

A Holistic Education for the 21st Century Engineer Based on Wisdom and Multiplexity



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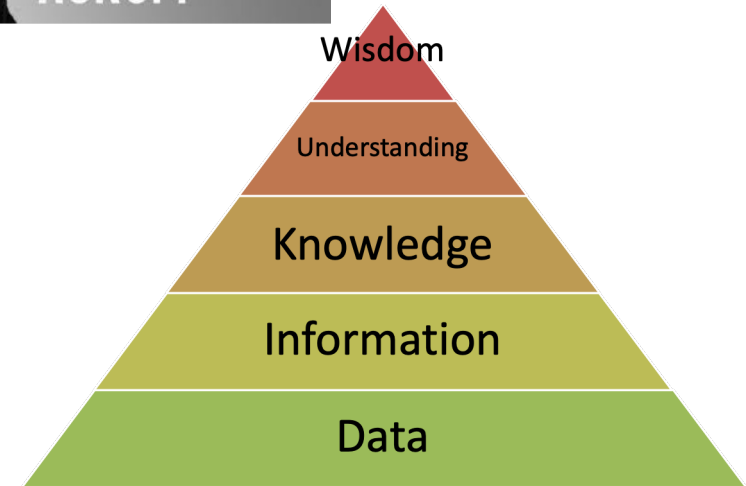
Using technology with wisdom

"We are now far too clever to be able to survive without wisdom."—E. F. Schumacher.

*An ounce of information is worth a pound of data.
An ounce of knowledge is worth a pound of information.
An ounce of understanding is worth a pound of knowledge.
An ounce of wisdom is worth a pound of understanding.*

