

Galileo before the Roman
Inquisition
(Cristiano Banti, 1857)



Science and Religion

Friends?

The Warfare/Conflict Model

- Proposed in the 19th century
 - Especially by John William Draper and Andrew Dickson White
- Science and religion are *essentially* in conflict
 - fundamentally incompatible ways of approaching nature.
- Many arguments for this view use premises that are historically inaccurate.

E.g. Columbus and the flat earth

- E.g. (some historical errors)
 - Belief in a flat earth was common in the middle ages, including among Church leaders.
 - When Columbus proposed to sail west to the Orient, the Church opposed his plan on the grounds that no such trip is possible on a flat earth.
- In fact, the Church's opposition was based on Columbus under-estimating the length of the voyage. The sailors would starve long before getting there.

Columbus's Proposed Voyage



A

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[Add Destination - Show options](#)

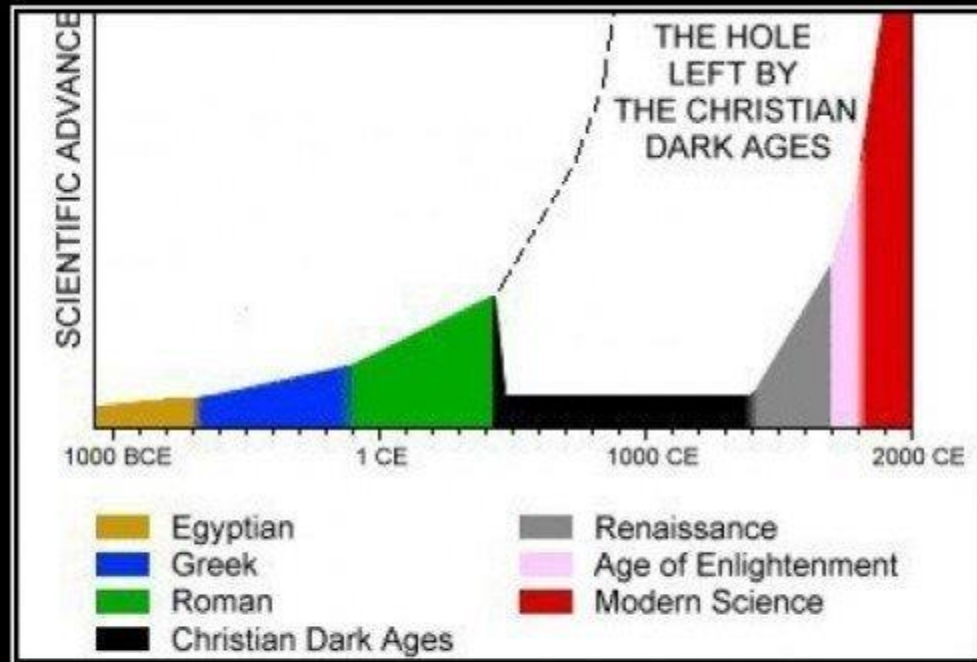
GET DIRECTIONS

It's 14,000 miles, not 2,800!

We could not calculate directions between **Canary Islands, Spain** and **Japan**.

E.g. Galileo and Pope Urban VIII

- Contrary to popular myth, historians say that objections to Copernicanism during the time of Galileo were largely *scientific*.
- Galileo was *encouraged* by his friend Maffeo Barberini (Pope Urban VIII) to write a new book about the Copernican hypothesis, considering arguments pro and con. (*Dialogue Concerning the Two Chief World Systems*)
 - The book was not balanced, but a Copernican polemic.
 - The main pro-Copernican argument was very weak.
 - It insulted the Pope



CHRISTIANITY

Just think, we could have been exploring the galaxy by now.

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- The term 'Dark Ages' (referring to Medieval Europe) is now considered a misnomer. It was a period of scientific and philosophical advancement.

How are science and religion related?

- 1. Conflict.** (Science and religion are essentially opposed, and incompatible.)
- 2. Independence.** (Science and religion deal with entirely separate, non-overlapping domains.)
- 3. Limited interaction.** (Science and religion have some areas of overlap, and so may interact, with either mutual benefit or harm.)

St. Augustine (354-430 AD)

(“The African Doctor”. Catholic bishop, philosopher, theologian. Very influential in the middle ages, and among Catholics and Protestants today.)

- Augustine held that the meaning of a text is the author’s intention, which may be different from a literal reading. E.g. There may be metaphors, hyperbole, poetic license, etc.
- Augustine thought that there couldn’t be any contradiction between valid science and scripture properly interpreted. (Aquinas agreed with this.)
- Hence scripture should be interpreted in a manner that is consistent with (proven) science.

