Philosophy of (Music) Science?

Theories and Music
Issues and Music and Sciences
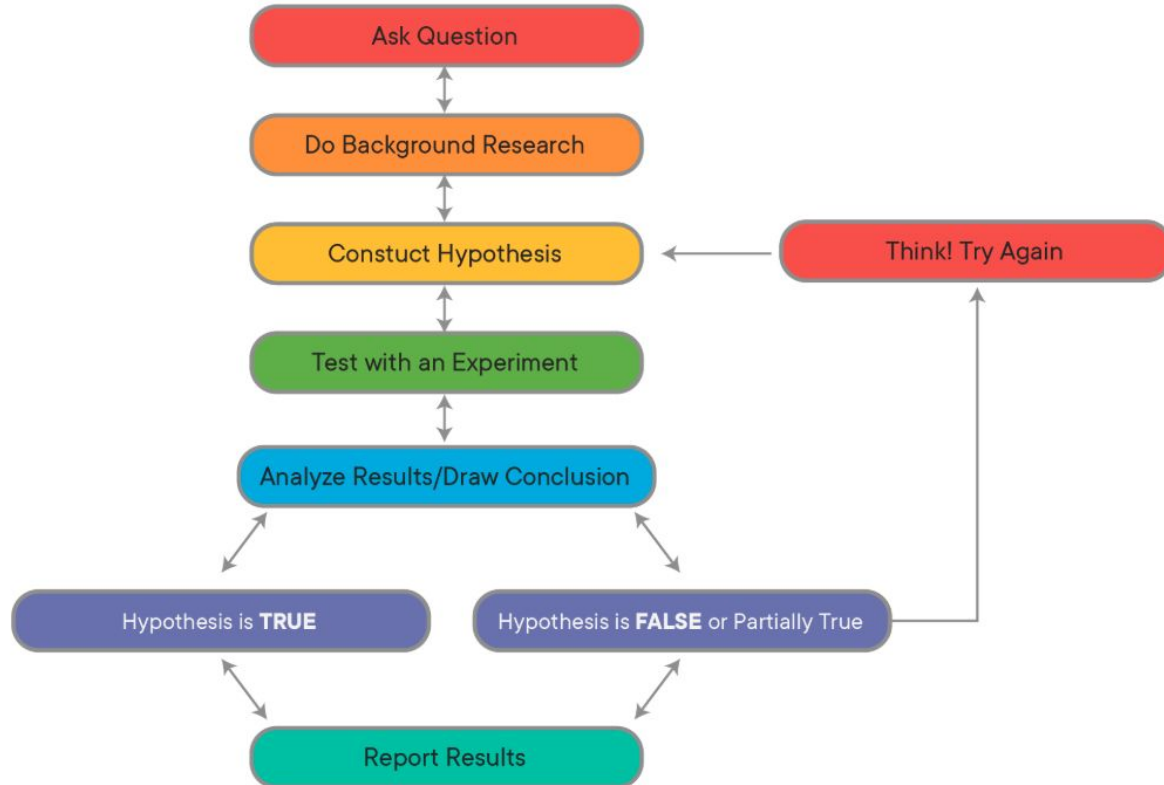Dr. David John Baker
HU Berlin, Winter 2020