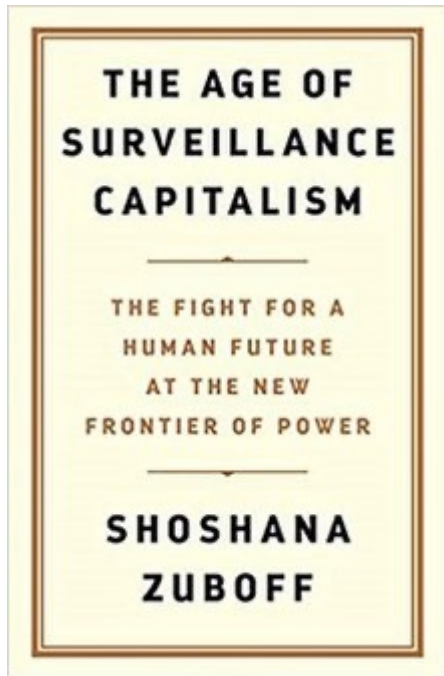


***But.. what is
wisdom?***



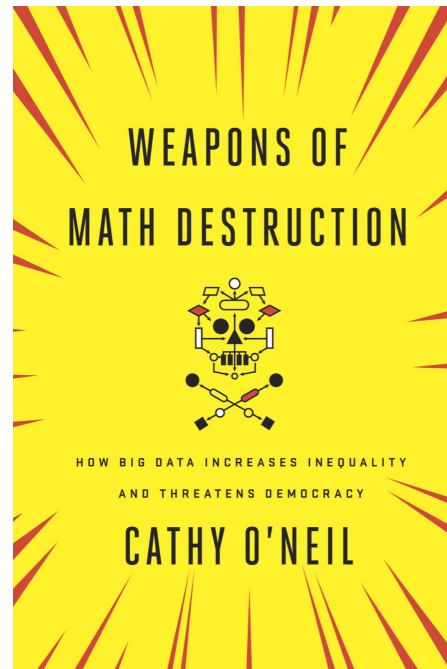
What happens when we ignore wisdom

SCIENCE BECOMES A TOOL FOR POWER AND MANIPULATION



IATROGENICS

*The Wounds that
the Healer Gave*

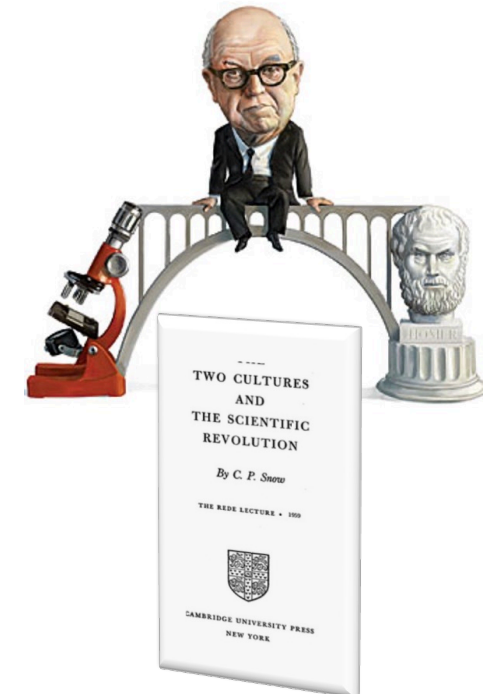


KING MIDAS EFFECT

*The importance of
objective and purpose*



CHASM BETWEEN SCIENCE & HUMANITIES



What is wisdom?

“Knowledge hard fought for, and then used for good”—Peterson & Seligman

BIG PICTURE THINKING

- Systems Thinking
- Synthesize and integrate different models
- Seeing the forest for the trees

BALANCED THINKING

- Finding the Right Balance Between Extremes and Dichotomies
- Managing and dissolving tradeoffs

CRITICAL THINKING

- Knowing the context
- Knowing the pitfalls of rules/model/methods
- Knowing that there is no silver bullet

PURPOSEFUL (SPIRITUAL) THINKING

- Knowing which ends/objectives/ purpose to pursue and prioritize
- Know thyself!

PRACTICING VIRTUE

- Transcending Egocentrism
- Striving towards common good

TRUTH-DIRECTED THINKING

- Knowing the use and limits of reductionism
- Trying to understand reality as it is

