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### Student's Question of the Day

#### What is particle physics?

Universe is composed of atoms which in turn consists of three fundamental particles namely electron, proton and neutron. When these particles are smashed at high energy ( $\sim 5\text{GeV}$ ) then hundreds of even smaller new particles are produced. The study of these new particles and interaction among them is called Particle Physics or High Energy Physics. Though Particle Physics has existed since 20<sup>th</sup> century but the earlier study was done by the ancient Greeks who predicted that matter can be broken down into fundamental invisible particles. All these particles interact in nature through three fundamental forces namely gravitational force between masses, weak electromagnetic between charges, and strong nuclear forces. These particles have been classified into groups according to their properties. The earlier classification was based on their masses, for example the light particles were named as Leptons (means lighter), the heavier were named as baryons (means heavy) and the medium called mesons (means middle).

Today this classification is not valid but the names are retained as descriptive of three major families of particles with similar properties. Leptons have no internal structure and include electrons, muons, Tau muons and neutrinos. Mesons are short lived particles including quarks and anti-quarks. While baryons include proton, neutron and hyperons made of quarks. There is another group of particles called field particles which are responsible for carrying three fundamental forces through which leptons, mesons and baryons interact in the nature. These are gravitons (gravitational force) photon (electromagnetic force), bosons (weak nuclear force), and gluons (strong nuclear force). Dr. Abdus Salam a Pakistani Noble laureate is credited to discover weak bosons (Electro-weak Theory) along with his co-researchers during his research work. All these groups of particles are placed in two major categories, the fermions (which obey Pauli Exclusion Principle) and bosons (which do not obey Pauli Exclusion Principle). The quarks, leptons and baryons are fermions while the field

particles and the mesons are bosons. The major research centers of particle Physics are CERN and Fermi Lab. CERN at Geneva have the biggest particle accelerators and detectors which were launched in 1950. The world's highest energy accelerator Tevatron is present in the Fermi Lab, USA since 1967. In both labs hundreds of scientists are involved in exploring the mystery of particles and their role in the composition of universe. Large hydron collider (LHC) experiment has been recently conducted at CERN to verify the grand theory.

***Samia Aslam***

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### **New Research**

#### **High- $T_c$ Superconductivity in superhard diamond like $BC_5$**

A Study calculates that boron-doped diamond like  $BC_5$  should be superconducting up to temperatures of 45 K, which, if borne out in experiments, would make this class of material with the highest transition temperature into a superconducting state mediated by the passing of phonons.

(Matteo Calandra and Francesco Mauri Phys. Rev. Lett. 101, 016401 2008)

### **Not wonder, this is Physics**

The size of Earth is roughly the geometric mean of size of the universe and size of an atom, and the mass of a human is roughly the geometric mean of mass of the Earth and mass of the proton.

### **News Bulletin**

1. The International Biographical Centre, situated in the historic city of Ely, near Cambridge, England, has declared Dr. M. Asif, Assistant Professor Physics, as Leading Scientist of the World-2008 (I.B.C, UK, January, 2008).
2. The manuscript of Dr, Afaq Ahmed titled "Interferences in the photodetachment of negative molecular ion model" has been officially accepted for publication in the journal "Communications in Theoretical physics".
3. A research paper by Dr. Salman Naeem Khan titled: "Shorted pin circular axe-shaped patch antenna for compact and dual band applications", has been accepted in Journal of electromagnetic waves and applications, Vol. 22, 2105–2112, 2008
4. Col. (R) Javed Iqbal Abid has been transferred from CIIT Abottabad, to Department of Physics CIIT Lahore on 18-08-08.
5. Dr. Salman Naeem Khan has joined Department of Physics CIIT Lahore on 18-08-8.
6. Dr Ashfaq Ahmad (HoD) attended CIIT Forum 2008: "Looking ahead" held at CIIT Abottabad from 11-13 August 2008.