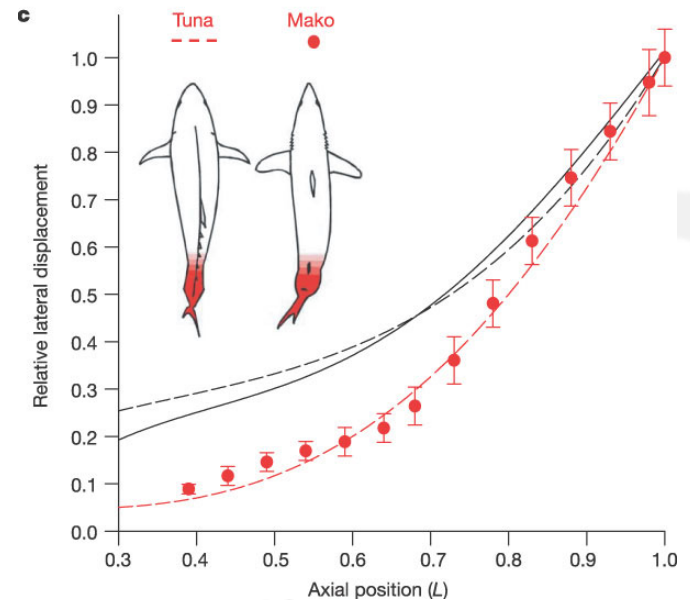
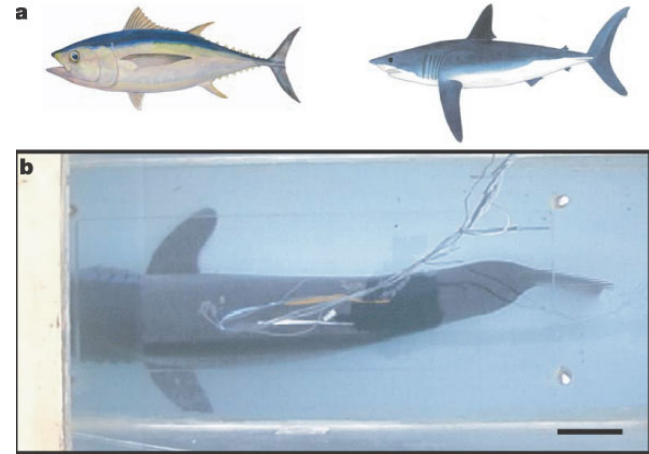
Convergence means that life is not only predictable at a basic level; it also has a direction.

Simon Conway Morris “*Life's Solution: Inevitable Humans in a Lonely Universe*”; (CUP, 2003)

Convergent Evolution?



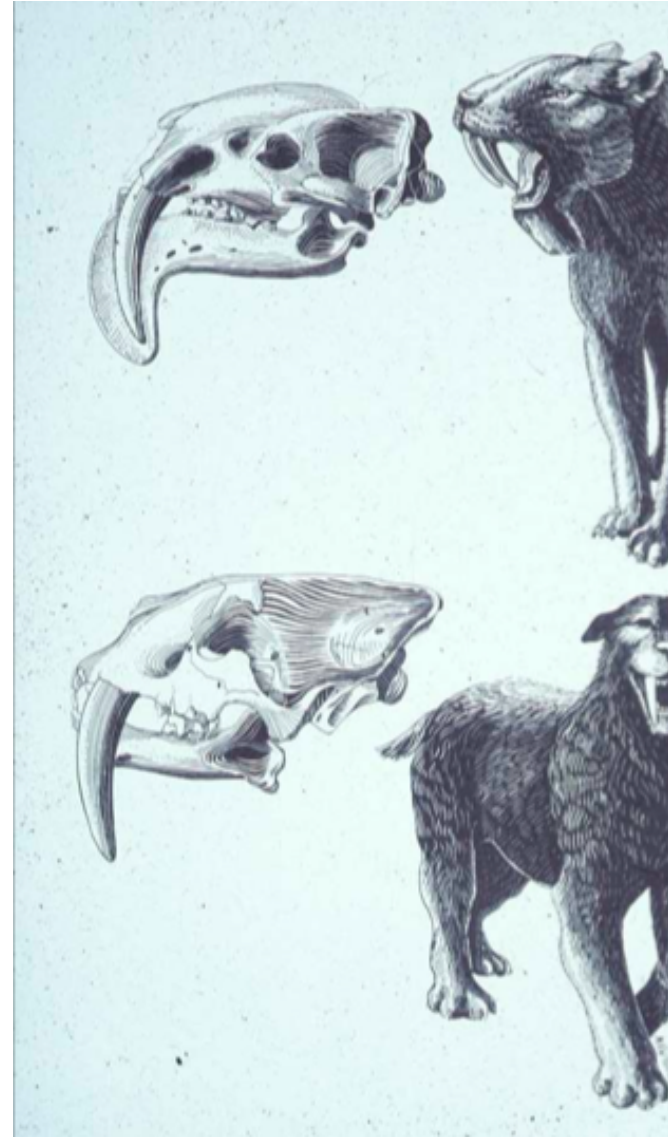
"For the harmony of the world is made manifest in Form and Number, and the heart and soul and all poetry of Natural Philosophy are embodied in the concept of mathematical beauty." (On Growth and Form, 1917.)



