

INFERENCES TO THE BEST EXPLANATION (IBE): If a hypothesis explains things better than any others available, it gains inductive support

Scientific Reasoning uses IBE:

Example (p 257ff):

Observations: broken lock, missing valuables

Possible explanations:

- burglary
- friends' prank
- meteorite
- CIA
- metal fatigue
- leprechauns...



1

STANDARD FORM FOR IBE's:

(1) **Observation:** Fact(s) to be explained

(2) **Explanation:** Hypothesis + accepted facts, principles properly explains (1)

(3) **Comparison:** No other available hypothesis explains (1) as well as hypothesis (2)

(4) **Conclusion:** Probably, (2)

We accept explanations because they help us explain and predict the world

Explanations make sense of things, put them in order, create a "cosmos" out of "chaos"

Predictions test our explanations, and allow us to expect or control new events

In contrast, we derive (infer) the truth of an explanation by its ability to explain the facts

Uses of IBE (forensics, murder mysteries)

IBE's are defeasible: New information can show that our hypothesis does not provide the best explanation

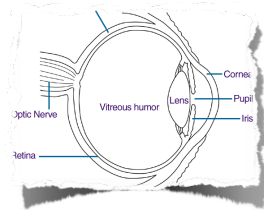
2

Paley's famous argument from design as an IBE (Text, pp 275-6)

What makes an explanation the best?

- (i) *The explanation should actually explain (predict) the facts and all the facts*

Does Paley's hypothesis of a supreme creative intelligence explain the facts of nature?



- (ii) *The explanation should be **deep***: Your explanation should not itself require explaining (at least not as much as that which it explains)

Paley?

- (iii) The explanation should be powerful or "consilient": it should be able to (really) explain a wide range of facts

e.g. Einstein's theory is able to explain a wider range of facts than Newton's (Mercury's orbit, "bending" light by large bodies, time dilation, etc.)

- (iv) *Explanations should be falsifiable*: Some explanations "cover" a wide range of facts but without predicting anything specific; as a result, no fact counts against them

Why do things happen as they do? Gremlins/spirits/ etc., make this happen vs. Comet Shoemaker Levy

3

Why do things happen as they do? Gremlins/spirits/ etc., make this happen



Why, then, did A happen rather than B?
Because that's what the Gremlins chose to do

But who knows how Gremlins think? How
would we prove this false?

Is Paley's hypothesis powerful but unfalsifiable?
vs Shoemaker-Levy

- (v) **Explanations should be modest**: Don't
make the explanation more involved or
intricate than is needed to explain the
phenomena:

e.g. suppose you find your locked bike has
gone missing.

A modest explanation might be that it was stolen by a reasonably
professional bike thief or thieves. Your explanation would be immodest if
you added that the thief was working for the CIA, smoked an Indian cigar,
was a sociopath who dropped out of kindergarten, etc.

You've gone far beyond what is needed to explain the facts.

4

(vi) **(Occam's Razor) Explanations should be "simpler":**
"Don't multiply entities beyond necessity." Don't hypothesize new things that aren't necessary to explain the facts

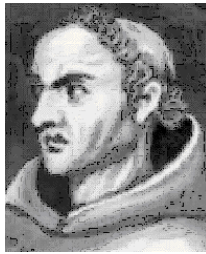
Simplicity also involves ease of understanding

Again, suppose your locked bike has gone missing. The semi-professional thief is a simpler explanation than, say, that of a secret government organization in league with aliens who need the special material of your bike to fuel their space ship

Paley?

(vii) **Explanations should be conservative:** An explanation should fit with as many of our other well-supported views as possible, and the explanation should not contain any otherwise improbable elements.

e.g., homeopathy says that very dilute doses of drugs that produce effects similar to a disease can cure that disease (if the drugs are shaken hard enough), which conflicts with our strongly supported beliefs that extremely low doses have no effect, and that shaking has no effect on the ways in which drugs work



5

Paley?

These criteria: being (i) more explanatory; (ii) deeper; (iii) more powerful/consilient; (iv) falsifiable; (v) more modest; (vi) simpler; and, (vii) being more conservative can conflict with each other

e.g., a more powerful explanation may require us to give up many beliefs, etc.

