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Spiral Note Book



2/10/2007

• The 20th Century Journey to the two ends of the Universe - Micro and Mega

• The Unfolding of the Micro and Macro Universes in the 20th Century.

• 17th, 18th, 19th Centuries -

• Dynamics, Thermodynamics, Statistical Mechanics, Optics, Electricity and Magnetism, Acoustics

• Later Part of 19th Century:

• Et Maxwell's EM Theory.

• Problem Like the Ether

• Michelson-Morley Expt.

• Hertz proves EM Waves

• Marconi, J.C. Bose -

• Three major discoveries - Radio, x-rays, cathode

• The blackbody spectrum anomaly.

• Discrete spectral lines

• The quantum hypothesis

• Theory of Relativity -

• Drastic change in Concepts - Space and time.

Causality - Uncertainty, Probability.

• Indeterminacy

• General Theory of Relativity

• Gravitation - Curvature

Nuclear physics -

- Discovery of Proton, Neutron, β -decay
- Fine Structure of Spectral Lines
- Spin. Bohr-Einstein, Fermi-Dirac Statistics
- Cosmic Rays \rightarrow Microwaves
- Discovery of positron, neutron, pion, kaon

Extensive Air Shown - 10^{21} EV. $\left\{ \begin{array}{l} 3^\circ \text{ radian} \\ \text{400} \end{array} \right.$

Heavy Protons

Theory of Elementary Particles -

Indicates for High energy accelerators

Anti-protons

New Particles - Resonance

Quark Theory - Chromodynamics

- Neutron - Proton Decay.
- Manifestation of forces -

- Quark-Gluon Plasma

- Dirac Vacuum Q.V.

Role of Instruments -

+ Accelerators

+ Computers

Cloud Chamber, Geiger counter

Bubble Chamber

Spark Counter

Calorimeter

The Macro World -

- Planets, stars, Solar System
- Expanding Universe - Hubble
- External galaxies - $10^4, 200^4$ light years
- Radio Astronomy.
- UV and IR -
- X-ray Astronomy.
- γ -ray Astronomy
- TeV, EeV, PeV
- Neutrino Sun, Brain holes
- Acc. 30 minute rockets
- Big Bang Theory
- Accelerating Universe -
- Dark Matter
- Dark Energy.

What is Charge?
What is Electric Field
What is Magnetic Field

Physical Realities
in 3d Space
and 1d time

Multi-Dimensions -
String Theory

What is the
connection between
Physical Reality,
Abstract Reality.

Pictures

- ① Glashow Snake
- ② Expanding Universe. (Smoot)
- ③ Cosmic Ray Shower
- ④ Electron-Positron pair
- ⑤ Cosmic Ray Neutrino Detection (KGS)
- ⑥ Anti-Positron -
- ⑦ Table of Elementary Particles
- ⑧ Pulsar - Neutron Stars -
- ⑨ Black holes
- ⑩

Problems

Big Bang - zero or infinite energy (?)
Dark Energy } 97.5% (?)
Dark Matter }
Multiverse }
Multi-universes }
Quantum Vacuum - Empty Space -
Ultimate Reality (?) - Universal Substrate
String Theory -

- Curvature - geometrical property - by analogous definition
gravitation is a physical property - by human
experience of lifting a stone.
- Electric Charge - Kaluza Klein theory -
property of 5 dimensional space.

