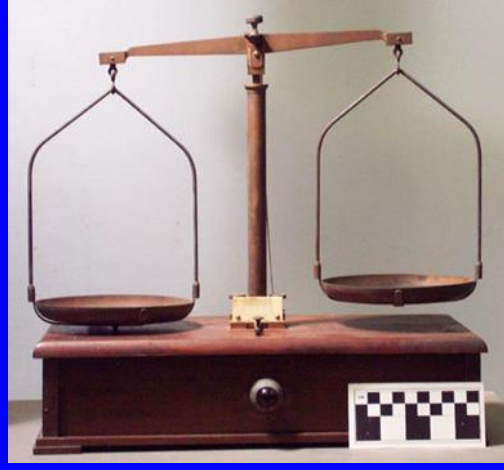
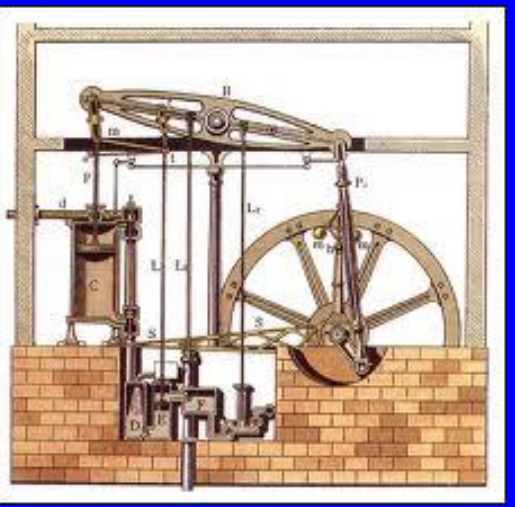
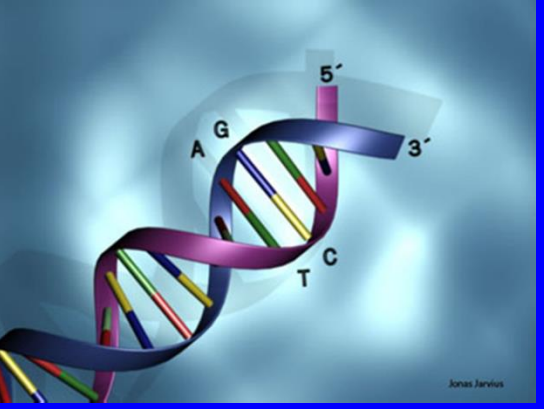
Mediating machines



A historical look at the information universe

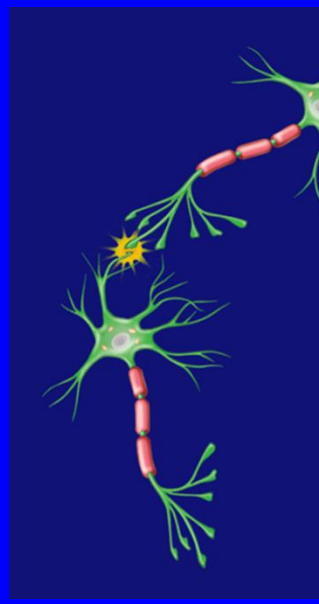


Frans van Lunteren

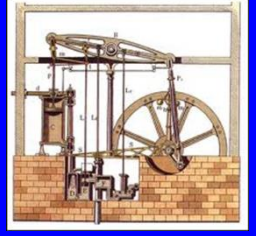


Science and society

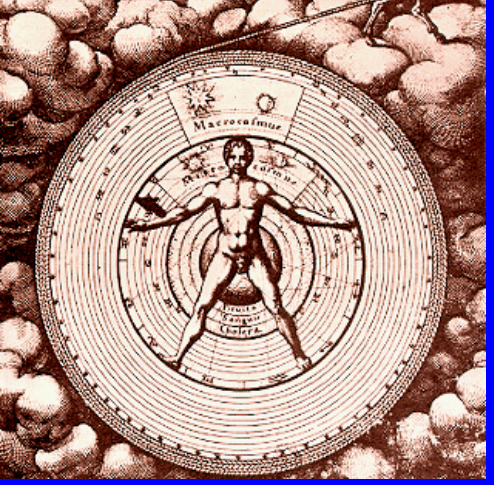
- Information society, network society
  - Information economy: Google, Facebook, Alibaba
  - pc's, laptops, tablets, smartphones
- Information universe
  - Life → information, encoded in large molecules
  - Brain → information exchanged between neurons
  - Space-time → information at Planck scale
- Is this correlation a mere coincidence?