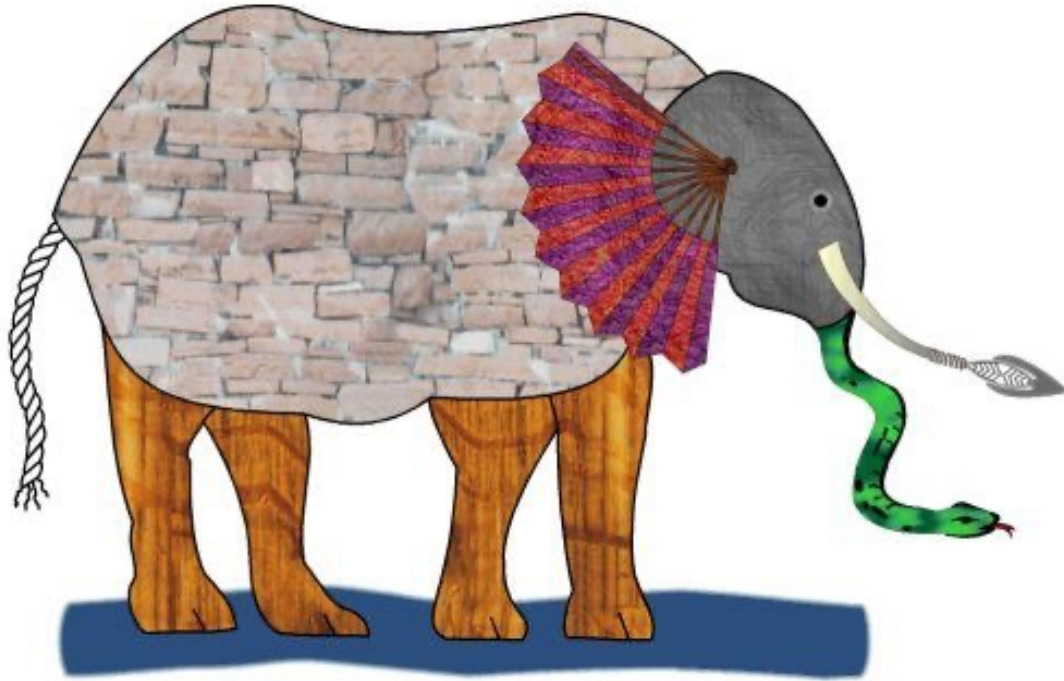
MULTI-MODEL THINKING

- Hanging experience on a lattice of mental models
- Synthesize and integrate different models
- Being Multi/transdisciplinary

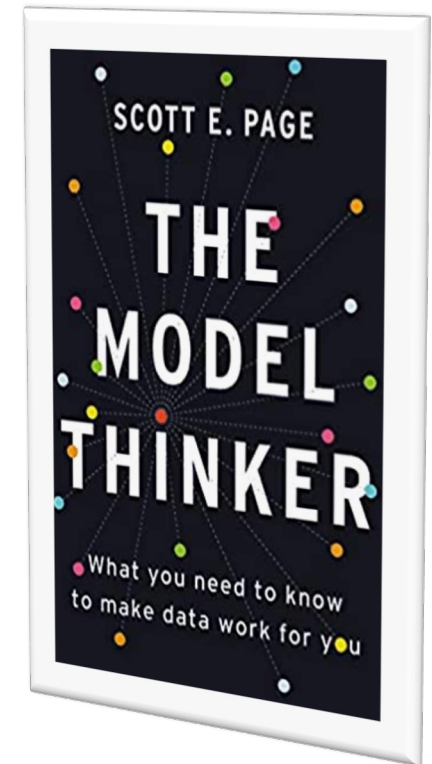
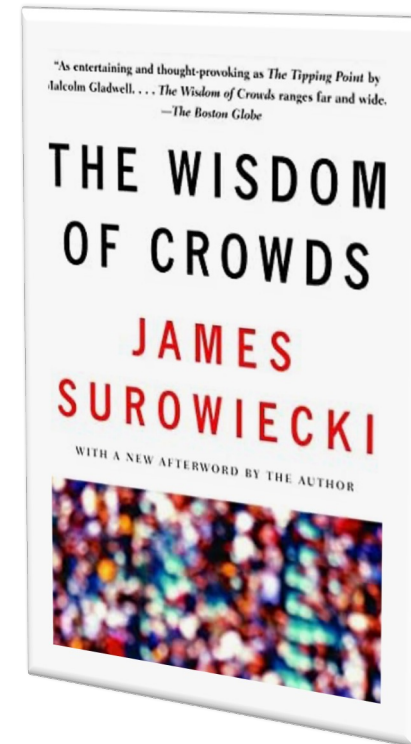
MULTI-LEVEL THINKING

- Knowing reality is multi-layered and complex.
- Knowing and applying the right rule/model for the task