Further considerations: (a) The best available explanation may not be a very good explanation, that is, the explanation may not meet the seven criteria very well

e.g. the flood waters of the Nile; why Dinawan, the emu, can't fly (Goomblegubbon, the brush turkey)

(b) the phenomena to be explained must be genuine: e.g., shark cartilage and cancer; Darwin, gemmules and Lord Morton's mare (telegony: the supposed fact that the first male to fertilize a female alters her so that later offspring that aren't his, still have some of his traits)



6

When an explanation is good, explains genuine facts and is better than any other available explanation, it has strong inductive support. Otherwise, the IBE is weak

Context affects strength: Whether we should accept an IBE depends on the situation: e.g. O.J. and murder:

(a) **criminal trial** (beyond a reasonable doubt: one would base one's most important judgements on this evidence) &

(b) **civil suit:** on the balance of probabilities (more likely than not)

Context affects relative importance of factors: e.g., most explanations involve universal principles (laws), and a single counterexample is sufficient to refute a universal claim.

However, if the explanation has tremendous “consilience,” for example, a few counterexamples will not usually be taken as refuting

Why? Because we don't usually test a proposition on its own, but only together with many other beliefs

1. If Newton's view is correct, Uranus should have a particular orbit, Y.
2. Uranus doesn't have orbit Y (counterexample)
 ∴ 3. Newton's view is false.???

But Newton's theory gives a powerful explanation of many, many facts and laws

7

Which of the above might we reject instead?

General principle: when we meet with contrary evidence to a general system of beliefs, we have only discovered that there is something wrong with the system, not exactly where it is

e.g., student lab results vs. fundamental laws

Crises in science (Kuhn): When previously accepted and powerful explanations clearly fail, scientists are forced to give up their "paradigms"



8

ARGUMENTS FROM ANALOGY

"You can get a large audience together for a strip-tease act... Now suppose you came to a country where you could fill a theatre simply by bringing a covered plate onto the stage and then slowly lifting the cover so as to let everyone see, just before the lights went out, that it contained a mutton chop or a bit of bacon, would you not think that in that country something had gone wrong with the appetite for food?" (C. S. Lewis)



Analogical arguments compare two sets of things for similarity in some areas as a basis for concluding that they are similar in some additional sense.

Analogical arguments are common in all areas of life: For example, we buy new cars, computers, etc., because they have the same brand as a previous good car we've bought

We go to chain restaurants, because we believe their food will be similar to others in the chain, and so on.

Analogical arguments are also used in science: e.g., James Watson argued that, since most biological entities come in pairs, and since DNA is built from helices (screw-shaped molecules), it's probable that DNA itself is built of pairs of helices.

Pattern of analogical arguments:

- (1) Object A has properties P, Q, R, ...
- (2) Objects B, C, D,... also have properties P, Q, R, ...
- (3) Objects B, C, D,... also have further property X.
- ∴ (4) Object A probably also has further property X

We can call A the "primary subject" of the analogy; objects B, C, D, ... are the "analogues"

The primary subjects and analogues of the previous examples: strip teases, cars, chain restaurants, DNA

Arguments from analogy are inductive, because they seek to provide strong, but not 100% support for their conclusions

They are also defeasible, since new information about Object A or the analogues can weaken or destroy the analogy

Evaluating for strength:

- (i) **True premises?** The premises should be known to be true: That is, the compared objects must actually share the stated properties

Is there something wrong with the appetite for food of the people Lewis describes?

- (ii) **Relevant similarities?** The similarities (P, Q, R, etc.) mentioned must be relevant and important; that is, these common properties must actually make it likely that the new object shares a further property.

But finding what is “relevant” or “important” requires additional, background knowledge
For example, perhaps all our previous computers had a particular colour, weight, shape, brand name, cost, type of hard drive, system software, loaded software, etc.

Which of these might be relevant to determining whether your new computer will be as reliable as the previous ones you’ve owned?

If we aren’t fully confident about which properties are relevant, we still might have some idea about **possibly** important features

We would then make sure that as many of these features are included in both sets of objects → we get “more and closer analogies”

(iii) Relevant disanalogies? If we find an important difference between the new object, A, and the analogues, B, C, D, ..., we clearly lessen the likelihood that A will share a further property with them.

Caution: occasionally, relevant differences can *strengthen* analogies

E.g., suppose a certain computer operating system is fairly resistant to viruses, etc., and a seriously reworked version of the operating system is later offered.

