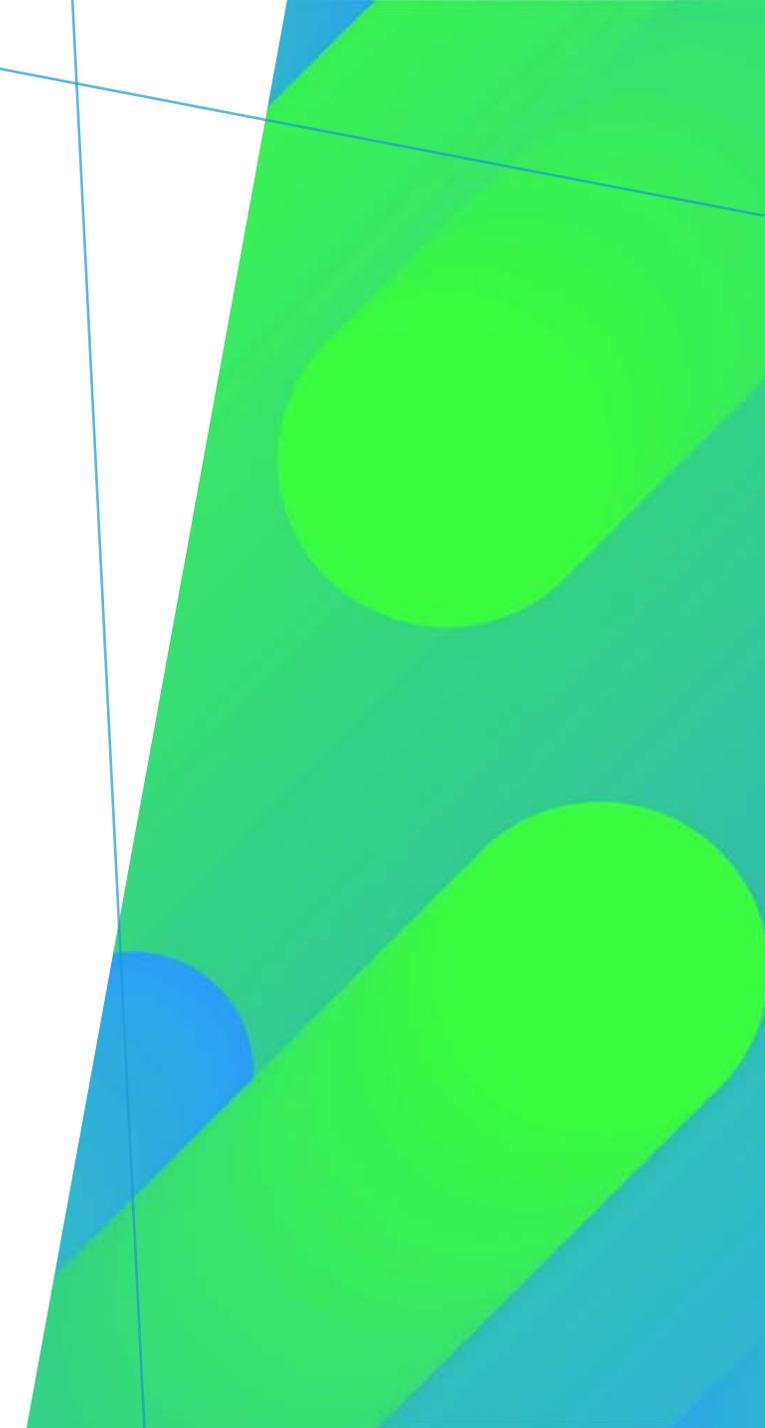


DR. USHA SISTA, MONDAY, APRIL 18, 2022

*PHILOSOPHY OF  
SCIENCE  
DEMYSTIFIED AND  
DESANCTIFIED*



# MOUTON'S 'THREE WORLDS' MODEL

Mouton's 1996 text, *Understanding Social Research*, offers a helpful starting point in the form of a 'three worlds' model of human inquiry.

The model distinguishes between the different rules, practices, role expectations, and sets of skills and competencies associated with three different realms of knowledge production.

