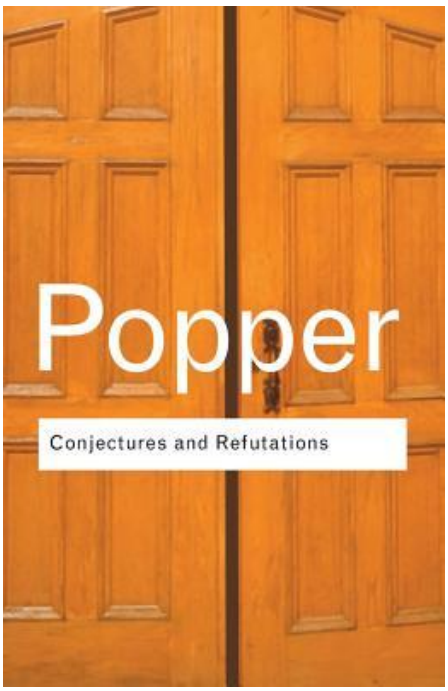


# Conjectures and Refutations: The Growth of Scientific Knowledge

*Karl Popper , Giuliano Pancaldi (Translator )*

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**Conjectures and Refutations: The Growth of Scientific Knowledge** Karl Popper , Giuliano Pancaldi (Translator )
*Conjectures and Refutations* is one of Karl Popper's most wide-ranging and popular works, notable not only for its acute insight into the way scientific knowledge grows, but also for applying those insights to politics and to history. It provides one of the clearest and most accessible statements of the fundamental idea that guided his work: not only our knowledge, but our aims and our standards, grow through an unending process of trial and error.

## Conjectures and Refutations: The Growth of Scientific Knowledge Details

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# From Reader Review Conjectures and Refutations: The Growth of Scientific Knowledge for online ebook

### Michael B. B. says

Cut to the chase, easy to read book

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### Ari says

Karl Popper is one of the leading figures in the 20th-century philosophy of science. He is primarily known for his emphasis on the concept of "falsification." The popular understanding of Popper goes something like this: Science is good, science is about falsification, and if it can't be falsified, it's nonsense. This "straw-Popperism" is open to a number of objections, advanced forcefully by e.g. Kuhn.

As it happens, Popper's thought is much more sensible and subtle than I had realized. He's perfectly aware that theories aren't simply tested on their own -- when an experiment is surprising, we typically have a choice about which of our beliefs to reject -- (including the belief that we did the experiment correctly!) His point rather is that we *ought* to set up our experiments to be as clear and unambiguous as possible so that we can make the most reliable decision about which belief to reject.

There is one point where I think Kuhn's criticism is telling. Popper implies that if we are uneasy about a theory, we should set up a decisive experiment, and if the theory is disproven, move on. As Kuhn notes, major paradigmatic theories are not generally falsified in this way. Rather, as the theory becomes increasingly problematic, scientists try to "correct" or patch the theory, and over time, if they are unsuccessful, the theory gradually disintegrates rather than being simply "rejected." This strikes me as a relatively minor point in the overall scheme of Popper's thought.

Many of the things that I found attractive in Kuhn are already in Popper. The emphasis that "scientists attack problems and puzzles," they don't go about trying to observe things at random, is Popperian. Likewise Popper already pointed out that observation is theory-dependent and that what we see depends on what we know. Poppers conclusion from this is merely "science is hard", not "objective knowledge or progress is impossible."

The book is a collection of essays and lectures, stitched together and lightly organized. This gives it a pleasing breadth of topics, at the price of some repetitiousness. Popper is generally a clear and pleasant writer, but has a tendency towards self-importance. He wants to tell you what he proved and that nobody has yet disproved it. This isn't quite my style but it's a minor point. He also blurs the distinction between descriptive and normative analysis. This is a somewhat bigger problem but I think it's easy enough to pick them apart as a reader.

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### Parker says

Well damn I've been hoping to read something like this for awhile. Best I've read this year or longer. I've had the foggy intuition that obtaining true knowledge is both a myth and very important, but had never read

Popper's explaination of why. True scientific knowledge can only be falsified by observation, not derived from it. And the implications of this explain so much about today...
The (Greek tradition) value science for us informative content and for it's ability to free our mind from old beliefs/prejudices/certainties. Science is not interested in the quest for (neither objective nor subjective) truth/certainty or establishing a theory as certain or probable. Only interested in criticising, hoping to find mistakes, learning from mistakes, and proceeding to better theories.

