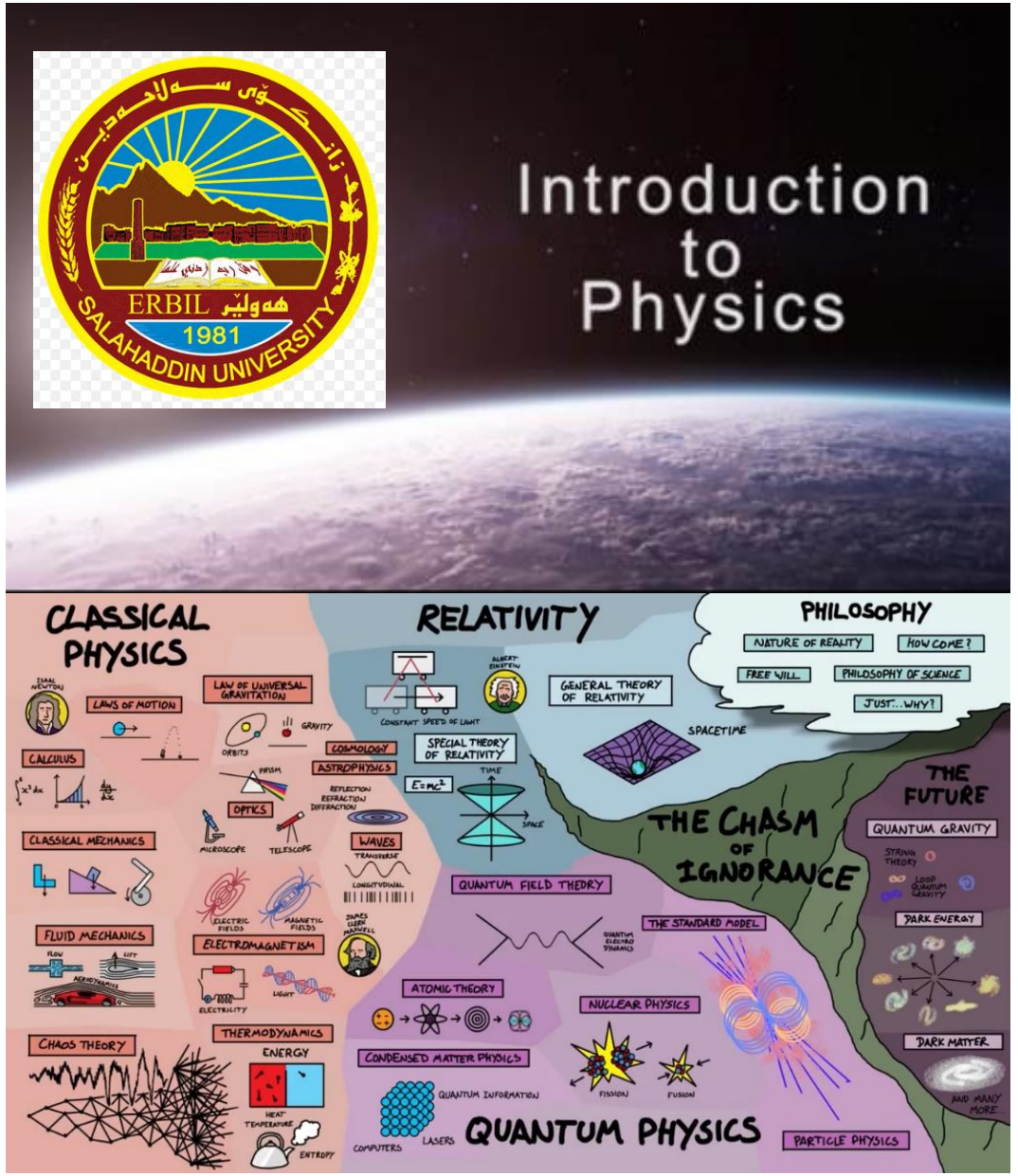
Chapter One



1.1 Course Objective
1-2 References list
1-3 What is Physics?
1-4 Classical Mechanics
& Properties of Matter

By

Asst Prof Dr. Botan Jawdat Abdullah

(PhD in Physics-Nanoscience)

1-1 Course Objective

(Mechanic and Properties of Matter)