St. Augustine (354-430 AD)

“Often, a non-Christian knows something about the earth, the heavens, and the other parts of the world, about the motions and orbits of the stars and even their sizes and distances, ... and this knowledge he holds with certainty from reason and experience. It is thus offensive and disgraceful for an unbeliever to hear a Christian talk nonsense about such things, claiming that what he is saying is based in Scripture. We should do all we can to avoid such an embarrassing situation, which people see as ignorance in the Christian and laugh to scorn.”

[Augustine, *The Literal Interpretation of Genesis*]

2. Nonoverlapping Magisteria (NOMA)

- Stephen Jay Gould, a paleontologist, believed that science and religion have "nonoverlapping magisteria".
- *magister* is Latin for "teacher."
- *magisterium* = domain of teaching authority
- There should be no 'conflict' or 'warfare' between science and religion because each subject has a legitimate magisterium—and these magisteria do not overlap.

- “The Bible is concerned with the Rock of Ages, not the age of rocks.”
- “The Bible teaches us how to go to heaven, not how the heavens go.”

(Cardinal Cesare Baronio, quoted by Galileo)

“Theistic Evolution”

- Theistic evolution (a.k.a evolutionary creationism) says that standard (i.e. Darwinian, selectionist) evolutionary theory is compatible with theism.

“Keith Ward speaks of evolution as “having been chosen by a rational agent for the sake of some good that it, and perhaps it alone, makes possible?” John Polkinghorne speaks of creation as “realising the inbuilt potentiality with which the Creator has endowed it”

Gould, NOMA, 1997

- “The net of science covers the empirical universe: what is it made of (fact) and why does it work this way (theory).”
- “The net of religion extends over questions of moral meaning and value. These two magisteria do not overlap, nor do they encompass all inquiry (consider, for starters, the magisterium of art and the meaning of beauty).”

- “... the two magisteria bump right up against each other, interdigitating in wondrously complex ways along their joint border. Many of our deepest questions call upon aspects of both for different parts of a full answer—and the sorting of legitimate domains can become quite complex and difficult.”

(Gould, NOMA)

What are some of the topics that are very near the border (if not straddling it)?

- Free will (and determinism). Humans are purely physical machines?
- The ground of moral judgement, and moral truth.
- Humans arose from a purely physical process, with no plan or purpose.
- The age of the earth?
- Humans are descended from an ape-like ancestor?

- Dawkins rejects Gould's idea of "non-overlapping magisteria"
- Why?

First, Dawkins wants religion to have **no magisterium at all.**

- “The Church has no teaching authority in ethical matters, for example—they’ve botched it too badly in the past. Why get moral guidance from scrolls written thousands of years ago by primitive nomads?”

Second, Dawkins interprets evolutionary theory as *contradicting* Christian theology (and that of other theistic religions).

“All appearances to the contrary, the only watchmaker in nature is the blind forces of physics ... Natural selection, the blind, unconscious automatic process which Darwin discovered, and which we now know is the explanation for the existence and apparently purposeful form of all life, has no purpose in mind.”

The Blind Watchmaker (1996) p. 5

Science talks about morality

- Morality as a social phenomenon
- Morality as a biological (evolved) phenomenon.
 - E.g. marital infidelity, by men and women, explained in evolutionary terms?
- Can theists accept such views of morality?

The Rev. Sedgwick doesn't think so!

- A prominent critic of Darwin's *Origin* was the geologist (and Reverend) Adam Sedgwick. Sedgwick liked parts of the book, but was very unhappy with the idea of new species being formed through natural selection. This seemed to contradict God's design.

“It repudiates all reasoning from final causes; and seems to shut the door on any view (however feeble) of the God of Nature as manifested in His works. From first to last it is a dish of rank materialism cleverly cooked and served up.”

3. Religion *helps* science?

- Theistic religions encourage the idea of the universe as comprehensible, rational, orderly, etc.

“From a theistic perspective, the rational intelligibility of the universe makes perfect sense in light of the rationality of God the Creator. Indeed, it would seem that this was the driving force behind the rise of science.”

(Lennox, p. 562)

- “The chief aim of all investigations of the external world should be to discover **the rational order and harmony which has been imposed on it by God** and which He revealed to us in the language of mathematics.”

(Kepler, Johannes, De Fundamentis Astrologiae Certioribus, Thesis XX, 1601.)

“I was merely thinking God’s thoughts after him. Since we astronomers are priests of the highest God in regard to the book of nature it befits us to be thoughtful, not of the glory of our minds, but rather, above all else, of the glory of God.”

Plantinga

“God created both us and our world in such a way that there is a certain fit or match between the world and our cognitive faculties.

The medievals had a phrase for it: *adequatio intellectus ad rem* (the adequation of the intellect to reality).”

