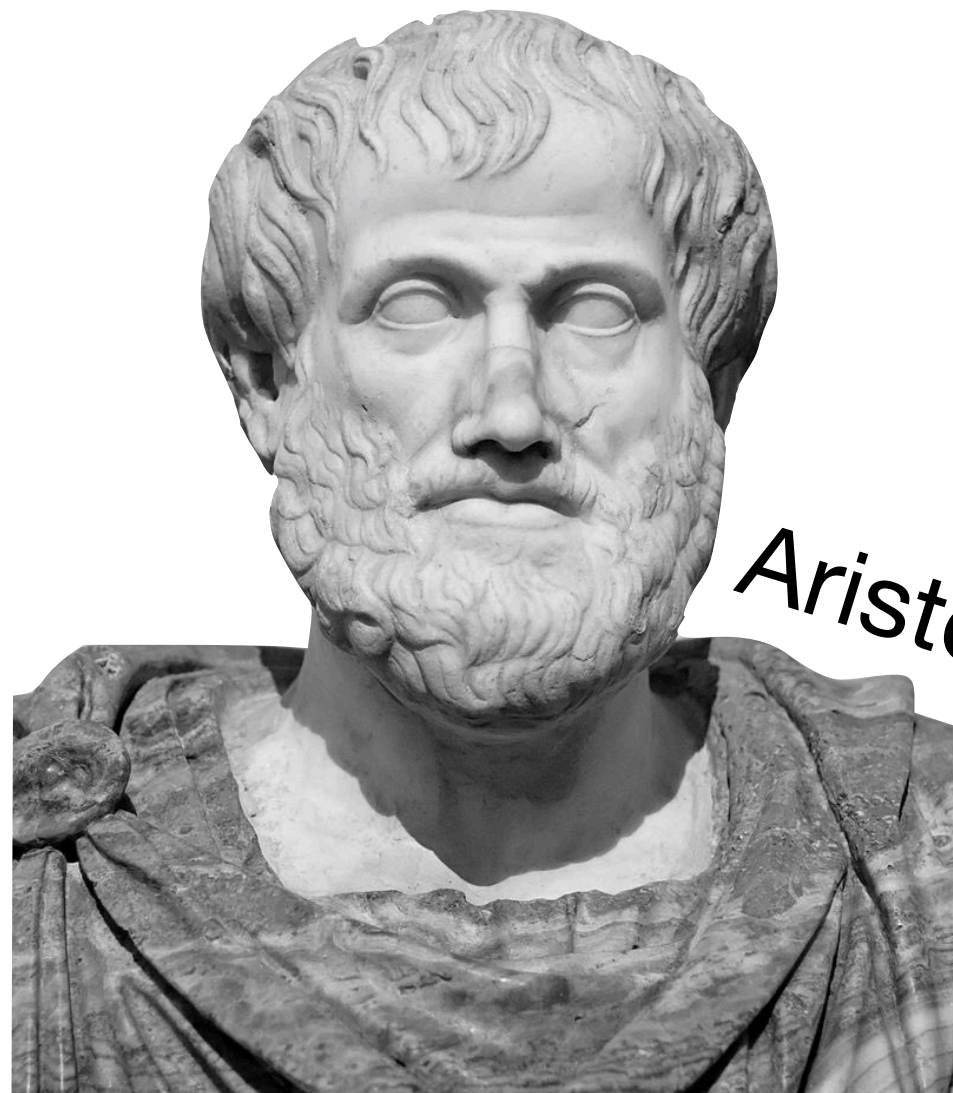


# Research Design (also, How to read a research paper)

# Introduction to the scientific (publication) method



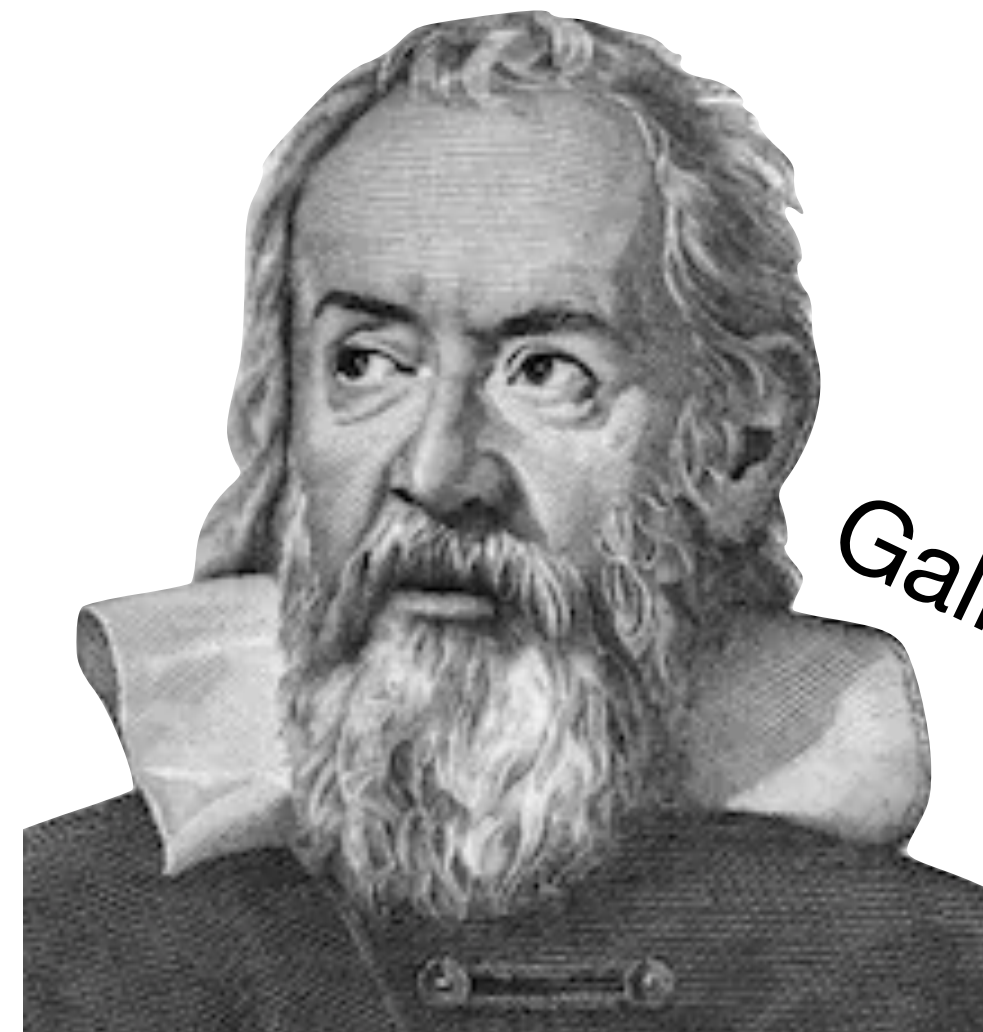
Aristotle

Knowledge from the  
rational analysis of nature



Ibn al-Haytham

Experiments  
and reproducibility



Galilei

Independent, rational  
Confirmation



Bacon

First-hand  
Experience

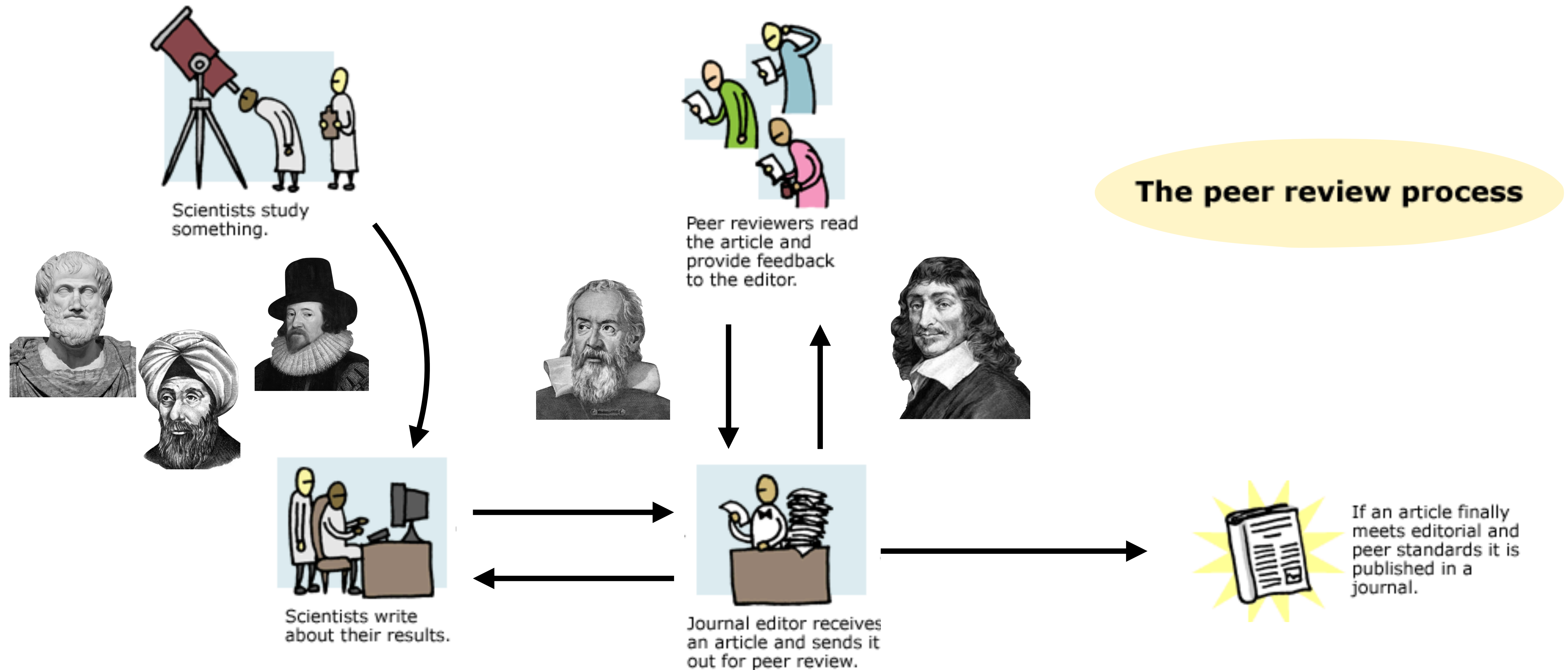


Descartes

How do we know  
what we know?  
(Math can help)



# Introduction to the scientific (publication) method



# Elements of a Research Paper: Context

## What is the general context of the paper?

The context include:

- the general field (e.g., literature, history, archeology, tourism, biology, forensics, religious studies);
- the specific application (e.g., literary analysis, quantitative history, genetics, virology, forensics intelligence, tourism planning, biblical quantitative studies).

# Elements of a Research Paper: Problem/Motivation

- What are the problems the authors want to address?
- Why are those problems important (impact, theoretical and/or practical needs, etc.)?
- What are the main contributions of the paper?

# Elements of a Research Paper: Data

- How did the authors gather their data?
- Did they digitise their data? How? Is the material publicly available?
- What tools did they use 1) to handle (store, manipulate) the data and 2) to compute measures on the data?
- What measures did they apply?

# Elements of a Research Paper: Results

- What is the connection among:
  - the gathered data;
  - the applied measures;
  - the properties found.