Convergent Evolution

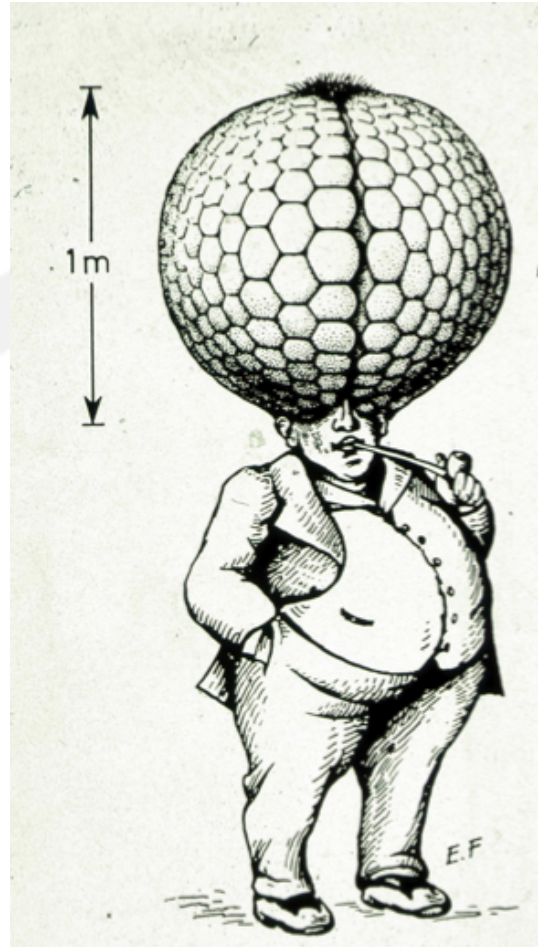
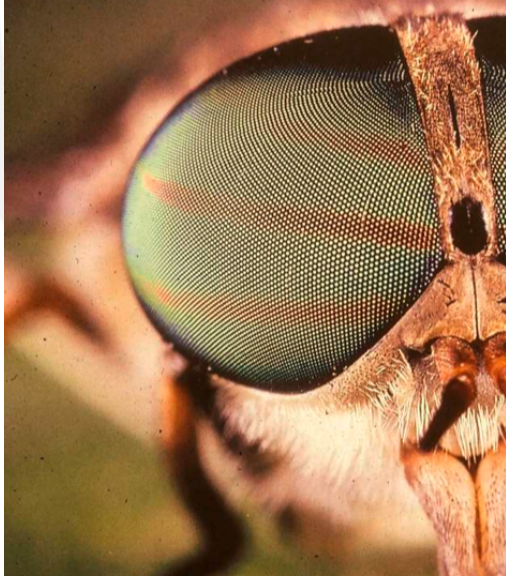
North America:
Placental Sabre-toothed cat

South America''
Marsupial Sabre-toothed cat

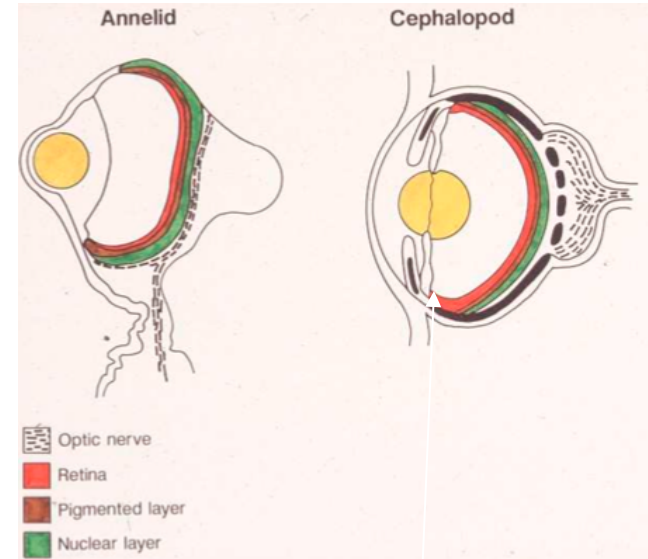


Convergent Evolution

compound eye



camera eye



Convergent Evolution?



- Enormous number of examples ... from proteins to vision up to societies to intelligence.
- Are rational conscious beings an inevitable outcome? “

The principal aim of this book has been to show that the constraints of evolution and the ubiquity of convergence make the emergence of something like ourselves a near-inevitability. SCM, “Life’s Solution”, (CUP 2005) pp328

Evolution, God & Morality

- I expect **moral truths**
 - (like killing innocent people is wrong)
 - (pace Euthyphro) – most likely emanate from God's character
- I expect a **moral sense**
 - This is widely observed
- I expect the moral sense to be **truth-tracking**
 - Note, atheism may be able to explain moral sense,
 - But it would be a tremendous accident if this was truth tracking:
 - A Darwinian Dilemma for Realist Theories of Value – Sharon Street
 - “*evolution is only interested in the four f's (feeding, fleeing, fighting, and reproducing)*”, truth “definitely takes the hindmost.” -- Patricia Churchland,
 - *the evolutionists case is that ethics is a collective illusion of the human race, fashioned and maintained by natural selection in order to promote individual reproduction, ... ethics is illusory inasmuch as it persuades us that it has an objective reference. This is the crux of the biological position.* -- Michael Ruse

SUMMARY on Evolution

COMPLEX MATERIAL!

Does where we come from determine who we are and how we should then live?

Metaphors are important

Evolution as:

1. Natural history
2. Mechanisms to create biological complexity
3. World view (evolutionism)

The mechanisms of evolution can be beautiful

Among evangelicals, this is going to be a long hard slog

Outline

- Fun things about science
- Creation or Evolution, do we have to chose?
- God, Atheism & the Philosphers

Science & Ultimate Questions



Stephen Hawking
Cambridge U

- How can we understand the world in which we find ourselves?
- Did the universe need a creator?
- Why is there something rather than nothing?
- Why do we exist?

*Traditionally these are questions for philosophy, **but philosophy is dead...** Scientists have become the bearers of the torch of discovery in our quest for knowledge*

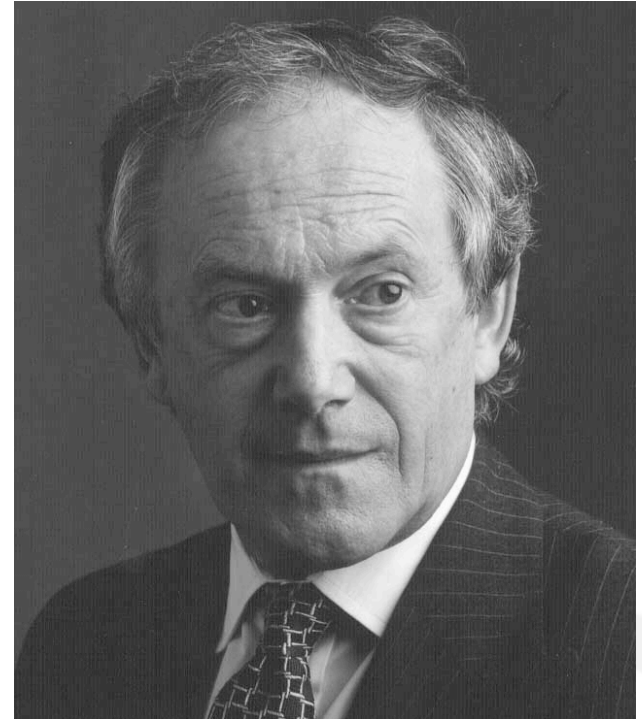
The Grand Design: new answers to the ultimate questions of life

S. Hawking (2010)

Science without limits?

