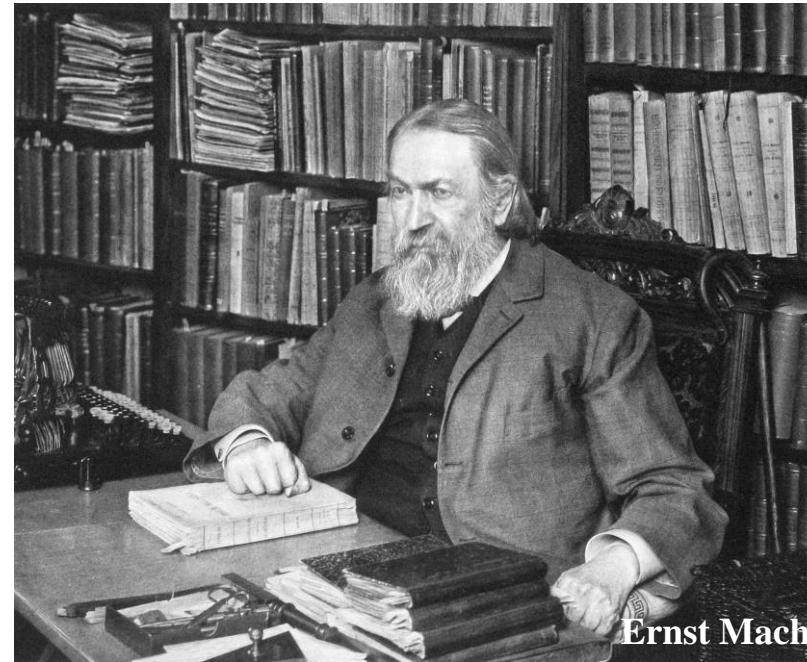
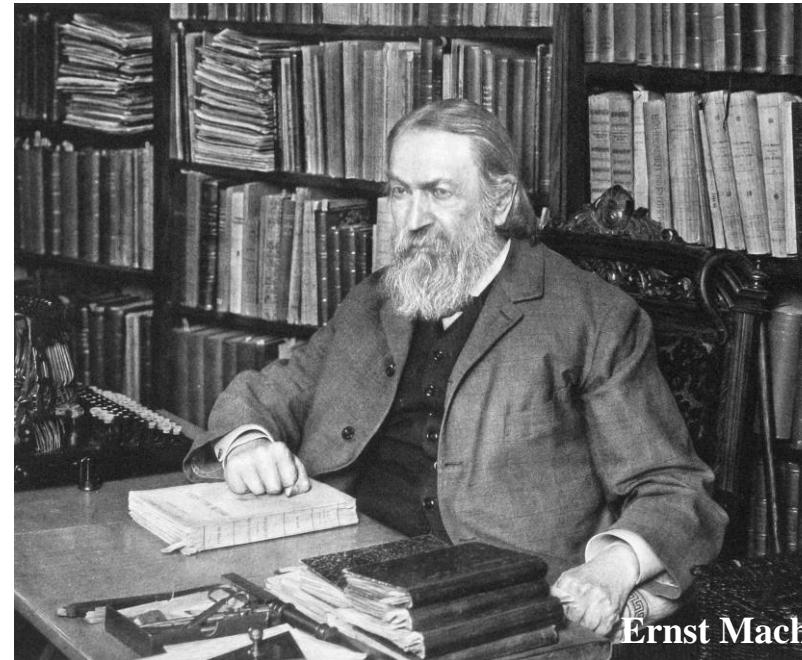


It is what it is!

Is it?