CRAZY AMOUNT OF NOTES--
Introduction:
Neither British empiricism nor Continental rationalism (senses vs intellect) can be sources of knowledge. Despite being part of the great movement of liberation that started the Renaissance and free societies, it relied on the (fallible) idea that the TRUTH is manifest and can reveal itself to those seaking it. Manifest truth: we hold these truths to be self evident. But we can always be wrong. Manifest/observable/empirical truth can be knowledge, but none has authority to be a source. It has to be continually checked for err.

"Knowledge can be only finite, while our ignorance must necessarily be infinite."

"the more we know about the world, and the deeper our learning, the more specific and articulate will be our knowledge of what we do not know, our knowledge of our ignorance"

Empiricism: observation is the ultimate source of knowledge. Empiricists ask, how do you know? What is the source of your knowledge? But they are appealing to an Authority.

Rationalism: logic is the only source of true knowledge.

Ch 1.CONJECTURE AND REFUTATION
Popper's fallibilism says it is our ability to be wrong and then show we are wrong and correct errors that creates knowledge, whittling away at the incorrect to point toward truth.

Pg51. Science cannot be demanded to achieve a narrow rational certainty, only the broad realm of rationality... And ultimately, be a method of trial and error to propose conjecture and refutation. -- the criterion of the scientific status of a theory is it's falsifiability, or refutability, or testability.

Also, a statement that makes high probability predictions is uninteresting because it says little and has no explanatory power.

2.NATURE OF PHILOSOPHICAL PROBLEMS
Beginning with axiomatic basic truths (infallible, prima facie) in philosophy cannot lead to understanding of the problems that inspired Plato, and then the Renaissance in science. No longer explaining the physical world by a pushed invisible world.

3. THREE VIEWS OF HUMAN KNOWLEDGE (Essentialism, Instrumentalism, Fallible Conjecture/Fallibilism)
Galileo was followed by hundreds of years as the church gradually accepted, then twisted natural philosophy into an instrumentalist view of science (science as an instrument only to make accurate observations based on hypothesis/tricks that say nothing on the true description of the real world). IE they turned a scientific theory back into a philosophical theory and retained ultimate authority over Truth. And this is still generally accepted by scientists everywhere. On the opposite side, rationalists (Greek tradition) value science for us

informative content and for it's ability to free or mind from old beliefs prejudices certainties. And to offer new hypothesis conjecture in their place. BUT explanations by 'essence' are no better than instrumentalists. All Conjecture is Fallible. Essentialism = science will find the base level/essential reality to believe in and not question. Instrumentalism = scientific theories are merely instruments to build better and better instruments for predicting observations and relationships, but say nothing about ultimate truth and not the physical systems of our reality.

But whether science is descriptive (of essential truths) or instrumental is a psuedo-problem. Fallibilism = we should provide creative conjecture and then refute, and repeat.

4. RATIONAL THEORY OF TRADITION

Rationalists/skeptics say, I'm not interested in traditions and want to judge everything in it's own merit. But they can't escape their own traditions. So how can you analyze the scientific tradition and where it came from? Popper says it wasn't only the Greeks who tried to explain nature rationally: all myth makers do that. But the Greeks added the tradition of criticism, and challenging new myths to have better explanations.

Science is not about coming up with new myths, it's about being able to criticize myths to find better explanations. 2 ways science grows; (1) by accumulating knowledge in new volumes, (2) by eliminating bad explanations/traditions/and myths. The second is the important one, for the first alone cannot be different from accumulating more myths.

Socially traditions are required for people to know how to act, they are necessary regularities for us to be able to act rational in society, and don't depend on their particular merits or demerits. It's not possible to act rationally unless you know how the world should respond to you; children crave uniformity. Social sciences attempt to come up with social fact, just as the natural sciences attempt to explain nature and it's reactions to our actions. Social reformers that attempt to wipe out traditions (Platos 'canvas cleaners') and stay over with a new blue print simply start with a new set of traditions/myths. But you'll have a new complex system in need of criticism, not necessarily and better than our current one, that will take many years of study and experiment in a new social vacuum to know how we can better it. Why throw away all of our progress? Why not make it's better.

