The Engineering Worldview and the Philosophy of Engineering

I will argue that the Engineering Worldview and Philosophy of Engineering represent the long sought after post-scientific, post-objectivist framework. They constitute the More General Framework subsuming the successes of traditional science as inherently limited special cases. The modern evidence requiring a post-scientific understanding of nature and our place in it arose with ‘the new physics’ at the beginning of the 20th century. The failure of the interface of the highly successful Newtonian and Maxwellian Research Programs forced the embrace of complementarity – a new, scientifically enigmatic, post-objectivist situation. Complementarity entails that the Participant inquirer encounters a reality that is not governed by one universal, objective order that uniquely determines the course of events. Complementarity entails that the future is mechanically under-determined. The emergence of the actual future involves a choice. That choice by its very nature can have no objective mechanical determinant or traditional scientific explanation. The choice is by its very nature scientifically incoherent – scientifically arbitrary. However – in the framework of the Philosophy of Engineering – the choice is the understandable as the embodied ability of the engineer to problem solve – to attempt to bring about a more desirable (viz better) future.

The Engineering Worldview is found through a reflection on the limits of the Scientific Worldview, and the correct, self-referentially coherent Philosophy of Engineering is found through a reflection on the limits of Philosophy of Science.

Henry Petroski has recently argued¹ along the same lines that all real inquiry – often misrepresented as classically logico-mathematically scientific – is better understood as part of the overall creative, experimental, exploratory engineering problem solving.

The inadequacies of the standard Logical Positivist Philosophy of Science were pointed out by Thomas Kuhn,² Sir Karl Popper,³ Paul Feyerabend⁴ and Imre Lakatos⁵ – among others. Many of these difficulties stem from the failure to take into account the broader, more fundamental, real world context of the History and Philosophy of Engineering.
American Pragmatist John Dewey\(^6\) differentiates the competing scientific and engineering representations of inquiry by characterizing them correspondingly in terms of the Spectator and the Participant frameworks.

In the Spectator representation inquiry is intent on discovering the objective nature of reality. Advances in knowledge progressively converge to the final Theory of Everything\(^7\) – a complete and consistent correspondence of Theory with objective reality.

In order for Spectator inquiry to converge to reality, the nature of reality must remain constant. If the nature of reality were changing, perhaps randomly, convergence would be impossible. The Spectator representation tacitly assumes that the nature of reality, the order governing all the phenomena of the universe, must be invariant over time.

The Spectator representation also entails that our activity as inquirers doesn’t alter the nature of reality. If our activity as inquirers causally alters the nature of reality then the possibility of convergence is lost.

The Participant representation of inquiry, which I identify with Engineering Philosophy, immediately accepts that the activity of inquiry causally alters the structure, the operation, and, indeed, the very nature of reality (viz. ‘nature of reality’ in the Spectator’s scientific sense). The Spectator’s representation of inquiry as a convergence to a fixed nature of reality is rejected.

Engineers naturally imagine that their problem solving activities alter the course of events and progressively re-organize the way the universe works. The Philosophy of Engineering and the Engineering Worldview are Participant representations and so presuppose that the universe develops, and must have an emergent history. The proponents of the Scientific Worldview have recognized that their defining symmetry presuppositions entail a Steady State Model of Reality.\(^8\) However, modern cosmology now accepts the Big Bang Model entailing a beginning – incompatible with the symmetry
of time-space invariance. Cosmological as well as biological evidence supports an emergence through a series of symmetry-breaking events. Subsequent states are always, to some irreducible extent, unpredictable by their very nature, under-determined by the order of the prior state.

Whereas it is unclear whether the Spectator representation and the Scientific Research Program can ever make sense the Big Bang Model, the Engineering Worldview naturally expects the evidence for a progressive, emergent history of the cosmos.

Herbert Simon argues that ‘engineering activity is problem solving’ and that problem solving is ‘attempting to move from a current state to a more desirable future state’. The ‘solution’ is never derivable, predictable or completely determined from any prior ‘problem’ state. Engineering presupposes that the engineer finds himself ‘enabled’ in a situation with potential alternative futures. Problem-states are more accurately characterized as opportunity-states – enabling alternative futures. What is better (viz. actually more desirable) must be explored and discovered because the better solution is not derivable from the description of the prior state.

What I refer to as Carnot’s Epiphany (viz. the Engineering Worldview) is that we are all engineers in a world of engineering. John Dewey referred to the evolutionary engineering process as ‘the construction of the good’.

References