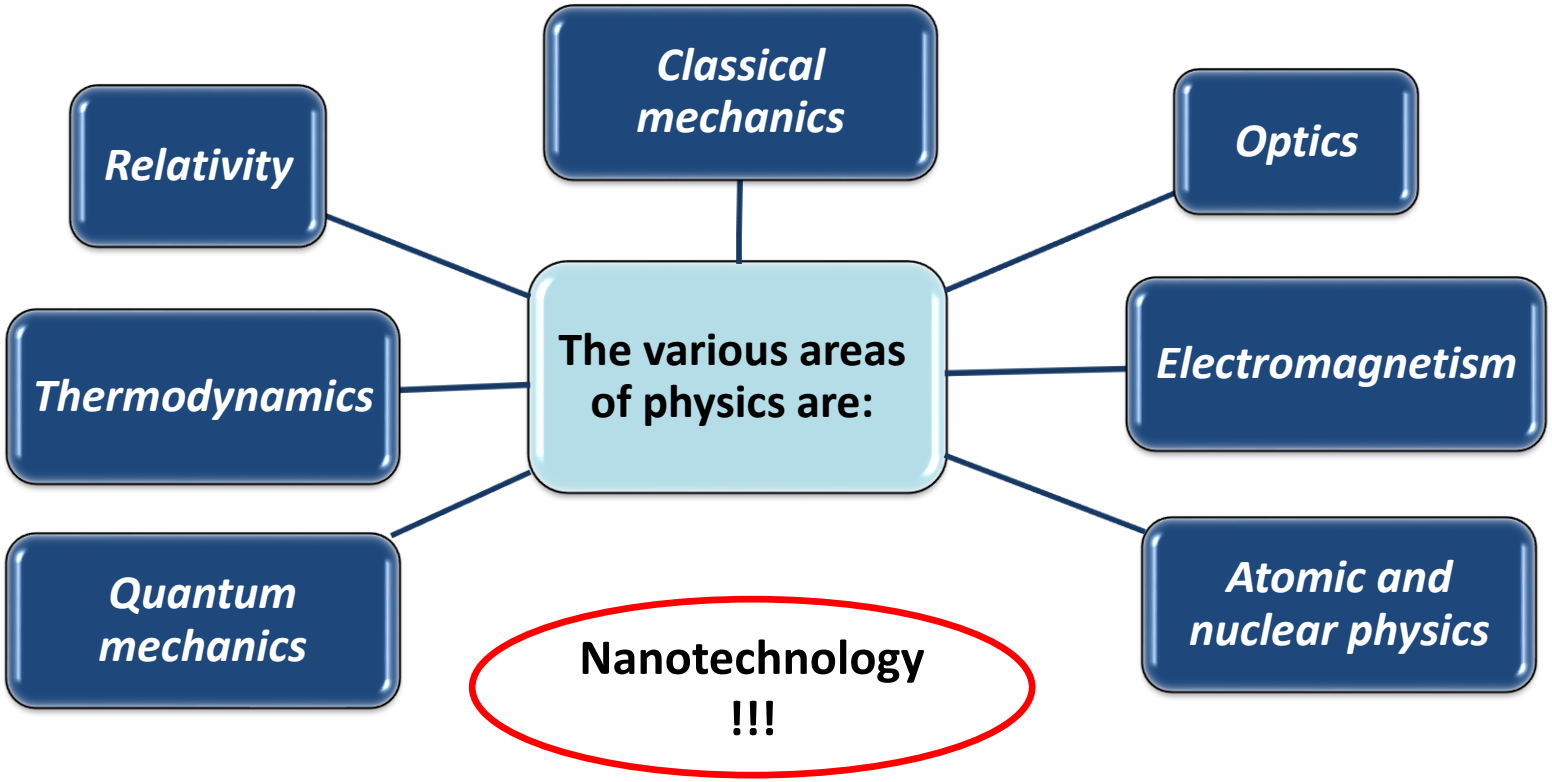
To Study the concepts of Vector.
To Study the basic & concepts of Forces.
To Study the concepts of Motion and the Laws of Motion.
To Study the concepts of Energy, Work & Power, …
To Study the Rotation of a Rigid Objects, …
To Study the concepts of Universal Gravitation.
To Study the Motion in a Circle.
To Study the concepts of Momentum and Collisions, …
To study the basics of Elasticity and its importance.
To study the concepts of bending of beams and its applications.
To study the Fluid, Viscosity and Surface tension.
To study the Oscillations, Mechanical Waves & Sound.