Language is a tradition and institution. We can use it to emote, signal, describe, but also argue. Modern enemies of reason can be both anti-traditional or traditional, but they try and destroy the argumentative. Instead telling on the emotive, self-expression (self_truth?)

5. PRESOCRATICS

Aniximander came up with the theory of the Earth bring equidistant from everything else and therefore motionless in it's position. This idea must have come as critical response to previous asymmetrical theories, because it can't be purely his primary observation that the Earth is a flat sided drum. In each of the next several generations the Greek find at least one genius new philosophy of cosmology based on their critiques and arguments of other theories. Their (rationalist) tradition of critical discussion enabled this. It is the ONLY practical way of expanding our (conjectural/hypothetical) knowledge.

10. TRUTH, RATIONALITY, AND THE GROWTH OF SCIENTIFIC KNOWLEDGE

A.(GROWTH). Science starts from problems, and not from observations. A scientific theory is an attempt to solve a problem (concerned with discovering an explanation). The goal is to over throw current theory and replace with a more explanatory one. Rejecting all available theories is scientific growth and the only way to make better explanations, so science has to grow to be science. A statement that explains more (i.e. explains both a and b, not just a) is less probable be definition: [p(a)>p(ab)]. And a less probably explanation is more

easily tested/refuted. Only a highly testable theory is worth testing. Therefore, we must be looking for less likely explanations because they explain more, are more predictive of unexpected/unexplained observations, solve more problems. Science starts with problems, not observations.
B.(TRUTH).
There are many forms of truth/facts (theories of objective truth say truth always "corresponds" to facts, while theories of subjective truth say truth is a property of our state of mind (beliefs) and that facts are mere instruments for understanding these states of mind. Subjective theories of truth are irrefutable: everything they say about the world can be replaced with a belief statement (snow is white, can be replaced with I believe the snow is white).
C.(Truth-Content)
Science is not interested in the quest for certainty or establishing a theory as certain or probable. Only interested in criticising, hoping to find mistakes, learning from mistakes, and proceeding to better theories. Versimilitude, or truth approximation, shows we can say theory 1 is less wrong than theory 2, even if both end up being wrong. T2 passed more severe tests, which T1 failed.
D.(Background Knowledge and Growth)
E.(3 Requirements for Knowledge Growth)
1.Requirement of simplicity says a new theory should find a new simple way to unify/connect ideas or previously unrelated facts.
2. Independent testable, and not ad hoc-produced after the test was complete.
3. Must pass a new severe test.

REFUTATIONS
11. Science vs Metaphysics (and it's demarcation)
This demarcation cannot rely on the senses (to demarc nonsense), but most rely on its falsifiability.

Bacon said metaphysics operated byl) mental anticipating (like hypothesis).

14. Prediction and Prophecy in Social Sciences.
A criticism of historicism (unravelling the plot of mankind will hold the key to the future, predict and avoid apocalypse, etc. Who authors this plot?), and specifically Marxism.
Scientific prediction relies on variable conditions, eg when a water boils relies on its changing temperature.
"The main usefulness of physical science is not the prediction of mechanical system like eclipse: and social sciences do not need to make predictions/prophecy.
No need to hate reason just because social sciences can't make prediction. Task of social sciences: hello us understand the consequences of our actions, and help choose our actions, correct our errors more wisely.
Social sciences cannot: (1) study and predict group/classes/societies behavior holistically (2) describe, as a conspiracy theory, the results of society a direct design of powerful individuals and groups.

18. Utopia and Violence
All ends at irrational. Only means can be rational. Rationalism is argument, not violence. Utopia and it's blueprint is an ideal that cannot be questioned, therefore a dogmatic end which can be justified by any means. But there's nothing won't with political ideals that work toward eliminating error through rationalism, but just focusing on one abstract Utopian ideal is fatal toward tyranny.
-don't sacrifice today's misery for tomorrow's promised Utopia. Potential future happiness cannot be predicted, today's misery is real. Our actions must be ends to eliminate misery today. It's easy to agree across the lines on what constitutes an intolerable evils of society, and we can make progress on arguing toward them. Ideal Utopias are prophecy, and opposite, and by definition irrational first principals.