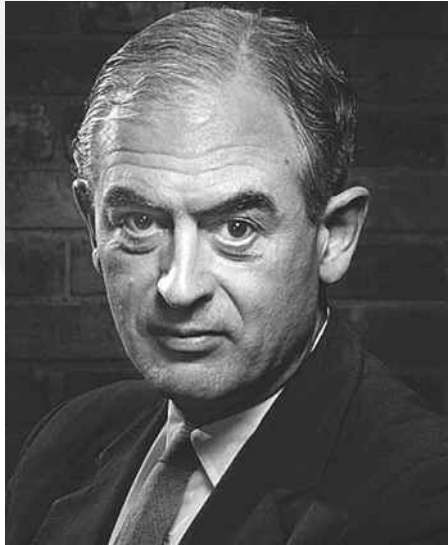
*“there is no reason to expect that science cannot deal with any aspect of existence...
...although poets may aspire to understanding, their talents are more akin to entertaining self-deception. Philosophers too, I am afraid, have contributed to the understanding of the universe little more than poets ... I long for immortality, but I know that my only hope of achieving it is through science and medicine, not through sentiment and its subsets, art and theology”*

--The Frontiers of Scientific Vision, Ed. J Cornwell. Oxford University Press, Oxford, 1995



Prof. Peter Atkins
Oxford U

Limits of Science?



“ That there is indeed a limit upon science is made very likely by the existence of questions that science cannot answer and that no conceivable advance of science would empower it to answer. These are the questions that children ask – the “ultimate questions” of Karl Popper. I have in mind such questions as:

How did everything begin?

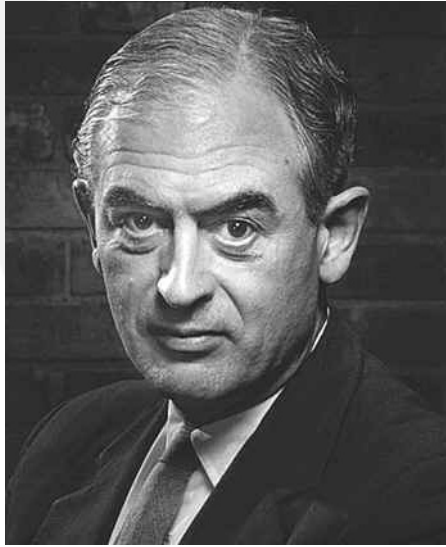
What are we all here for?

What is the point of living?”

“ It is not to science, therefore but to metaphysics, imaginative literature or religion that we must turn for answers to questions having to do with first and last things.”

-- Sir Peter Medawar, The Limits of Science, (Oxford University Press, Oxford (1987))

God & Science not the right question?



- *Science is a great and glorious enterprise - the most successful, I argue, that human beings have ever engaged in. To reproach it for its inability to answer **all** the questions we should like to put to it is no more sensible than to reproach a railway locomotive for not flying or, in general, not performing any other operation for which it was not designed.*

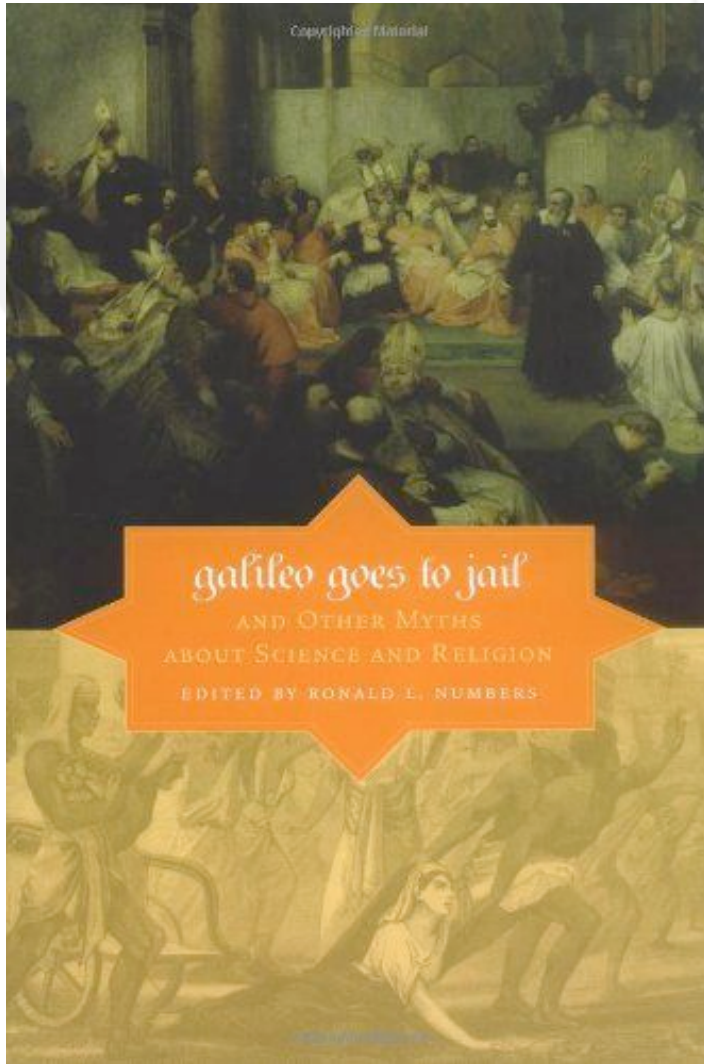
-- Sir Peter Medawar, The Limits of Science, (Oxford University Press, Oxford (1987))



We are all
philosophers or
theologians

What these don't disagree on: *How do I obtain reliable knowledge about the world?*