A new conflict: “intelligent design”

“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.**” (The Discovery Institute)

- Intelligent design (ID) is in conflict with standard evolutionary theory.
- Most ID proponents are religious, but claim that they accept ID for scientific reasons.
 - (They are almost all “old earthers”.)

Philip Kitcher on I.D.



- Ph.D. in history and philosophy of science, working with Thomas Kuhn.
- Professor of philosophy at Columbia University.
- Critic of creationism
- Atheist, but not as hostile toward religion as (e.g.) Dawkins.

Kitcher on ID

Kitcher sees ID as making two main claims:

Negative claim of ID: Darwin's mechanism for evolution, natural selection, is inadequate for macroevolution. (Not all ID people are opposed to common ancestry.)

Positive part of ID: Evolution is well explained by being the result of an intelligent designer. (Similar to Paley.)

I.D.'s anti-selectionism

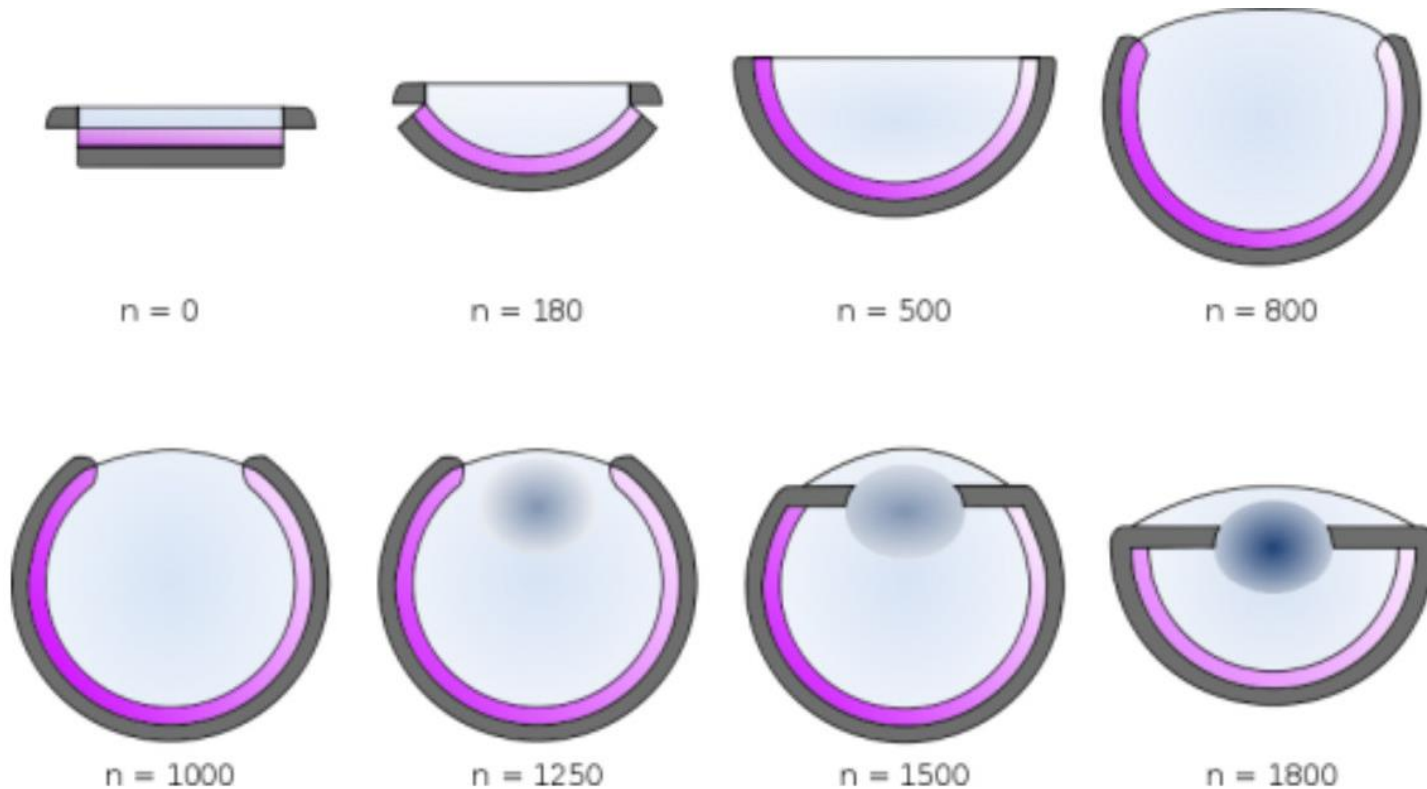
- Historically, this line of argument begins with Cuvier's (1817) rejection of evolution on the grounds that organisms are interdependent wholes, and Mivart's (1871) "problem of incipient stages".
- **Mivart:** something complex, like an eye, cannot evolve by natural selection. Natural selection can build an organ only in very tiny steps, where each step noticeably improves the function. But complex organs don't work *at all* until all the pieces are in place.
- I.e. "What good is half an eye?"