19. Our Time.

Five thesis on our time:
History: the Renaissance and the Reformation is the conflict between the idea is the truth being manifest (an open book-first the Bible, then book of Nature- we just need to read) and that truth is hidden (discernable only by deciphering God's will be an Authority).

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### Anahita Sharma says

In my final years of high-school, I encountered Popper's theory of the process of 'Conjectures and Refutations' when studying the epistemology of science, and subsequently referenced his work in an essay - yet my understanding of it at the time was highly superficial.

When writing my final year dissertation at university, in Biology, I found myself mining through scientific literature and trying to place the experiment in its wider context. I was confronted with an immense and initially overwhelming body of knowledge, and eager to understand what sort of human ability, thought, and spirit, drove its construction, I found myself returning to these high-school essays. I went to the library and picked up the book, which I read over the course of almost five months during which I was writing the dissertation.

It's a remarkably uplifting read that I'd recommend to any scientist, for it draws the scientific method back to its philosophical origins - those of traditionalism, empiricism, probability, falsifiability, and verification. Popper, like that of many great minds, has the ability to pin down concepts into exhaustively clear and thorough writing. Science, he proposes, isn't a result of an accumulation and aggregation of observation statements about the truths of our world, but is a process that identifies and draws on problems, inconsistencies, and myths, through which scientific theories arise and regenerate on discovery of contradictory evidence. Popper draws on the concepts of many other philosophers; he simultaneously propounds his own theses as well as takes the reader on a historical journey.

A beautiful read that makes one think, hard. As a layman with respects to Philosophy, this was truly a remarkable read, paved the way for future readings within the discipline, and I think it would bring a great deal perspective to anyone trading in 'knowledge' arena.

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### Philippe Malzieu says

Popper is a point of required passage for all those which are interested in sciences. But the originality is that the method Popper bracket with other sectors and particularly with the policy.
Classically we defined a science in a positive way. we choose an hypothesis, we accumulated experiments to check the veracity of its. There a completely opposite way is taken. We will imagine experiments to prove that this théory is false.
For exemple, the proposal is “all the swans are white”. If I adopt an empirical attitude, I go in all the garden of London and I accumulate the observations. I see only white swans, so I conclude the swans are white. If I adopt Popper's method, I will seek to refute this assertion. I will search a black swan. And after some time, I find a black swan. So the sentence "The swan are white" is false. It's really a reverse méthod. It's thus consists in being endangered. The best exemple, it is Einstein and the Eddington experiment. For him the light rays follow a curve when they are in a massive gravitational field. Many people contest it.Einstein said to a particular place in Africa, at one specific time, It's necessairy to take a photo. If it didn't show, the curve,

Eistein said that his theory is false and he loosed it. Of course, relalivity resist at this falsification test.
It is with that we can define asciences. A good scientific assumption must be refutable obviously but also risked but it will be thus fertile.
This explains why psychanalysis is not a science. If dreamed is from Freud the expression of the driven back desire, I can refute while saying: and the nightmare? But Freud who has answer to all will say me that it is the expression with a conflict with the super-ego. The psychanalysis is not refutable, this is not a science.
The following point is the problem of the objectivity. Popper is formaly opposed to the Marxist thought developed by the second school of Frankfurt. For Horckheimer and Adorno, sciences pure do not exist. There are always hidden interests. Sciences is always partial. This will be amplified by Bourdieu, Ricoeur and Foucault.Popper refutes this approach. The necessity is to be the most objective as possible. It's an intersubjectivity without subject. The good question for him is well “What did you say?” and not “for which reason and of which right did you say that?"
The application to the political arena is very operative. The problem is not knowledge which controls but how to refute controlling them. Thus in his eyes, the only legitimate mode is which makes it possible to return its leaders. It is thus the superiority of the democracy.
Popper is a free personality, apart from any ideology. His thought fascinating me.