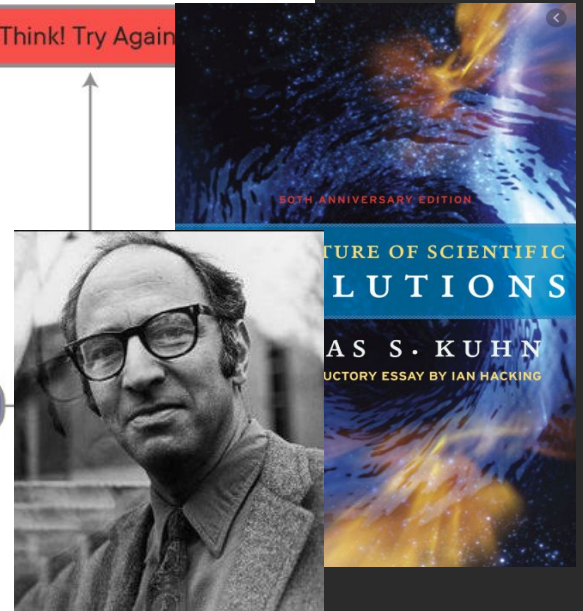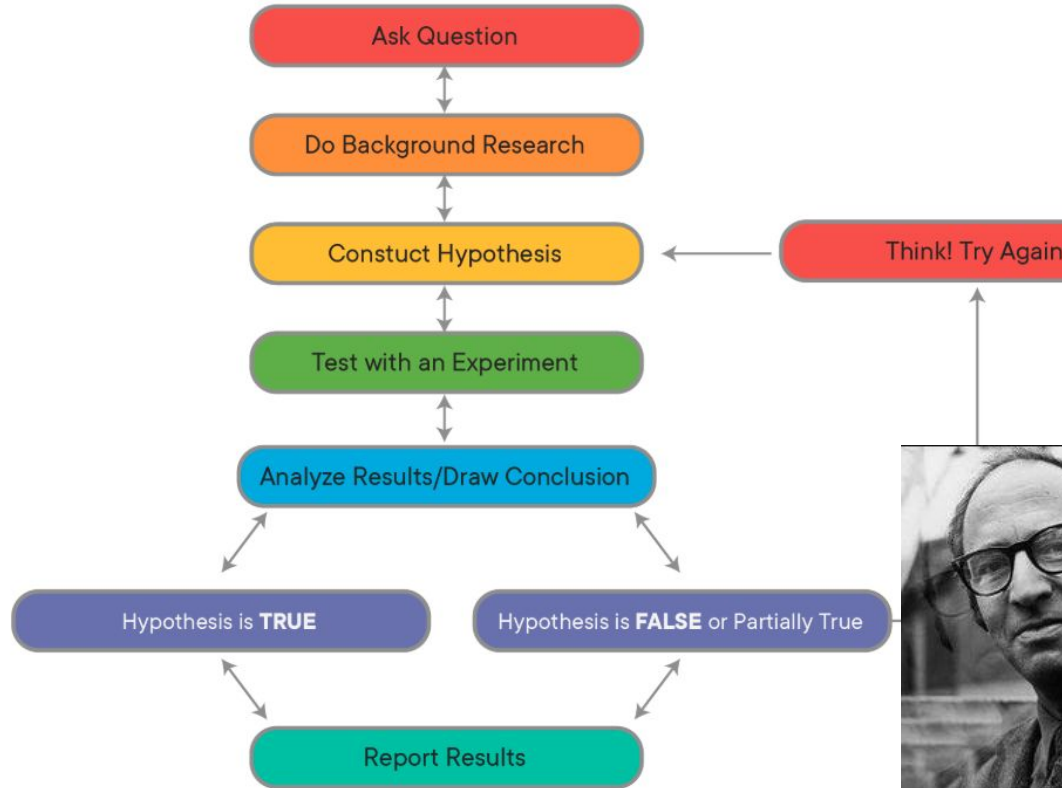# Outline

1. Learning about the world is very difficult
2. The "Scientific Method" is here to help us
3. It gets very complicated, very quickly

