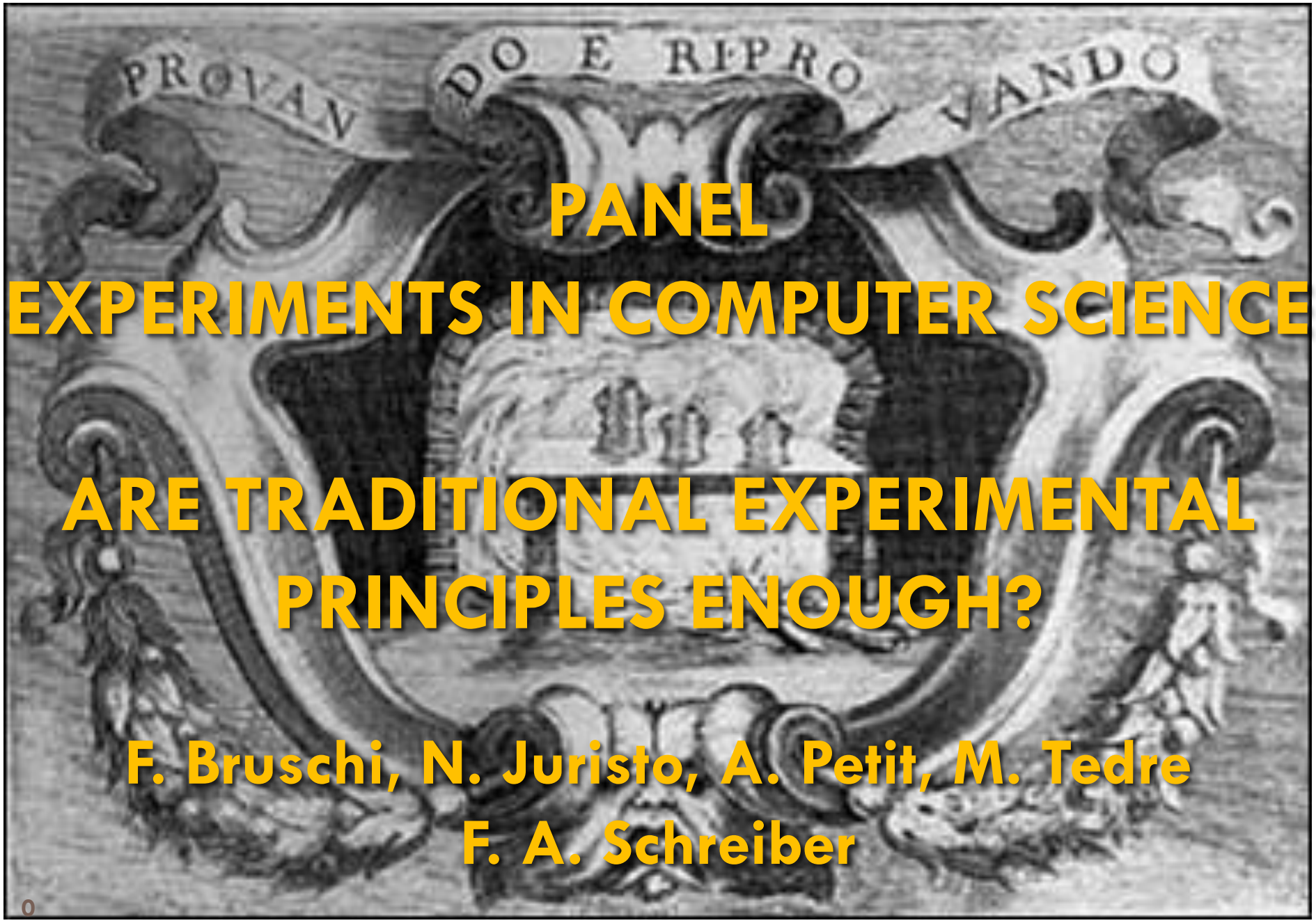
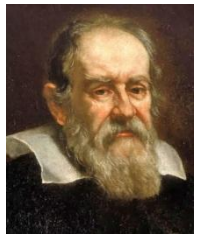


PANEL
EXPERIMENTS IN COMPUTER SCIENCE

ARE TRADITIONAL EXPERIMENTAL PRINCIPLES ENOUGH?

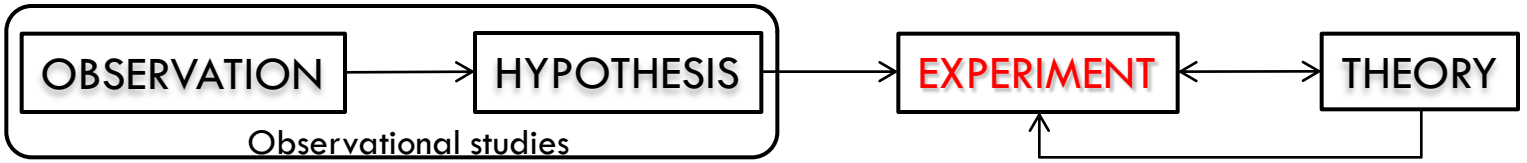
F. Bruschi, N. Juristo, A. Petit, M. Tedre
F. A. Schreiber

