

What is Physics?

Physics (greek physike): “Study of Nature“

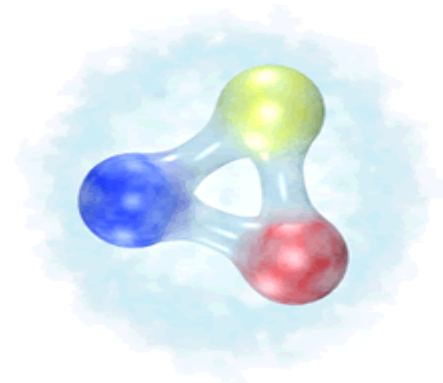
The science concerned with the structure and the motion of material objects (as well as energy, space, and time)

Two timeless questions:

- What substances make up the world?
- Which laws govern the motion of objects?

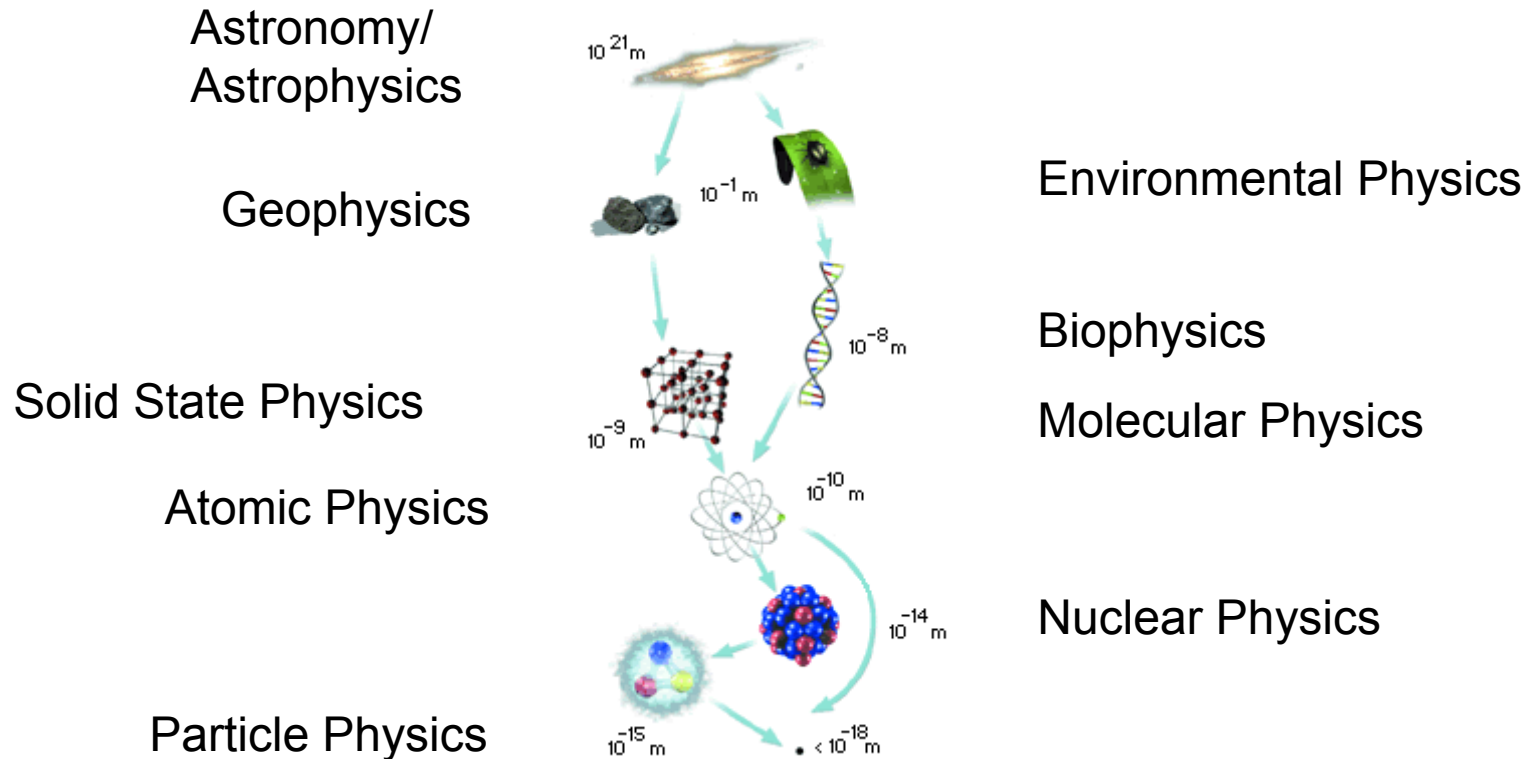


Andromeda Galaxy:
distance to Earth: 2.2 Mio ly;
diameter $\approx 100\,000$ ly $\approx 10^{21}$ m



