



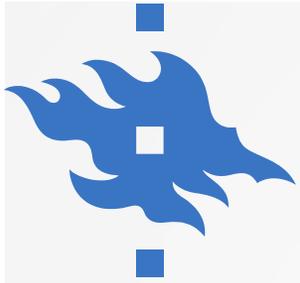
# SCIENTIFIC PROGRESS AND PRADIGMS

Tuomas Vesterinen

Aalto University

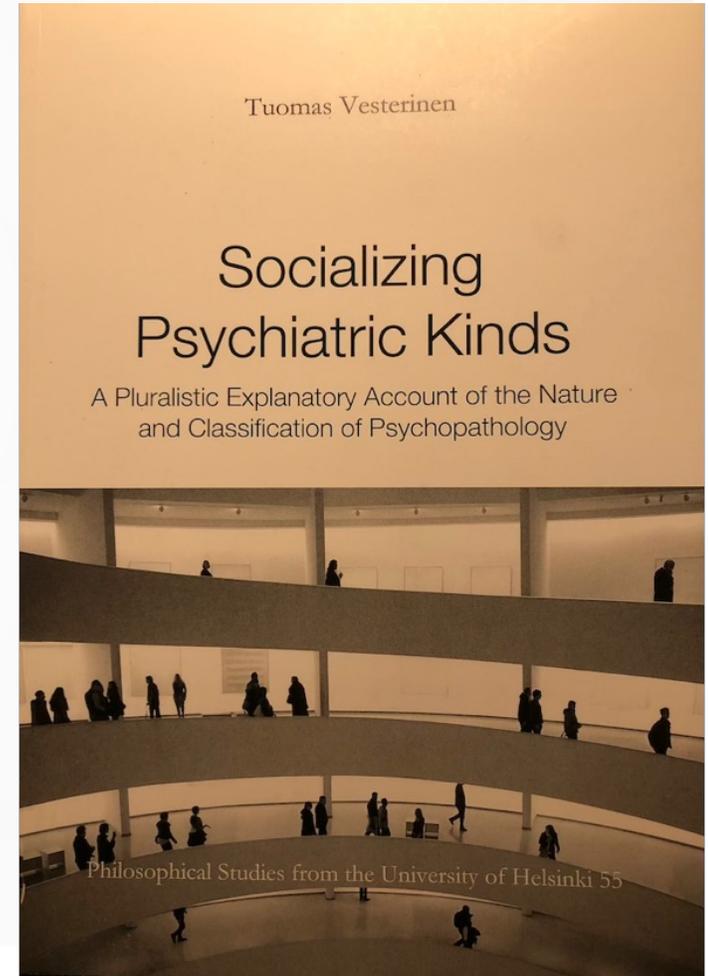
January 30, 2024





# MY DISSERTATION: PHILOSOPHY OF PSYCHIATRY

- Philosophy can help to critically examine our assumptions about psychiatric disorders
- What kinds of things are mental disorders?
  - How to classify them?
  - Relationship between the brain and the mind?
  - Cross-cultural variation?
  - Values in research and classification?
- What is the right kind of explanation: psychoanalysis, phenomenology, cognitive science, molecular neuroscience?
- Ethical questions





# MY PART OF THE COURSE

- Scientific progress and paradigms, Jan 30
- Classification and kinds of things, Feb 6
- Explanation and understanding, Feb 27



# SMALL INTRODUCTION

- Your name and field of research?
- Why are you interested in philosophy of science?



# OVERVIEW

- Traditional view of scientific progress & logical positivism/empiricism
- Karl Popper and falsificationism
- Thomas Kuhn's paradigms
- Criticism and legacy
- Naturalistic turn in the philosophy of science



# IS SCIENTIFIC PROGRESS SPECIAL?

- *Enlightenment*: Humans were thought as rational and knowledge as power
- Knowledge should be used for the benefit of human kind: believe in progress
- Unlike in religion, ethics, art, there seems to be objective criteria for scientific progress
- Naïve view: the discovery of *the complete true story of the world*
- Cumulative and linear knowledge gathering of the world through “scientific method”
- But since 1950’s and 1960’s this belief has been challenged



Frontispiece of Diderot's *Encyclopédie*. Reason and philosophy revealing truth. Drawn by Charles-Nicolas Cochin, 1764



# YOUR TAKE ON SCIENTIFIC PROGRESS?

- What do you think that progress in science consists of?
- Is it the same in the natural and social sciences?
- What is progress in your field? E.g. technology, arts?