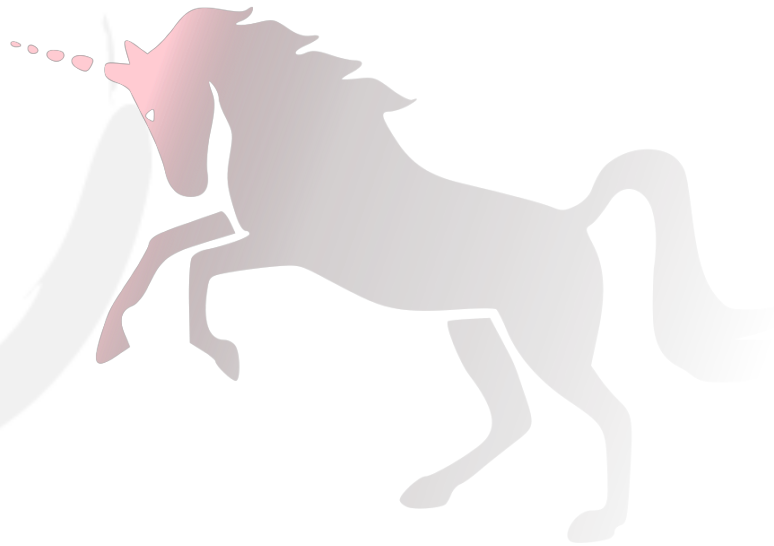
Science-Religion conflict metaphor



Galileo goes to jail and 25 other myths about science and religion

Ed. R. Numbers (Harvard U Press 2009)

Unicorns or the source of all being?



If you want to believe in ... --teapots, unicorns, or tooth fairies, Thor or Yahweh -- the onus is on you to say why you believe in it. The onus is not on the rest of us to say why we do not. We who are atheists are also a-fairyists, a-teapotists, and a-unicornists, but we don't have to bother saying so." -- Richard Dawkins

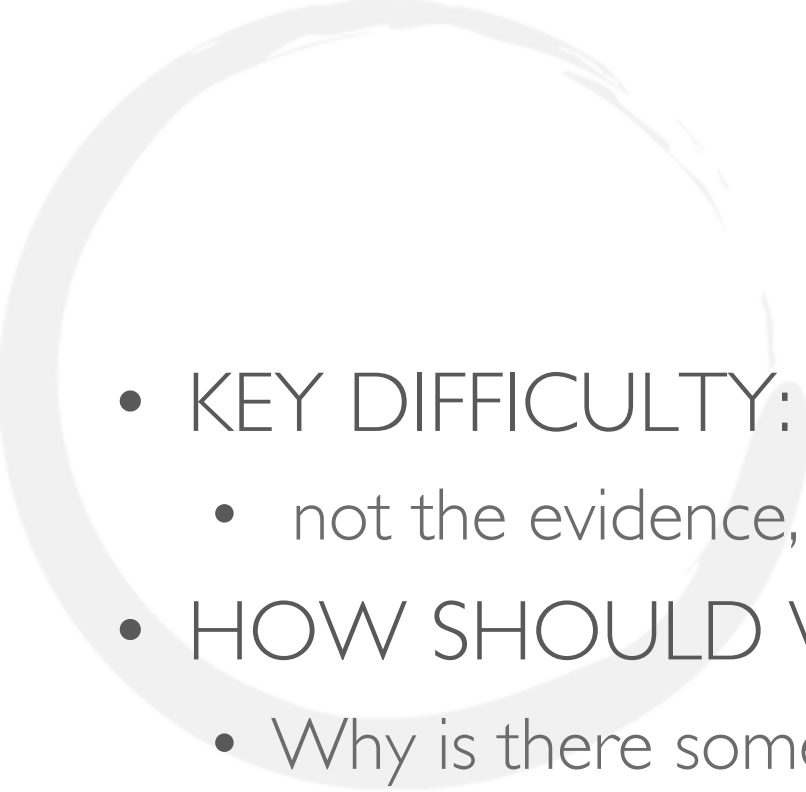

The professional debate



“The justification of most contemporary naturalist views is defeated by contemporary theist arguments”

The Metaphilosophy of Naturalism, by
Quentin Smith, Philo 4, vol 2 (2000)

Quentin Smith
Western Michigan U

- 
- 
- KEY DIFFICULTY:
 - not the evidence, but:
 - HOW SHOULD WE WEIGH THE EVIDENCE?
 - Why is there something rather than nothing?
 - All options are completely different from prosaic experience

The professional debate



Alvin Plantinga (Reformed Epistemology)

- God & other minds: belief in God is properly basic; “Warranted Christian Belief (2000)”

Basil Mitchell (Cumulative argument)

Others: Woltersdorf, Alston, ...

The Evidentialist Objection to Theism

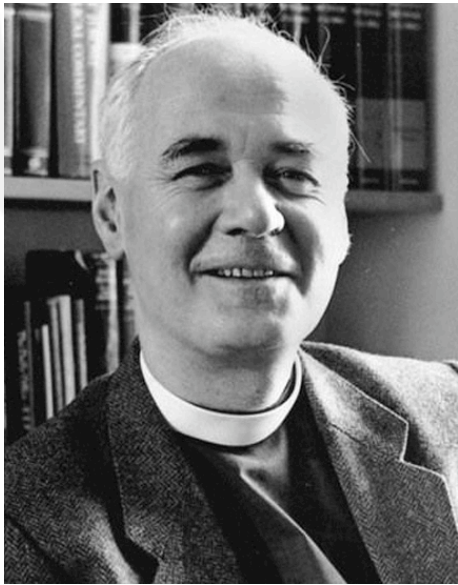
- 1) It is irrational or unacceptable to accept theistic belief without sufficient or appropriate evidence or reason.
- 2) There is not sufficient/appropriate evidence or reason for theistic belief.
- 3) Belief in God is irrational

Science and Hawking's Ultimate questions?



Science's great success comes from self-imposed limits

Brute facts



John Polkinghorne
Cambridge U

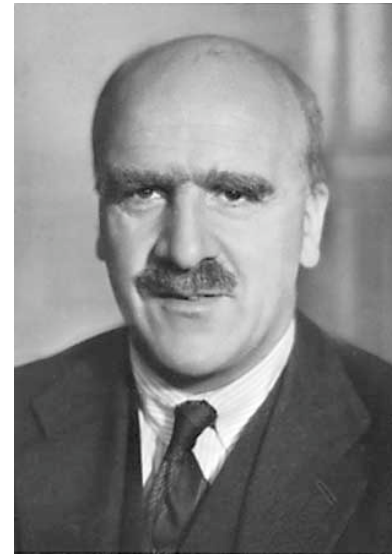
If we are to understand the nature of reality, we have only two possible starting points: either the
1) Brute fact of the physical world or the 2) Brute fact of a divine will and purpose behind that physical world

John Polkinghorne, Serious Talk: Science and Religion in Dialogue, (1995).