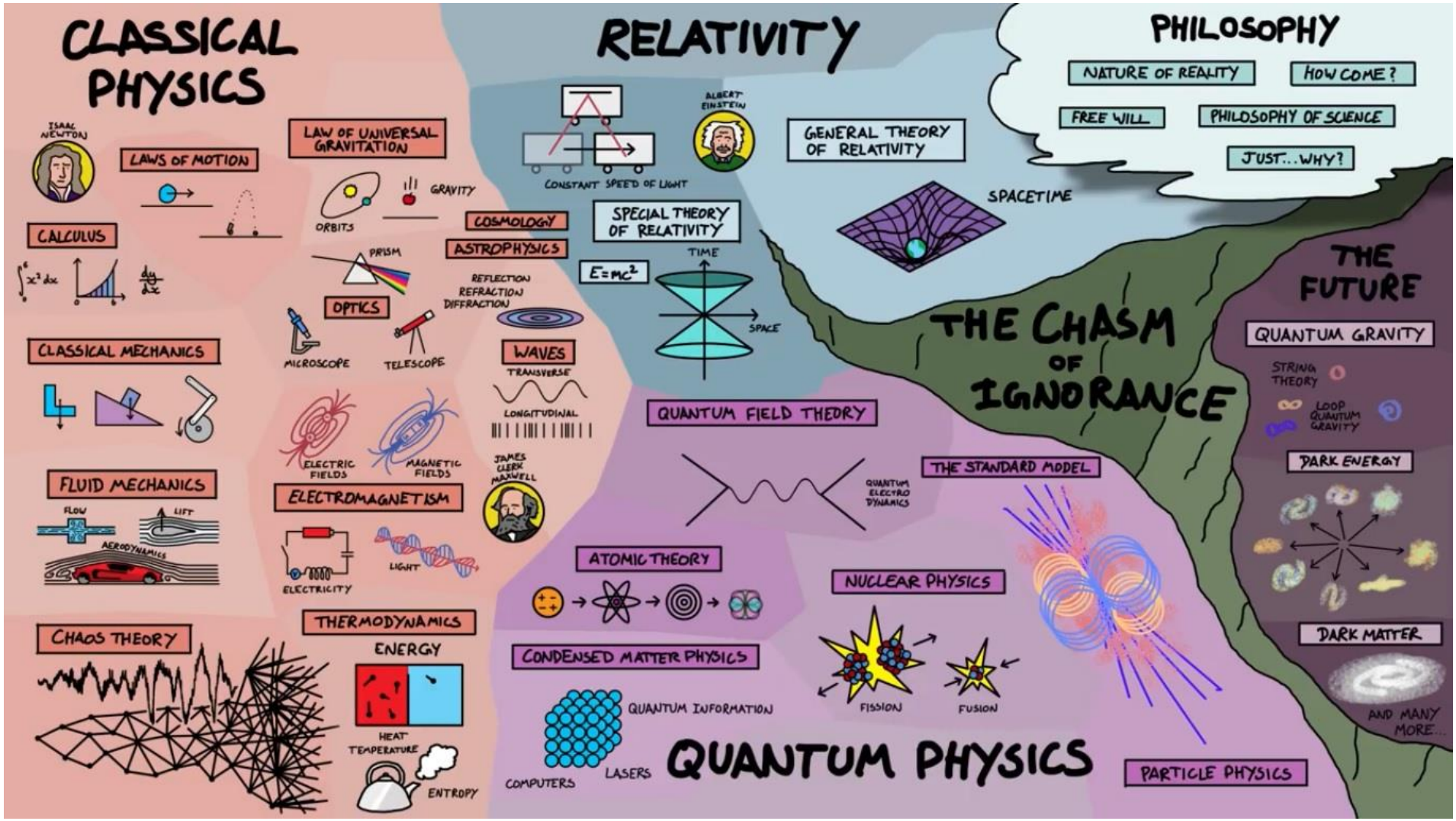
1-2 References (Book) list:

1. M. Alonso & E.J. Finn (1980) "Fundamental University Physics“ Volume I, 2nd edition Addison-Wesley.
2. Serway Jewett (2004) "Physics for Scientists & Engineers" 6th edition, Raymond A. Serway.
3. R. Resnick, D. Halliday & K.S. Krane (2002) “Physics (1) Mechanics" volume 1, 5th edition, Jon Wiley & Sons, Inc.
4. D.S. Mathur (1962) "Elements of properties of matter" S. Chand & CO.
5. Shipman, Wilson & Todo (2009) "An introduction to physical science“.
6. R. A. Serway & C. Vuille (2010) "College physics".
7. Young & Freedman (2013) "University Physics with modern physics" 11th edition, Sears and Zemanasky’s.
8. James Treftil & Robert M. Hazen (2004) "Physics Matters" John Wiely @ Sons. Inc.
9. Randall D. Knight (2003) "Physics for Scientists and Engineers with Modern Physics" Pearson Addison Wesley.
10. Paul A. Tiper (1999) “Physics for Scientists and Engineers”4th edition, W.H. Freeman and Company.
11. Other resources in internet are included with specific activities,…

1-3 What is Physics?