# RATIONALISM VS. EMPIRICISM

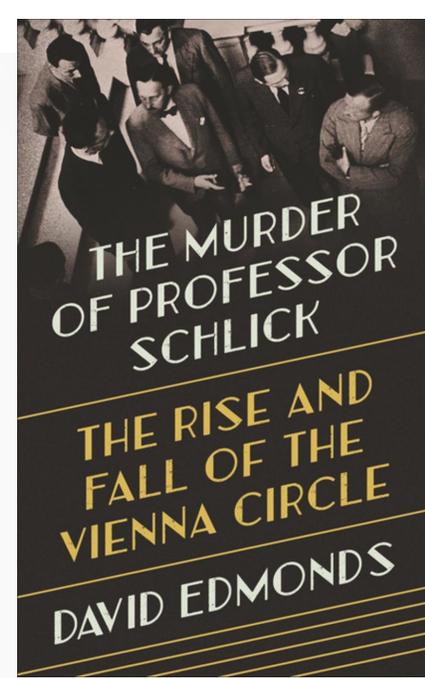
- Plato: all knowledge is derived from ideal types through thinking
  - Mathematics as an ideal
- Aristotle: all knowledge requires empirical investigation
  - Biology as an ideal
- Rationalists: Descartes “Cogito, ergo sum” , Leibniz, Spinoza
- Empiricists: Locke “tabula rasa”, Hume, Berkeley
- Kant’s synthesis: ding an sich vs. thing as it appears to observer

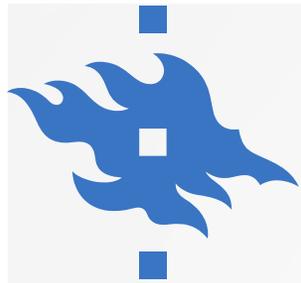


# LOGICAL POSITIVISM/EMPIRICISM

- Scientific explanation is credible because of observation, experiment and test
- New logic to clarify natural language
- Influenced by Wittgenstein and Einstein
- Theoretical terms are meaningful only in relation to observational language: *analytic / synthetic distinction*
- *Verifiability theory of meaning*: knowing the meaning of the sentence is knowing how to verify it (*excludes traditional philosophy, ethics, theology?*)
- Progress cumulative through reduction

Ayer (1979) when asked what was wrong with logical positivism: "everything".





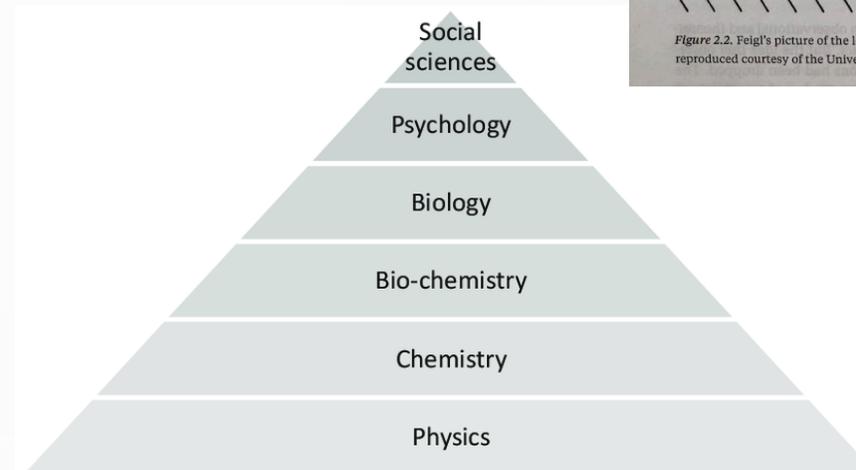
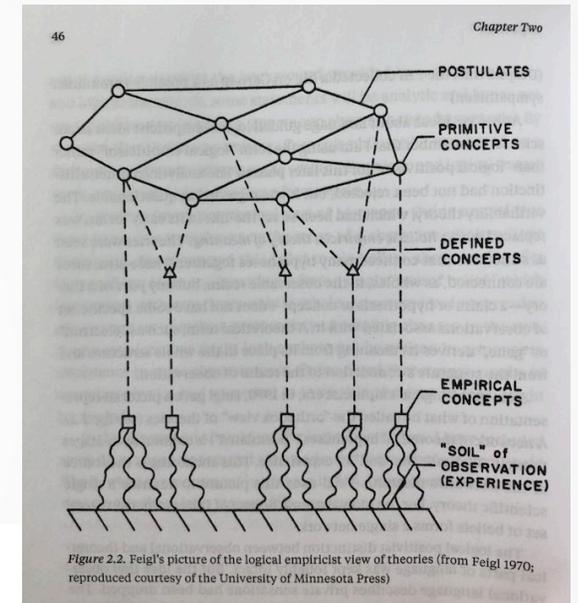
# REDUCTIVE PROGRESS AND TWO-STAGE PICTURE OF SCI. LANGUAGE