Dawkinsian evidentialism presupposes 1)

If there is a God

- Theistic assumptions help ground rationality
- *For if my mental processes are determined wholly by the motions of atoms in my brain I have no reason to suppose that my beliefs are true... And hence I have no reason for supposing my brain to be composed of atoms.*
- -J.B.S. Haldane, "When I am Dead"



If there is a God

- A universe fine-tuned for life that allows free, rational, moral creatures is what you would expect.
 - In addition: something like *sensus divinitatus*, incarnation, are not surprising
 - Something like the scientific method (studies the customs of the creator) is likely

If there is no God

- Questionable justification for:
 - Moral realism
 - Free will
 - Rationality
 - Fine-tuned universe for life
 - Even scientific method (only a-posteori)
 - Unless you posit many brute facts. (or deny the above)
- By **Occam's razor**, Theism is much more likely, given the evidence.

If you assume there is no God

- “The universe we observe had precisely the properties we should expect if there is, at bottom, no design, no purpose, no evil and no good, nothing but blind pitiless indifference.
- Richard Dawkins

Science and God?

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Who are some of the most interesting resource people on science/faith?

- Francis Collins at NIH – general topics/genome/biology/evolution
- John Polkinghorne at Cambridge – physics/theology/fine-tuning/
- Simon Conway Morris at Cambridge – evolution/convergence
- Denis Alexander at Cambridge – evolution/creation/history
- John Barrow at Cambridge – physics/ fine-tuning/anthropic principle
- Alister McGrath at Oxford/Kings – theology/philosophy/science/atheism
- John Lennox at Oxford – science/faith
- Peter Harrison at Queensland/Oxford – history of science/religion
- Ron Numbers at Wisconsin – history of science/religion
- Mark Noll at Notre Dame – history of science
- David Livingston at Belfast – history of science
- John Hedley Brooke Oxford/Lancaster – history of science
- Bill Newsome at Stanford – mind/brain/neuroscience
- Ian Hutchinson at MIT – physics/scientism
- Rosalind Picard at MIT – robots/computers/emotions
- Gerry Gabrielse at Harvard – physics
- Jeff Schloss at Westmont – evolution, morality & ethics
- Justin L. Barrat at Oxford/Fuller – cognitive science of religion/
 - evolutionary ethics
- Pieces by the above can be found at <http://www.st-edmunds.cam.ac.uk/faraday/Multimedia.php>

The scientific method ...

- Science deals with things that can be systematically tested etc... Usually that means things that are repeatable under controlled conditions.
- It's strength comes from imposing strict limitations on the questions it allows.

Limits are not a sign of weakness

- Sir Peter Medawar, The Limits of Science, (Oxford University Press, Oxford (1987))

Science-Religion conflict metaphor

- Uniformity
 - Rationality
 - Intelligibility
 - Applicability of mathematics
-
- Science has deeply Christian roots,
See e.g. Alfred North Whitehead, Stanley Jaki; Rooijer Hooykaas; Peter Harrison

Science has deep Christian roots



- *“This most beautiful system of the sun, planets and comets could only proceed from the counsel and dominion of an intelligent being.”*
- Sir Isaac Newton

Science has deep Christian roots



- Wrote “The Wisdom of God Manifested in Works of Creation”,
- Was governor of the “Corporation for the Spread of the Gospel of Jesus Christ in New England”
- Sir Robert Boyle (1627-1691)

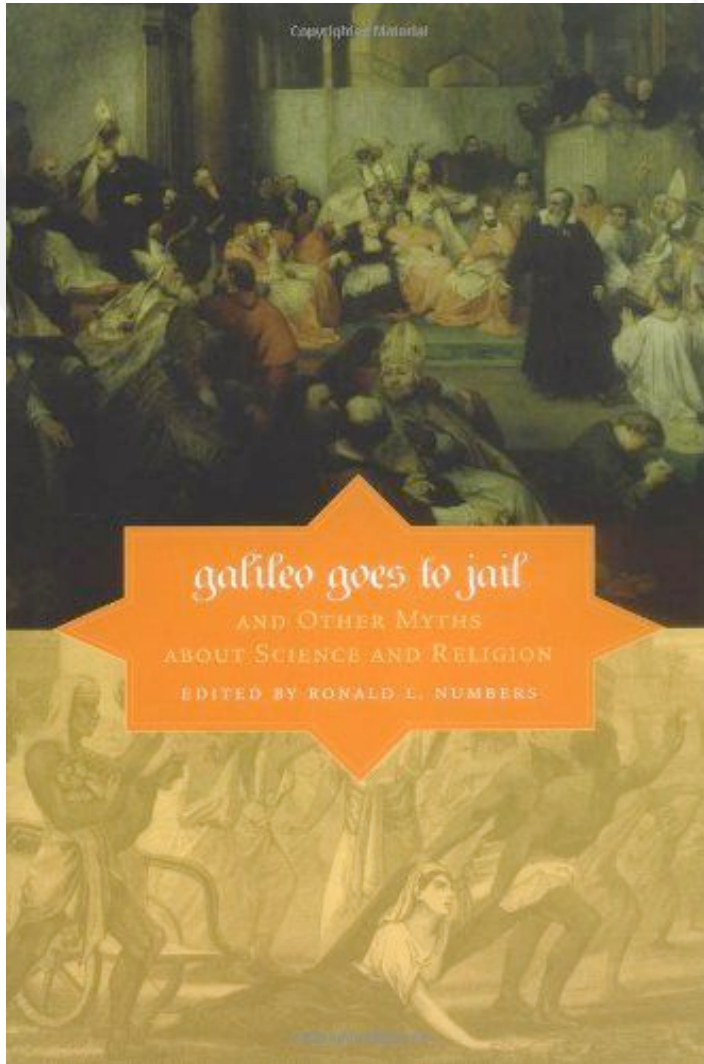
Science-Religion conflict metaphor



Peter Harrison,
Oxford

Those who argue for the incompatibility of science and religion will draw little comfort from history.....
the myth of a perennial conflict between science and religion is one to which no historian of science would subscribe.
-- Peter Harrison, Christianity and the rise of western science (2008)