Each of the three realms comprises

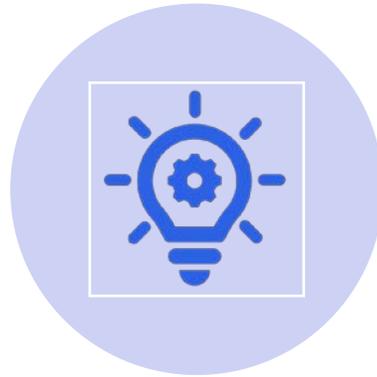
- a unique form of knowledge and
- a corresponding epistemic interest, i.e., a purpose, goal, or function of knowledge creation.

# *WORLD 1: EVERYDAY LIFE AND LAY KNOWLEDGE*

Peoples' routine engagements with learning, experience, and self-reflection contribute to stocks of problem-solving knowledge directed at coping with daily tasks and challenges (p. 8).

World 1 consists of the objects of everyday life: individual human beings; groups; social practices; institutions; and the elements of our physical surroundings — in other words, the 'stuff' we typically consider to make up reality (p. 10).

# *WORLD 2: SCIENCE AND TRUTH*



HERE, THE PHENOMENA OF WORLD 1 (I.E., EVERYDAY LIFE) ARE TRANSFORMED INTO OBJECTS FOR SYSTEMATIC AND RIGOROUS STUDY, I.E., INTO SCIENTIFIC OBJECTS OF INVESTIGATION (PP. 8–9).



THE MOTIVATING EPISTEMIC INTEREST HERE IS THE DESIRE TO PRODUCE A TRUTHFUL UNDERSTANDING OF THE OPERATIONS OF THE NATURAL AND SOCIAL WORLDS (PP. 8–9).



WORLD 2 COMPRISES: THE ACADEMIC DISCIPLINES OF THE SOCIAL, HUMAN, AND NATURAL SCIENCES (CRIMINOLOGY, PSYCHOLOGY, SOCIOLOGY, ETC.); DIFFERENT METHODS FOR INVESTIGATION (E.G., QUALITATIVE VERSUS QUANTITATIVE TECHNIQUES); SCIENTIFIC HYPOTHESES, MODELS, AND THEORIES; AND ALL THE OBJECTS OF WORLD 1 (P. 10).

*WORLD 3: PHILOSOPHY  
OF SCIENCE  
(METASCIENCE) AND  
CRITICAL/REFLECTIVE  
INQUIRY*



HERE, THE PHENOMENA OF WORLD 2 (I.E., SCIENCE) ARE EXPLICITLY TRANSFORMED INTO OBJECTS OF REFLECTIVE INQUIRY DRIVEN BY A CRITICAL INTEREST, I.E., BY “[THE] AIM TO CRITICISE, DISSECT, DECONSTRUCT OR ANALYSE WHAT SCIENTISTS DO TOWARD THE ULTIMATE IMPROVEMENT OF SCIENCE [ITSELF]” (P. 9).



WORLD 3 CONTAINS: ACADEMIC DISCIPLINES LIKE THE PHILOSOPHY OF SCIENCE, THE SOCIOLOGY OF KNOWLEDGE, AND THE HISTORY OF SCIENCE; DIVERSE METHODOLOGIES BROADLY GUIDING SCIENTIFIC INQUIRY (E.G., POSITIVISM VERSUS INTERPRETIVISM VERSUS CRITICAL REALISM); AND ALL THE OBJECTS OF WORLD 2 (P. 10).

# *SUMMARY*

- How can Jane Doe successfully apply for a new job? → World 1 (coping with everyday problems)
- How can scientists demonstrate a new medication is safe enough for human consumption? → World 2 (empirical scientific study)
- How can scientists or philosophers make sense of what science and scientists as a whole do or should do? → World 3 (investigation into science as such).



# MEANING, PRACTICE, AND PURPOSE OF 'SCIENCE'



The philosophy of science is concerned with the very *definition* of 'science'— with what science is, what scientists should try to accomplish, and how science operates both in theory and in practice.