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### Omar nagib says

what is the book all about?

it discusses epistemology(philosophy of knowledge), philosophy of science, logic, philosophy of language and politics.

every article is an independant article, which can be read separately.

the book's title "conjectures and refutations" is borrowed from one of the articles within this book, it stands for popper's philosophy of science and how science procedures, science stars from problems but not observations, a scientist propose a myth or conjecture or hypothesis from his mind to solve the problem, this is about "conjectures", and for "refutations", this is the way by which we can test the theory, by serious attempts to refute it, and to falsify it by observations, and if this "conjecture" passes
the test, it is held "tentatively", but still remains conjecture which may turns out to be wrong in possible future tests.

what's very notable about the book is popper's infintely lucid and clear writing-style, yet the words carry very deep meaning, his arguments are solid and convincing.

another notable thing in popper is that he clears up complex philosophical terms so that his work becomes accessible to both professional philosophers, and beginners(like me).

I like how popper is original, genius in looking at things from completely new prespective, and offering ingenious solutions, I like his critical attitude that he's able to challenge widespread beliefs(dogmas).

this book really has changed my intellectual life, and it encouraged me to ge the remaining of popper's works, everyone interested in these subjects must read it.

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### Kristoffer Berg says

Popper skriver engasjerende og klart uten å forenkle. Boken gir god innsikt i hypotesetisk-deduktiv metode samtidig som den spenner over svært mange forskjellige filosofiske tema. Dessverre er den ganske repetitiv og til tider for omstendelig. Det kan av og til virke som han slår inn åpne dører (anti-kommunisme og anti-dialektikk), men med tanke på at første utgave ble gitt ut i 1963 kan det også bety at slagene er vunnet i etterkant. Jeg liker at Popper er ærlig, litt frekk og veldig direkte. Den er verdt å lese, om ikke hele, og hvert kapittel er noenlunde selvstendig. En svak fire stjerner, men pluss for morsomme ligninger og fotnoter.

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### Jim Mehnet says

I found the essays on what differentiates science from pseudo-science really interesting. Loved them. They have given me a clear to evaluate BS from science and set me on a new line of inquiry, the philosophy of science. His ideas of the strengths of Demarcation, falsifiability, and the inadequacies of induction and confirmation are very convincing. As a non-philosopher I found some of the other essays great and some tedious at best.

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### David Withun says

This book is a classic of twentieth century epistemology and the philosophy of science and must-read for anyone interested in those subjects. I also recommend this book for anyone interested in the development of knowledge as well as social justice within a democratic setting. Popper's thesis is that the truth of any given matter is not obvious due to the limitations of human perception and reasoning and that, with this in mind, we should approach the process of observing and understanding the world around us in a spirit of tolerance, open-mindedness, and perpetual questioning. This book is difficult in parts and assumes a great deal of prior experience with logic as a philosophical discipline as well as with the philosophy of science. It is, however, well worth the challenge even for those who are new to these subjects.

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### Helisa Taban says

This book has given me a lot to think about. The most important lesson that I got from it is that a good scientific theory is very specific and seeks falsification. The problem with Freudian science, astrology, and other such broad theories is that they are vague and can be applied to almost everything. Everything can be interpreted with a pseudoscientific lens. Once someone believes in Marx or Freud, it is easy to view all human interactions as manipulated by bourgeois propaganda, or simply symptoms of Freud's idea of Fixation and the Oedipus Complex. That is not to say that these theories are necessarily false, but they tend to have a confirmation bias, and they are somehow always immune to being falsified. Observations in the real world easily confirm these theories, but Popper suggests that a good scientific theory MUST run the risk of falsification and should not be sought to be confirmed but be refuted instead. This approach could even be applied to social and political theories. An interesting case that occurred to me is the idea of biblical, Koranic, or other claims of scriptural miracles. It seems to be that it is always the real world that conforms to such beliefs, and not the other way around, but that can't be scientific. That is more like deluding ourselves by choosing to interpret the world the way we want to. According to Popper, the beliefs need to seek

falsification, and should be refuted on the basis that they do not adequately describe the universe. This is also why he proposes the idea that contrary to the commonly accepted scientific method which begins with an observation and then a hypothesis and then the experiment, all scientific methods begin with a hypothesis first and then proceed to the observation stage. He suggests that no observation is made without a question or some prior conjecture. In fact, it is the hypothesis that actively seeks to observe and experiment, and not the other way around. To be most scientific, we should form conjectures, and then attempt to refute them and see how well they stand scrutiny. Great book! A must-read for anyone interested in science or philosophy, or both.