Science-Religion conflict metaphor



Galileo goes to jail and 25 other myths about science and religion

Ed. R. Numbers (Harvard U Press 2009)

Nothing Buttery

humans are collections of chemicals:



enough P for 2000 matches



enough Fe for 1 nail



enough Cl to disinfect
a swimming pool



enough fat to make
10 bars of soap

Nothing Buttery

humans are collections of chemicals:



enough P for 2000 matches



enough Fe for 1 nail



enough Cl to disinfect
a swimming pool



enough fat to make
10 bars of soap

Nothing Buttery

humans are collections of chemicals:



enough P for 2000 matches



enough Fe for 1 nail



enough Cl to disinfect
a swimming pool



enough fat to make
0.1 bars of soap

Dawkins on being human

- "The individual organism ... is not fundamental to life, but something that emerges when genes, which at the beginning of evolution were separate, warring entities, gang together in co-operative groups as 'selfish co-operators'. **The individual organism is not exactly an illusion. It is too concrete for that. But it is [NOTHING BUT] a secondary, derived phenomenon, cobbled together as a consequence of the actions of fundamentally separate, even warring agents.**"
- - Richard Dawkins, *Unweaving the Rainbow*, (Penguin, London, 1998) p 308.



Mechanism does not exhaust meaning



why is the water boiling?

Is science the only way to reliable knowledge?



Newsome



Monument to irrationality?

“The most important questions in life are not susceptible to solution by the scientific method”

Evidentialism or blind Faith?



Richard Dawkins
Oxford U

"Faith is the great cop-out, the great excuse to evade the need to think and evaluate evidence. Faith is belief in spite of, even perhaps because of, the lack of evidence."

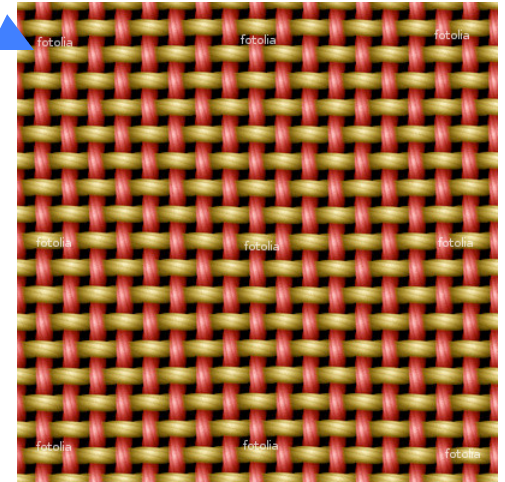
<http://richarddawkins.net/articles/89>

Evidentialism or tapestry arguments?

BRUTE FACTS:

In the beginning God, or in the beginning nothing?

- Morality
- Basis for modern science (rationality, uniformity)
- Beauty
- Intelligibility (unreasonable effectiveness of mathematics)
- Fine tuning of the universe



*I believe in Christianity as I believe that the Sun has risen—
not only because I see it, but because by it, I see everything else.*
C.S. Lewis, *The Weight of Glory*, (1942).

Fine Tuning of physical constants: Goldilocks Enigma ... why just right?

If the [fine structure constant] were changed by 1%, the sun would immediately explode

-- Prof. Max Tegmark, MIT



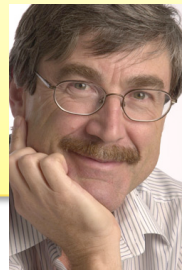
“The universe is the way it is, because we are here” – Prof.

Stephen Hawking,
Cambridge U



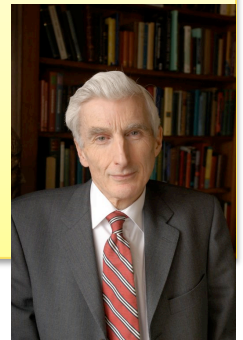
The Goldilocks Enigma: Why Is the Universe Just Right for Life ...

Paul Davies (2006)



Just Six Numbers

Sir Martin Rees (2000)

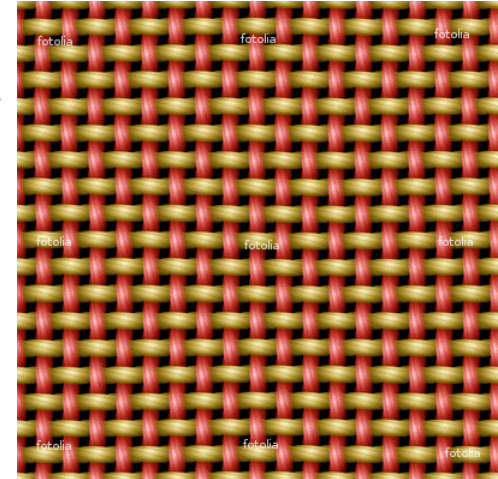


Tapestry arguments and Christian faith?

Why do I believe in Jesus Christ?

---tapestry arguments----

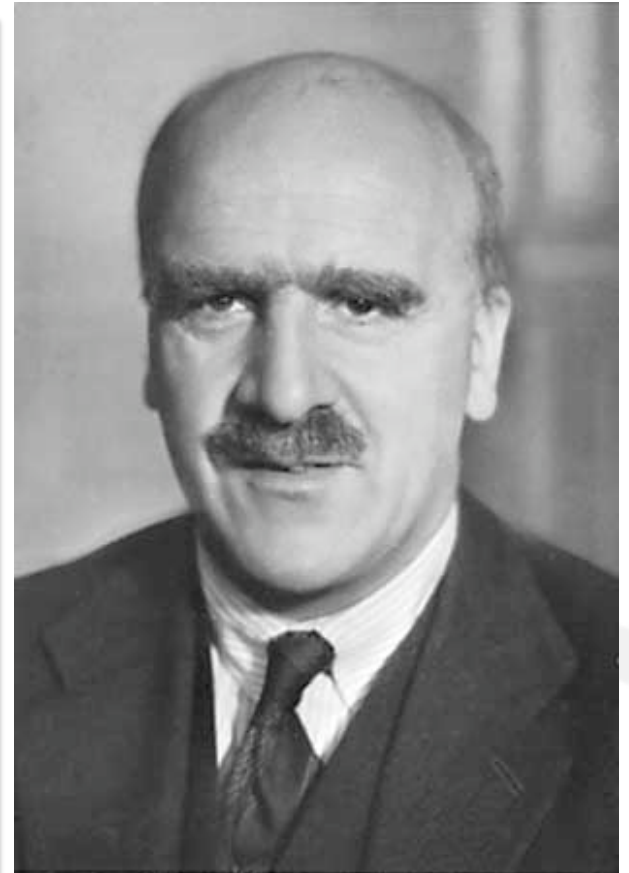
- Bible
- Resurrection
- Life and teachings of Jesus Christ
 - Just a great teacher?
- Experience of God in myself and friends



*I believe in Christianity as I believe that the Sun has risen-
not only because I see it, but because by it, I see everything else.*
C.S. Lewis, *The Weight of Glory*, (1942).