Ernst Mach



Mach: Analysis of Sensations

IV. Chief points of view for the investigation of the senses

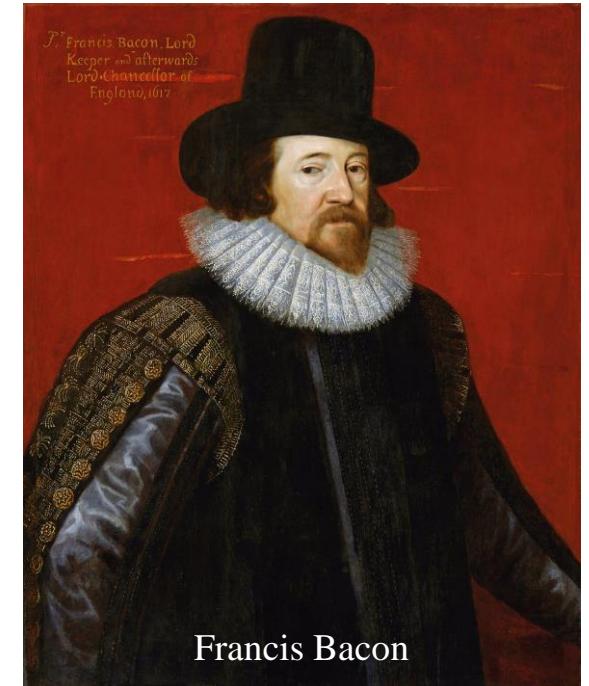
Ernst Waldfried Josef Wenzel Mach

- February 18, 1838 – February 19, 1916
 - *Contemporaries**: Boltzmann, Poincaré, Helmholtz, Darwin, Huxley, Pasteur, Fechner, Freud, Weber, Jung, Einstein...
- 1838: Born on February 18th in Moravia
- 1855-60: University of Vienna (Physics, philosophy and mathematics)
- 1862: *Doppler Effect*
- 1864-67 : University of Graz (**Professor of Mathematics**; later **Physics**)
- 1865: *Mach Bands*
- 1866: Begins writing the Analysis of Sensations
- 1867-1895: **Chair of Experimental Physics**, Praha
- 1887: Shadowgraph of Shock Waves
- 1889: The Principles of Physical Optics
- 1893: The Science of Mechanics: A Critical and Historical Account of Its Development
- 1895: University of Vienna (**Professor of Inductive Philosophy**)
- 1897: Analysis of Sensations (written over 3 decades)
- 1901: Retired following a stroke
- 1901: ‘Reformer’ in the Austrian Parliament

...

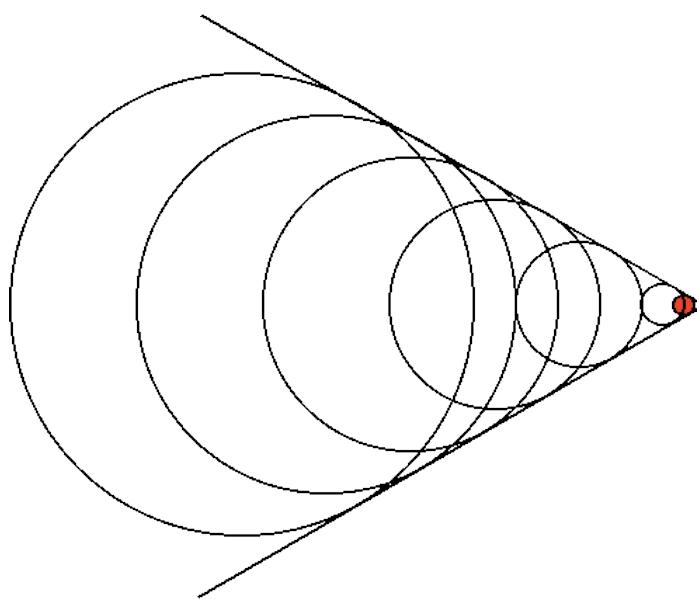
Aphorism 1:

Man, as the minister and interpreter of nature, does and **understands as much as his observations** on the order of nature, either with regard to **things or the mind**, permit him, and **neither knows nor is capable of more**.