Physics, the most fundamental physical science, is concerned with the basic principles and concepts that describe the workings of the universe. It deals with matter, motion, force, and energy. It is the foundation upon which the other sciences astronomy, biology, chemistry, and geology—are based.




CLASSICAL PHYSICS
ISAAC NEWTON
LAWS OF MOTION
LAW OF UNIVERSAL GRAVITATION
GRAVITY
ORBITS
CALCULUS
COSMOLOGY
ASTROPHYSICS
PRISM
OPTICS
REFLECTION
REFRACTION
DIFFRACTION
MICROSCOPE
TELESCOPE
CLASSICAL MECHANICS
WAVES
TRANSVERSE
LONGITUDINAL
ELECTRIC FIELDS
MAGNETIC FIELDS
JAMES CLERK MAXWELL
FLUID MECHANICS
FLOW
LIFT
AERODYNAMICS
ELECTROMAGNETISM
ELECTRICITY
LIGHT
CHAOS THEORY
THERMODYNAMICS
ENERGY
HEAT
TEMPERATURE
ENTROPY
RELATIVITY
CONSTANT SPEED OF LIGHT
ALBERT EINSTEIN
GENERAL THEORY OF RELATIVITY
SPECIAL THEORY OF RELATIVITY
E=mc²
TIME
SPACE
SPACETIME
PHILOSOPHY
NATURE OF REALITY
HOW COME?
FREE WILL
PHILOSOPHY OF SCIENCE
JUST...WHY?
THE CHASM OF IGNORANCE
THE FUTURE
QUANTUM GRAVITY
STRING THEORY
LOOP QUANTUM GRAVITY
DARK ENERGY
DARK MATTER
AND MANY MORE...
QUANTUM FIELD THEORY
QUANTUM ELECTRO DYNAMICS
THE STANDARD MODEL
ATOMIC THEORY
NUCLEAR PHYSICS
FISSION
FUSION
CONDENSED MATTER PHYSICS
QUANTUM INFORMATION
COMPUTERS
LASERS
QUANTUM PHYSICS
PARTICLE PHYSICS

1-4 Classical Mechanics **&** Properties of Matter

Classical mechanics*, the study of the motion of objects moving at relatively low speeds.* Classical Mechanics valid on scales which are: Not too fast ,Not too small & Not too large

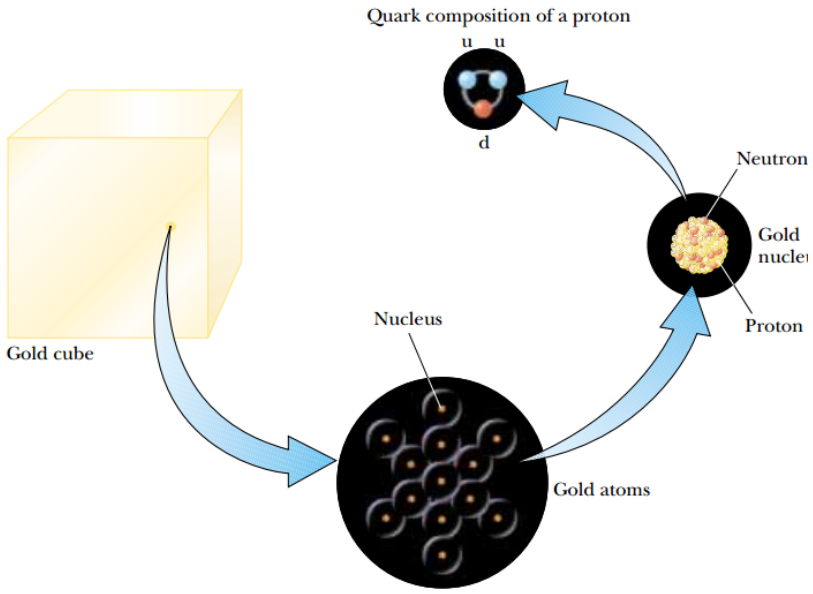
It has many important applications in many areas of science:

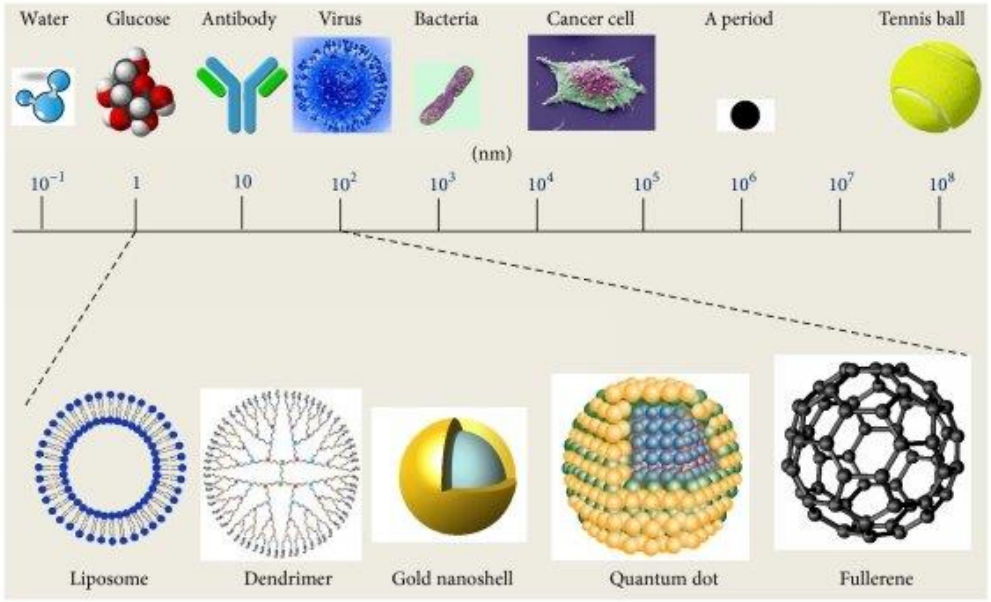
- Astronomy (motion of stars and planets)
- Molecular and nuclear physics (collisions of atomic and subatomic particles)
- Geology (e.g., the propagation of seismic waves)
- Engineering (eg structures of bridges and buildings)

Classical Mechanics covers:

- The case in which bodies remain at rest
- Translational motion– by which a body shifts from one point in space to another
- Oscillatory motion– e.g., the motion of a pendulum or spring
- Circular motion–motion by which a body executes a circular orbit about another fixed body [e.g., the (approximate) motion of the earth about the sun]
- More general rotational motion–orbits of planets or bodies that are spinning
- Particle collisions (elastic and inelastic)