Materialism & self-consistent rationality

- For if my mental processes are determined wholly by the motions of atoms in my brain I have no reason to suppose that my beliefs are true... And hence I have no reason for supposing my brain to be composed of atoms.
-
- -J.B.S. Haldane, "When I am Dead "



Science and questions of value

- What is the value of a human life?
 - chemist – value of the elements?
 - physiologist – size of your brain
 - psychologist – how smart you are
 - anthropologist – how the community values you
 - economist – how much economic value you produce

Tapestry arguments for Bible



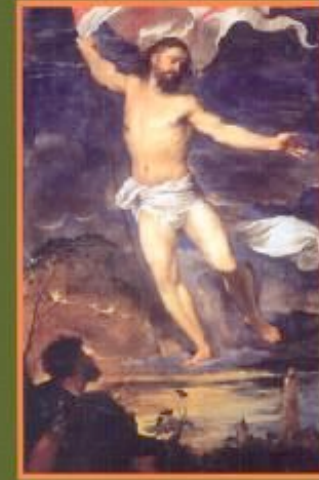
C.S. Lewis
1898-1963

I have been reading poems, romances, vision literature, legends and myths all my life. I know what they are like. I know none of them are like this. Of his [gospel] text there are only two possible views. Either this is reportage .. or else, some unknown [ancient] writer .. without known predecessors or successors, suddenly anticipated the whole technique of modern novelistic, realistic narrative.

Resurrection



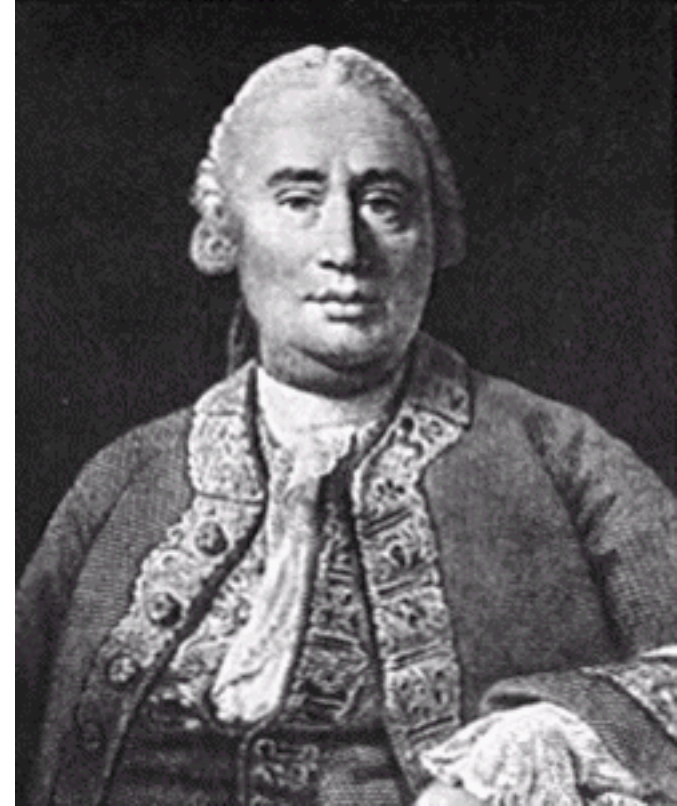
THE RESURRECTION
OF THE SON OF GOD



N. T. WRIGHT

Deriving an ought from an is

- when all of a sudden I am surpriz'd to find, that instead of the usual copulations of propositions, **is**, and **is not**, I meet with no proposition that is not connected with an **ought**, or an **ought not**.
- D. Hume in “A Treatise of Human Nature”



Materialism is not self-consistent

- Epicurus: “He who says that all things happen of necessity cannot criticize another who says that not all things happen of necessity. For he has to admit that the assertion also happens of necessity.
- (here it is an argument against determinism, but is linked to the argument against materialism)



Science on values, meaning purpose

- In matters of values, meaning, and purpose, science has all the answers, except the interesting ones.
- F. Ayala in Darwin's Gift to Science and Religion. (2007)



F. Ayala

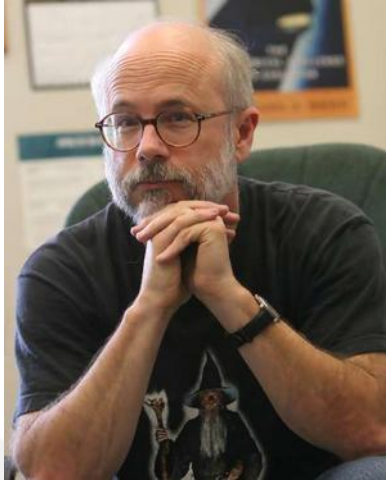
What is ID

- The theory of intelligent design holds that certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection. Through the study and analysis of a system's components, a design theorist is able to determine whether various natural structures are the product of chance, natural law, intelligent design, or some combination thereof.
- <http://www.intelligentdesign.org/whatisid.php> (Discovery Institute)