Argument for Multi-Model Thinking



*The Elephant and the
6 Blind Men*

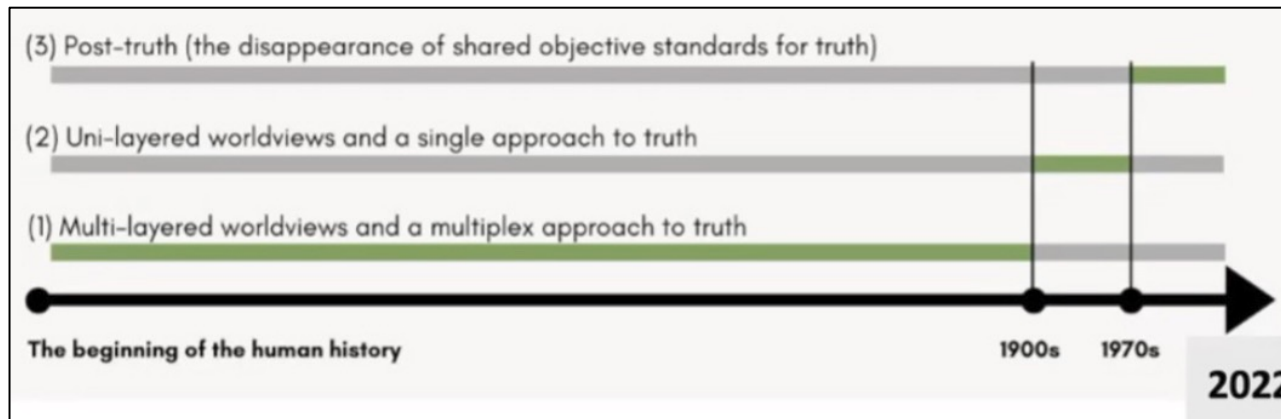


Argument for Multi-Layered Thinking

Multiplexity is a translation of the Arabic term “marātib”, which literally means hierarchy or levels.

Multiplexity provides a multi-layered understanding of reality, knowledge, and truth.

This provides an alternative to the currently dominant Eurocentric post-Enlightenment uniplex scientific paradigm.