- Kitcher gives the standard response about the evolution of eyes (e.g. Darwin himself, later Nilsson and Pelger) that there *can* be a sequence of intermediaries, with gradual increase of function.

“It has taken more than a century of research on a wide variety of organisms to demonstrate that Darwin’s hunch was basically right. Appearances to the contrary, organs and structures sensitive to light can be assembled piecemeal, with the intermediates enjoying some advantage over the competition. ... ”

(Kitcher, p. 566)

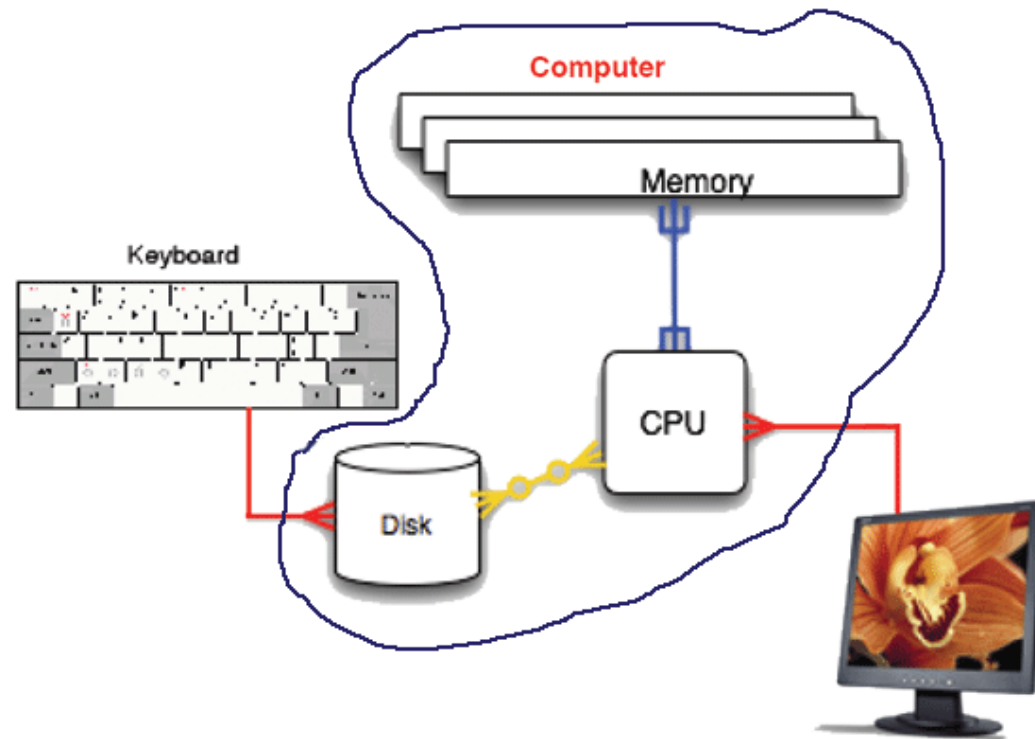
Nilsson and Pelger's model



Vision improves slightly after *each and every one* of the 1800 changes.

Reply #1 (Michael Behe)

This model barely scratches the surface. Their model is not an eye at all, but only a crude schematic, rather like the “computer” below. (In their model, all the elements of the eye are present at the beginning, and merely *change shape* during their evolution.)



Reply #2: What about embryology?

- Their model did not include any embryology, i.e. no consideration of how eyes are built by the egg and genome.
- Mutations affect the genome, not the eye (directly). The relation between genome and phenotype (body, or part of the body) is complicated.
- A sequence of small phenotypic changes may not correspond to any sequence of small changes to the genome.