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### Paul says

This is in places an extremely engaging and intriguing book. The history of philosophy Popper describes in the early chapters is fascinating, as is his chapter 15 demolishing Hegelian and Marxist dialectic; between Gilson and Popper I have a feeling of much stronger grip of the history of philosophy (where fortunately Gilson is strong where Popper is weak, i.e., medieval philosophy).

Let me quote from that chapter 15 a sentence out of a passage that I might take as a banner for the intellectual contribution I want someone most to bequeath to theology:

"This [sketchy reasoning by modern dialecticians] should emphasize that for anyone who wants to promote truth and enlightenment it is a necessity and even a duty to train himself in the art of expressing things clearly and unambiguously--even if this means giving up certain niceties of metaphor and clever double meanings." (p 322)

It is a shame that Popper was so clearly dismissive of the Catholic faith and its intellectual tradition; he could see only the abuses of the Middle Ages, which abounded just as do the errors of every age. In reality, I think Catholic theology is uniquely suited to debate along critical lines, and humanity would profit greatly if its dogmas and the world outside were to be pondered critically, rather than with the kind of fluffy metaphorical thinking and desire to avoid all criticism of authorities even when they clearly conflict and are in need of reconciliation and contradiction.

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### Xander says

Conjectures and Refutations (1963) is Karl Popper's extension of his original work The Logic of Scientific Discovery (1934; English version published in 1956). It is a collection of philosophical essays and adresses for audiences or the radio. In a sense, this book is nothing new under the sun, if you already know Popper's philosophy of science. This doesn't mean that it isn't interesting material, but it lacks the originality and impressiveness of Popper's first work.

So what is interesting about this book? First of all, it is very readable and - apart from some deep discussions on logic - easy to follow. This is a big pré. Popper doesn't just give an exposition of his own views, but meticulously describes the positions of his opponents.

This last point brings me to another interesting point: Popper, by clearly stating the problems and offering his as well as his opponents' views, gives the reader the chance to learn many new things or to see familiar topics from a different angle. For me, this is the most important reason for reading Conjectures and Refutations.

The book itself is composed of 21 chapters, stand alone and can therefore be read at will. At the same time, all the chapters are implicitly connected by the limited amount of themes that play a role in this book. This is a good choice of Popper, since it offers cohesion and makes it feel as a whole (instead of a loose collection of essays; something that happens, sadly, a bit too often).

For the rest of this review, I want to pick three chapters that impressed me and that stand for the main thesis of Popper's book; the rest of the book can be read on own terms (which I can happily recommend!).

1. In chapter 10, Popper explains his own - revolutionary - philosophy of science. From Plato to Kant, philosophers have searched for a logic that would offer us a tool by which to collect certain knowledge. This attempt has failed miserably, for a reason that is - with (Popper's) hindsight - as stupid as it is simplistic. It is logically impossible to positively prove a proposition by experience. Yet experience is the only source we have by which we can perceive the world we live in. This, by the way, is a breath of fresh (philosophical) air if one has read the works of Locke, Berkeley, Hume and Kant, who all tried to make abstract distinctions in order to solve the problem.

Popper cuts the Gordian knot by simply saying: give up all these difficult attempts. Science should proceed by trial and error. The scientist should pick the interesting problems; try to come up with an interesting theory (how he/she does this doesn't matter); deduce specific predictions from this theory; test these predictions with experiment and observation; and last but not least, give up the theory or hypothesis as soon as it is refuted. In other words: even though theories cannot be proven true, they can be falsified - and this falsifiability is the criterium by which we can distinguish science from pseudoscience (or superstition, or religion).

So, how does science grow? By scientists that try to come up with new theories that explain all the known (and relevant) facts. So this means that all theories can be called science? No, according to Popper, the scientist should only come up with theories that offer new predictions to test (by observation and/or experiment) and/or that offer an incorporation of seemingly unconnected theories or facts. So, when Newton came up with his theory of universal gravitation, he offered a synthesis of Copernicus' heliocentric model, Kepler's laws of planetary orbits and Galilei's law of free fall. This is, Popper would say, scientific growth. And when Einstein came up with general relativity, he incorporated Newton's mechanics into a bigger, more general theory. This is, Popper would say, scientific progress.

