RESEARCH

A Quick Introduction 28.02.2019 by Oldouz Moslemian

“Science Is Derived From Facts”

Yes? No?

Arguments of Facts?

1. Facts are Directly Given to careful, unprejudiced Observers via the Senses

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1. Facts are Directly Given to careful, unprejudiced Observers via the Senses

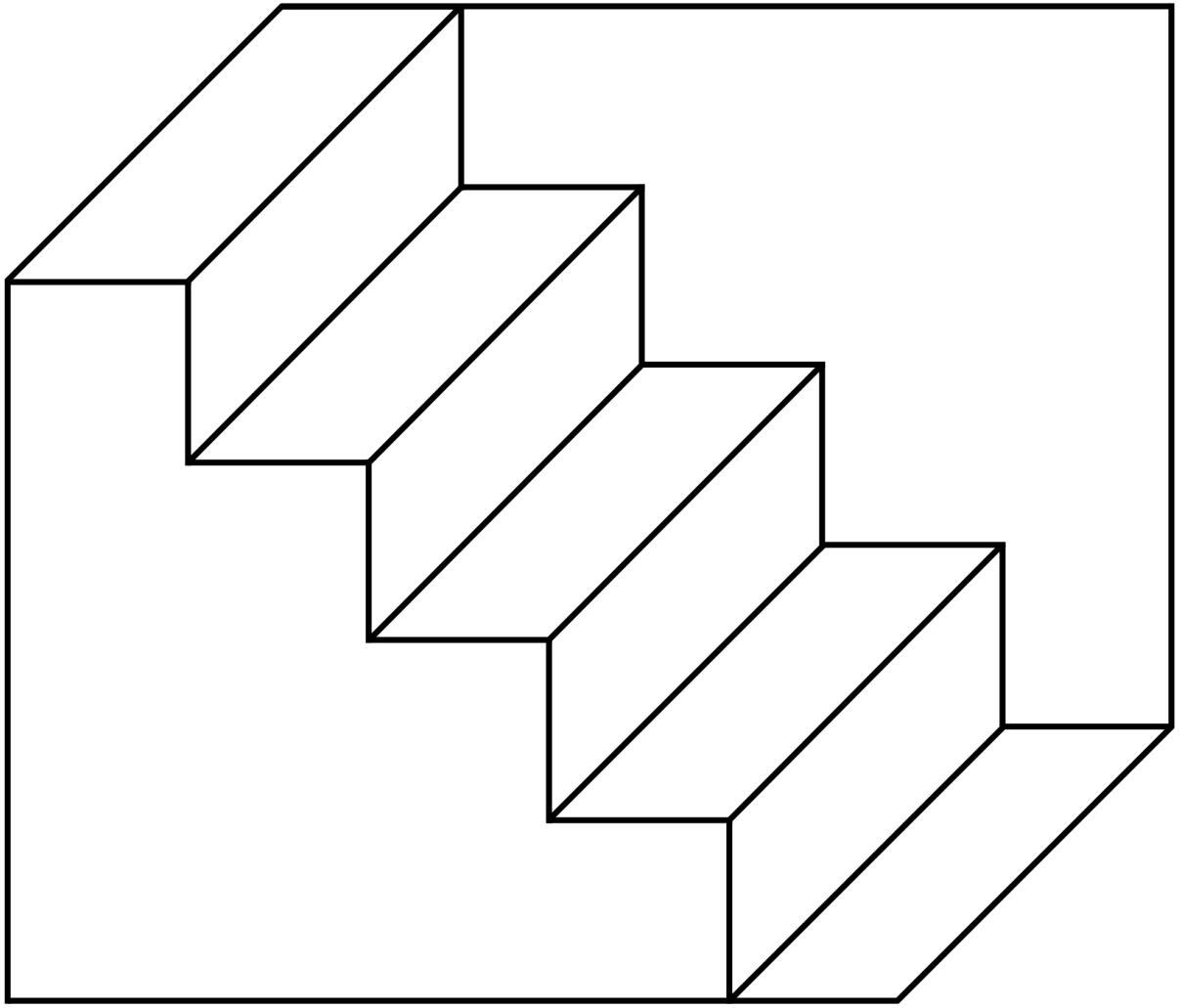
2. Facts constitute a Firm and Reliable Foundation for Scientific Knowledge

Arguments of Facts?