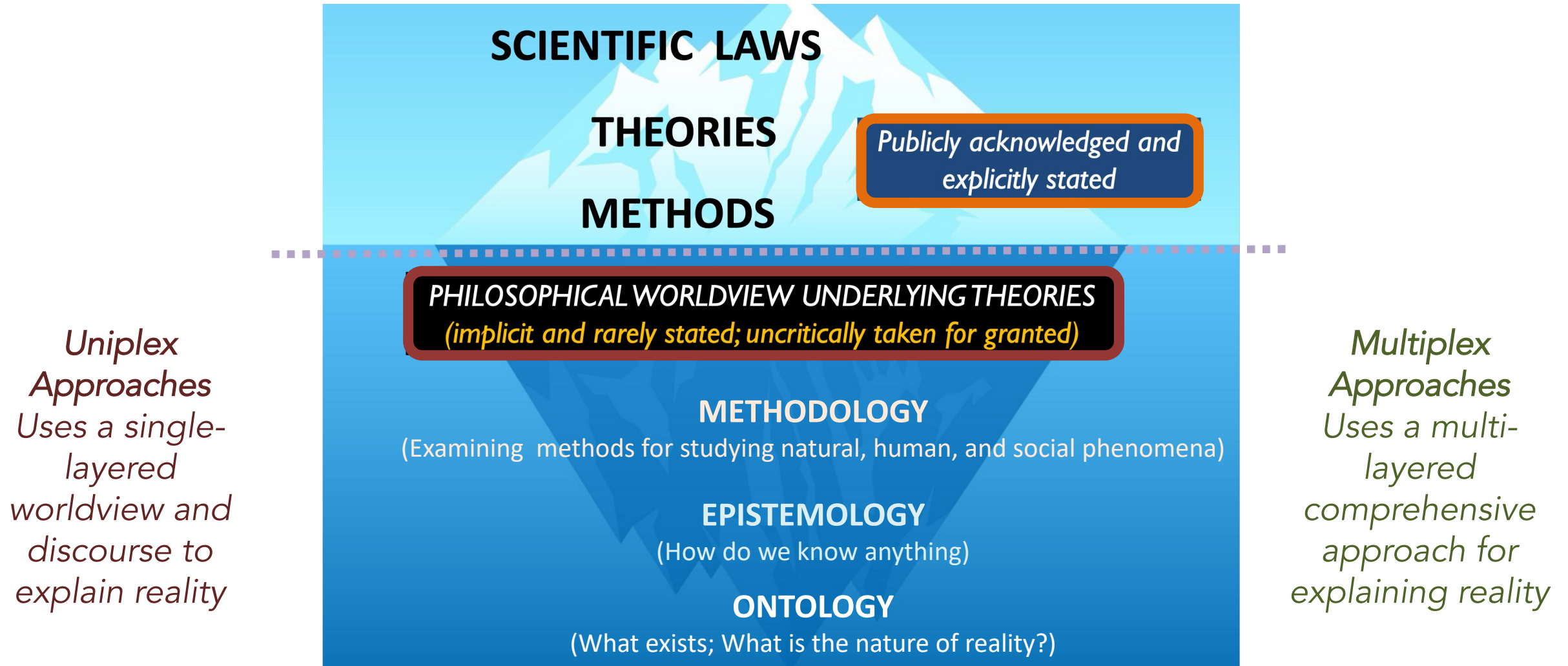


■ Prevalent
■ Obsolete

(1) Classical period
(2) Modern period
(3) Postmodern period

Şentürk, Recep et al.
Comparative theories and methods between uniplexity and multiplexity, 2020.

Philosophical Worldviews Underlying Science



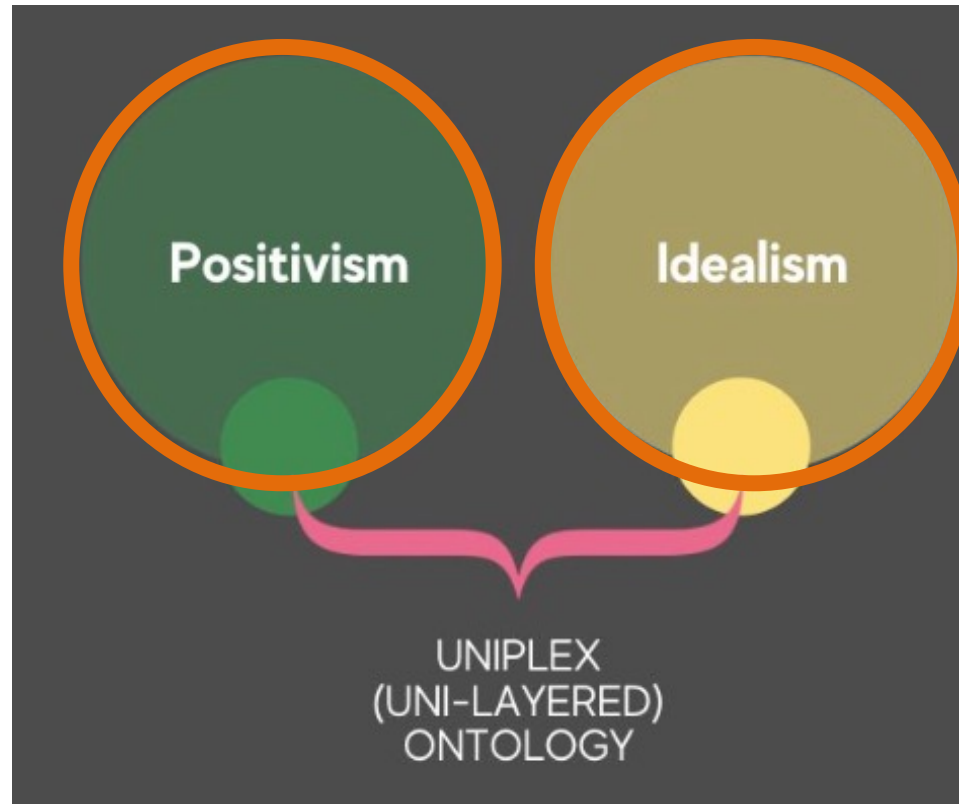
Uniplexity (Reductive Uni-Layered Frameworks)

All that exists consists solely of matter, and that what we perceive through our senses is all of reality.

Reality is *objective*, *mind-independent*, and is explained through *causal relations*. Reality is "out there".