Popper clarifies in this chapter (in a more accessible way than in his Logic of Scientific Discovery, in my opinion) what scientific hypotheses are desirable and which aren't. According to Popper, there is a common misunderstanding when it comes to scientific theories. Most people think that scientific theories, since theories cannot be certainly true (i.e. the problem of induction), they should be probable. We should apply probability calculus to evalute theories and this will lead us to the most probable theory. But this is a fallacy! The probability of a theory is, according to Popper, inversely related to its content. Popper advocates hypotheses that are as specific as possible (i.e. exclude as much other states as possible). This means that the most interesting hypotheses are the most easily falsified (since they exclude so many alternate states).

In other words: the best scientific theories are the ones that are the most improbable! And this makes sense, since if the most probable theories are the best ones, they should have been discovered by now - after 3000

years of scientific search. Popper's clarifying insights are simply amazing!

2. In chapter 5, Karl Popper offers us his interpretation of the Presocratics. Besides offering a thorough, yet accissible, invesigation of all the ideas involved - and offering us the chance to learn about ancient Greek philosophy in a modern day book - Popper clearly outlines his - by now infamous - message of what constitutes the scientific method.

The Presocratics (especially the Ionian school) picked the most interesting problems and tried to come up with answers to these questions. They did this, and were the first to do this, in a unique way; a way that would in 17th century turn into the 'scientific method' and what Popper calls 'rational criticism'. The Presocratics openly criticized the then-current theories about the universe and trying to offer new theories that were improvements - in the sense that the criticized points were improved upon - to the former theories. In practice, this meant that the student was encouraged to offer an intelligent critique of his master's theories. In other words: students were encouraged to use their reason to criticize their master's ideas.

With Aristotle, this way of improvement, of science, was abruptly halted. Aristotle claimed that certain knowledge (episteme) was possible and that one could use his reason (logos) to discover this truth. Aristotle's philosophy overtook Greece and the rest is history (in a nutshell: the Romans adopted Aristotelianism; the muslims copied and improved his manuscripts; the christians in the Middle Ages adopted it as a dogma). This meant that another way of doing science became influential and widespread: arguing for argument's sake.

This, of course, led nowhere. And it is only in the 17th century, with Galilei, that the method of singling out particular problems and trying to build on work of predecessors becomes important again. And it is this method of doing science - using reason to criticize theories of predecessors and offering new, improved theories - that is the philosophical foundation of all the changes - for better or worse - that we have witnessed from the 17th century onwards. In that sense, Isaac Newton was less important than Galileo Galilei, and Charles Darwin was less important than Louis Pasteur. Newton and Darwin offered grand syntheses of (up to that point) loose strands of science; Galilei and Pasteur singled out specific problems, tried to offer interesting new theories and tried to test them with experiments and observations. A theory that doesn't lead to new predictions and/or unification of hitherto loose strands of knowledge, is, according to Popper, a bad theory. And it is this crucial way of thinking about science that has its roots in the Ionian school of Thales, Anaximander, Xenophanes and others.

3. The third and last point of interest I want to mention is Popper's revaluation of Immanuel Kant in chapter 7. In this chapter, Popper argues that Kant's Critique of Pure Reason - or better, Kant's whole philosophy - has been misunderstood by his contemporaries and heirs. More specifically, Kant's contemporary Schelling, and Heirs like Fichte and Hegel, have misrepresented Kant's transcendental idealism in order to promote their own versions of radical, Romantic idealism. This development has led to an unfortunate chain of events in Western philosophy, in the sense that existentialism and nihilism are direct offspring from this misrepresented Kantian idealism (something which Popper works out in chapter 8 as well).

So what's the matter here? Kant was impressed - just like ma ny of his contemporaries - with Newton's mechanics. Newton's theory was so succesful in explaining all of celestial mechanics, and was vindicated time and time again (for example, in explaining better the planetary orbits than Kepler did, and in leading to the discovery of hitherto unknown planets) that nobody could seriously doubt the truth of Newton's model. Yet, as David Hume showed, there is no way to positively prove any fact as certainly true - this is logically impossible. Kant was so impressed by and convinced of the truth of Newton's mechanics, that he saw a serious problem here. (Popper: and interesting problems, not inductive observations, are the driving force of

science!).