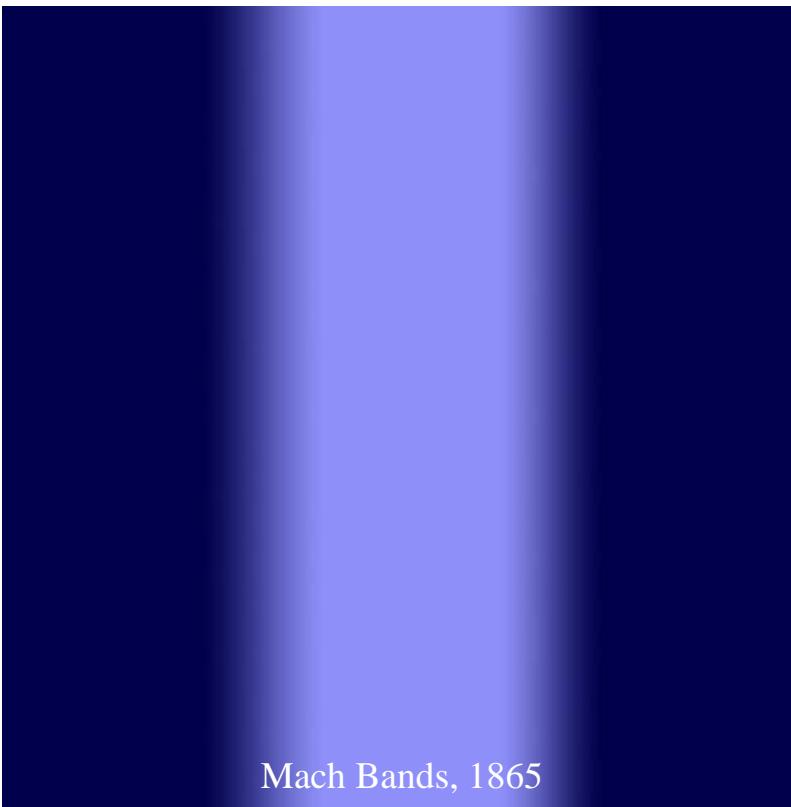


Francis Bacon

Doppler Effect, Mach Bands, Illusions...