Reasoning, on the other hand, is dependent on empirical knowledge.

Social reality does not depend on culture or time, it is *universal*, and it waits 'out there' to be discovered independent of human subjectivity.



The ultimate nature of reality is immaterial and mental. It is the forms of things (ideas) that are real, not the matter itself.

Reality is ontologically *subjective*, *mind-dependent*, or *mentally constructed*.

Since our senses frequently mislead us, *reality should be known through our reason through interpretive* rather than causal relations.

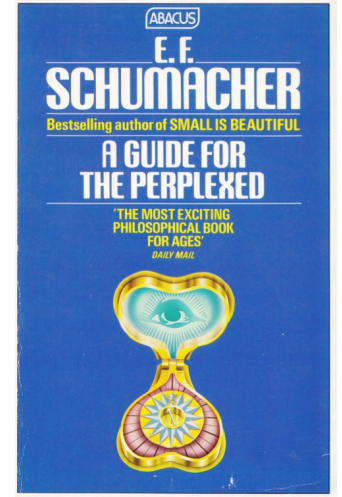
Social reality depends on culture as well as time, it is not *universal*, and it cannot be discovered independent of human subjectivity.

Reductionism: Hacking away aspects of reality

Procrustean Fallacy:
Stretching or Constricting
Reality to Fit the Model



“On a visit to Leningrad some years ago I consulted a map to find out where I was, but I could not make it out. I could see several enormous churches, yet there was no trace of them on my map. When finally an interpreter came to help me, he said: 'We don't show churches on our maps.' Contradicting him, I pointed to one that was very clearly marked. 'This is a museum,' he said, 'not what we call a "living church". It is only the "living churches" we don't show.'”—E. F. Schumacher



Positivist Methodology

(Example Uniplex Methodology)

Acceptable Reductionism: points of entry into otherwise impenetrably complex systems.

The problem arises when we think of it as all of reality

Scientism/ Dataism

The unobservables are often more important, fundamental, and cannot be ignored just because they cannot be observed

Correlations

"Big Data"

Mathematical/ Statistical Models

Extrinsic Rewards

Causes

Contrafactuals

Reality

Purposes

Values

Intentions

Virtue

*multiplex
ontology*

LEVELS OF EXISTENCE
(MARATIB AL-WUJUD)



*multiplex
epistemology*

LEVELS OF KNOWLEDGE
(MARATIB AL-'ULUM)



*multiplex
methodology*

LEVELS OF METHODS
(MARATIB AL-USUL)



OBJECTIVE SOURCES OF KNOWLEDGE	SUBJECTIVE SOURCES OF KNOWLEDGE
Revelation <i>al-khabar al-sadiq</i>	· Intuition (<i>hads</i>)
Reason <i>al-aql</i>	· Dreams (<i>ru'ya</i>)
Sense perception <i>al-harwass al-salîma</i>	· Inspiration (<i>ilham</i>)
	· Opening of the heart's eye (<i>kashf</i>)

- **Pure reasoning** based on rational & empirical methods
- **Religious reasoning** based on rational and empirical methods & interpretation of revealed texts
- **Purification of the self** (*tasfiya*)

HOLISTIC, INTEGRATED, APPROPRIATE

ESCHEWS REDUCTIONISM, IDEALISM, RELATIVISM

MULTI-CULTURAL AND NOT JUST EUROCENTRIC

Summary

Engineering education can benefit from wisdom and multiplexity.

How to put this into practice is an open question.

Reality is multi-level and complex. Complexity requires wisdom.

Problems considered in engineering schools are often simplified problems whose complexity has been sterilized.

Role of Reductionism. *Reductionism is useful as a way to understand complexity but it should not be used to hack away complexity and reality. Importance of Holism.*

Integrating. Combining sciences and humanities.

Humanities are where wisdom is most likely to be taught.

Wisdom is not only theoretical.

Phronesis and virtue-based ethics in engineering education.

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