T. Nagel (1962):

Theories and laws of nature are subsumed under more general theories and laws.

e.g. Galileo's examples can be explained with the more comprehensive Newton's law of gravitation

e.g. Thermodynamics explained by molecular chemistry





# PROBLEMS WITH LOGICAL EMPIRISM

- No linear advancement of science
- A strict distinction between theoretical and observational language cannot be maintained
- Scientific realism became more dominant
  - Not predictions (only), but real structure of the world
  - Theoretical terms refer to real entities, which do not have to be understood merely as observational or through experience to be meaningful
- Psychology and history became important in understanding science, logical lost its importance



# KARL POPPER

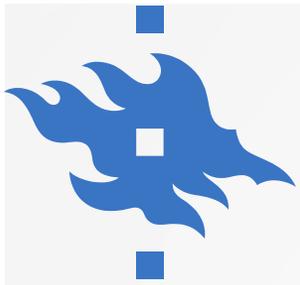
- Considered himself as the “official” critic of the Vienna Circle
- E.g. Soro’s was influenced by “Open Society and Its Enemies”
- Popper and Wittgenstein had a famous “fireplace poker” fight (Edmons: Wittgenstein's Poker: The Story of a Ten-Minute Argument Between Two Great Philosophers)



# KARL POPPER

- Aim is not to find confirmation but to trying to prove theories wrong: *falsification*
- We can never prove our theories, they are only hypothetical
- Science should be risky: we should seek to find empirical evidence against our theories
- Theories are better the more they are *falsifiable* (not metaphysical, ambiguous etc.)
- Falsification as a demarcation criterion between science and pseudo-science





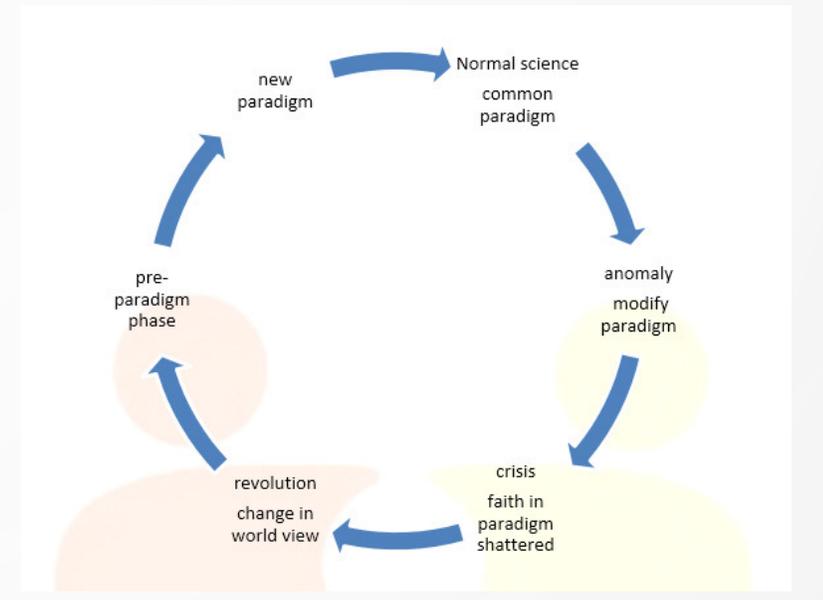
# PROBLEMS

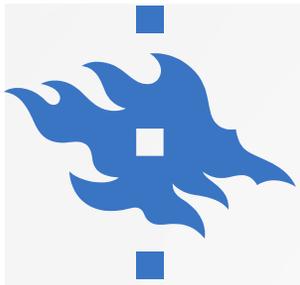
- BUT not possible to falsify all statements? (there is blackhole somewhere beyond our testability?)
- BUT is there never confirmation?
- BUT Duhem-Quine thesis: experiments of hypotheses always make background assumptions
- What do you think: does falsification work as a demarcation criterion between science and pseudo-science? Popper though that Marxisms and Freud's theory cannot be falsified..



# THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (1962)

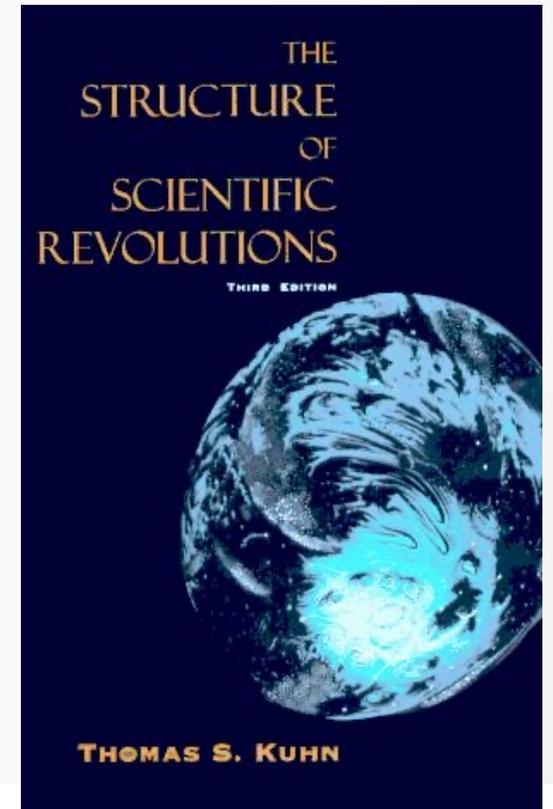
- The most read philosophy book in 20<sup>th</sup> century
- Pre-paradigm → normal science → anomalies → crisis → revolution → new normal science → anomalies → new crisis
- Discipline gains structure when it adopts a *paradigm*
- *Normal science* enables concentration on specific (miniscule) *puzzle-solving* tasks
- *Crises* appear when many unsolved puzzles pile up, and a new approach appears that seems promising
- If enough scientists "convert" to the new approach, a revolution takes place in favor of the *new paradigm*





# PARADIGMS AND NORMAL SCIENCE

- Mature/normal science is governed by a *single paradigm*
  - Criteria for problems which are considered relevant in the discipline
  - Conceptual, theoretical, instrumental, methodological tools for solving them
  - Criteria for measuring success
  - Conventions and forums for publishing and communiting
  - (Kiikeri & Ylikoski)





# PARADIGMS AND NORMAL SCIENCE

- Paradigm enables concentration and specification
- Discipline progresses through *puzzle solving*
  - Governs observations and experiments
  - During normal periods, scientists assume that the paradigm offers the means to solve the puzzles
  - Inability to solve puzzles is the scientists fault, not the paradigms
  - Puzzles that are not solved, are considered as anomalies, not falsifications
  - Most cannot articulate their paradigm, it is implicit
- Exemplars: model examples of puzzles and how to solve them
- Disciplinary Matrix: same education, metaphysical assumptions, cognitive values (aims)



# CRISES AND REVOLUTIONS

- There are always puzzles that paradigms cannot solve
  - Godfrey-Smith: models of the world are always incomplete representations of the complex world
- Anomalies: cannot be explained with the means of the paradigm, or is an observation that is in contradiction with the paradigm
  - Anomalies possible only within paradigm expectations
  - Sometimes those puzzles pile up and undermine faith in the paradigm
- But only when a new approach is available, reasonable to give up on the old paradigm
  - When most have lost their faith, there is room for a new paradigm



# MANY SCIENCES AT PRE-PARADIGM STAGE?

- Pre-pradadigm stage: e.g. human sciences, psychiatry?
- Stuck in fundamental (philosophical) questions
- In psychiatry, conferences over ontological questions of mental disorders



# PARADIGMS IN YOUR FIELD?

- Is there talk of paradigms in your field? How about in technology and arts?
- How is the term used? Does it match Kuhn's ideas?