Doppler Effect, 1862



Mach Bands, 1865

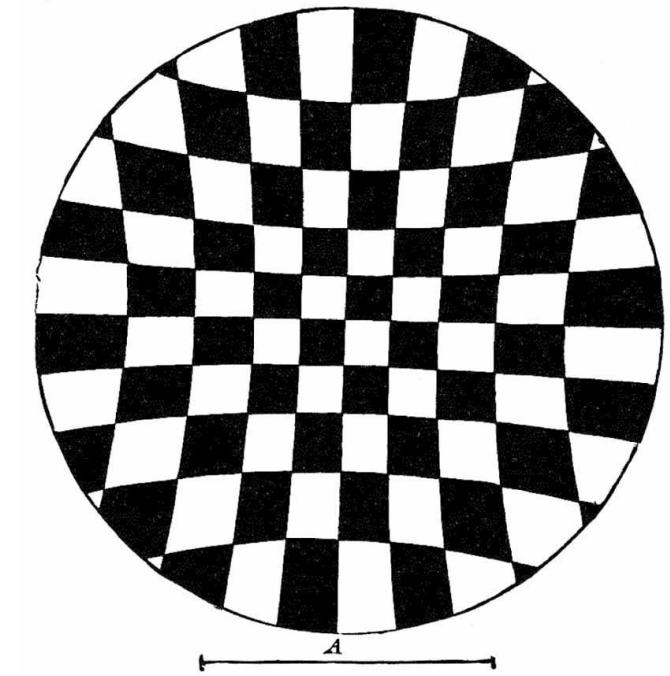
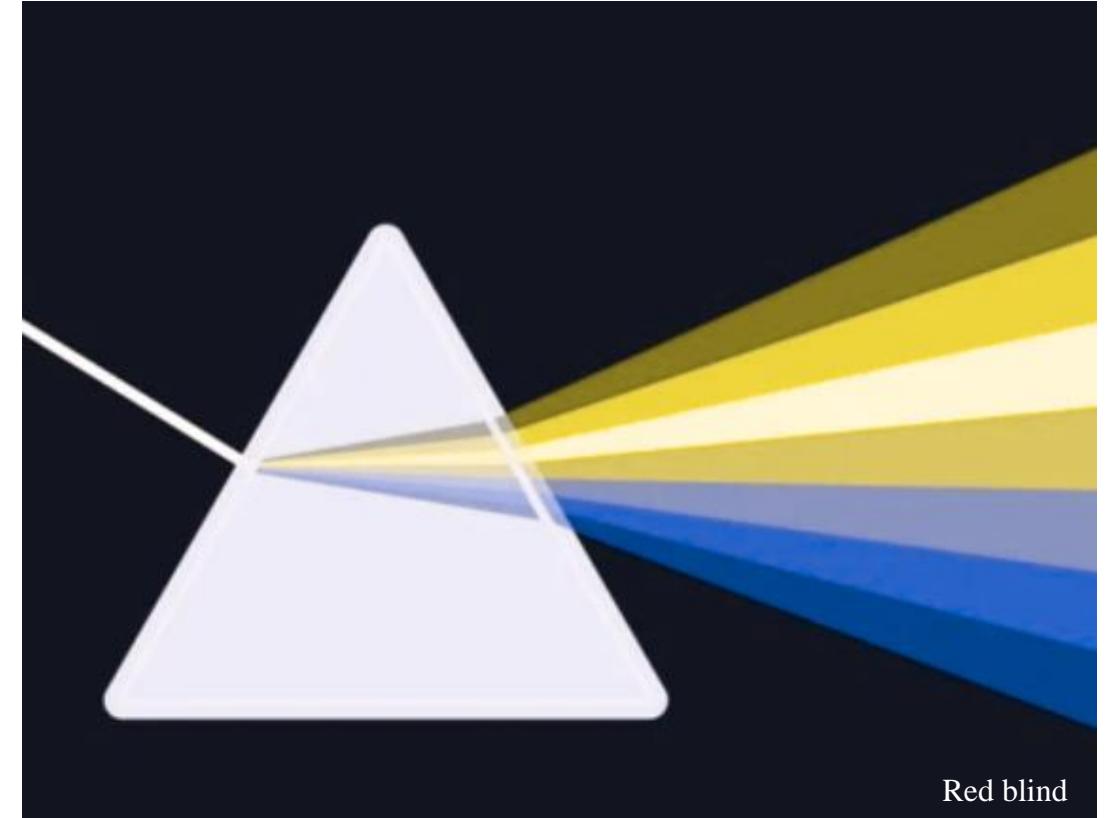
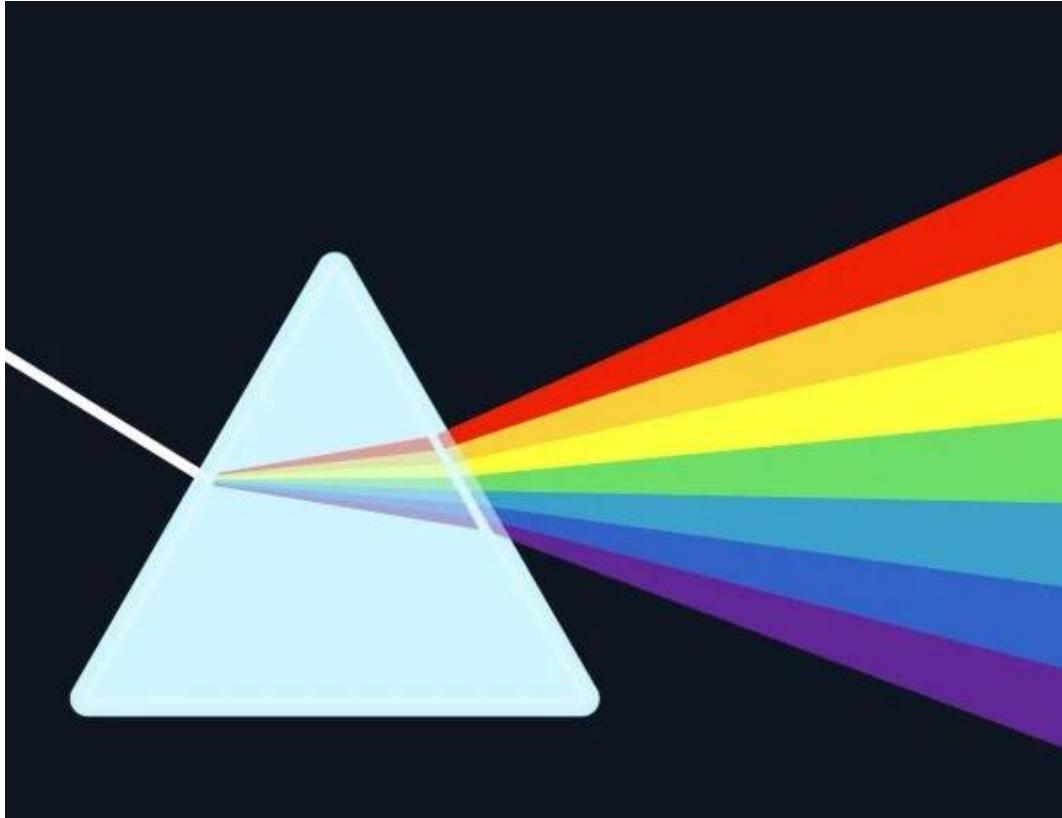