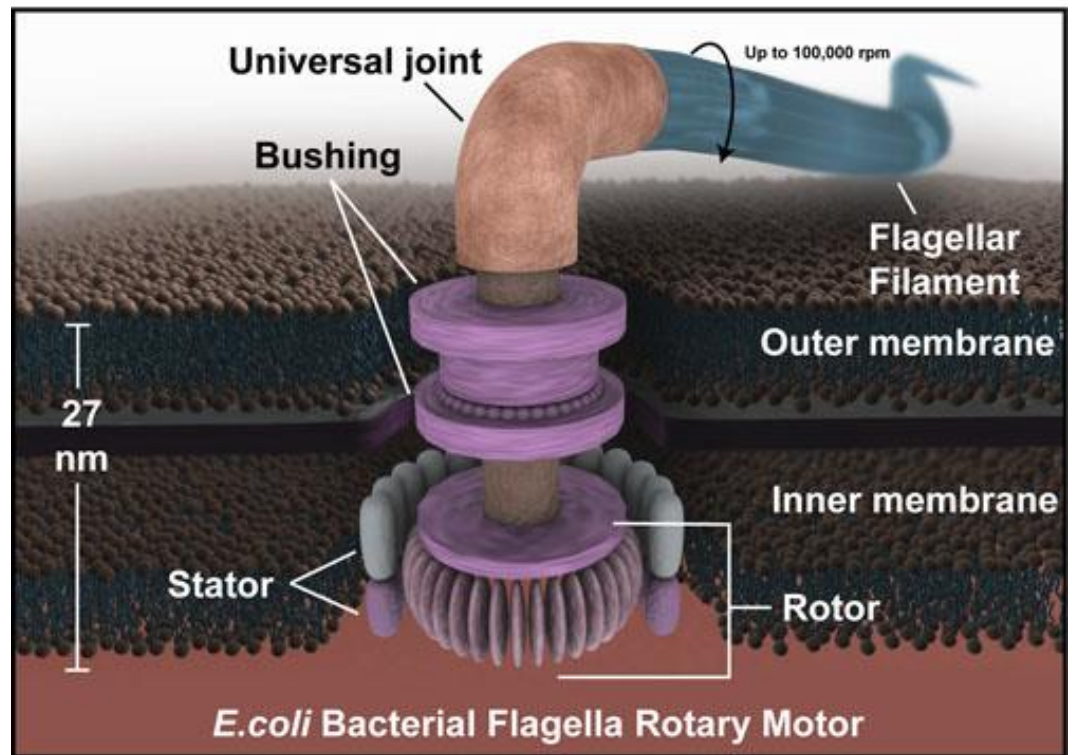
Michael Behe's 'irreducible complexity'

- Behe made this argument in *Darwin's Black Box*, and *The Edge of Evolution*.
- “As biochemists have begun to examine apparently simple structures like cilia and flagella, they have discovered staggering complexity, with dozens or even hundreds of precisely tailored parts. It is very likely that many of the parts we have not considered here are required for any cilium to function in a cell. As the number of required parts increases, the difficulty of gradually putting the system together skyrockets, and the likelihood of indirect scenarios plummets. Darwin looks more and more forlorn.”
- (Behe, quoted in Kitcher, p. 567)

Flagellum = ID's “poster child”!

Intelligent Design Theory:

If one of its 30 parts is removed, it no longer works.



If it looks designed, maybe it is.

Kitcher responds

- “Most sciences face unsolved problems—indeed the exciting unsolved problems are the motivators for talented people to enter a field.... **Unsolved questions are not typically written off as unsolvable**— nobody proposes that there’s some special force, unknown to current chemistry (an “intelligent force” perhaps?) that guides the proteins to their proper forms, or some hand that assembles the cilium in the development of an individual bacterium. **Why, then, should we believe that the problem of the bacterial flagellum is unsolvable?** ”

(Kitcher, p. 567)

Conclusions from “irreducible complexity”

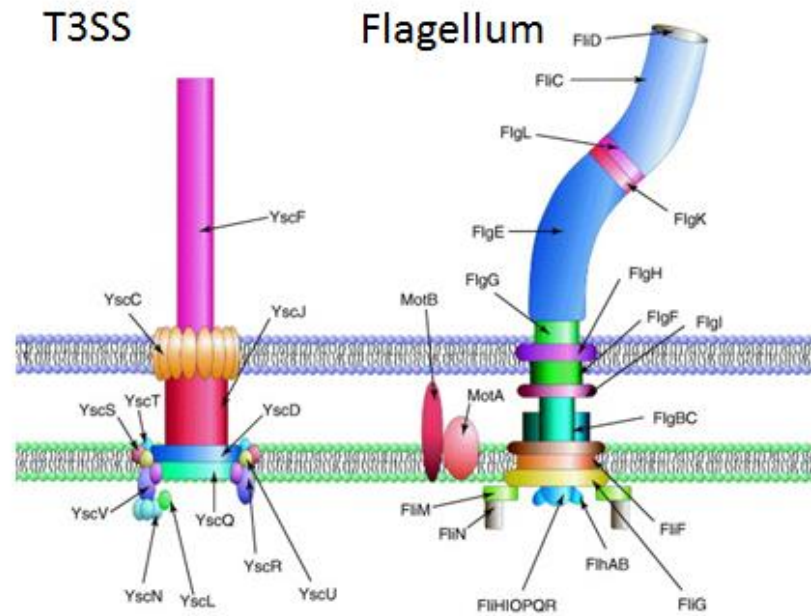
1. (*Strong*) It's *impossible* that NS could do it.
2. (*Medium*) It's *rather unlikely* that NS could do it.
3. (*Weak*) It's *not clear that* NS could do it.