So Kant built a new philosophical system in which he claimed that we, as subjects, continuously order, by means of categories like space, time and causality, the sensual input of the empirical world around us. In other words: we constitute our own world. This led Kant to the conclusion that the world we think we know - the empirical world - is only an imperfect resemblance of the world as it is in itself. This world as it is in itself - the transcendental, or noumenal world - is unknowable.

But, even though Kant postulated a whole new - and by definition unknowable - world, he did accept the empirical world as existing and as knowable (via science). According to Popper, this has been radically taken out of context by Romantic philosophers like Schelling and Hegel, who twisted Kant's transcendental (!!!) idealism into a racial idealism, which basically says that, since we constitute the world around us ourselves, this is all there is. If this is all intellectual dishonesty or 'just' sheer misunderstanding Popper doesn't tell, but there are contemporary reports that Kant argued against Schelling's abuse of his philosophy, so the evidence points in the direction of intellectual dishonesty.

What Popper implicitly states - and he does this in various chapters - that one cannot understand philosophy if one reads the works of the great philosophers. One has to know the contemporary PROBLEMS that these great minds tried to solve, in order to understand their works in a meaningful way. So in another chapter (chapter 2) Popper argues that Plato's theory of Forms is not understandable, unless one knows about the contemporary problems in arithmetic. (Arithmetic was unable to deal with irrational numbers, which led Plato to geometry. This, in effect, is the foundation of Euclid's infamous geometry. It is rumoured that the Pythagorean sect, that based their creed on arithmetic as a universal explanation of the universe ["Everything is numbers"], drowned someone who told the outside world about the inability of arithmetic to deal with rational numbers, thereby falsifying their whole creed).

So to sum up, Karl Popper argues that scientific growth only comes about by scientists focussing on interesting problems, coming up with new theories that lead to new predictions, trying to flasifiy these predictions with experiments and observations and dropping all refuted theories. In this way, science progresses by trial and error, conjectures and refutations, and this leads us ever closer to the truth. The key words here are: interesting problems, interesting problems, interesting problems. To understand science or philosophy, one has to understand the problems involved; otherwise one doesn't understand the true meaning of these works.

The above is the central message of Popper's philosophy and this is the main theme in Conjectures and Refutations. It is a wonderful collection of stand alone chapters, which all deal with different aspects of this common line of thought. Therefore, even though it is a collection of loose chapters, it is one whole. The only drawback is the lack of originality of the material. I do think that for some who is new to Popper's philosophy (or to philosophy in general), Conjectures and Refutations can be a better start than his original work The Logic of Scientific Discovery. This last work is much less accessible and deals with much more complex (logical) aspects.

The best, of course, would be to read both books and to look for online material as clarification (for example, Youtube has much to offer on interesting and relevant philosophical material; the change of medium [audio or video] can add a lot of insight to the material in books!).

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### Eric says

The overwhelming power of falsification, and reminiscent of Hegelian dialectics

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### Gnuehc Ecnerwal says

One of the most challenging ideas from this book is to convince the general society to acknowledge that no amount of 'confirmative evidence' can validate a theory to the same extend as how one counter-example could invalidate a theory once and for all. We are socially conditioned not to rock the boat (argue and criticize), to trust the viewpoints of experts/elders/authority, and we are told that we have to prove our case with evidence or testimony from a trust-worthy source. Popper proposed that it is only through criticism and attempts to 'disprove' others' claims that drive the progress of knowledge. A fascinating idea that is worth contemplating and incorporating into our attitude towards all knowledge in general.

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### Brian says

Brilliant writer - very dense, intellectually complicated, and takes a long time to read. But if you're looking for a book that makes you feel smarter and examine life more critically and logically, then this book will help you along that path. Popper's primary argument is that science is not developed through carefully thought-out hypotheses, but by essentially random attempts at figuring things out (conjectures) and then attempts that prove them wrong (refutations).

He also argues that, basically, nothing can be scientifically proved - there's no such thing as a law, only a hypothesis. For example, the 'law' of gravity could be disproved by finding a planet in the universe that operated by different rules. A hypothesis cannot be proved with a thousand supporting examples, but can be disproved by a single contrary example. Those areas that do not work like this (psychology, etc.) are not sciences but pseudo-sciences.

Overall, great book but extremely philosophical and intellectual.

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