PHY 114

Quantum Physics

Lecture 1-A

Introduction

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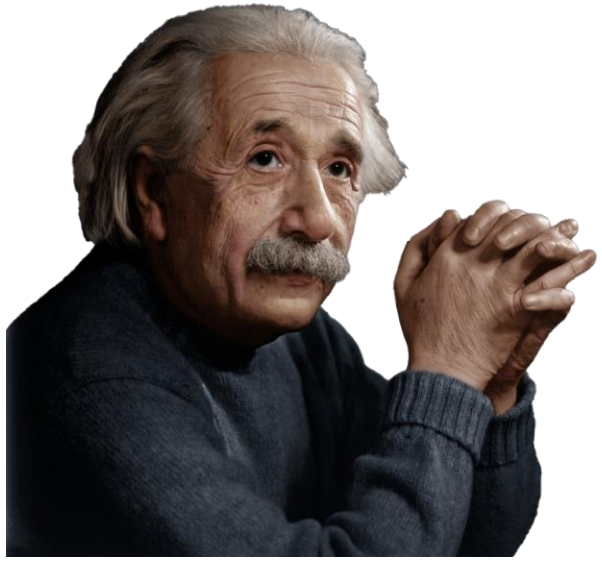
“Most people **say** that it is the intellect which makes **a great scientist**. They are wrong: it is <u>character</u>.”

(Emphasis mine.)



“Those who are not shocked when they first come across quantum theory cannot possibly have understood it.”

Objectives

- Basic Understanding of Quantum Mechanical Paradigm

  => Foundational Pillar of Modern Science & Technology

  Scope : *Concepts that you need, no matter what your discipline*

  Contents : Three Parts

  I. Phenomena & Formalism
  II. Typical Models
  III. Applications

  .

Learn to connect Physical phenomena and concepts using the language of maths.

EVALUATION : The Necessary Evil

Continuous, Monitoring Progress

- Quizzes : 40
- Mid-Sem Exam : 120
- End-Sem Exam : 180

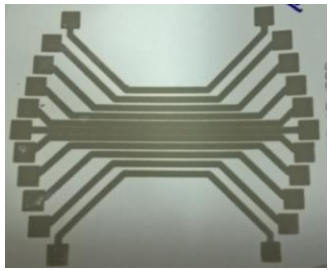
Total : 340

- Two Quizzes
- Whole Syllabus (Weighted)
- Typically subjective

I am one of your Instructors speaking

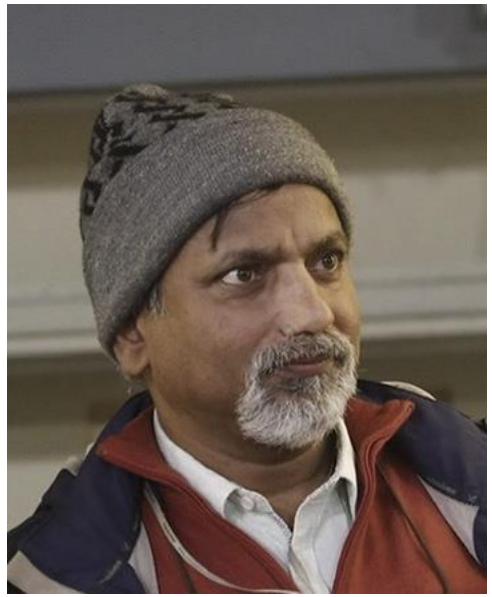
‘Who am I ?’

- Physicist & Material Scientist
  - Condensed Matter Physics
    - Experimentalist
      - Electronic Materials
        - Semiconductors : Inorganic & Organic
          - Device Structures



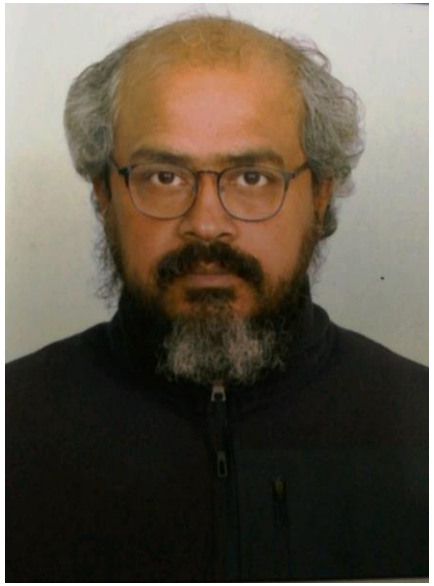
Currently, interested in
Flexible & Printable Electronics

