

# *The Scientific Method*

(PHYS 264)

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## Overview

What information can Science provide of the natural world, and how do we, scientists, go about investigating it?

This class will address all concepts pertaining to the scientific method: objective reality and approximate description of natural phenomena; the role of the observer; the difference between objective facts, hypotheses and theory; the meaning of “falsifiability”; the “absence of democracy” in the pursuit of scientific truths, and the fundamental and *inalienable* role of experimental evidence in scientific knowledge.

Rather than a class on epistemology, it will convey the scientific methodology from a point of view of a practitioner. It will also clarify the limits of Science and the errors we make when abusing its method in contexts that are not scientific.

Several examples, taken from well-known and easy-to-follow scientific facts, will be used to elucidate all concepts. The lectures will be structured around open discussions with active students’ participation to stimulate critical thinking.

## Topics

- The logical foundations of Science
- Material world and objective reality
- Natural phenomena and the primacy of experiment
- The role of human faith in Science
- Approximate and limited description of natural phenomena
- Hypothesis
- Theory
- Competing theories
- Can one theory be “derived” from another?
- Verifying or falsifying? And what?
- Consensus in Science? What is that?
- The “What” and “Why” questions
- “Scientism”: abusing the scientific method

## Suggested reading:

- M. Di Ventra, *The Scientific Method: Reflections from a Practitioner* (Oxford University Press, 2018)
- Pierre Duhem, *Essays in the History and Philosophy of Science* (Hackett Pub. Co. 1996)
- Thomas Kuhn, *The Structure of Scientific Revolutions*, (U. Chicago Press, 1962)