Introduction to the Problem

The Scientific Method

Ask Question

Do Background Research

Constuct Hypothesis ← **Think! Try Again**

Test with an Experiment

Analyze Results/Draw Conclusion

Hypothesis is TRUE   **Hypothesis is FALSE or Partially True**

Report Results

The Scientific Method
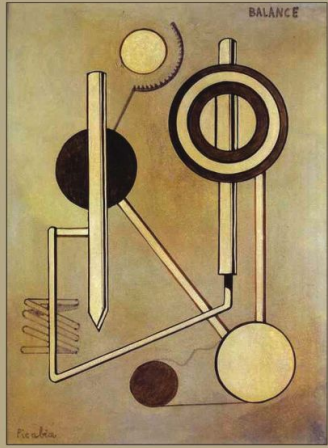
The Scientific Method
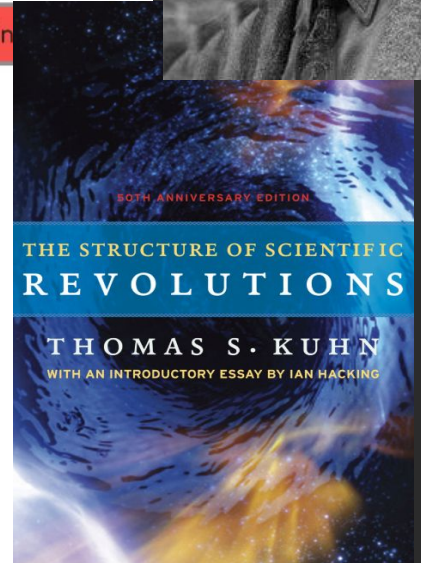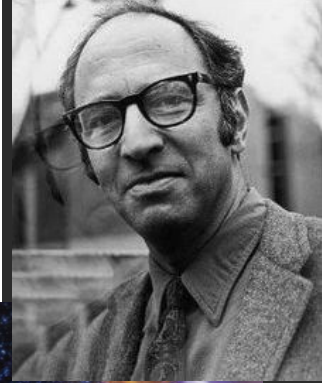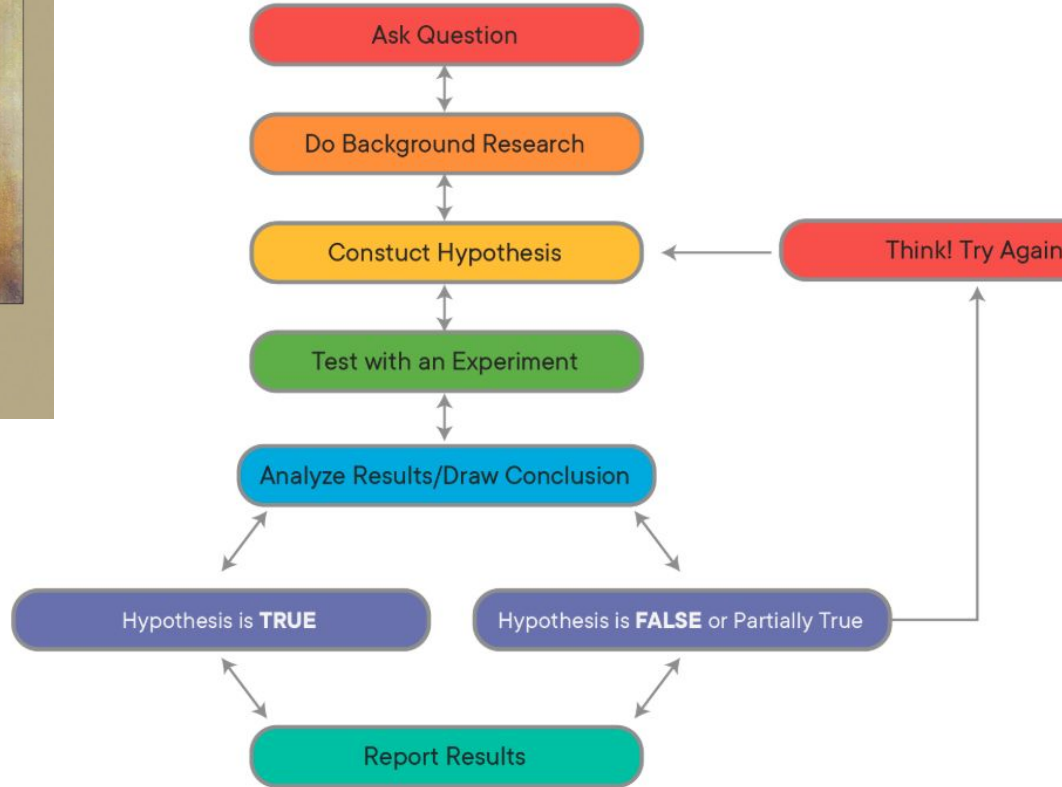
People

- Thomas Kuhn
- Paul Feyerabend
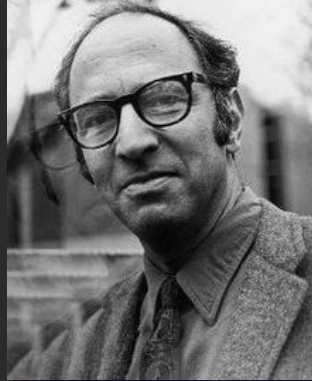
- Further Reading
- Zoltan Dienes
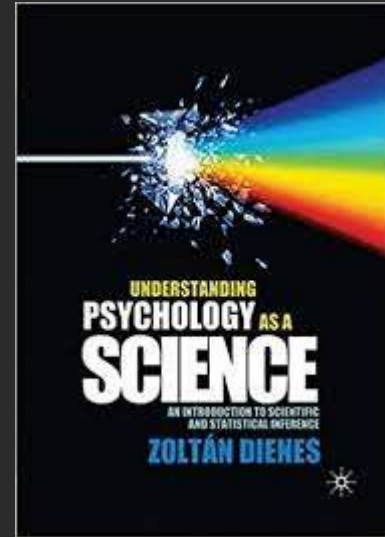
What makes a question scientific?