The Team



Prof. Anjan K Gupta

Prof. Sudeep Bhattacharjee



Prof. Saikat Ghosh

Prof. Aditya H Kelkar

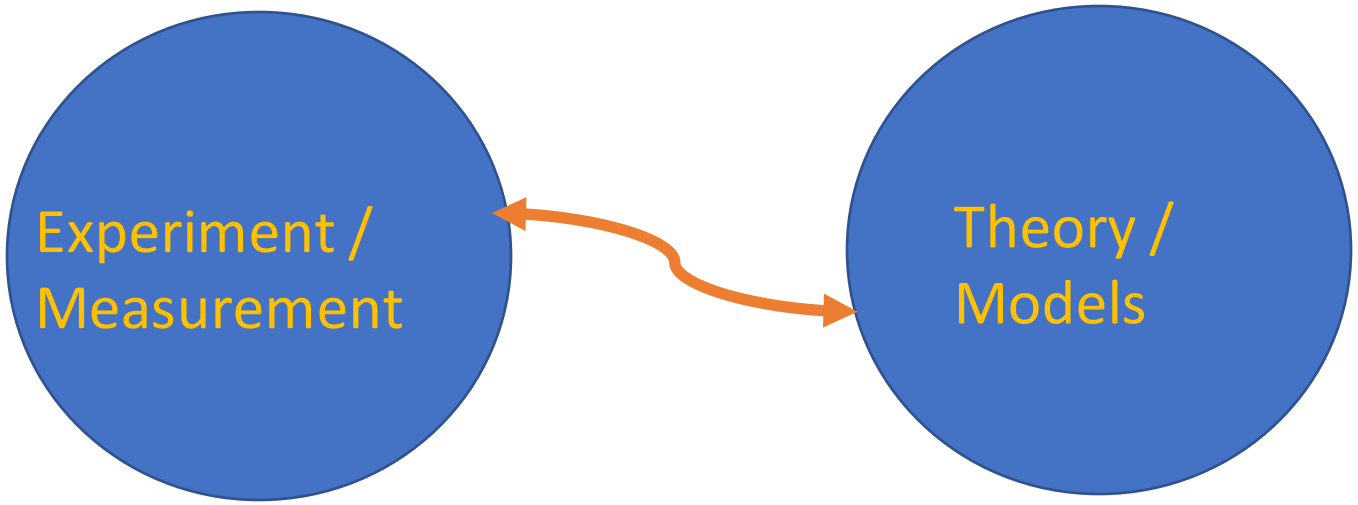
Where is this Course located in the larger Canvas of Knowledge Network ?

Physics is an empirical Science

We talk about only those things or ideas which can be measured !

Everything else is Metaphysics, powerful though they can be.

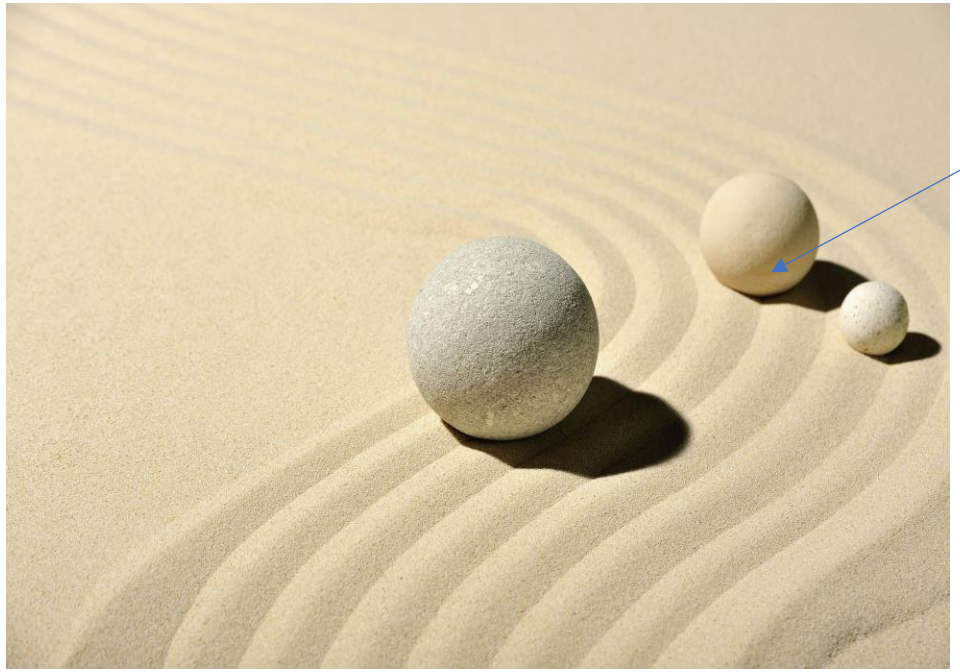
- Copernican
- Heat as Motion
- Newtonian
- Chemical
- Relativity
- Quantum
- Genetic (DNA)
- …
- …