1. Facts are Directly Given to careful, unprejudiced Observers via the Senses

2. Facts constitute a Firm and Reliable Foundation for Scientific Knowledge

3. Facts are Prior to and Independent of Theory



Schroeder's Staircase

Source: https://commons.wikimedia.org/wiki/File:Schroeder%27s_stairs.svg , Retrieved on Feb 27,2019

Observation is Dependant on

the observers Experience, Knowledge, Presumptions, Expectations and What they are Looking For?

Observation as a Practical Intervention and Experimentation

Observations suitable to constitute a basis for scientific knowledge are both:

Objective: as they can be tested through procedures

Fallible: as they may be undermined by new kind of tests through advancement in technology

How do we arrive at these Appropriate Facts?

"derive" a conclusion in a "logical" way

Basic Principles of Logical Reasoning

Basic Principles of Logical Reasoning

- Deductive reasoning
- Inductive reasoning
- Abductive reasoning

Deductive Reasoning

If the Premises are True

then,

the Conclusion must be True

Deductive Reasoning

Premise A = True

Premise B = True

Conclusion = True

Deductive Reasoning

Premise A = True

All books on philosophy are boring

Premise B = True

Conclusion = True

Deductive Reasoning

Premise A = True

All books on philosophy are boring

Premise B = True

This book is on philosophy

Conclusion = True

Deductive Reasoning

Premise A = True

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This book is on philosophy

Conclusion = True

This book is boring

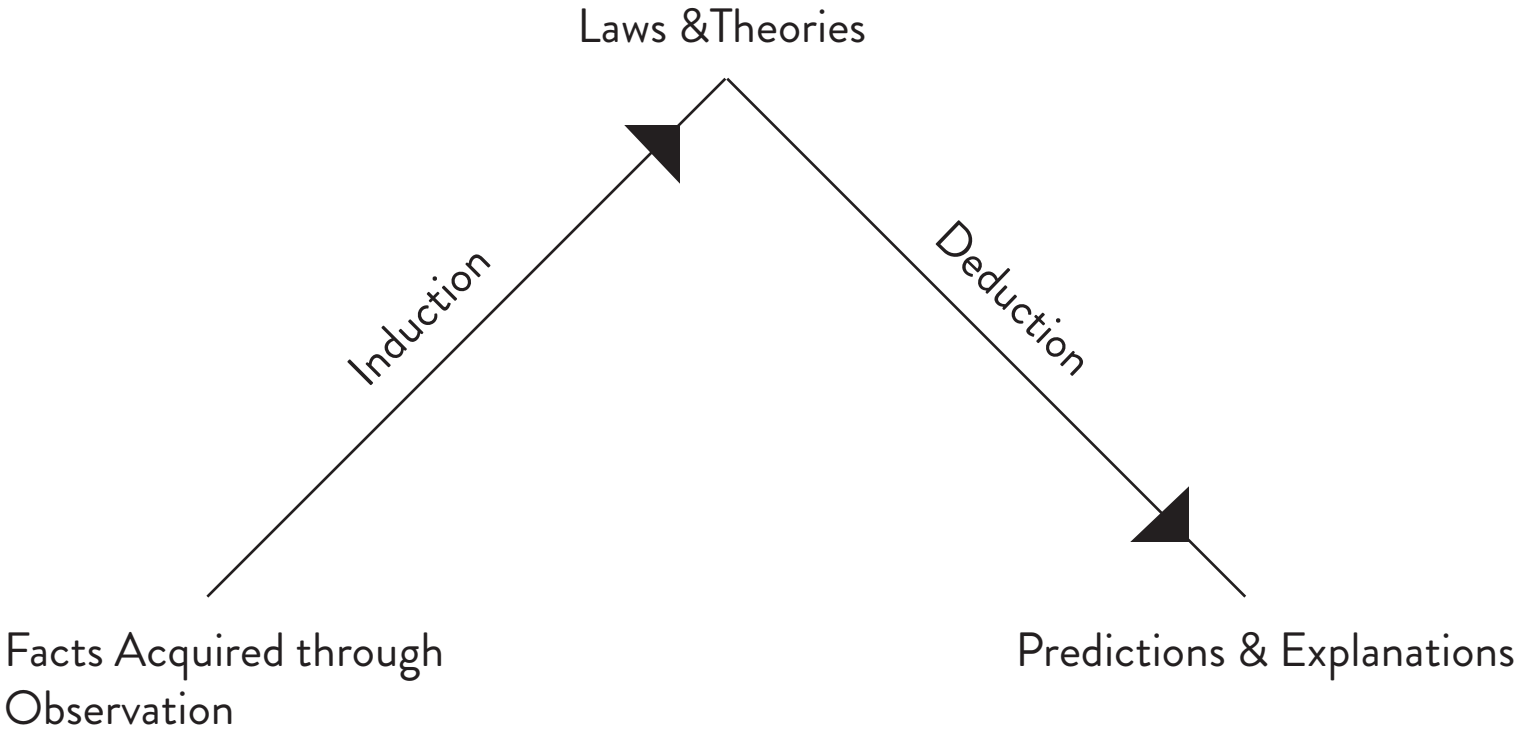
Inductive Reasoning

For the inductivists

the Source of Scientific Truth is

Experience not logic

Inductive Reasoning



Inductive Reasoning

Premise A = If True

Premise B = If True

Conclusion = Most Probably True

Inductive Reasoning

Premise A = If True

Fairly pure water freezes at about 0C (if given sufficient time)

Premise B = If True

Conclusion = Most Probably True

Inductive Reasoning

Premise A = If True

Fairly pure water freezes at about 0C (if given sufficient time)

Premise B = If True

My radiator contains fairly pure water

Conclusion = Most Probably True

Inductive Reasoning

Premise A = If True

Fairly pure water freezes at about 0C (if given sufficient time)

Premise B = If True

My radiator contains fairly pure water

Conclusion = Most Probably True

If the temperature falls well bellow 0C, the water in my car radiator will freeze (if given sufficient time)

Inductive Reasoning

- Laws and theories

- Initial Conditions