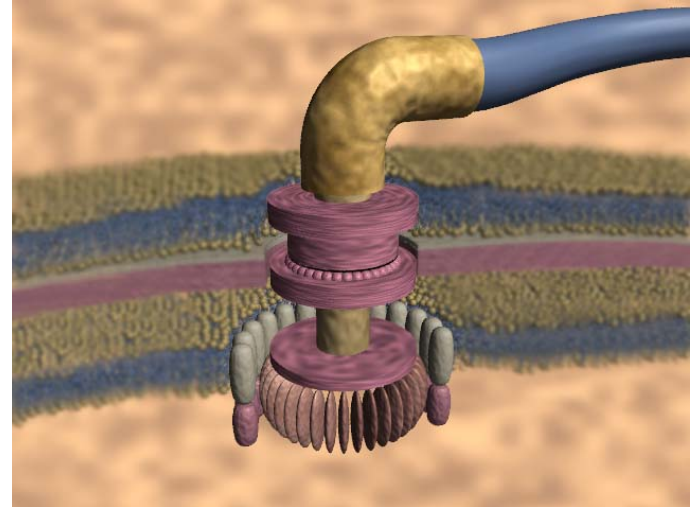
Intelligent design movement

- Very successful at popularisations.
- Scientific issues raised include:
 - Origin of life
 - Cambrian Explosion
 - Irreducibly Complex biological elements e.g. the bacterial flagellum
 - biological information

Irreducible Complexity



Michael Behe



•Bacterial flagellum, immune system, etc... are too complex to have evolved in stepwise manner. “Darwin’s Black Box” 1996

Darwin (1850): "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down

This result is so unambiguous and so significant that it must be ranked as one of the greatest achievements in the history of science ... The discovery [of intelligent design] rivals those of Newton and Einstein, Lavoisier and Schroedinger, Pasteur and Darwin."

Darwin's Black Box (1996)

Irreducible complexity?

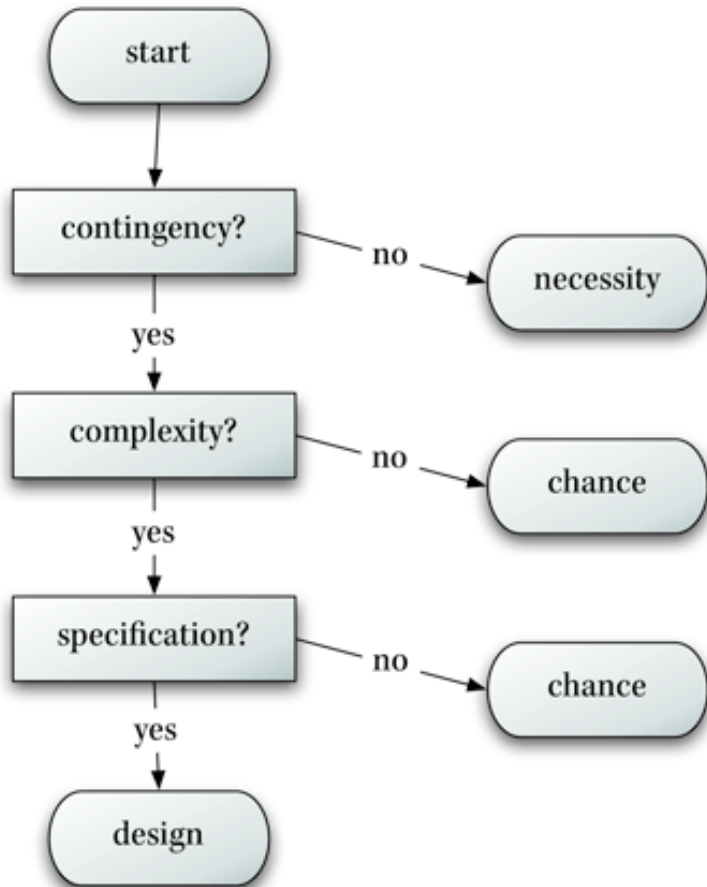
- Easily popularized
- Appealing to physical scientists and engineers
- Biologists counter with reasoning based on indirect evidence that implicitly depends on tapestry arguments
- Possibly a genuine scientific question -- but see Levinthal paradox

Complex Specified Information

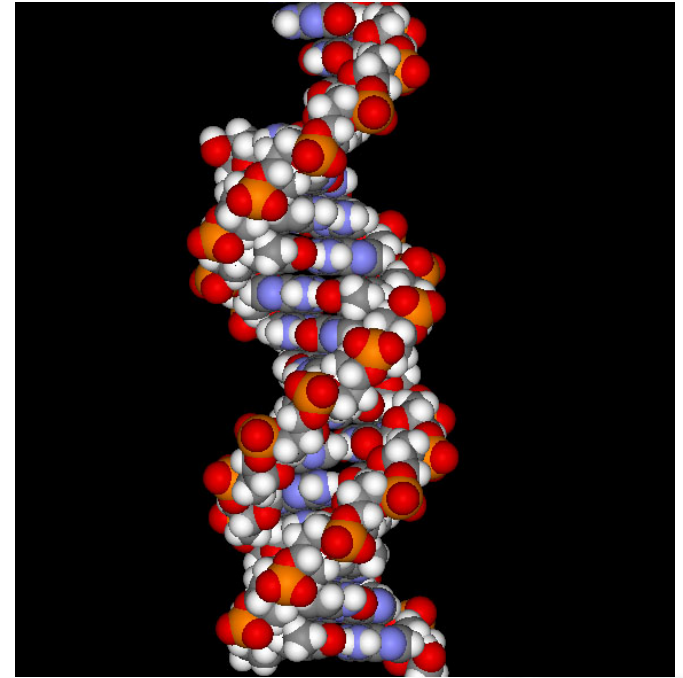


- Complex specified information
- “Law of the conservation of information”
- No Free Lunch theorems
- Explanatory filter

Complex Specified Information



Complex Specified Information



- Easy to popularize
- Appealing to physical scientists
- Information theory in biology has a bad name
- Theoretical arguments in biology are suspect

Mathematical proofs in biology?



The Design Inference, W. Dembski CUP (1998)

- endorsed by William Wimsatt:

“Dembski has written a sparkingly original book ...

No Free Lunch, Roman & Littlefield (2001)

- *Anyone who could have succeeded in showing that natural selection is incapable of generating biological structures according to standards from mathematics or logic would have constructed a mathematical proof that would have dwarfed Godel's famous Undecideability theorem in importance. ... I can categorically say that Dembski has surely done no such thing, and I call upon him as a mathematician to deny and clarify the implications of his advertising copy. ... William Wimsatt April 4, 2002*

Public Appeal of ID?

- Primarily a reaction to evolutionism/culture wars



- Appeal to physical scientists?
 - Use of theoretical/logical arguments (e.g. counterfactuals and explanatory filter)
 - Lack of experience with culture of biological tapestry arguments – e.g. historical science
 - Public perceptions of “real science” are often closer to traditions of the physical sciences