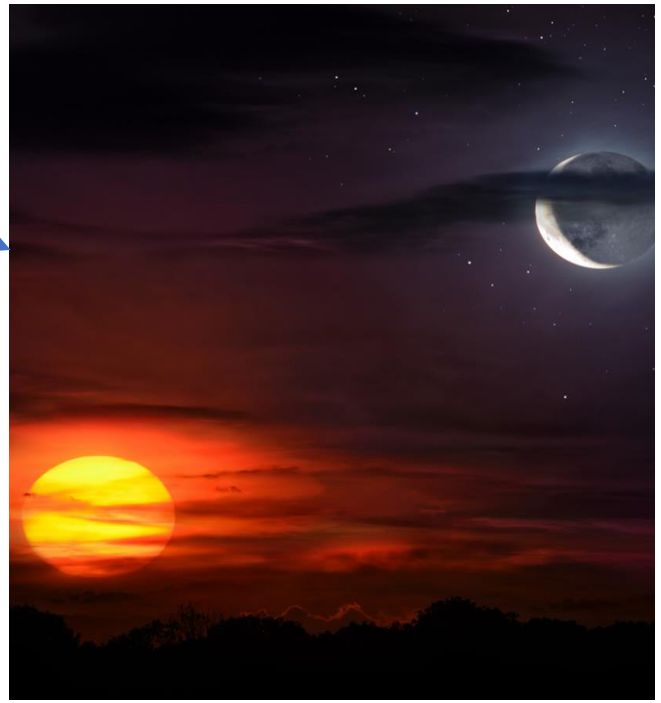


Integration of seemingly disparate phenomena.

From earthly ‘corruption’ to heavenly ‘Heavens’

Newtonian
Mechanics





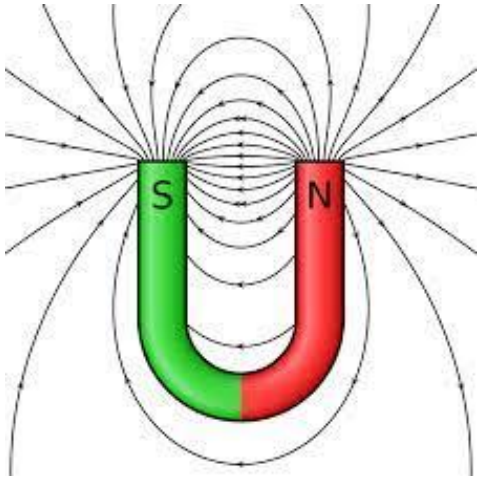
yeswevibe

Terrestrial Mechanics

Villain : ‘Friction” ?