proton (uud)/ neutron(duu):
diameter $\approx 10^{-15}$ m

Areas of Physics



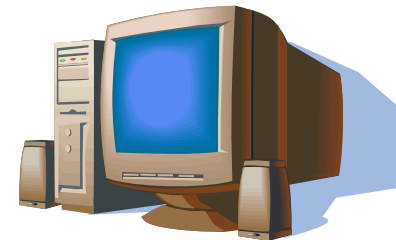
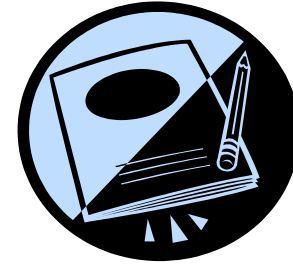
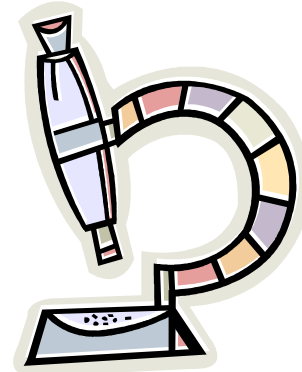
Physics: Experiment and Theory

Physics is based on empirical facts
→ experiments (lab)

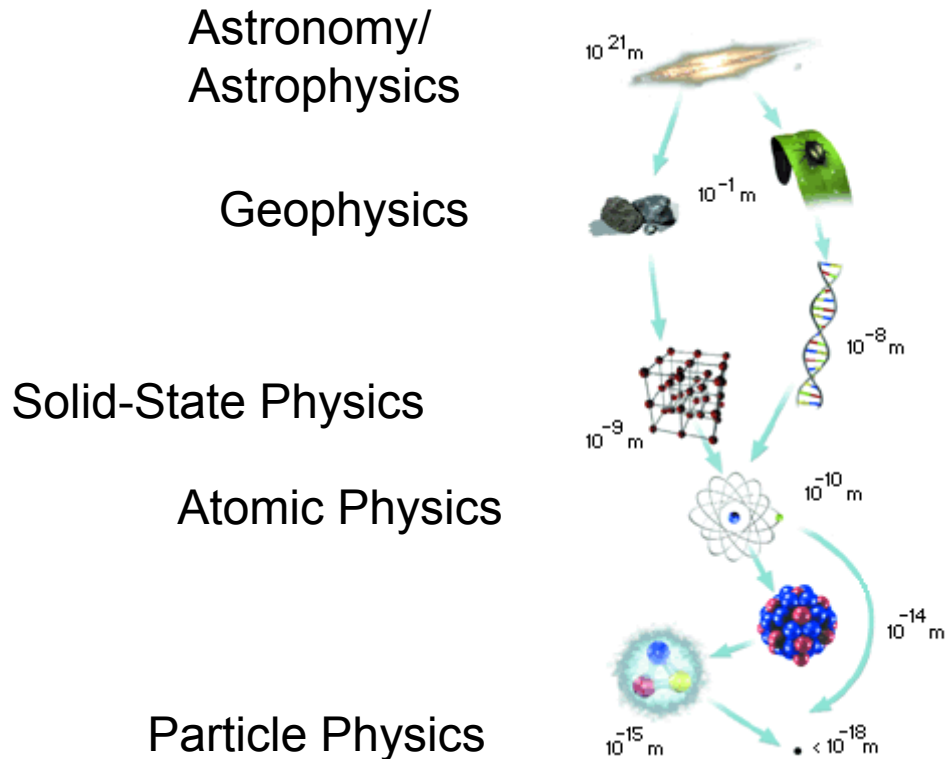


empirical facts can be summarized and
described by mathematical laws

→ theory
+ computation



Classification



macroscopic world

classical theories

Mechanics, Electrodynamics,
(Optics), Thermal Physics, ...

microscopic world

quantum theories

Quantum Mechanics,
Quantum Electrodynamics,
Quantum Optics, ...

Course Outline

- I. Mechanics: particles
- II. Electromagnetism: fields (and waves)

Outlook on Modern Physics:
particles or waves?

Mechanics (Fall)

- Kinematics, Forces, Newton's Laws
- 1D, 2D, and 3D Dynamics
- Tension forces and static equilibrium
- Air Drag and Friction
- Reference frames
- Circular Motion and Gravitation
- Work and Energy
- Momentum, Impulse, Collisions
- Rotational Motion, Angular Momentum, Torque
- Harmonic Motion (Oscillator, Pendulum and such)