For Example...

Are questions about the physical limits of human hearing (audiology) and musical taste (social psychology) equally scientific? Why or why not?

What makes a question scientific?

For Example…

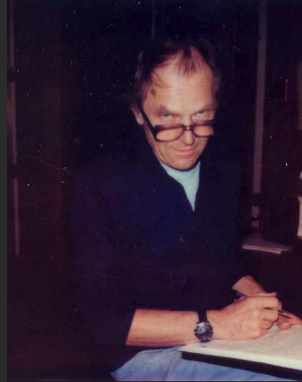**Are questions about the physical limits of human hearing (audiology) and musical taste (social psychology) equally scientific? Why or why not?**

Discuss this question in your breakout groups for the next 7-10 minutes, have one person from each group be prepared to share interesting parts of your discussion for the class.

Leave enough time at the start for people to introduce themselves!!

Discussion Follow Up Points

- Note that it is not the subject matter itself that determines how scientific the question is, but the nature of the question itself
- Some assertions and questions by nature are not going to be scientific
  - The oboe is the most glorious of all instruments
  - Music is a gift from God
  - Toru Takemitsu composed for Japanese films

Demarcation and Falsifiability

- Claims that are scientific in nature are special: DEMARCATION
- DEMARCATION allows us to distinguish scientific claims from others
    - Scientific versus Metaphysical? (Lecture 3)
    - Scientific versus Pseudoscientific?
- For this class, our demarcation criteria will be: FALSIFIABILITY
- An assertion is falsifiable if there is a way that it can conflict with observation… In other words, _can the assertion be proven wrong_?

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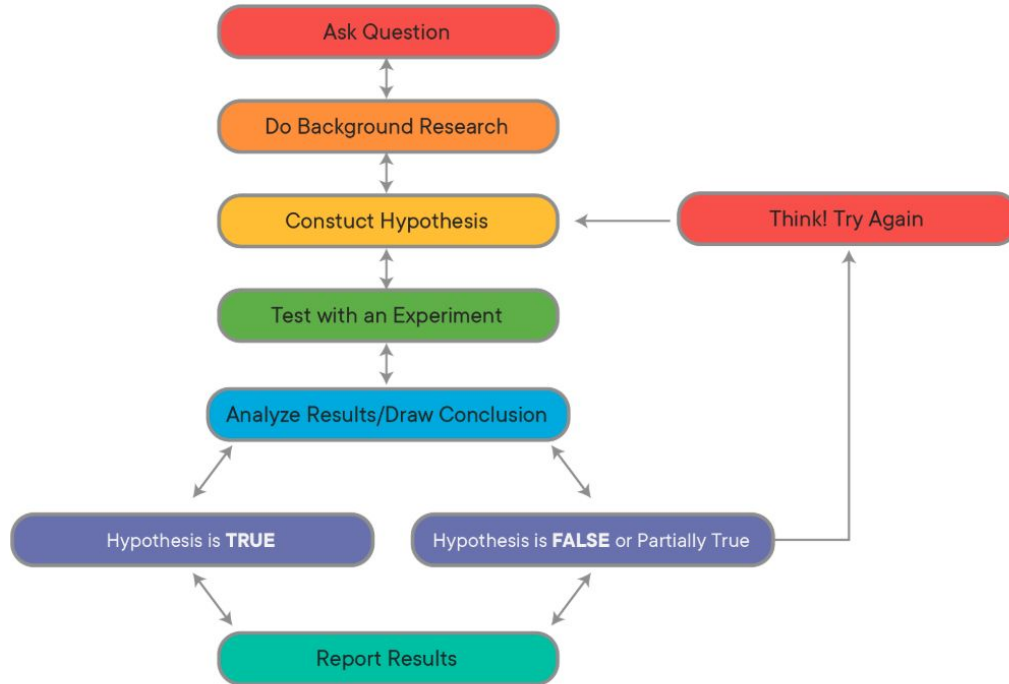**Can you come up with a claim about music and science that could be proven wrong? Answer either by un-muting or writing in the chat!**

The Problem of Induction

Where do our questions come from?