Pattern




- From 1600 four machines used as metaphors:
  - Mechanical clock, balance, steam engine, computer
- They all
  - Developed into sophisticated forms of technology
  - Highly visible role in society, both socially and economically
  - Provided framework for understanding nature (& society)
  - Highlighted key concepts: motion, force, energy & information
  - each of which was seen as explanatory ultimate, building block
  - went through process of radical innovation
  - Were eventually applied in scientific research

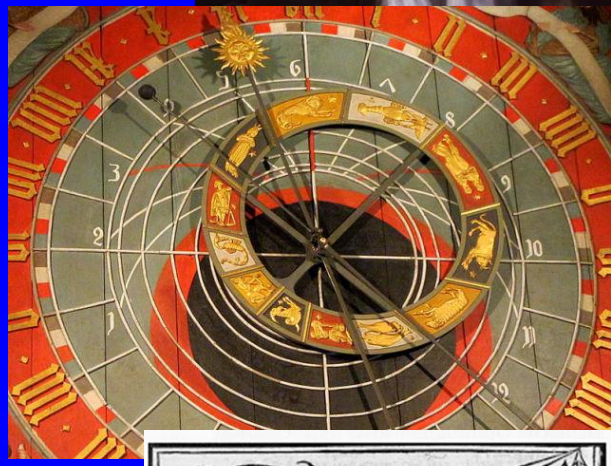


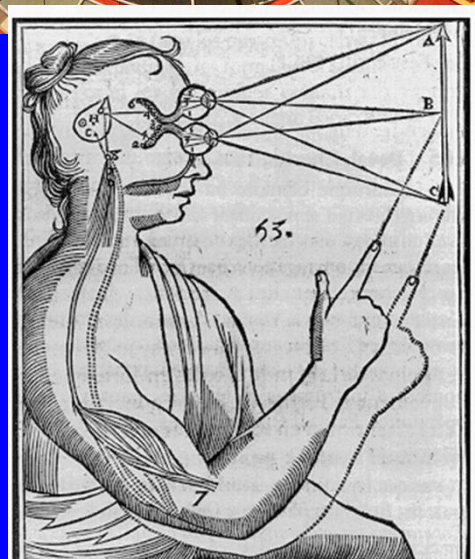
Renaissance: body

- Dominant metaphor: (human) body
  - 'Body politic', head of state
  - Universe mirrors human body (microcosmos), activated by world soul (anima mundi)
- E.g. Johannes Kepler
  - 1596 planets moved by *anima motrix* of the sun
  - 1605 'the celestial machine is to be likened not to a divine organism but rather to a clockwork'

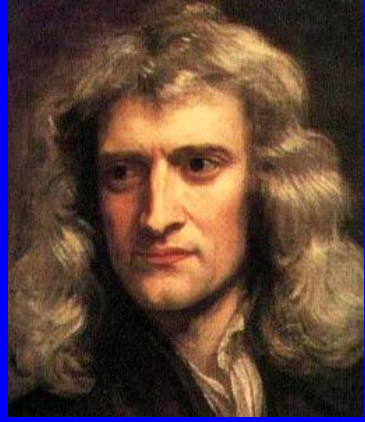
17th Century clock

- Use of clock metaphor rampant
- Both for the state:
  - Hobbes, *Leviathan*
- And for nature
  - Boyle, natural world is ‘as it were, a great piece of clock-work’
  - Descartes, body is a machine, swallows returning in spring ‘behave like clocks’