Celestial Mechanics

Electromagnetic Paradigm



$3x10^{+08}$ m/s

Special Relativity

Speed

10^{+26} m

General Relativity

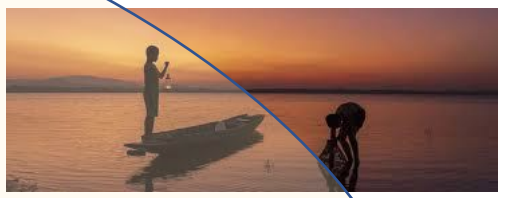
Classical Mechanics

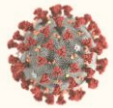
Size

Quantum Mechanics

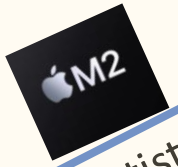
Quantum Electrodynamics

10^{-15} m





Complexity



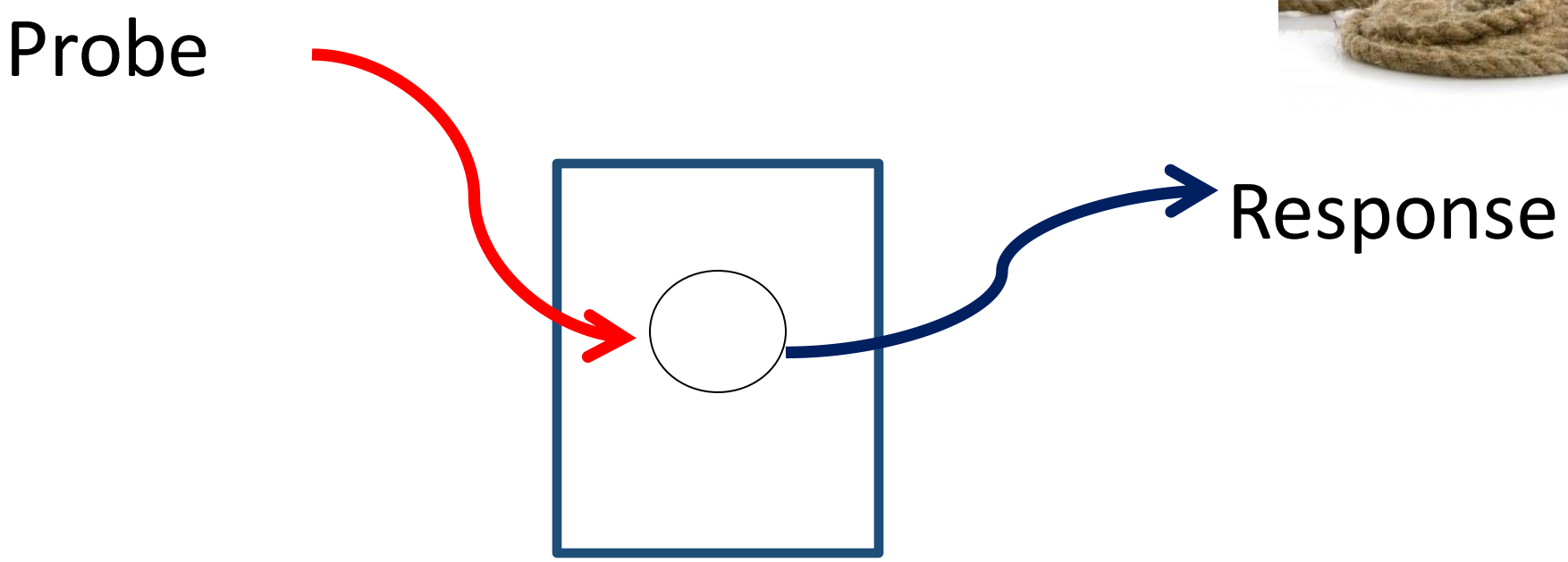
Statistical Mechanics

Condensed Matter Physics

Quantum Mechanics

Knowing : General Elements

Rope or a Snake ?



