

Explanatory Simplicity – Notes

Bob Clarke - March 2024

'... the human understanding is like a false mirror, which, receiving rays irregularly, distorts and discolors the nature of things by mingling its own nature with it'. Francis Bacon, Novum Organum (1620), from Aphorism 41.

'The human understanding is of its own nature prone to suppose the existence of more order and regularity in the world than it finds'. Francis Bacon, Novum Organum (1620), from Aphorism 45.

Introduction: We really do like simple explanations! We will examine how our desire for simplicity colours and biases our thinking, both in our everyday lives and, philosophically, in fundamental metaphysics. We will start by placing our penchant for simple explanation within the broader context of our wider *Human Structures of Understanding*. We will then examine how our desire for simplicity arises and trace how *Principles of Parsimony* have guided both Philosophy and Science, encouraging arguments to the effect that The World is, at base, simple. We will finally examine the evidence for and against this proposition.

Simplicity vs. Complication & Complexity: two concepts that oppose simplicity. For 'Complexity' see e.g. Holland, *'Complexity a Very Short Introduction'* (2014), Nicolis & Prigogine, *'Exploring Complexity'* (1989), Miller & Page, *'Complex Adaptive Systems'* (2005).

Human Understanding: Understanding can be seen as a pragmatic form of *pattern-recognition* in which *salient* features of a situation are accounted for, but, *equally importantly*, in which other features of one's situation are *ignored, forgotten* or are deemed to be *unimportant* or *negligible*. Understandings are selective. Understandings simplify!

Manifestations of Simplicity in our Thinking: (1) *Sound-Bite Culture* in politics and advertising, (2) *Simple Binaries: Fight or Flight, Us & Them, Right & Wrong*, (Burkeman, *'The Death of Nuance'*, BBC Sounds, 2020-21), (3) *Principles of Parsimony* ...

Seven Principles of Parsimony - As expounded in catchphrases
See e.g. Feuer (1957), Kaye (2003), Carey (2010), Sober (2015).

Natural Principles

Principles that tell us about Nature

- 1. Nature is Simple:** *Natura simplex est. Aristotle*, ca. 350 BCE (NB. He said it in Greek!). Arguably, previously promoted by the '**Presocratics**' - early Greek philosophers who predated Socrates, also Johannes Kepler, ca 1605 and Robert Boyle & Isaac Newton in the later 17th C.
- 2. Nature does Nothing in Vain:** *Natura nihil fit in frustra:* i.e. Nature does not waste its efforts on purposeless creations: **Aristotle**, ca. 350 BCE. In the later Middle Ages this was adopted by philosophers of the university schools – the '**Scholastics**', also Robert Hooke & Isaac Newton.

Methodological Principles

If Nature is simple then our Theories of Nature should be simple.

Frugality of Posited Principles: e.g. **Laws of Nature, Types and Categories** - '**Occam's Razor**':

- 3. Plurality is not to be posited without necessity:** '*Pluralitas non est ponenda sine necessitate*': **William of Ockham**, 14th CE, also Newton, Robert Boyle & Robert Hooke.
- 4. It is pointless to do with more what can be done with fewer:** '*Frustra fit per plura, quod potest fieri per pauciora*': **William of Ockham**, 14th CE, also Newton, Boyle & Hooke.

Frugality of Posited Entities in our theories - '**Quantitative Parsimony**':

- 5. Entities are not to be multiplied without necessity:** *Entia non sunt multiplicanda praeter necessitatem*: John Ponce (or Punch) of Cork (ca. 1640 CE) – but *erroneously* called '**Occam's Razor**'.

Common Origin Inferences (COIs):

- 6. Like Effects Imply Like Causes:** Nicolas Copernicus, Kepler, Hooke, Newton.

Comprehensiveness of Theories:

- 7. The Most Comprehensive Theory is to be Preferred:** Hooke, Popper.

'**Occam's Razor**' is embodied in Principles {3} & {4} and **not** in Principle {5}, which was **not** formulated by Occam - see William Thorburn, *'The Myth of Occam's Razor'* (1918). The distinction between frugality of posited *Principles* (e.g. *Types*) and frugality of posited *Entities* (i.e. *Tokens*) is important. Thus, *Occam's Razor* ({3} & {4}) motivates: (i) The '*Many Worlds*' Interpretation of Quantum Mechanics (see Gribbin 1984), (ii) The '*Multiverse*' in Cosmology (see Crease, 2019) and (iii) The '*Possible Worlds*' of the '*Modal Realism*' of David Kellogg Lewis (1941-2001) in Philosophy (see Lewis, 1986 & Divers, 2002). They are justified on the basis

that they are frugal in their use of *Principles* - but they are *profligate* with *Entities* (contra-{5}) giving rise to *potential infinities* of Worlds! *Occam's Razor* more generally motivates *Monism* in metaphysics - leading to *Materialism* at one extreme and *Idealism* at the other. It has arguably been very valuable in Physics but has misled Biological and Ecological thought, as both require a full appreciation of complexity.

William of Ockham (1287-1347) (Latin: '**Occam**') did not invent '*Occam's Razor*', he followed up the thinking of his 'Master' Duns Scotus, see Tweedale (1999), but he used it consistently & so it came to be named after him. He used his 'razor' to simplify both theological & philosophical positions – e.g., Aristotle's philosophy recognised ten categories: *Substance, Quantity, Quality, Relation, Place, Time, Position, State, Action and Affection*, Occam '*shaved*' them down to three: *Substance, Quality and Relation*.

Why are we attracted to Parsimony? For **Logical, Aesthetic** or **Heuristic** reasons? *Occam's Razor* itself (i.e. Principles {3} & {4}) has been assimilated with Bayesianism, see MacKay (2003), Laumann (2018), Sober (2015). But all of our Principles of Parsimony could be grounded if we knew that Nature itself really was simple at root – i.e. if Principles {1} and {2} were valid. *But are they?*

Is the World Basically Simple? Today many fundamental physicists argue that the basic 'Laws' and building blocks of the Universe are 'simple' because they exhibit a high degree of **symmetry** - see e.g. Turok (2015). Other fundamental physicists appear to disagree, see, e.g., references to Smolin, Laughlin & Hossenfelder. **See especially Wood & Sherman (2022)**. See also Barrow (2004).

Can Complexity arise from Simplicity? An argument to that effect from the generation of *Fractals* (also from *Cellular Automata*) is vulnerable to the objection that that simplicity is itself generated from complexity – that of *Life on Earth!*

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The Foundational Questions