# What is real about operational research?

## Sean Manzi

Associate research fellow

PenCHORD

# What is OR?



…is the use of advanced analytical techniques to improve decision making.

Employing techniques from other mathematical sciences…operations research arrives at optimal or near-optimal solutions to complex decision-making problems.

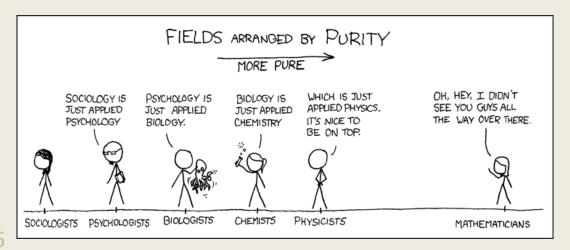# Why consider a philosophy of science for OR?

- **Is OR a science or a technology?**
  - OR has its origins in military application and aviation
  - Decision making
  - Evidence based decision making
  - Rigor
  - What is more rigorous than science?

# Why consider a philosophy of science for OR?

- **Is OR a science or a technology?**
  - Traditionally and today viewed as a science
  - Hindrichs (1953) states that while the accuracy and approach of OR is closer to that of the social sciences it is still none the less a science
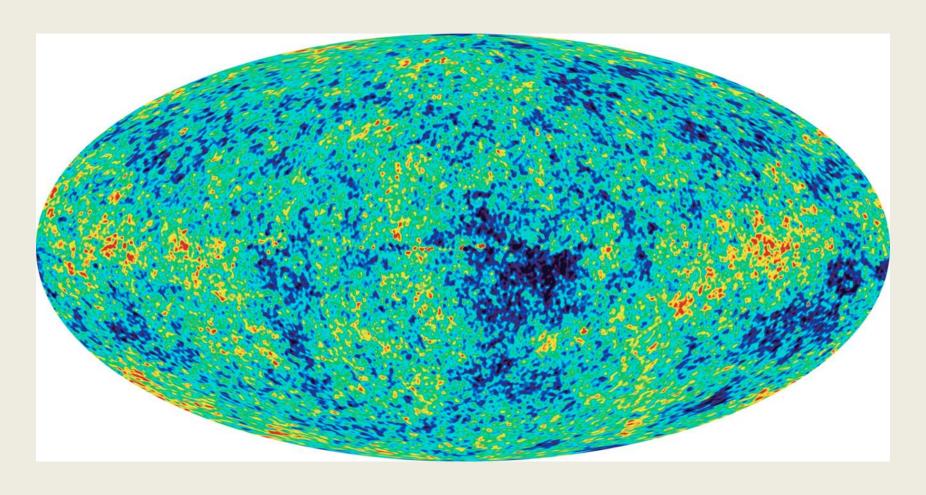
# Why consider a philosophy of science for OR?

- **Is OR a science or a technology?**

  Miser (1991) argues for OR as a science and says:

  "In sum, OR is… an enterprise that has now built the foundations for a glorious future provided it finds itself guided and inspired by a realistic but visionary philosophy"

  *"The challenge to the OR community is to join in fleshing out a philosophy…"*

# What is the importance of a philosophy of science?

http://apod.nasa.gov/apod/image/0302/sky_wmap_big.jpg

# Do we really need philosophies of science?



Why

How

What

Why

How

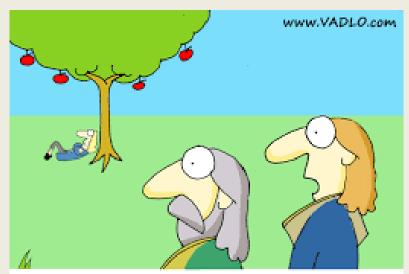What

http://www.hindustantimes.com/Images/popup/2014/3/traffic2.jpg

# How do you decide on a philosophy of science?

- More about understanding why you have chosen it

- Logical argument

- Consensus

- Belief



www.VADLO.com

"Reviewers have asked him to reproduce the experiment."

# Do we neglect our philosophy?

- Have you ever decided which methods or research design you will use to study something before determining the research question?

- Do you consider whether a research question is within the bounds of your underpinning philosophy of science at the start of a project?

# Has philosophy of science been neglected in OR?

- Limited literature
- Some consideration
- No consensus

# What would be a suitable philosophy for OR?

- Temperate rationalism?? (Miser, 1991)
  - A philosophy constructed by Newton-Smith (1981)
  - In 1988 Newton-Smith argues for a new kind of realism – modest realism
  - The rationale for temperate rationalism is that is accounts for subjective reality

# What would be a suitable philosophy for OR?

- Realism

    *"...operations research provides a golden opportunity for philosophy to gear itself to the day-to-day decision making process..."*

    *"more humanly significant results than is possible on the basis of a limited concept of efficiency"* (Hindrichs, 1953)

    - The impact of context on the action of mechanism and the resulting outcome in human contrived systems

# What is Realism?

- Embraces two different yet inter-related types of knowledge.
- That which would exist without the presence of a human observer - Intrasitive knowledge
- That which can only exist with the presence of a human observer - Transitive Knowledge
- Allows for the development of generalisable theory based on both types of knowledge.
- Imitates aspects of preconscious free will

# What other philosophies could we use?

- There are hundreds of philosophical schools and 'sub-schools' of thought.

Antireductionism

Existentialism

Deism

Critical realism

Positivism

Confucianism

Empiricism

Idealism

Pragmatism

Social constructivism

Pythagoreanism

Realism

Post-positivism

# Limitations of realism and other approaches

- Realism
  - Not seen as a sufficiently rigorous approach by some sciences.
  - Lacks generalisability with too much focus on context
- Pragmatism
  - Provides a basis for the investigation of both the objective and subjective aspects of human behaviour and experience.
  - Does not allow for the development of theory that is generalisable beyond the space and time in which it takes place.

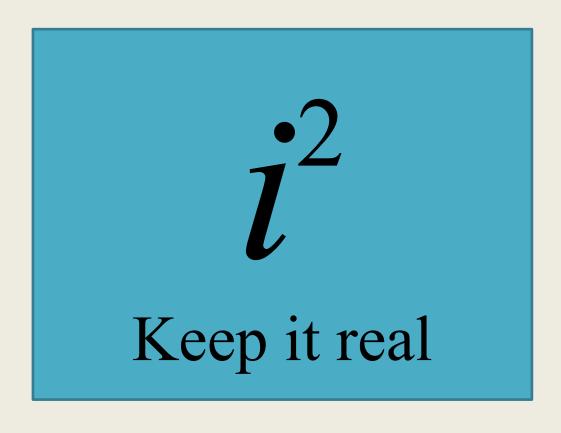# Limitations of realism and other approaches

- Post-positivism
  - A rigorous method by which to investigate social phenomena
  - Potential dilution of the human experience it is trying to capture.
- Social constructivism
  - Provides a detailed insight into the experience of the individual
  - Does not allow for the robust testing of the similarities between individuals

# How a realist OR can work in practice

- Human contrived systems not naturally occurring systems

- The properties of the system are the result of the initial conditions

- Enabling the understanding of 'why'

- Integration of objective measurement and subjective experience to answer these questions

# Is this not what we are already doing?

- Perhaps without realising it
- Minimal discussion or consensus
- A more pragmatic approach seems to be used in the most applied fields
- A post-positivist approach in the more scientific areas
- Realism as a middle ground? A truly scientific approach to studying applied problems to support decision making

Thank you for listening and joining the discussion

Any questions or further discussion points are welcome

# References and related reading

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- *Also see the reference list for the paper titled 'Opening the black box: Combining agent based simulation and realism in intervention development'*