Philosophy of Science: A Very Short Introduction	
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Scientific Revolution	Period of rapid scientific development that occurred in Europe between 1500-1750 which led to the birth of modern science
Copernican Revolution (1542)	Copernicus, a Polish astronomer, attacked the geocentric model of the universe, which was unchallenged for 1800 years, and suggested a heliocentric model
Galileo (d. 1642)	Early pioneer of the telescope who helped convert the scientific community to Copernicanism, and is regarded as the first modern physicist. He showed that mathematics could be used to describe the behavior of material objects and emphasized testing hypotheses experimentally
Isaac Newton (d. 1727) Newton's principle	He agreed with mechanical philosophers that the universe is simply composed of particles in motion. He came up with the principle of universal gravitation - Every body exerts a gravitational attraction on every other body - Newtonian physics became the framework for science for the next two hundred years
Two new developments	Relativity theory, discovered by Einstein, showed that Newtonian mechanics cannot be applied to very massive objects and objects at very high velocities Quantum mechanics shows that Newtonian theory cannot be applied to subatomic particles
Physics	The most fundamental scientific discipline since all other sciences study objects made up of physical particles
Charles Darwin (d. 1882)	He discovered the theory of evolution by natural selection, arguing that contemporary species have evolved from ancestral ones, which provides the framework of the modern biological worldview
Philosophy of science	Analyzes the methods of enquiry used in the sciences and uncovers assumptions that are implicit in science
Karl Popper (d. 1994)	Philosopher of science who believed that the fundamental feature of a scientific theory is it should be falsifiable

	- This is used to differentiate between science and pseudo-science - However scientists do not just abandon their theories when they conflict with observational data, rather they look for ways to reconcile since almost all scientific theories conflict with some observations
Induction versus deduction	In a deductive inference, if the premises are true then the conclusion must be true too i.e. the truth of the premises guarantees the truth of the conclusion Ex: Every person has a mother, you are a person, therefore you have a mother Inductive inference involves using a limited set of observations to form a conclusion about something unobserved yet similar to the observed set Ex: I've only seen dogs with tails, therefore all dogs have tails
David Hume (d. 1776)	Scottish philosopher who argued that the use of induction cannot be rationally justified - Induction presupposes "uniformity in nature" which in turn relies on inductive reasoning
Inference to the best explanation	A non-deductive inference that proposes a hypothesis that provides a better explanation of the data than other hypotheses - The simpler explanation is regarded as the better explanation. Whether this is justifiable is debated by philosophers of science
Carl Hempel (d. 1997) Criteria of a valid, scientific explanation Problem with the model	The Covering Law Model of explanation suggests that scientific explanations have the structure of an argument (set of premises followed by a conclusion) 1) Premises should entail the conclusion 2) Premises should be true 3) One premise should be a general law or law of nature It can lead to an explanation that is not the actual cause of the phenomenon
Causality Pg. 45	Avoids some of the problems of the covering law because to explain a phenomenon is to generally give the cause for it i.e. an explanation is the reason for the phenomenon
Can science explain everything?	Science cannot explain the fundamental laws and principles used to explain other phenomenon e.g. the law of gravity

Scientific realism versus anti-realism	Scientific anti-realism, also called instrumentalism, regards scientific theories as instruments for helping us predict observable phenomena as opposed to attempts to describe the underlying nature of reality (scientific realism)
Empiricism	Philosophical doctrine that states that human knowledge is limited to what can be experienced and limits scientific knowledge to what can be observed - Unobservable entities, such as atoms and electrons, are merely "convenient fictions" used to help predict observable phenomena
Hilary Putnam (d. 2016)	Formulated the "no miracles" argument in favor of scientific realism by claiming it would be an extraordinary coincidence if a theory which posits unobservable entities made accurate predictions without the actual existence of those entities - The history of science provides many examples of scientific theories which were empirically successful but later proven false
	* The empirical success of our modern scientific theories cannot be taken as a guarantee that they are true
Underdetermination argument	Anti-realist argument that states that scientific theories which posit unobservable entities are underdetermined by empirical data i.e. there are a number of competing theories which can account for the data equally well
Thomas Kuhn (d. 1996)	American philosopher of science who wrote *The Structure of Scientific Revolutions* which highlighted scientific revolutions as a shift in the paradigm (shared assumptions, beliefs, and methods) of a scientific community in light of anomalies (irreconcilable experimental results or phenomena)
Pg. 78	- Kuhn argued that adopting a new paradigm involved a level of faith rather than being solely motivated by rationale. A new paradigm gains acceptance due to peer pressure - He suggested that facts about the world are paradigm-relative and therefore they change when paradigms change i.e. there is no objective truth (anti-realism) - He argued against the idea that science progresses towards the "truth" in a linear fashion over time. Our theories are not necessarily "truer" than our predecessors' e.g. Einstein's theory of relativity
Response to Kuhn	The problem with truth being paradigm-relative is that the claim itself must be objectively true to hold weight
Scientism	The belief that science is the only legitimate source of knowledge about the world

Scientific methods	Science changes rapidly and there is no fixed, unchanging scientific method used by all scientific disciplines - The claim that science is the only source of knowledge presupposes a fixed understanding of the scientific method