In other words, the philosophy of science — the study of science as such — seeks to:

**Establish which problems (puzzles, questions, etc.) scientists can legitimately treat as *scientific* problems**

**Establish which forms of reasoning, concepts, and methodological instruments scientists can legitimately use to investigate such problems.**



When we're talking about the *results of a particular study*, we're in the realm of science.



When we're talking about the *general parameters according to which the results of any scientific study* (or, indeed, the theories that a study uses) *can be judged* as either accurate and defensible or flawed and unjustifiable, we're in the realm of metascience.

*ONTOLOGY AND  
EPISTEMOLOGY:  
THE TWO  
FOUNDATIONS OF  
METASCIENCE*

- First, here are a couple of simple descriptions:
  - ‘Ontology’ is the study of what exists; it’s concerned with ‘stuff’.
  - ‘Epistemology’ is the study of what (and how) we can know about what exists; it’s concerned with the production and limits of human knowledge.

# ONTOLOGY



Ontological theories try to offer ways of analyzing that which *is* (that which exists), the nature of (different forms of) *reality*, and the kinds and numbers of *relations* that persist between extant entities.



Ontology asks:

*What is reality made of? How is reality structured?*

*What sorts of things can scientists investigate?*

*What types of associations exist amongst and between objects?*



Whenever a scientist or philosopher expresses judgments about the nature of a thing to be explained, they're engaged in ontological examination.

# EPISTEMOLOGY



## Epistemology asks:

What is knowledge? How, if at all, is knowledge different from mere information and/or from understanding/comprehension?

Are there differences between efforts to produce explanations of causal mechanisms on the one hand and interpretive understanding of meaning on the other? If so, what are these differences?

How can scientists employ techniques — modes of logic, methodological instruments — in order to effectively come to know something?



**Whenever a scientist or philosopher endeavours to outline or assess the procedures through which some object or process can become known, they're involved in an epistemological pursuit.**

# IMPORTANCE OF ONTOLOGY

Although they're not always overtly framed as such, many scientific questions, debates, and puzzles are ultimately rooted in efforts to examine and to make sense of the nature of reality and of the objects and processes within it.

In other words, **ontological problems rest at the heart of science.**

On one level, this is readily apparent.

After all, scientists are constantly trying to explain the 'stuff' they investigate:

- Physicists aim to uncover the nature of matter.
- Neuroscientists endeavour to explain how the brain works.
- Sociologists try to discover the structures and untangle the influence of social relations, social interaction, and elements of culture.

On a deeper level, science *isn't* just about designing and carrying out hyper-specialized, concrete empirical studies in an effort to 'build up' knowledge over time.

*STRATIFIED  
VERSUS  
'FLAT'  
MODELS OF  
REALITY*

A 'flat' ontology

A 'depth' or  
'stratified' ontology.

# A FLAT ONTOLOGY

- Is the defining ontology of mainstream science
  - Suggests all of reality exists on one main 'level'
  - Treats what can be measured as equivalent to both what exists and what is scientific.
- Within a flat ontology, different dimensions of reality are recognized, but, ultimately, everything is understood to exist on the same 'plane'.
  - The most common way in which scientists (implicitly) advocate for a flat ontology is by insisting that what exists is synonymous with what can be measured.
  - If something can't be measured, it isn't real; and it isn't real because it can't be transformed into an object of scientific investigation, which produces scientific knowledge.
  - On this view, there is nothing beyond the empirical world with which science is rightly concerned; 'metaphysical' discussions of unobservable entities or processes simply don't belong in science (Keat and Urry, 1975, p. 82).

# EMPIRICISM

Empiricism, which is not the same thing as 'empirical', is the notion that:

- “[A]nything worth knowing...must be apprehendable to our senses” (Rigakos and Frauley, 2011, p. 243)
- “[S]ense-perception exhausts the possible objects of knowledge” (Bhaskar, 1986, p. 230).