Behe seems to argue for the medium and weak conclusions, but some of his critics (especially Ken Miller) present him as making the strong conclusion.

Scientists respond to Behe

- **E.g. Ken Miller:** The flagellum has about 30 proteins (complex parts), and Behe says it won't work with just 29 of them. In fact, however, the T3SS functions quite well (as a toxin injector) with only 10 of the flagellum's proteins.

- **Falsified!**



Scientists respond to Behe

- Miller's point is that, as a biological structure evolves, **its function often changes.**

(Evolution is like a garage tinkerer, who makes an electric lawnmower out of parts of an old washing machine. E.g. "MacGyver".)



Scientists respond to Behe

- In 1918, geneticist Hermann Muller proposed a “2 step” model for evolutionary innovation.
 - 1. Add a part. (It helps, but isn’t necessary.)
 - 2. Remove other parts. (*Now* it’s necessary.)
- Thus evolution doesn’t move in straight lines.
- E.g. to build a free-standing arch you can start with a mound of dirt, place the stones on top, then remove the dirt.



- The final product (above) is irreducibly complex, but it *was* built step-by-step.

Behe responds

To Miller: It takes intelligence to make something new out of old parts. They have to be modified, or new parts are needed to join them together, etc.

To Muller: Clever, but it won't help much. It's still going to be very hard to build a new complex machine without intelligence.

Science and Prediction

- In general, an adequate scientific theory is one that *predicts the data*.
 - (The *burden of proof* is always on the scientists who claim that the theory is adequate.)
- With selectionism, and the data of complex structures, there is no serious attempt to predict the data. Rather, biologists try to show that it is *conceivable* that the mechanism can in theory predict the data.
- Thus evolutionary biologists seem to shift the burden of proof onto critics of the theory.

(Imaginary conversation)

Darwinist: Natural selection explains the functional complexity we observe in living organisms

Behe: How do you *know* that natural selection explains that? No one has *predicted* such things from the theory. And the irreducible complexity of life makes it seem rather hopeless.

Darwinist: Your irreducible complexity argument fails. So we can assume that selection *is* adequate.

Polkinghorne (theistic evolutionist)

“It would be very difficult to prove that there was no pathway by which what was claimed to be an irreducibly complex structure could have evolved ... At the present stage, an open verdict is the utmost that might be claimed.

Yet, since the ID claim is of such potential significance, the burden of proof must surely rest with those who assert it.” (p. 587)

Science and prediction

- Generally speaking, science uses the method of IBE (inference to the best explanation).
 - This means that various hypotheses are *competing* for acceptance by scientists. (The *best* explanation deserves acceptance.)
- It's fair game to say that an opposing theory is defective in some way, in order to argue that your own theory is better.
 - But, in the game of IBE, it's rather futile to criticise a theory without offering an alternative.

(Chemist) Michael Polanyi on selectionism

“Arguments for the insufficiency of this explanation were rejected as unscientific, because no other principles of molecular interaction appeared conceivable. This reminds me of the impatience with which **most biologists set aside today all the difficulties of the current selectionist theory of evolution, because no other explanation that can be accepted as scientific appears conceivable.**”

(“The Potential Theory of Adsorption”, *Science*, vol. 141, 1963.)

Physicist: Selectionism is causally inadequate. It does not predict the biological data.

Darwinist: Do you have a *better* idea?

Science and prediction

- The scientific community will never reject *all* theories at once. It always needs to have some favoured theory.
- Nevertheless, the absence of a scientific alternative to natural selection gives no evidence at all that selection is empirically adequate.
- In other words, the philosophical claim that natural processes can create life needs evidence.
 - E.g. someone might show that selection, a naturalistic theory, predicts the evolution of life.

(Imaginary conversation)

Behe: Design is the best explanation of the biological data.

Darwinist: No it isn't. We now have a naturalistic explanation of life that is fully adequate. Your designer is redundant.

Behe: How do you know that natural selection is adequate?

Darwinist: Natural selection is the only possible naturalistic explanation of the functional structures in biology ...

ID's Positive Argument

“The line of reasoning seems to be this: these phenomena, unattainable by selection, look designed or planned, and, as a result, the mechanism that produced them must be intelligent.” (Kitcher, p. 570.)

(N.B. ‘must’ is too strong here. ID says that design is merely probable, or the “best explanation”. But Kitcher is basically right.)

“There is a fallacy here. **Even without the slightest characterization of the mechanism**, we’re meant to infer one of its characteristics from the appearances of its products.”