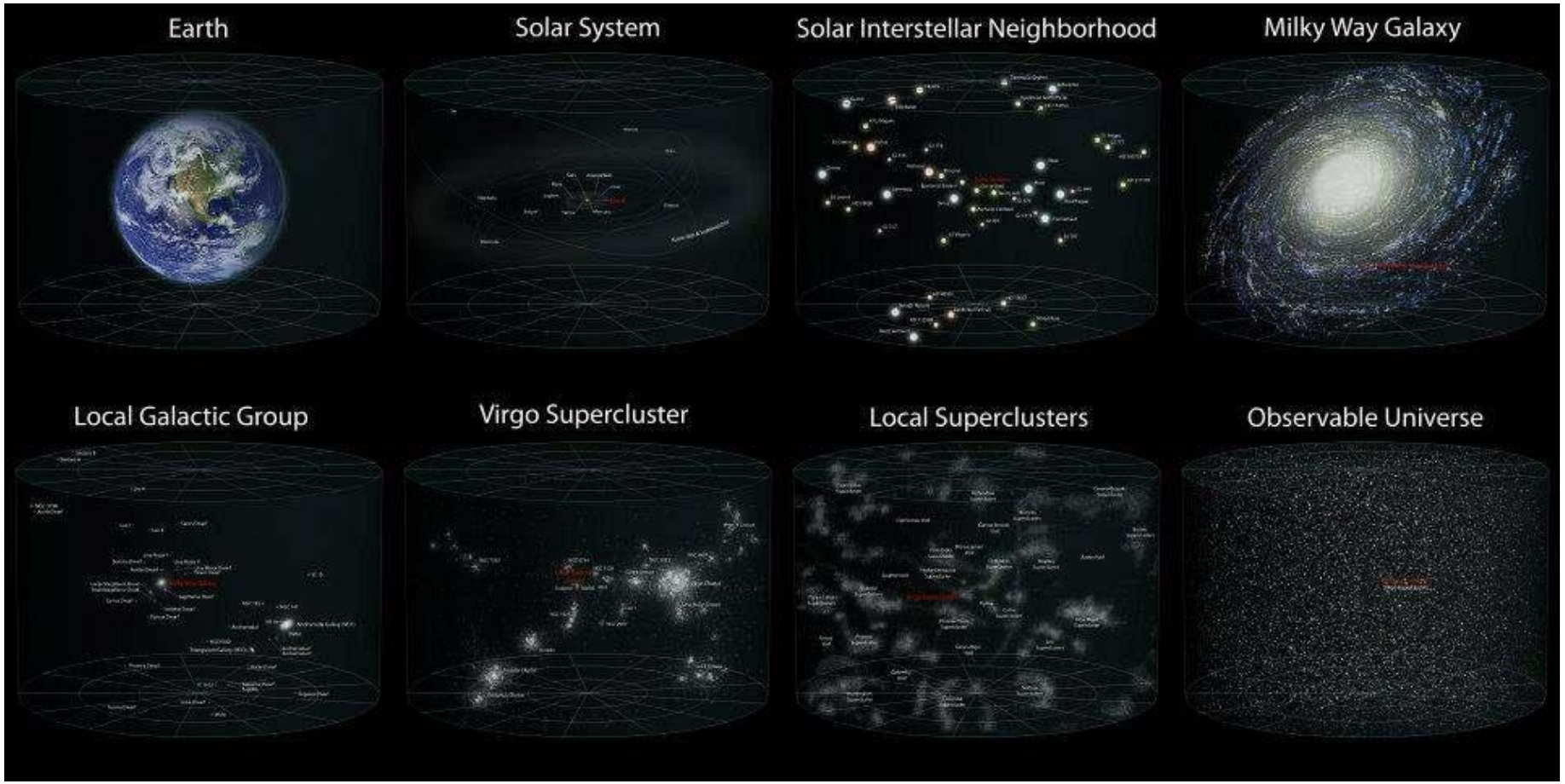
Levels of organization in matter. Ordinary matter consists of **atoms**, and at the center of each atom is a compact **nucleus** consisting of protons and neutrons. Protons and neutrons are composed of **quarks** as shown in the following figure:





Some typical lengths in the universe:

On a human scale, the Earth is a rather large object and it has been humanity's home since the dawn of the species. But, how does the Earth stack up on a Celestial Scale?



what is matter?

It's that simple! Everything in the universe that you can see is made up of some type of matter.

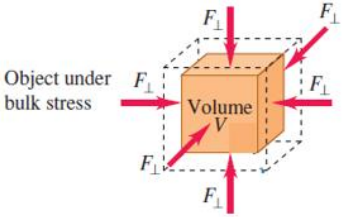
matter anything that has mass and takes up space

volume a measure of the size of a body or region in three-dimensional space

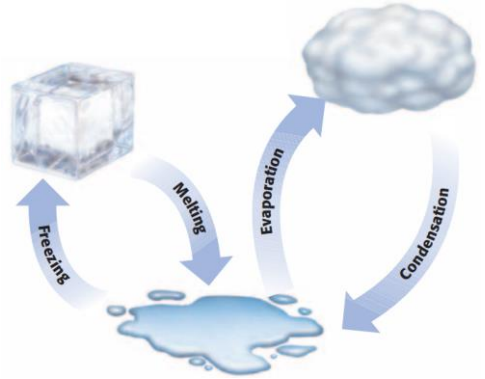
density the ratio of the mass of a substance to the volume of the substance

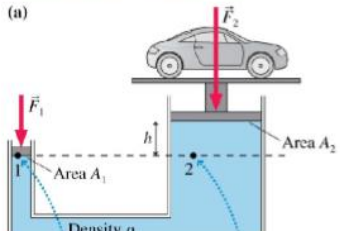
mass a measure of the amount of matter in an object

weight a measure of the gravitational force exerted on an object; its value can change with the location of the object in the universe



pressure the amount of force exerted per unit area of a surface





states of matter the physical forms of matter, which include solid, liquid, and gas