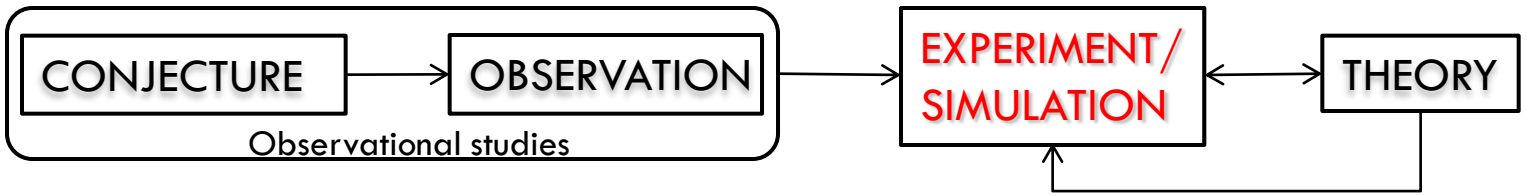
THE SCIENTIFIC METHOD



- There remains simple experience; which, if taken as it comes, is called accident, if sought for, experiment. The true method of experience first lights the candle [hypothesis], and then by means of the candle shows the way [arranges and delimits the experiment]; commencing as it does with experience duly ordered and digested, not bungling or erratic, and from it deducing axioms [theories], and from established axioms again new experiments.

Francis Bacon. Novum Organum. 1620





PROPERTIES THAT CHARACTERIZE AN EXPERIMENT

GOALS

- **Repeatability** at different times and in different places to check the universality of results
- **Reproducibility** by other scientists to confirm that results are independent of the details of the specific experiments
- **Comparison of the results** of different instances of the same experiments

DESIGN

- Adoption of a **precise language** to give rigor and precision to experimental data
- Use of **precise measurement methods and tools** to quantitatively describe the phenomena under investigation

OBSERVING BEFORE THE EXPERIMENT

- To discover the unknown

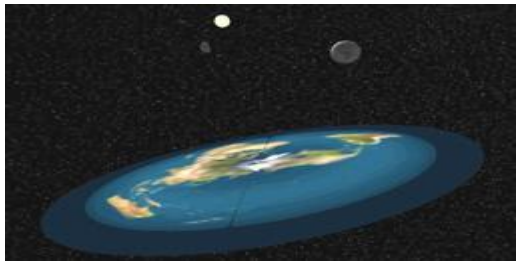
La chance ne sourit qu'aux esprits bien préparés.

Louis Pasteur

- "what happens if I mix H_2 and O?"

WHY EXPERIMENTS?

- To test a hypothesis
  - "I think the Earth is flat, am I right?"



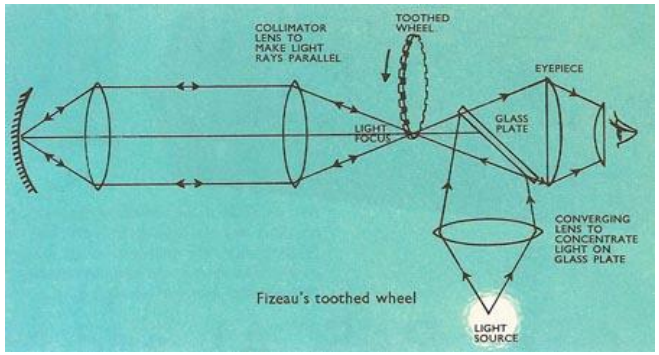
NO!

WHY EXPERIMENTS?

- To determine the value of some physical variable
  - "How much does one Ton of steel weigh?"

= 1 ton

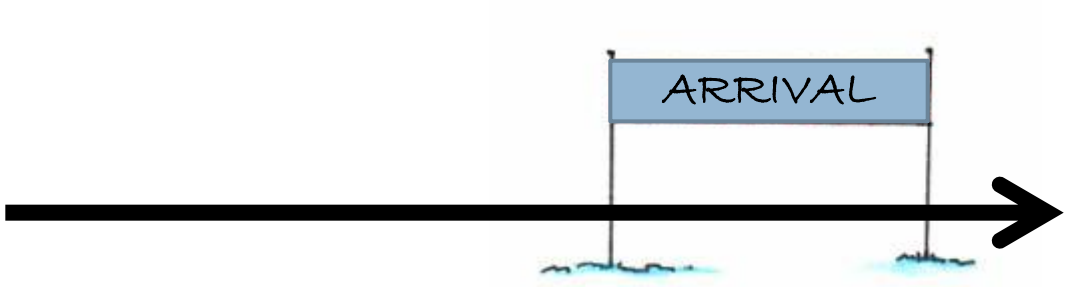
  - "How fast is light in a vacuum?"



= 300.000 Km/s

WHY EXPERIMENTS?

- To compare a set of different «objects» to determine their relative merits (benchmarking)
  - "I drive a Ferrari and you drive a 500; who is faster?"



INFORMATIC TOOLS AND SERVICES FOR SCIENTIFIC EXPERIMENTATION

- **Usage of simulation models and frameworks**

  make experimentation cheaper and faster than in real-life

- **Pervasive systems support**

  sensing real-life physical data as input to application programs which compute experiments outputs

EXPERIMENTATION ON AND ABOUT INFORMATIC SYSTEMS THEMSELVES

- Software testing/debugging is still (alas 🥶) mostly an empirical activity
- Usage of Data mining for knowledge discovery
- Usage of simulation models and frameworks to predict system performance
- System benchmarking is common practice

- **How do these activities compare to the classical notion of "experiment"?**
- **Do we need any new vision?**
- **Are CS/CE curricula suitable for giving our students an experimental awareness?**

EXPERIMENT WITH JOY …!