Fig. 22.

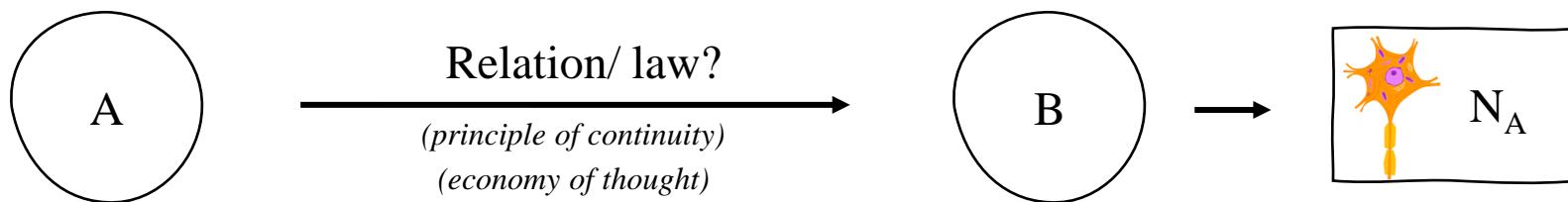
Optical Illusions, 1889

Colour → the eye has a mind of its own

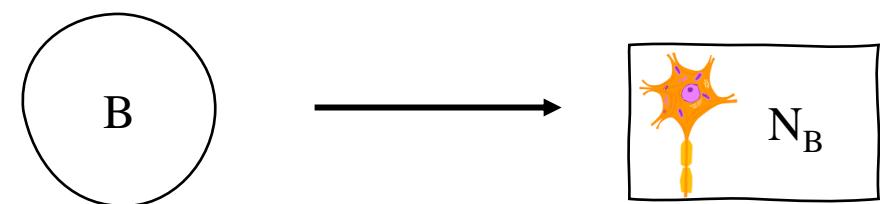
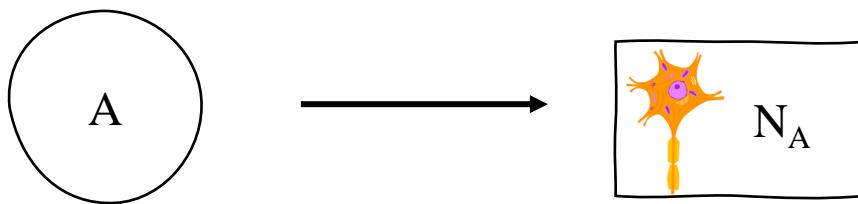