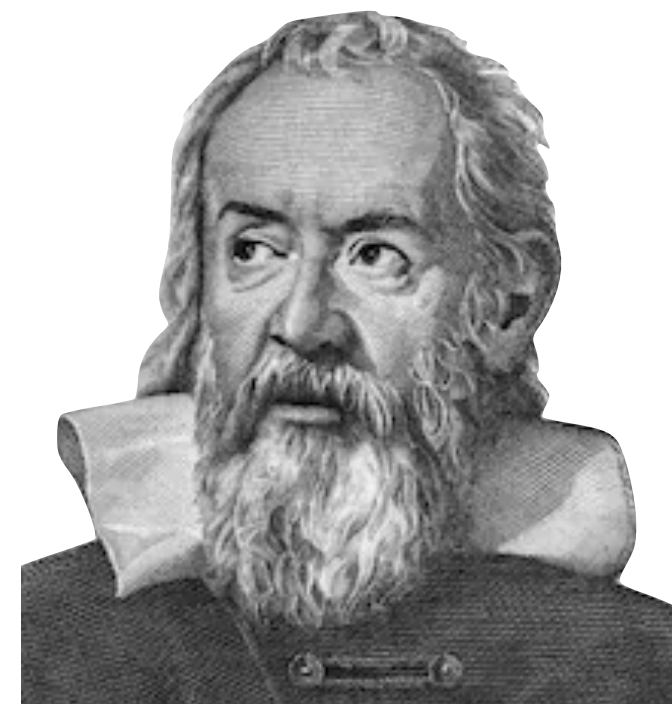
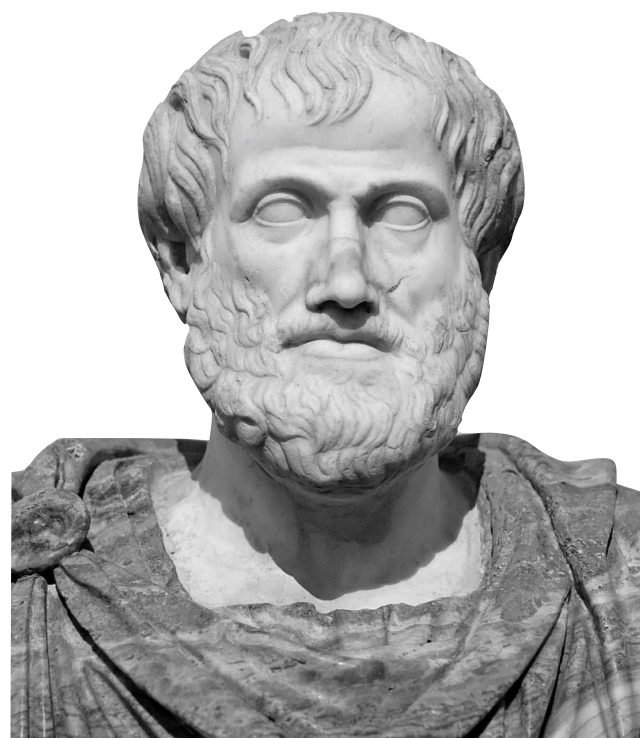
# Peer-reviewing: Critique

- What is your opinion/critique on the paper?
- Do you think the contributions solve the problems they presented?
  - To which extent (completely, what parts)?
  - Why?
- What could the authors have done differently to answer their research problems (e.g., gather data with additional information, build their model differently, apply alternative measures)?



# Elements of Network Analysis Research

There is a common denominator to all network analysis research: the usage of a tool from discrete mathematics, called **graph theory**, to *reduce and draw conclusions from naturally-occurring (network) phenomena*



# Whole-network and Personal-network Research Design

Two fundamental kinds of network research designs:

**Whole network:** we study the set of ties among all pairs of nodes in a given set, e.g., we study who is friends with whom among all members of a given organisation - there, the relation being measured is a dyadic variable that has a value for every pair of nodes (every dyad might be assigned a 1 or a 0, whether they are friends or not).

Whole-network designs enable researchers to employ the full set of network concepts and techniques, which often assume that the entire network is available. However, the cost of assembling and managing the network can quickly rise due to the whole-network scope.

**Personal network:** we study a set of nodes called "egos" and their ties to others, called "alters" (not necessarily among the set of egos). Personal-network designs have the advantage of simplifying the gathering and management of the network.



# Sources of Network Data

**Primary sources:** the researcher collects the data first-hand, e.g., by asking questions to or observing the behaviour of the interviewees, from a survey, probing a (computer) network or applying other kinds of first-hand measures on the focussed network.

**Secondary sources:** the researcher gathers data that already exists somewhere, whether in paper records (e.g., fish records, historical marriage records), or electronic databases (e.g., emails, social networking sites). Secondary data is often easier and quicker to collect but imposes strong and arbitrary limits on the type of relations studied. Some of the computer-based data generated by social media such as Facebook and even email represents a transitional form between primary and secondary data. Although the data is collected directly, as in primary research, there are limitations on the types of relations available for study, as in secondary research.

# Types of nodes and types of edges/ties

Relational states							Relational events	
Similarities			Relational roles		Relational cognition			
Location	Participation	Attribute	Kinship	Other roles	Affective	Perceptual	Interactions	Flows
Same spatial and temporal space	Same clubs, same events	Same gender, same attitude	Mother of, sibling of	Friend of, boss of, student of, competitor	Likes, hates	Knows, knows of, sees as happy	Sold to, talked to, helped, fought with	Information, beliefs, money