Only can access the world through our senses → Induction

Deduction vs Induction

All swans are white.
Roger is a swam.

Roger is white.

————————————————————

Melvin the swan in white.
Gary the swan is white.
Mary the swan is white.
Terry the swan is white.
Cherry the swan is white.

All swans are white (?)

Deduction vs Induction

All swans are white.
Roger is a swam.

Roger is white.

Deductive argument → eliminate with logic
———————————————————————

Melvin the swan in white.
Gary the swan is white.
Mary the swan is white.
Terry the swan is white.
Cherry the swan is white.

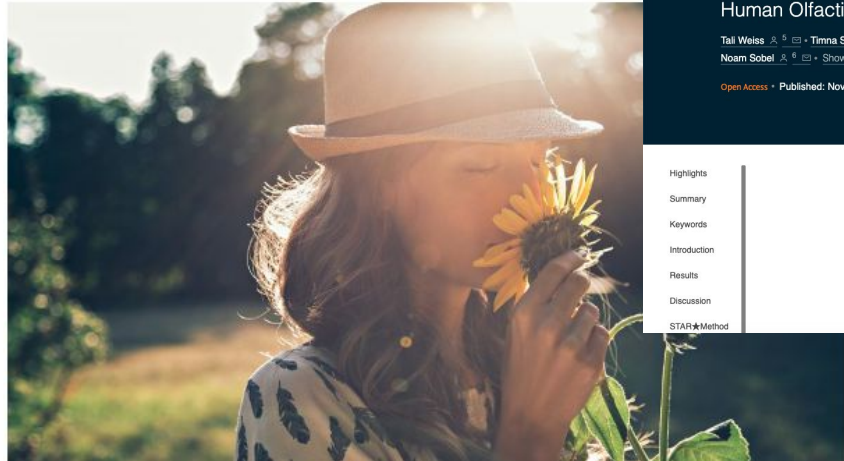**Inductive Argument → continually collect evidence**

All swans are white (?)

Problem of Induction

Women Missing Brain's Olfactory Bulb Can Still Smell, Puzzling Scientists

By Yasemin Saplakoglu - Staff Writer 13 hours ago   Health

Researchers have discovered a small group of people that seem to defy medical science.

Neuron

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Human Olfaction without Apparent Olfactory Bulbs

Tali Weiss · Timna Soroka · Lior Gorodisky · ... Edna Furman-Haran · Thijs Dhollander · Noam Sobel · Show all authors · Show footnotes

Open Access · Published: November 06, 2019 · DOI: https://doi.org/10.1016/j.neuron.2019.10.006

PlumX Metrics

Highlights
Summary
Keywords
Introduction
Results
Discussion
STAR★Method

Highlights

· Humans can have normal olfaction without apparent olfactory bulbs

· Olfaction without apparent bulbs is seen in 0.6% of women, but not in men

· Olfaction without apparent bulbs is associated with left-handedness

Summary

Cell Career Network
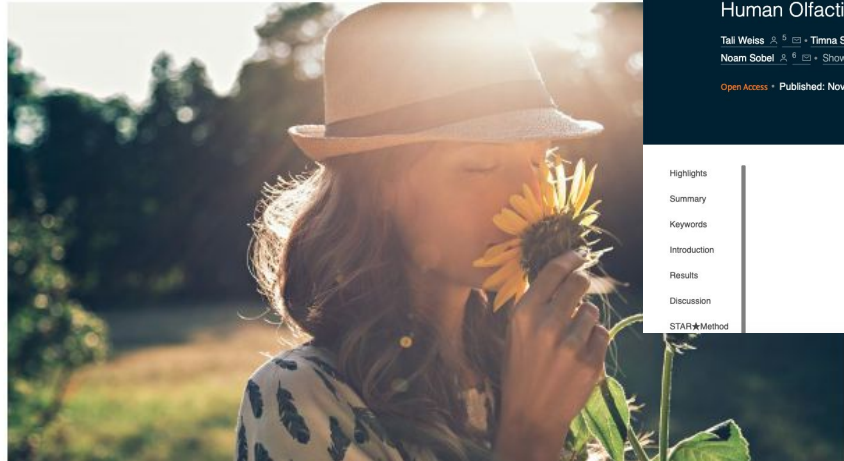
The best jobs in life science

Problem of Induction

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Researchers have discovered a small group of people that seem to defy medical science.