# CRISIS AND REVOLUTION

- Crises appears when scientists loose faith the paradigm
  - New scientists and people outside of the descripline suggest wild novel hypothesis
  - Scientists participate in philosophical and metaphysical discussions (cf. what are psychiatric disorders?)
- If a new paradigm appears, it can lure novel scientists
  - Can solve some of the old anomalies
  - Ritains puzzle-solving abilities



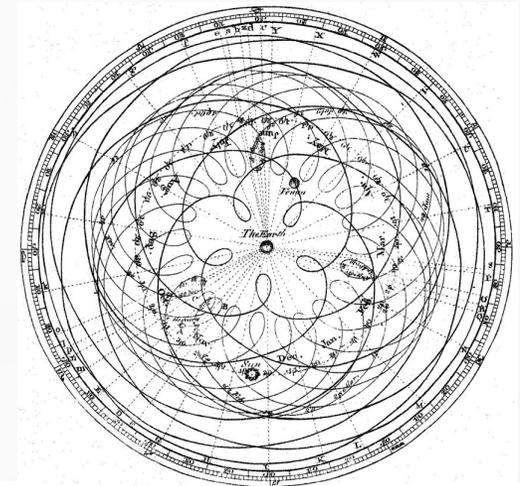
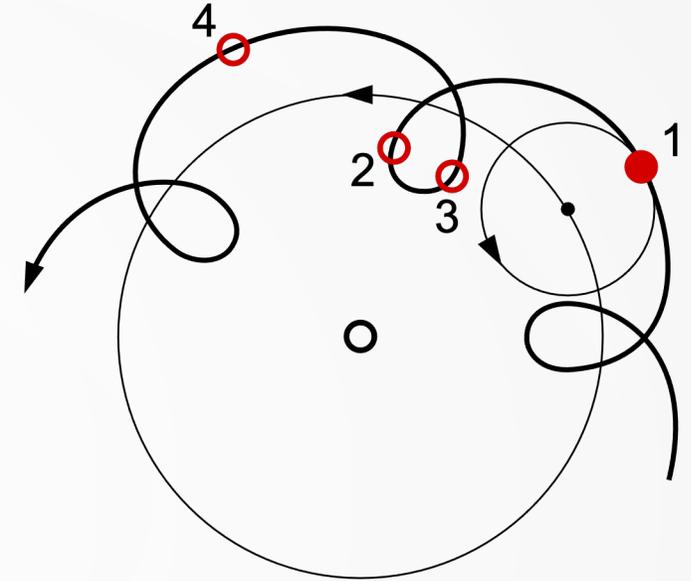
# NEW PARADIGM

- New paradigms are radically different from old ones
- They hold different questions as legitimate and relevant
- They have different concepts and standards
- Resembles religious conversion or Gestalt-switch
- Not individual scientists, but the community as a whole



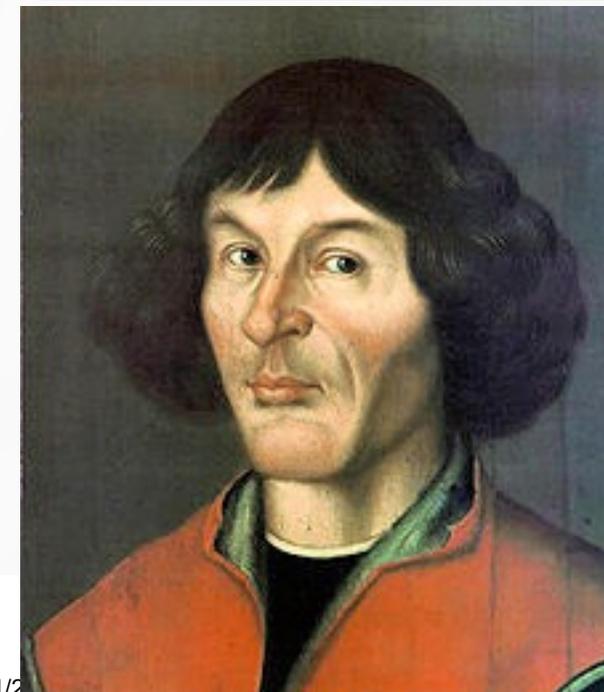
# EXAMPLE: THE COPERNICAN REVOLUTION

- Ptolemaic system was successful at predicting the position planets and stars
- Had many anomalies: discrepancies in predictions
- Adjustments were made in epicycles and compounded circles