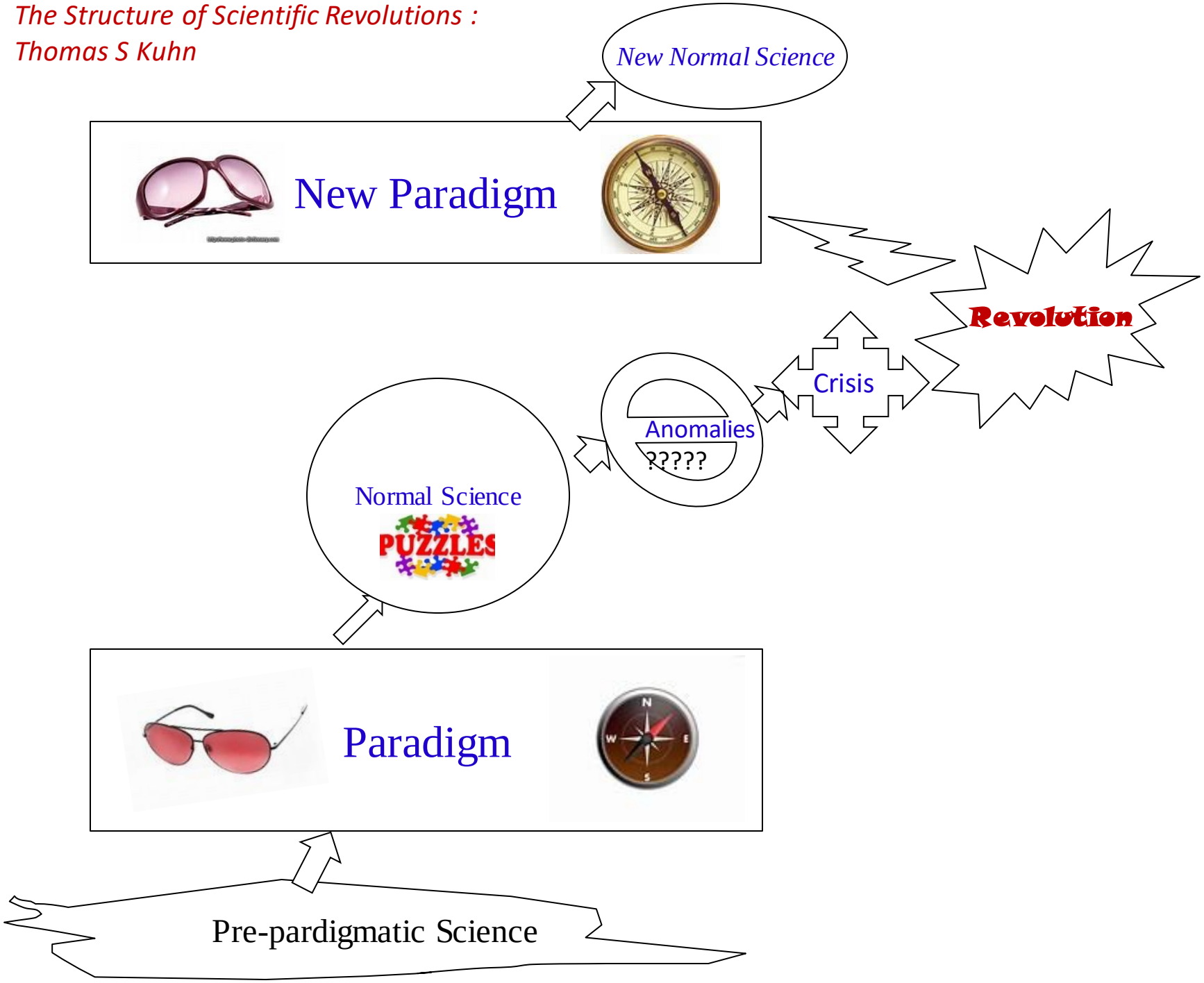
Control Parameters?