Is every day you live more evidence that you will continue to live?!?

Neuron

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Highlights

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Summary

Problem of Induction

Formulation of the problem [edit]

In inductive reasoning, one makes a series of observations and infers a new claim based on them. For instance, from a series of observations that a woman walks her dog by the market at 8 am on Monday, it seems valid to infer that next Monday she will do the same, or that, in general, the woman walks her dog by the market every Monday. That next Monday the woman walks by the market merely adds to the series of observations, it does not prove she will walk by the market every Monday. First of all, it is not certain, regardless of the number of observations, that the woman always walks by the market at 8 am on Monday. In fact, David Hume would even argue that we cannot claim it is "more probable", since this still requires the assumption that the past predicts the future.

Second, the observations themselves do not establish the validity of inductive reasoning, except inductively. Bertrand Russell illustrated this point in *The Problems of Philosophy*:

> Domestic animals expect food when they see the person who usually feeds them. We know that all these rather crude expectations of uniformity are liable to be misleading. The man who has fed the chicken every day throughout its life at last wrings its neck instead, showing that more refined views as to the uniformity of nature would have been useful to the chicken.

In several publications it is presented as a story about a turkey, fed every morning without fail, who following the laws of induction concludes this will continue, but then his throat is cut on Thanksgiving Day.[3]

Usually inferred from repeated observations: "The sun always rises in the east."

Usually not inferred from repeated observations: "If someone dies, it's never me."

We can't accumulate evidence for a theory by just adding more data since the addition of one piece of contrary evidence (the appearance of a black swan) has the potential to destroy our theory.

This has happened over and over again, see the history of science.

So how do we get around this problem?

Exploit the asymmetry between getting data to establish a theory and finding data to be critical of it. (One approach)

If you had a scientific theory that the parts of the brain that are next to your ears were responsible for processing sounds, how would you use inductive reasoning to help support your theory?

BREAK

Theories in Science

Theorizing In Science

- In the sciences, we want to be able to be able to describe, explain, and predict what happens around us
- Being able to form a coherent narrative that describes how or why something happens is extremely powerful
- The more specific you are, the more impressive it often is
- For example….

Theorizing In Science

- In the sciences, we want to be able to be able to describe, explain, and predict what happens around us
- Being able to form a coherent narrative that describes how or why something happens is extremely powerful
- Theories allow us to make predictions about the world around us
- The more specific you are, the more impressive it often is
- For example….

- Theory/Prediction 1: It will rain in Spring in Berlin of 2021
- Theory/Prediction 2: It will rain in March in Berlin of 2021
- Theory/Prediction 3: It will rain on March 21st of 2021
- Theory/Prediction 4: It will rain in the afternoon on March 21st of 2021
- Theory Prediction 5: It will rain between 16:00 and 17:00 on March 21st of 2021
- Theory Prediction 6: It will rain 2.7 cm between 16:00 and 17:00 on March 21st of 2021

Theorizing In Science

1. Which theory is the most falsifiable?
2. How impressed would you be if it rained on March 22nd between 16:00 and 17:00?
3. What if you knew ahead of time that it rained a lot in late March in Berlin? Does that change your opinion of my theory of German rain?
4. If Theory/Prediction 6 were to happen, how do you know that I didn't just luck out?
5. If Theory/Prediction 6 were to happen, does that mean that the Theory is good at explaining how the weather works?