- Is this a fallacy? Can you never conclude that the cause of something is intelligent, without knowing the mechanism?

- Suppose a flying saucer crash-landed on earth. There is no pilot aboard (perhaps they used an escape pod?) Should we infer that the saucer is a product of intelligence?
- Suppose a coin lands hthththththththth... We can't imagine a mechanism that would do this. Should we infer that there is such a mechanism anyway?

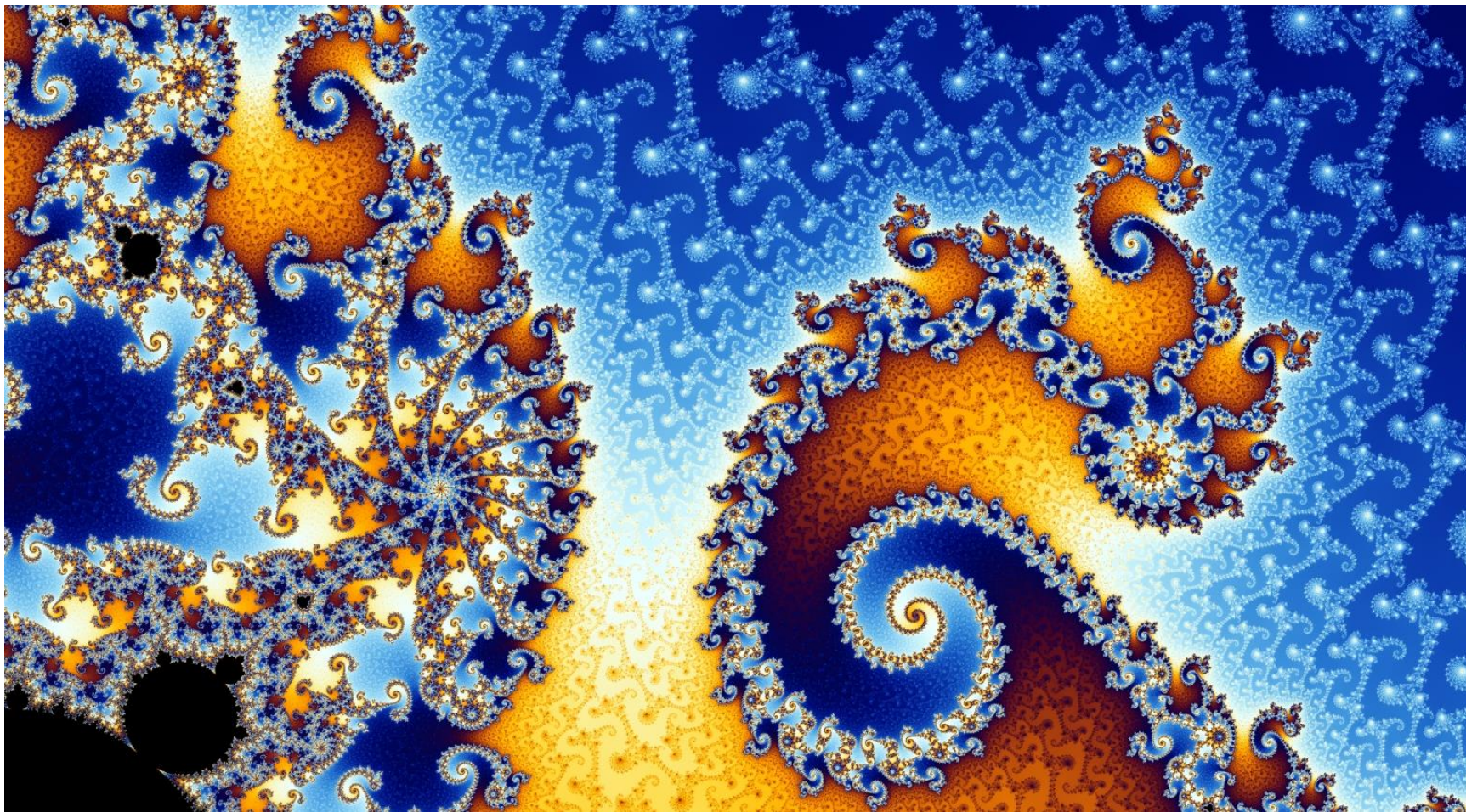
Self-organisation

“Yet if we forget about natural selection, and ignore the controversies about what it can and cannot do, there are plenty of other instances in which striking **order, pattern, and even beauty emerge from processes in which there is no planning**, no design, but only the operation of blind and simple rules....”

(pp. 570-71)

E.g. snowflakes, shell patterns, etc.

Did a great artist paint this?