Revolutions in Physics

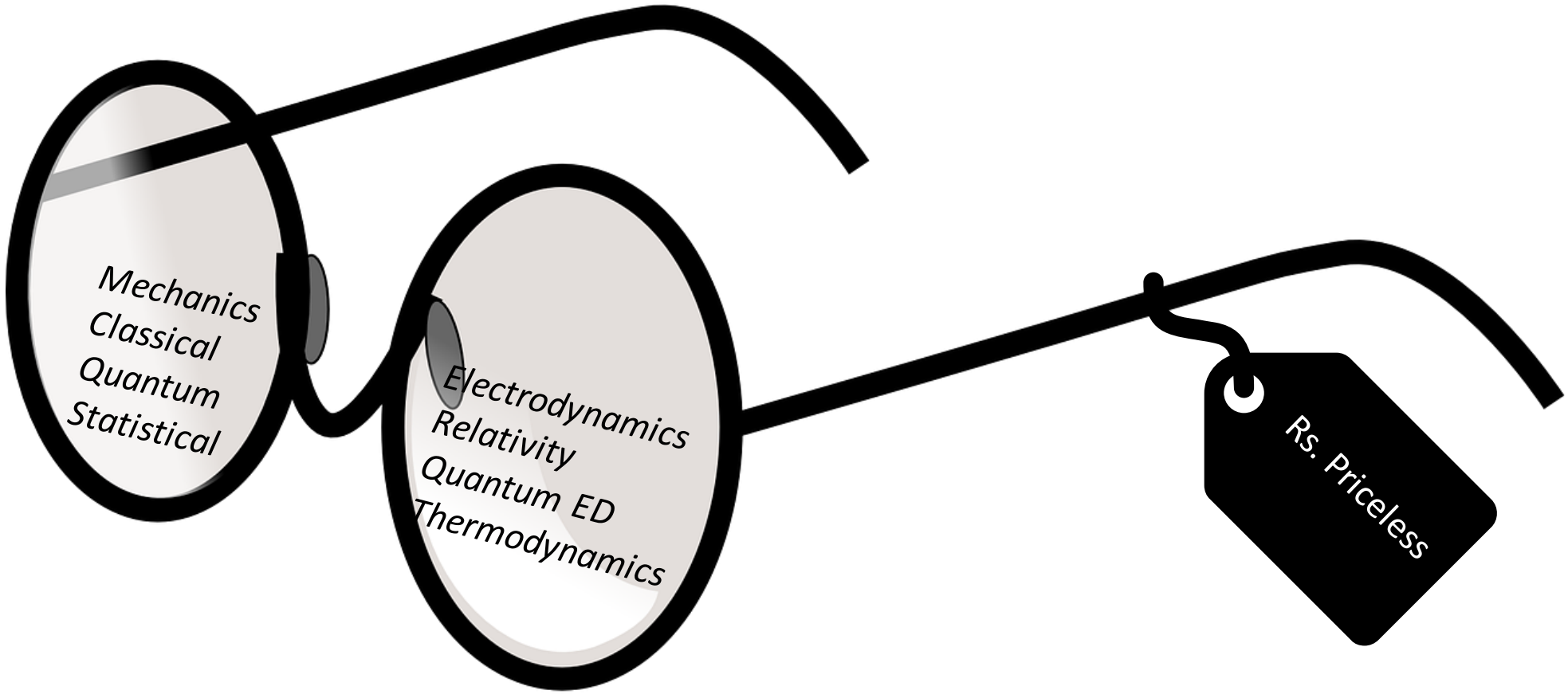
- Copernican
- Newtonian
- Dynamical Theory of Heat
- Chemical
- Einsteinian
- Wave Theory of Light
- Maxwell's em theory
- Quantum Mechanics