Because the system is very new, that would seem to count against its also being resistant to viruses, but if the new system were different by being specially designed to resist viruses, that difference might actually make one more confident about its ability to resist viruses.

In other cases, the very **diversity** of the examples having the properties can actually strengthen the analogical argument (by making it clearer that the differences are irrelevant)

(iv) **Strength of conclusion?** How guarded are we about the probability that the conclusion is true? The weaker the conclusion, the better support the premises provide—possibly, likely, probably, in all likelihood, almost certainly, the primary subject also has property X)

Summary of strengthening conditions:

- (1) The premises mention *more and closer* relevant analogies;
- (2) There are *fewer or less relevant disanalogies* between the analogues (B, C, D) and the primary subject, A;
- (3) The analogues are more *diverse*;
- (4) The conclusion is *weaker*.

e.g., Paley's argument from design as an analogical argument:

- (1) The world (especially including biological organisms) is structurally complex, in that many of the world's parts all work together for a common purpose.
 - (2) Things such as watches, computers, cars, houses, etc., are also structurally complex, in that their parts all work together for a common purpose.
 - (3) Things such as watches, computers, cars, houses, etc., are the products of intelligent design.
- ∴ (4) The world probably also is the product of intelligent design.

Arguments from analogy and IBE's: "arguments from analogy are often—if not always—implicit and incomplete inferences to the best explanation" (266)

Why? For similarities or differences to make it more likely that the primary subject also resembles the analogues in a further feature, the similarities and differences must provide the best explanation of why the analogues have, or don't have, the further feature

The implicit IBE can go:

- (i) From shared properties to inferred property: We judge whether these features are relevant by judging whether the best explanation of why the analogues share P, Q, R, ... is that they also have property X

Since the primary subject, A, also has P, Q, R,... we conclude that A also has X

13

Reworking the analogical argument pattern:

- (1) Object A has properties P, Q, R, ...
- (2) Objects B, C, D,... also have properties P, Q, R, ...
- (3) Objects B, C, D,... have property X.
- (3a) Having X is the best explanation of why an object has properties P, Q, R, ...

- ∴ (4) Object A probably also has property X

The sacrificial knife example (from p263): The best explanation of why these various knives have a certain shape, size, material composition, markings is that they are used in sacrifices (property X)

- (ii) From inferred property to shared properties: Analogical arguments can also depend on the shared properties being the best explanation for the inferred property, X

- (1) Object A has properties P, Q, R, ...
- (2) Objects B, C, D,... also have properties P, Q, R, ...
- (3) Objects B, C, D,... have property X.
- (3a) Having P, Q, R, ... is the best explanation of why an object has property X

- ∴ (4) Object A probably also has property X

14

We may observe a very great [similarity] between this earth which we inhabit and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve around the sun, as the earth does, although at different distances and in different periods. They all borrow their light from the sun, as the earth does. Several of them are known to revolve around their axis like the earth, and by that means must have a like succession of day and night. Some of them have moons that serve to give them light in the absence of the sun, as our moon does to us. They are all, in their motions, subject to the same law of gravitation, as the earth is. From all this similarity it is not unreasonable to think that those planets may, like our earth, be the habitation of various orders of living creatures. There is some probability in this conclusion from analogy.

(Reid, *Essays on the Intellectual Powers of Man*)

In other words, Reid implies that the best explanation of why earth is habitable (X) is that it revolves about the sun, on its axis, is heated by the sun, has a day and night, etc. So, probably, other planets with these properties will also be habitable



Whether we reason from shared properties to an inferred property or from the inferred property to shared properties, we can see arguments from analogy as incomplete IBE's

What makes them incomplete is not only that the explanation is not actually stated, but also that most arguments from analogy are stated prior to having a clear explanation

This means:

- (i) Arguments from analogy are useful where we don't know enough to have a good theory; but also
- (ii) Analogical arguments are more easily refuted, since it is more likely that the resemblances are accidental; and finally,
- (iii) Arguments from analogy are strongest when built around strong IBE's

Exercises:

Exercise II (264) (1, 2, 4 - 8)

Exercise III (265) 7 - 12

Exercise IV (271) 1 - 3

Exercise V (272) 4, 6, 7, 8