we perceive not direct stimuli but relations of stimuli

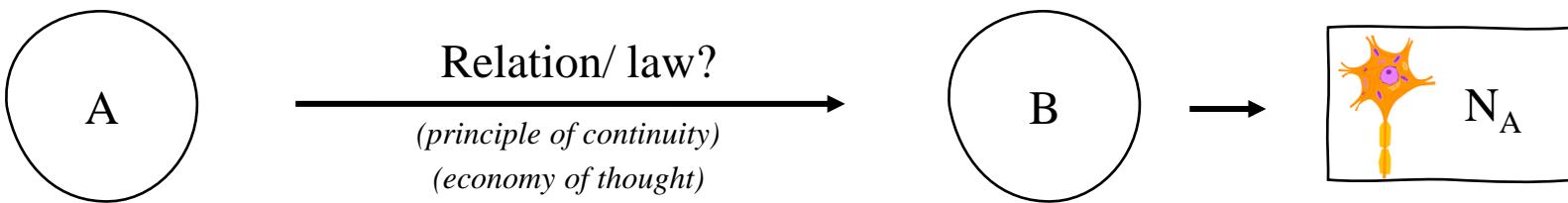
Event A – Nerve Process N_A



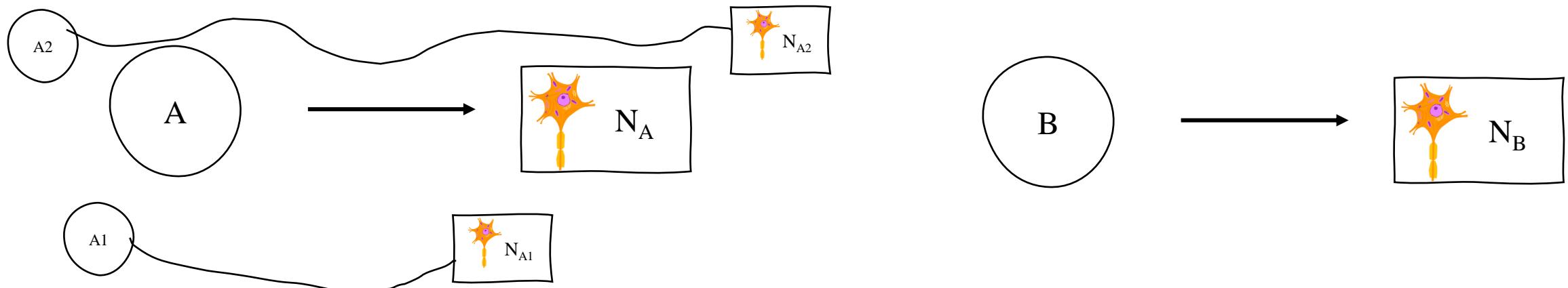
Fundamental criteria for a deterministic world:



Event A – Nerve Process N_A

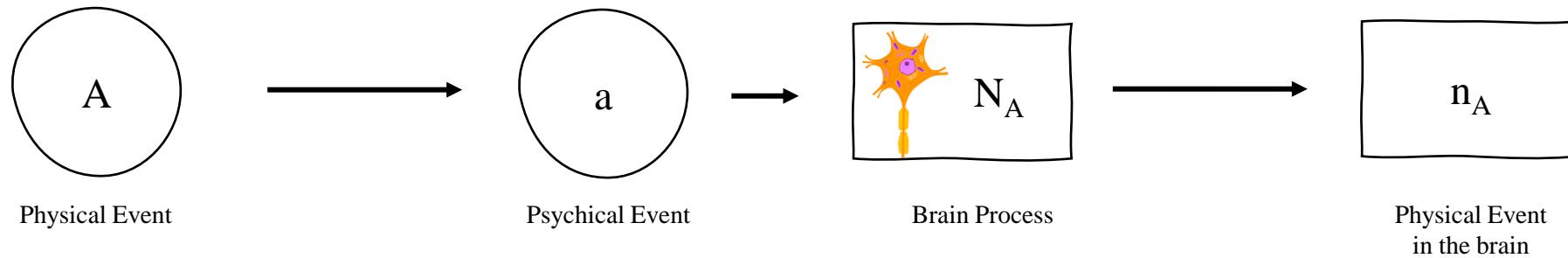


Fundamental criteria for a deterministic world:



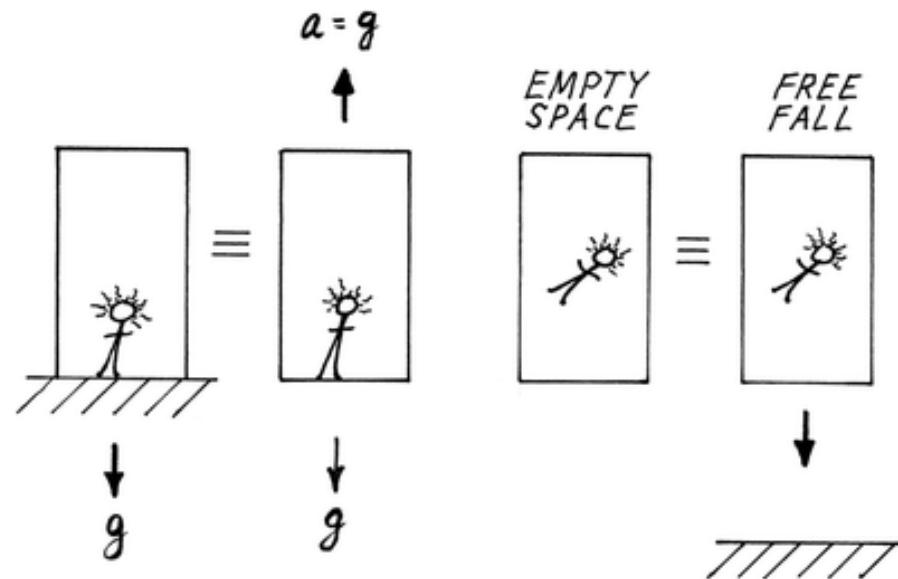
If A is a combination of A_1, A_2, \dots , there exists N_{A1}, N_{A2}, \dots

Physical – Psychical: Complete Parallelism

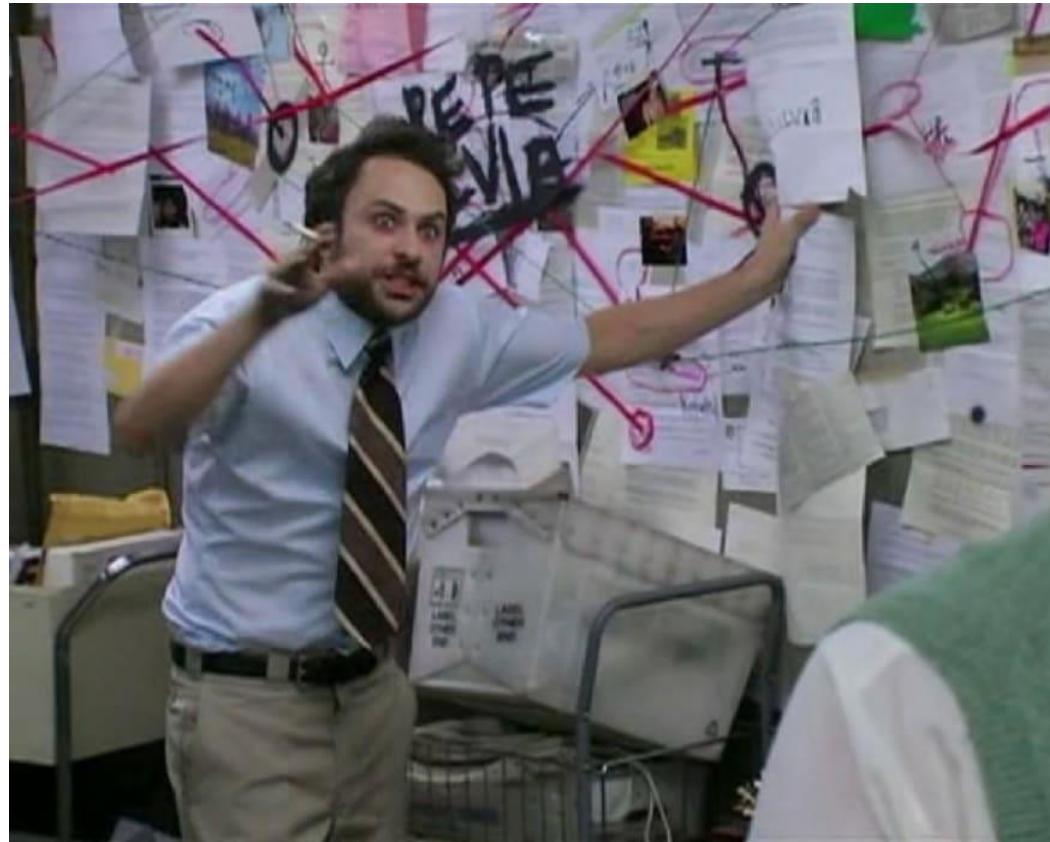


Thought Experiments

- *Imaginary* conduct of a *real* experiment
- Not true empiricism
- Acceptance of *a priori* principles if N_A, N_B, \dots are *independent*
- Inspired Einstein (among other ideas of Mach)



Music: Evolution and Sensation



Music and Darwinism



7 fundamental notes

What sounds make music?