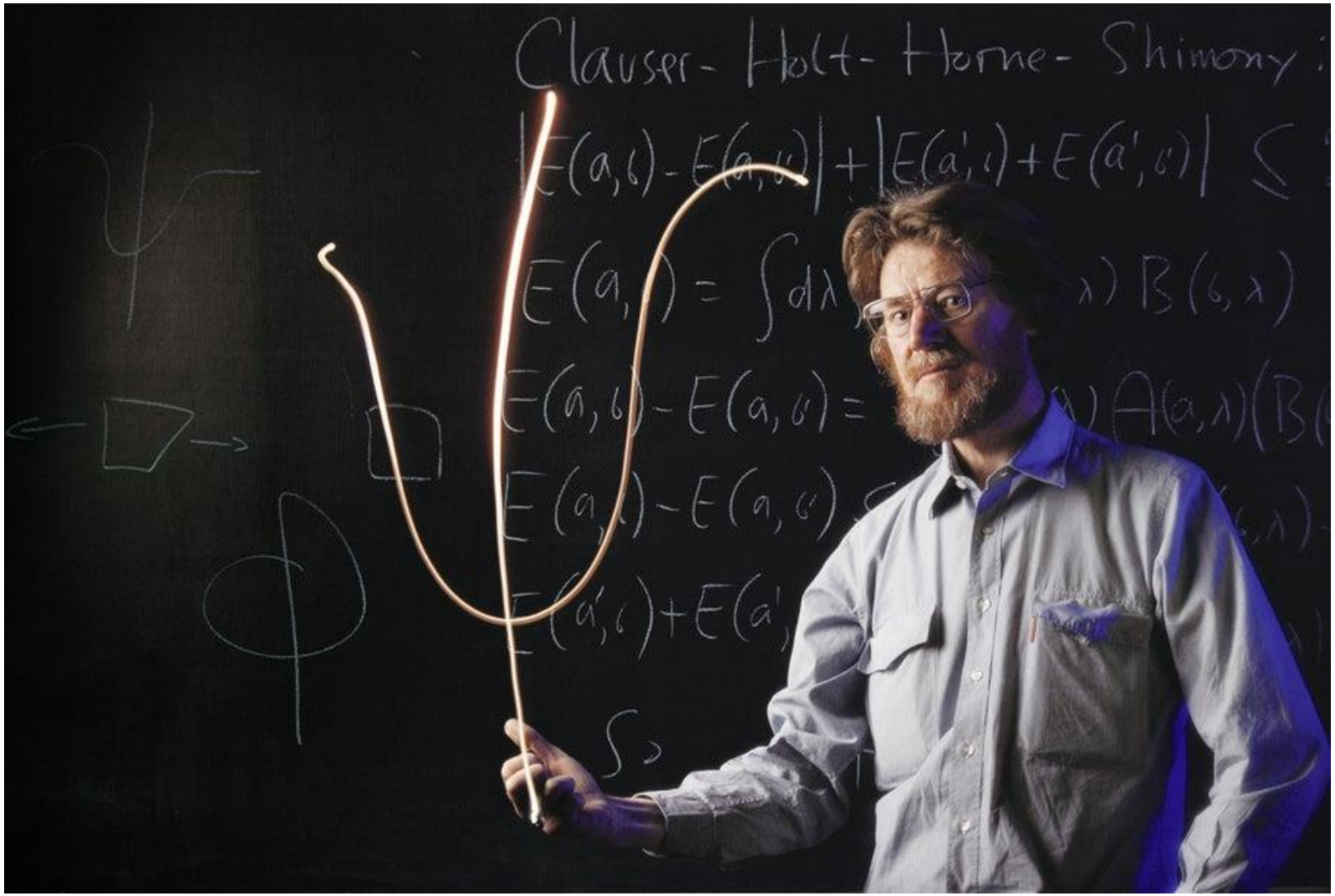
…….. And so on and on

The Structure of Scientific Revolutions :
Thomas S Kuhn



'Chasma' to view the World

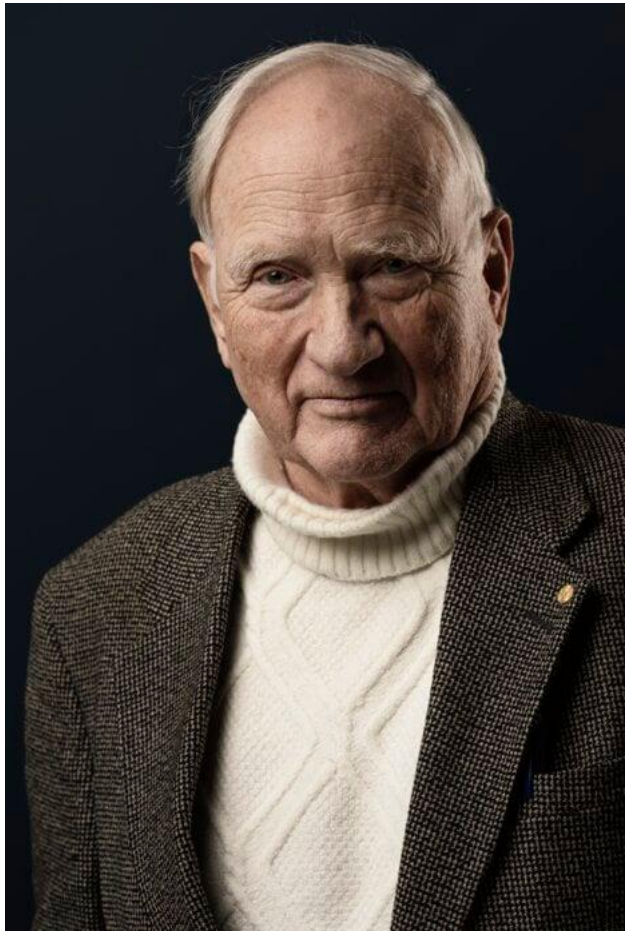




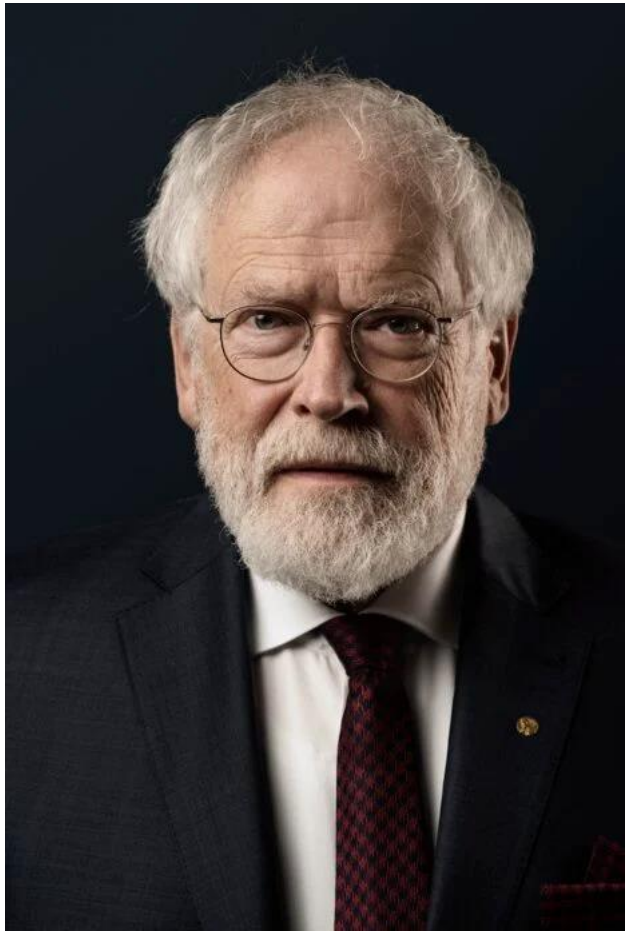
Work by John Stewart Bell in the 1960s sparked a quiet revolution in quantum physics. Credit: Peter Menzel/Science Source