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Picking One Framework

- Guest and Martin, 2020
- Multiple passes at paper
- Currently just looking at main terms

- Eventually want you to develop comfortable understanding of how different levels of scientific ideas relate to one another
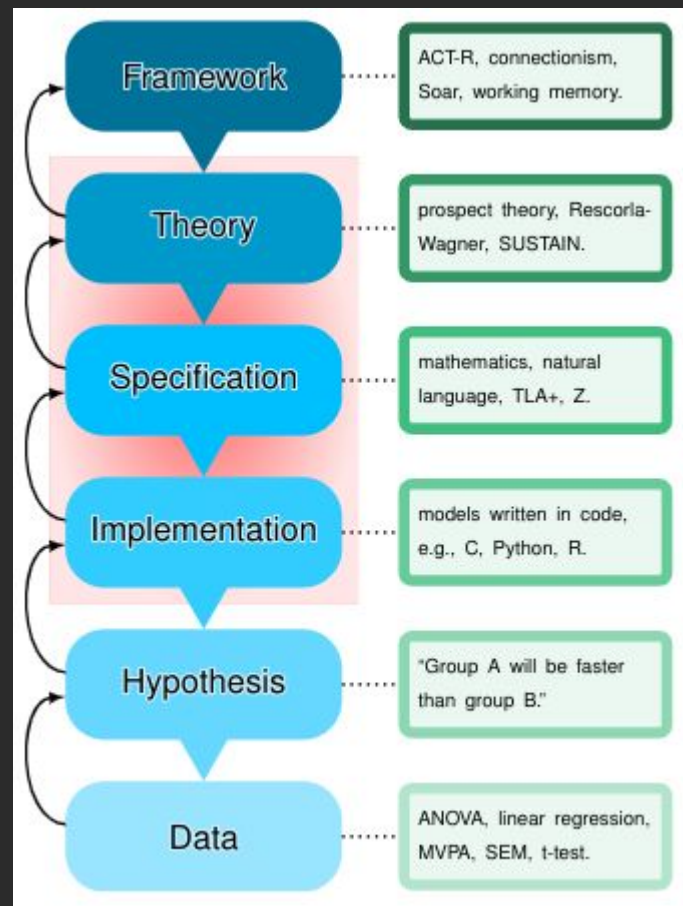
Getting Clear with Terms

- Framework → The weather/meteorology
- Theory → Dr. Baker's Secret Weather Theories
- Specification →(ignore for now)
- Implementation →(ignore for now)
- Hypothesis → If / how much rain in Berlin and when
- Data → What we get in the real world

Getting Clear with Terms

- Framework → Phenomena we want to describe
- Theory → set of causal relations that attempt to describe, explain, or make predictions about the world
- Specification →(ignore for now)
- Implementation →(ignore for now)
- Hypothesis → A narrow, testable statement
- Data → Observations collected from the real world

Theories in Music

Activity: Theorizing in Music

- Pick one side of the argument!
- Using the terminology and ideas covered in the lecture, write one sentence for each term below. Attempt to make an argument based on what you know about music theory asserting the kind of theory we talk about in music theory **SHOULD OR SHOULD NOT** be taken as a *scientific* theory
- For example…
  - "Questions music theorists/music analysts are interested in answering are not like scientific theory because they only rely on inductive arguments about a specific score they are analyzing"
  - "Because music theorists assert causal relationships as to why certain musical events happen, they are proposing a scientific theory and thus should be treated scientifically!"
- Breakout rooms!

Terms/Questions for Review

- Demarcation
- Falsifiability
- Inductive Reasoning
- Deductive Reasoning
- Framework
- Theory
- Specification
- Implementation
- Hypothesis
- Data

1. Pick two terms from the left hand column, try to use both in the same sentence.
2. Pick five terms and try to link each term to one another
3. Briefly skim the abstract of a scientific paper, see if you can figure out how their data connects to their hypothesis
4. Argue for the other side of the "music theory is/not scientific debate" by trying to find holes in your original argument that you presented

Further reading

- The Scientific Method and critique of it
  - What is this Thing Called Science?
  - Feyerabend, Against Method
- The Problem of Induction
  - What Is This Thing Called Science?
  - See Moodle
- Demarcation, Falsifiability
  - Stanford Encyclopedia of Philosophy: Pseudoscience
  - https://plato.stanford.edu/entries/pseudo-science/
- Inductive Reasoning, Deductive Reasoning
  - Zoltan Dienes: Explaining Psychology as Science
  - See Moodle
- Framework, Theory, Specification, Implementation, Hypothesis
  - Guest and Martin, 2020
  - https://psyarxiv.com/rybh9/