(The Mandelbrot set is the set of values of c in the complex plane for which the orbit of 0 under iteration of the complex quadratic polynomial $z_{n+1} = z_n^2 + c$ remains bounded.)

Wolfram's Rule 30



Conus Textile

“It’s simply a fallacy to suppose that because a particular structure or mechanism appears complex, then the causal agent that brought it about must be appropriately characterized as having “foreseen” or “planned” or “designed” the outcome.”

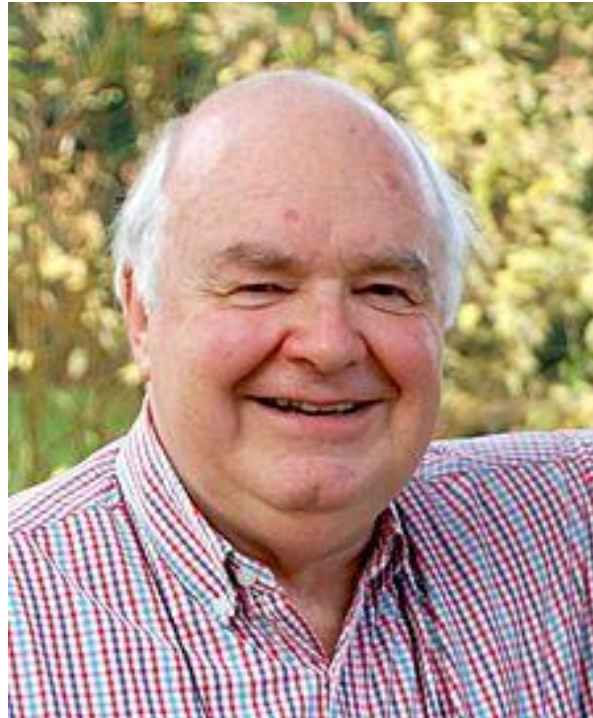
(Kitcher, p. 571)

-Agreed. But these patterns are all *regular*, in the sense of being repetitive or self-similar. Living organisms (and especially their genomes) are not like that. Machines aren’t either.

ID lacks explanatory power

- Kitcher spends the rest of the article arguing that ID can't explain much either. For example, what has Behe contributed to our understanding of the evolution of the flagellum? Nothing.
- If correct, does this show that ID is unjustified, or merely that it is not a *scientific* theory?
- N.B. Behe claims that there *is* scientific value in recognising the limited power of natural selection. E.g. it helps us to combat drug-resistant pathogens.

John Lennox on I.D.



Science might provide evidence that some things have no natural explanation

Is ID science?

- No, says Lennox.
 - But it might still be supported (or I guess undermined) by scientific evidence.
- E.g.
 - cosmological fine tuning is unlikely, given naturalism
 - the Big Bang theory says that the universe began to exist
 - A natural origin for life seems very unlikely, based on the chemistry we know

“God of the Gaps” fallacy?

No known material process can produce X

∴ No material process produced X

∴ X must have come from an intelligent source

This looks like an *argument from ignorance* (usually a fallacy, though not always).

It also looks intellectually lazy, and likely to hinder the progress of science.

“...how wrong it is to use God as a stop-gap for the incompleteness of our knowledge. If in fact the frontiers of knowledge are being pushed further and further back (and that is bound to be the case), then God is being pushed back with them, and is therefore continually in retreat. We are to find God in what we know, not in what we don't know.”

Dietrich Bonhoeffer, letter to Eberhard Bethge, 29 May 1944.

Stephen Meyer's response

- The argument has a **missing premise**. It should read:
 1. No known material process can produce X
 2. Intelligent beings can produce things like X-----

∴ Intelligence is the best explanation for X

- Lennox believes there are “good gaps”, where scientific *knowledge* provides reasonable (albeit fallible) grounds infer the existence of a supernatural cause.
 - From a theological perspective, why can’t God intervene in his own world?
 - N. B. Scientists argue on the basis of explanatory gaps in their rivals’ theories *all the time!*

Scientific *evidence* for gaps

- E.g. Pierre Wantzel in 1836 proved that it is impossible to trisect an angle with straightedge and compasses.
- Also, the 2nd law of thermodynamics shows that perpetual motion is impossible, etc.
- If science discovers a “conservation of information” law, then this may rule out the (probable) appearance of life by natural laws.

- Lennox refers to Paul Davies and Michael Polanyi, saying that the structure of a living organism isn't implicit in the laws of physics.
- (Unlike the spherical shape of a star, or the structure of a convection cell, or a crystal.)
- Naturalistic theories of biological evolution are impossible if Polanyi and Davies are right about this.

Lennox's "good gap" argument

1. Present science says that no material process can produce X
2. Intelligent beings can produce things like X

∴ Intelligence is the best explanation for X