Familiarity or Experience

knowledge is a product of evolution, that our senses, minds, and cultures have an evolutionary history



tropical background score

Principles of Evolution



Non background sounds

Modern day implications

- Standardisation of measures to fundamental quantities (SI)
 - General Conference on Weights and Measures, 1960
- Methods of Calibration
- Device approach to physiology

- Copenhagen interpretation (Bohr school)
“the observer is part of the system”

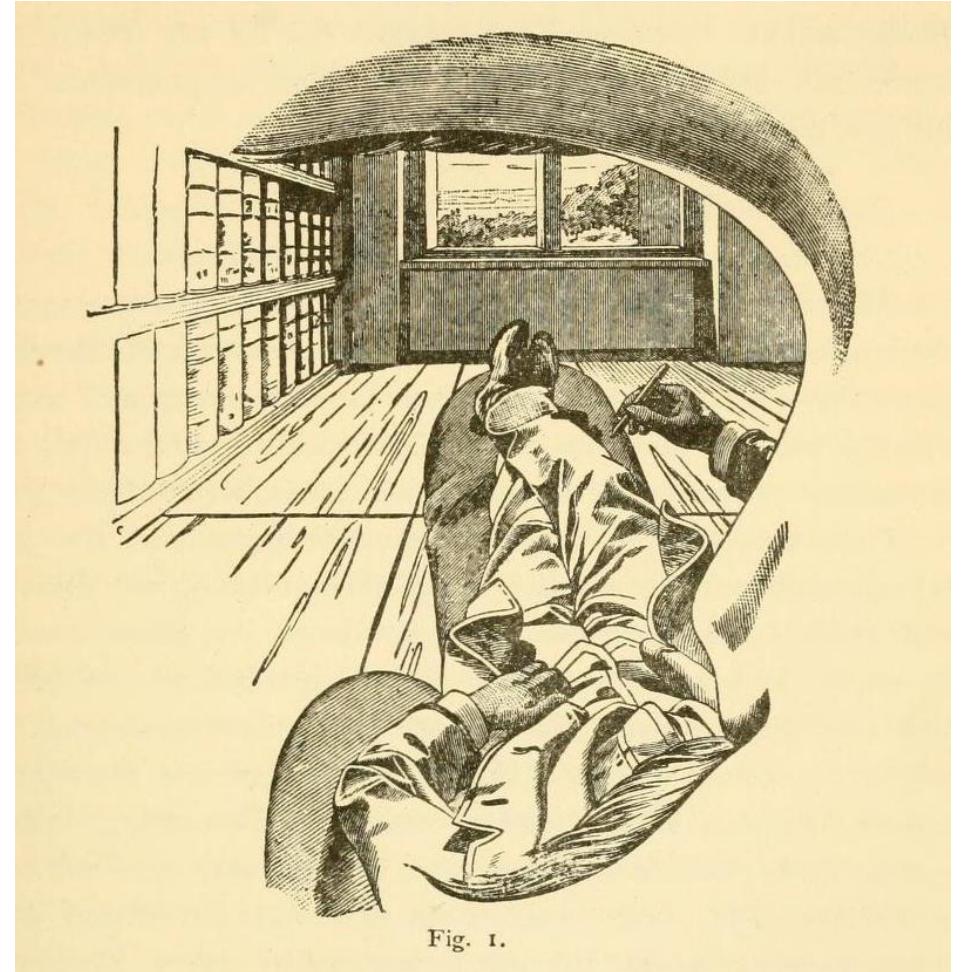


Fig. 1.

Self-Portrait by Ernst Mach (1886)