- Predictions and Explanations

General laws can be derived from experience

Abductive Reasoning

Inference to the best Possible Explanation based on an Evidencing Process (to generate new ideas and suggestions for further inquiry)

Abductive Reasoning

Rule = If True

Result = Observed

Case = to the best Possible Inference is True

Abductive Reasoning

Rule = If True

All the beans in this bag are white

Result = Observed

Case = to the best Possible Inference is True

Abductive Reasoning

Rule = If True

All the beans in this bag are white

Result = Observed

These beans are white

Case = to the best Possible Inference is True

Abductive Reasoning

Rule = If True

All the beans in this bag are white

Result = Observed

These beans are white

Case = to the best Possible Inference is True

These beans are from this bag

General tenants of Research

Principles to take into account while conducting research

General tenants of Research

Validity

Reliability

Accuracy

Ethics

General tenants of Research

Validity

Is the experiment suitable?(case design)
Am I testing what I intend to?

Keywords: the equipment, the method, the analysis,

the variables in the experiment, controls

General tenants of Research

Reliability

Can someone else repeat the experiment and get the same result?
Is the test repeated enough - number of trials and/or Sample size?
Is the period of experiment enough - long/short?

Keywords: repeatability, reducing random errors,

scheduling, reference to previous research

General tenants of Research

Accuracy

Can I make the experimental procedure more precise?
Can I make the methods simpler?

Keywords: calibrating equipment, more precise measurements,

better isolation of variables / controls

General tenants of Research

Ethics

Why is the research necessary / aim of research?
Am I securing the data properly?
Am I causing harm to others?

Keywords: data storage, truthfulness about results,

crediting others, codes of ethics, transparency, consent form

P-Hacking / Data Dredging / Data Fishing / Data Snooping

- Misusing the Data collected in different ways to find a correlation between the premises

- Finding patterns in Data Analysis that are not true

References & Other Literature

Chalmers, A. F. (1999). What Is This Thing Called Science? (Third Edition). Hackett Pub.

Flick, U. (2014). An Introduction to Qualitative Research (Fifth Edition). SAGE Publications Ltd.

Links:

https://www.youtube.com/watch?v=-wrCpLJ1XAw&t=407s

https://www.youtube.com/watch?v=IV-8YsyghbU