The problem with empiricism, however, is that acceptance of a flat ontology necessarily leads to incomplete and fractured scientific investigation and analysis:

- “[T]hat which is in fact real is greater than what human beings might be able to directly experience, including processes that have a hand in the emergence of actually existing things. Criminologists, for example, frequently speak of ‘power relations’. These are not directly observable, but the effects of domination and subordination, wage inequality, preferential treatment, racism, and the like are experienced. We might suggest that these are embodied forms of relations of power.
- Analyzing the emergence of inequalities rather than the experience of inequalities themselves would take us beyond the realm of the empirical[.] ... This is important as the things that are of concern to...scientists are not necessarily captured, revealed, or exhausted by our experiences (including our observations)” (Rigakos and Frauley, 2011, p. 247).

# A STRATIFIED ONTOLOGY

- Is the defining ontology of critical realist science (i.e., a 'third way' of doing science that distinguishes itself from positivism and interpretivism)
  - Suggests reality exists across three analytically distinct 'levels'
  - Argues what exists goes well beyond what is observable or measurable.
- The critical realist depth ontology comprises 1) the *empirical* 2) the *actual* and 3) the *real*.
  - The 'empirical' is the realm of **experience** wherein we interact with our physical surroundings and other living beings.
  - The 'actual' is the domain of **realized potentiality**, i.e., the world in which all events occur, regardless of whether people witness such events.
  - The 'real' is the realm of **potentiality**; it's where 'mechanisms' — the 'powers' that cause objects to act or to be acted upon — exist ([Collier](#), 1994, p. 43; [Rigakos and Frauley](#), 2011, p. 249).



# *AN EXAMPLE*

- As a practical example, in a hockey game:
  - The empirical is where the referee observes Player A slash Player B, and the referee issues Player A a penalty — *the slash occurred and the ref experienced it.*
  - The actual is where Player A slashes Player B, but the referee doesn't see the slash and thus doesn't call a penalty — *the slash occurred, but the ref didn't experience it.*
  - The real is where Player A possesses the capacity (the power) to slash Player B, but this capacity hasn't been actualized yet — *a slash could occur but it hasn't yet and, obviously, the ref hasn't experienced it.*

# MYTH OF THE 'SCIENTIFIC METHOD'

*“What [many scientists] have done...is to embrace one [particular] philosophy of science[,] which they now suppose to be The Scientific Method. This model of research is largely an epistemological construction; within the social sciences, its most decisive result has been a sort of methodological inhibition. By this I mean that **the kinds of problems that will be taken up and the way in which they are formulated are quite severely limited by The Scientific Method.** ...*

*The Scientific Method that is projected [today] did not grow out of...what are generally and correctly taken to be the classic lines of social science work. ... Those in the grip of the methodological inhibition often refuse to say anything about modern society unless it has been [filtered] through the fine little mill of The Statistical Ritual. ... **Much of [science]...has become the mere following of a ritual...rather than...a ‘commitment to the hard demands of science.’**” (Mills, 1959, pp. 57, 71–72)*

## *THE PROBLEM*

There's only one true method in science — the Scientific Method.

If you want to carry out genuine scientific inquiry and if you want to design, execute, and publish legitimate scientific work, you have no choice but to use the Scientific Method.

The Scientific Method is what differentiates science from non-science.

If you don't use the Scientific Method — if you don't explicitly commit yourself to tests of 'falsification', 'replicability', and 'threats to internal and external validity' — your work will be pseudoscience at best and rubbish at worst.

## METHODS VS METHODOLOGIES

**Methods** are technical instruments and processes scientists use to design and practically carry out their studies; they include procedures such as participant observation, interviewing, and content analysis as well as tools like surveys and software used in the coding of qualitative data or the statistical analysis of quantitative data. Methods are one component of a methodology.

**Methodologies**, otherwise known as ‘metatheories’ and ‘research strategies’, are concerned with the “logic of implementing scientific methods in the study of reality” ([Mouton](#), 1988, p. 15). Methodologies each distinguish themselves on the basis of ontological assumptions, epistemological principles, modes of inference, use of concepts and theories, and status of the outcomes of research.

# IN CONCLUSION



The Scientific Method is nothing more than one philosophy on how scientists should conduct their work.



It's *not* an objective standard against which all forms of inquiry must be measured.



It's *not* what distinguishes 'real science' from pseudoscience.



And it's *not* a guarantee that research conducted in accordance with its principles and rules will be accurate, credible, or robust.