- Geocentrism: Council of Trent 1545-1563
  - Religion stronger than natural philosophy (science)
  - Aristotelian world view: teleology & everything has its place
  - Canonization of Ptolemaios
- Helocentrism
  - Copernicus De Revolutionibus "useful calculation method" (1543)
  - Galileo's observations (1610): Moon's phases & moons of Jupiter -> convicted in 1633 ("and yet it moves")
  - Kepler: first modern astronomer (uses mathematics)





# PARADIGM(S) IN PSYCHIATRY

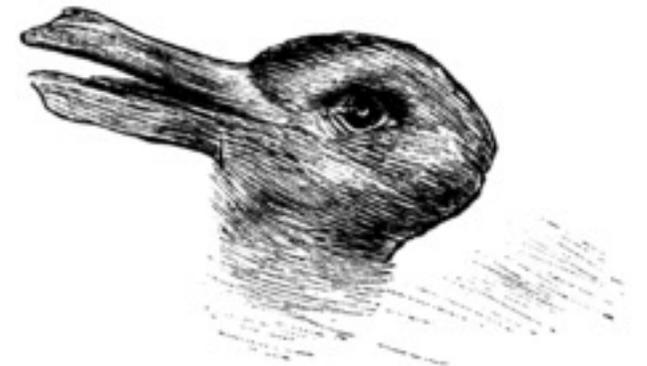
- Move from psychoanalytic model to medical model in 1970's in the USA
- Students were taught new exemplars, new methods, new observations
- Psychoanalytic students learned to listen to life stories, biocentric students learned to categorize
- They learned to see different questions/puzzles important
- An example from Buenos Aires: how to recognize and treat patients (Lakoff 2005)
- BUT how does one compare paradigms? Concepts like “melancholia” and “depression” are not co-extensive (do not seem to apply to the same phenomenon)



# INCOMMENSURABILITY

- No common measure to compare theories in cosequitive or competing paradigms
- No way to say whether new paradigms are better than the old ones?
- Gestal switch: all at once
- Two versions:
  - Translatability problem between paradigms
    - Theoretical terms gain their meaning holistically in relation to each other in a theory
  - No common standards or methods

Welche Thiere gleichen ein-  
ander am meisten?



Kaninchen und Ente.



# CRITICISM

- Relativism?
  - “after a revolution scientists are responding to a different world”
  - > The “world” is socially constructed?
  - Nominalism: classifications based on our interests?
- BUT scientific revolutions are not common
- Paradigm is given 21 meanings
- Why only one paradigm at a time?
- Exaggerates conformity in normal science and disconformity in crises



# LEGACY

- Change from viewing science as how it should work to analyzing how it is in reality conducted
- Showed a new *historical and sociological methodology* in studying science
- Open up new avenues in research: incommensurability, scientific progress,
- Sociology of science: the study of science need not be left to philosopher's alone
- Feminist approaches to science



# EXAMPLES OF PARADIGMS?

- Can you come up with examples of paradigms in science?
- What would a paradigm in your field mean? E.g. technology, art?



# IMRE LAKATOS

- Continued Popper's and Kuhn's work
- Considered Kuhn's influence as dangerous for society → science as irrational
- Methodology of scientific research programs: like paradigm, but more than one program at a time
- A research program has
  - A. hard core: essential to the program (e.g. Newton's gravitational law)
  - B. protective belt: ideas of applying the hard core to actual phenomena (e.g. ideas about Newtonian matter, universe, and mathematical tools).
- Normal science does exist, but it should not be encouraged



# NATURALISTIC TURN IN PHILOSOPHY OF SCIENCE

- Philosophy should aim to interpret science as it is, not as it is supposed to be
- Philosopher's task is not to provide the foundation for psychiatric research and practice, lessons from Foucault, Quine, Kuhn, Feyerabend (contra Hempel)
- Instead, it can help to analyze and make more precise the philosophical presumptions behind sciences, e.g. psychiatry
- 1. Concentration on special sciences: philosophy of biology, psychiatry, chemistry..
- 2. From analyzing the end results to analyzing the scientific process