Nobel in Physics 2022

Alain Aspect

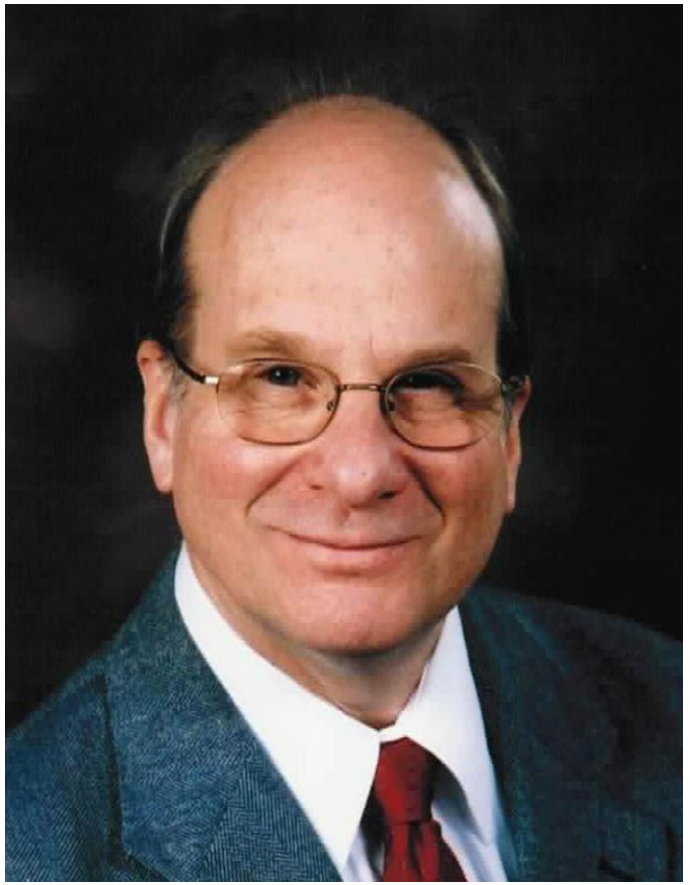


John F Clauser



Anton Zeilinger

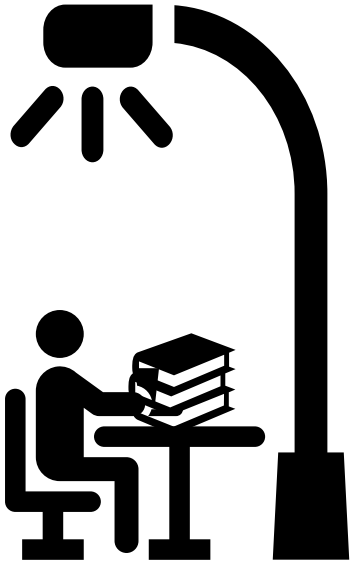
Noble in Chemistry 2023



Lois E Brus

Alexei Ekimov

Remember



As instructors, we are only Guides or Lamp Posts,
It is YOU who should take the opportunity to Learn.

Learning is ultimately a very very personal affair.