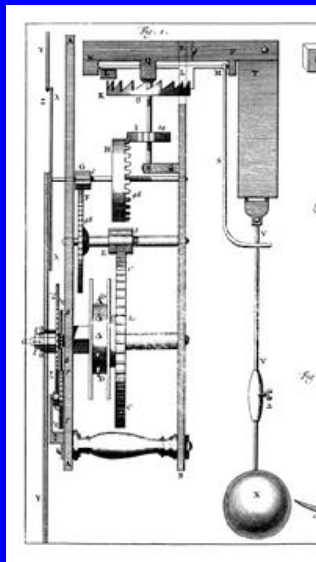


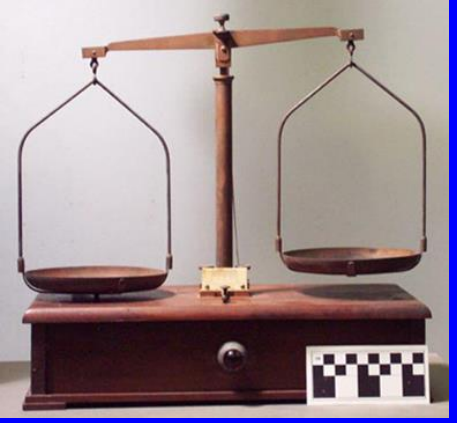


Motion

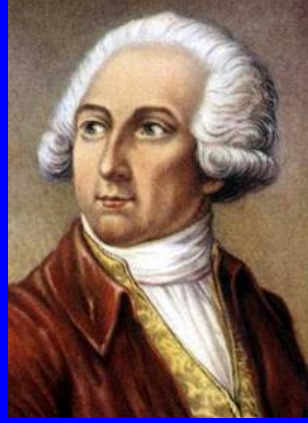


- ‘Mechanical philosophy’ (Boyle)
  - attempt to explain all natural phenomena in terms of those ‘two grand and most catholick principles of bodies, matter and motion’
- Highlights concept of motion
  - Transformed (inertia), refined and eventually subjected to strict rules or ‘laws’
  - Galileo, Descartes, Huygens, Newton
- Radical improvement clocks: instruments

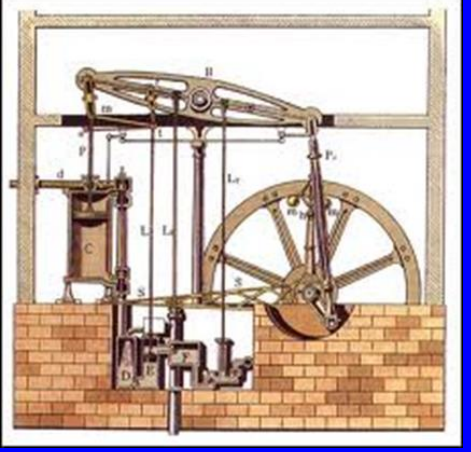




18th century: balance



- Nature (society, Montesquieu) as balance of powers or forces
- Forces (gravity, affinities, vital forces) seen as irreducible, defying mechanical explanation
- Matter complex of attractive & repulsive forces
- 1770s increasing precision, torsion balance: new chemistry Lavoisier, Coulomb, Cavendish

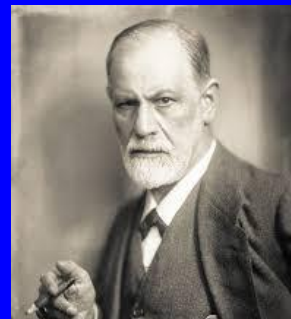


19th century: steam engine

- Promotes dynamic view of nature (and society), based upon transformation
- Transforms coal into heat and motion
- New terminology: work, efficiency, motive power
- Applied to nature: ‘energy’, conservation law, physics → science of energy transformations
- New engines (combustion, electric) applied in research
- Helm, Ostwald: ‘energetics’, energy rather than matter and force as explanatory ultimate

Steam engine: life

- Midcentury Berlin physiologists (Du Bois Reymond, Helmholtz): new view of life, based on engine metaphor & energy conservation
- Both body and steam engine transform chemical energy (food/coal) into equivalent quantity of heat and work (motion)
- Equation leaves no room for other ‘forces’ or vital principles: Life is a physical-chemical process
- Freud: psychodynamics (psychic energy), analogy steam engine



Conclusion

- Science is both a cultural product and an increasingly accurate representation of reality
- New technologies are powerful and fruitful resources for conceptual innovation
- Reductionist world views, based on single concept as explanatory ultimate have failed (so far)