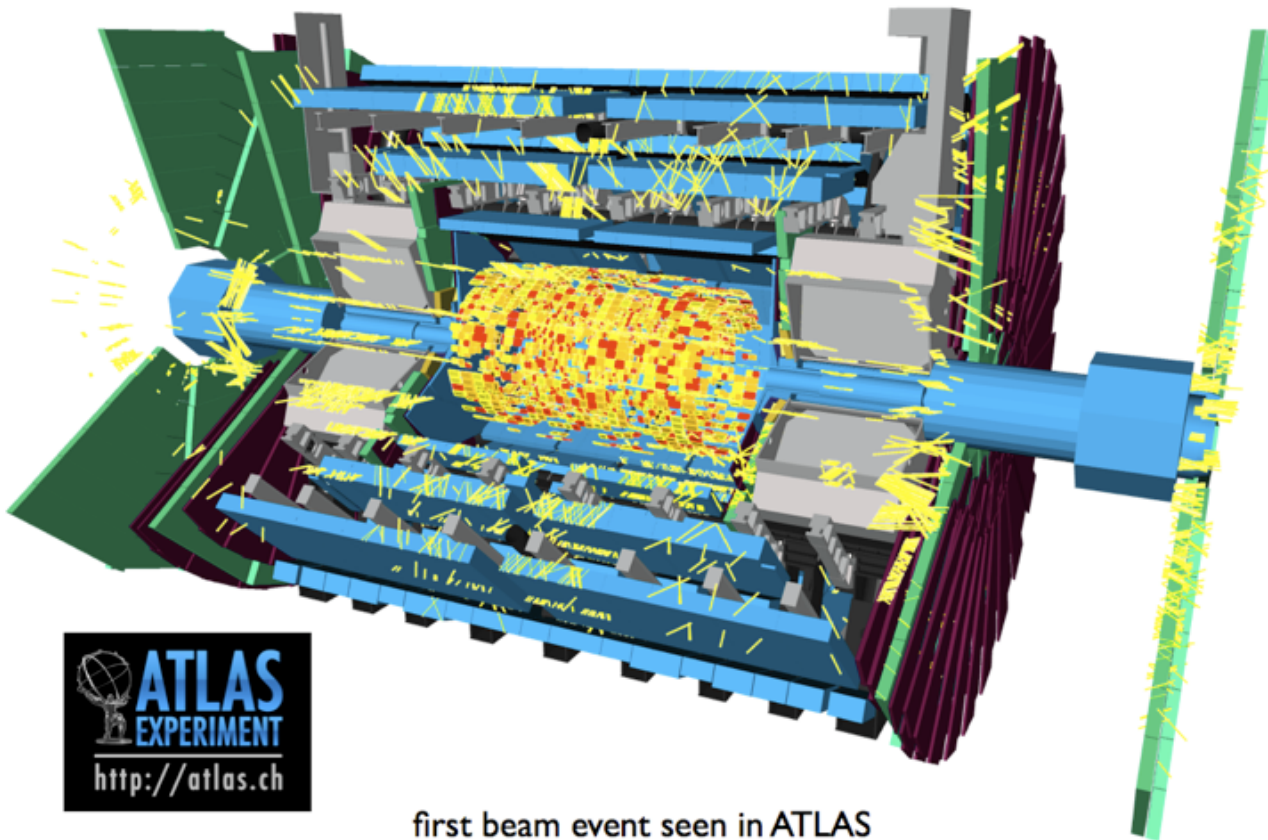




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First Beam at Large Hadron Collider

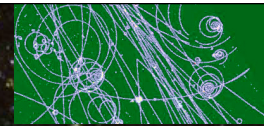


Particle beams were transported around the 17 mile ring in both directions

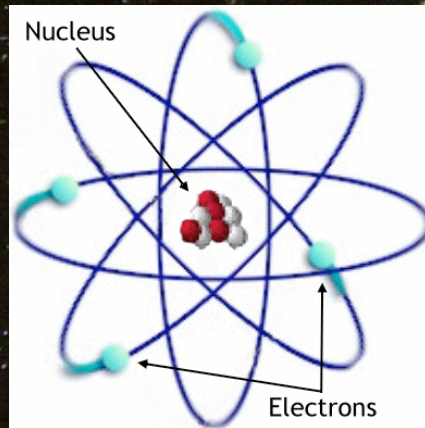
first beam event seen in ATLAS

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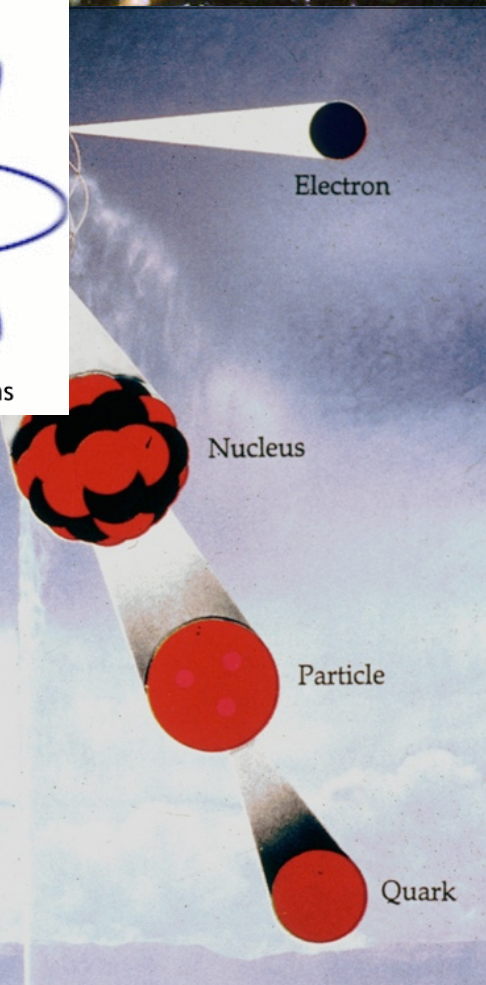
Large Hadron Collider - J. Brau



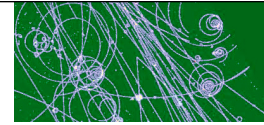
The Universe is Made of Particles



THE ATOM



- Investigating the particles reveals the fundamental structure of the Universe and matter within it

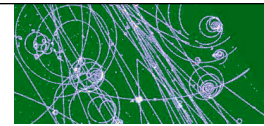


TONIGHT'S PROGRAM

- What are some highlights of particle physics history?
- What is the purpose of the Large Hadron Collider? - G. Kribs
- How do we do experiments at the LHC? - E. Torrence
- What are the unanswered questions from the audience?

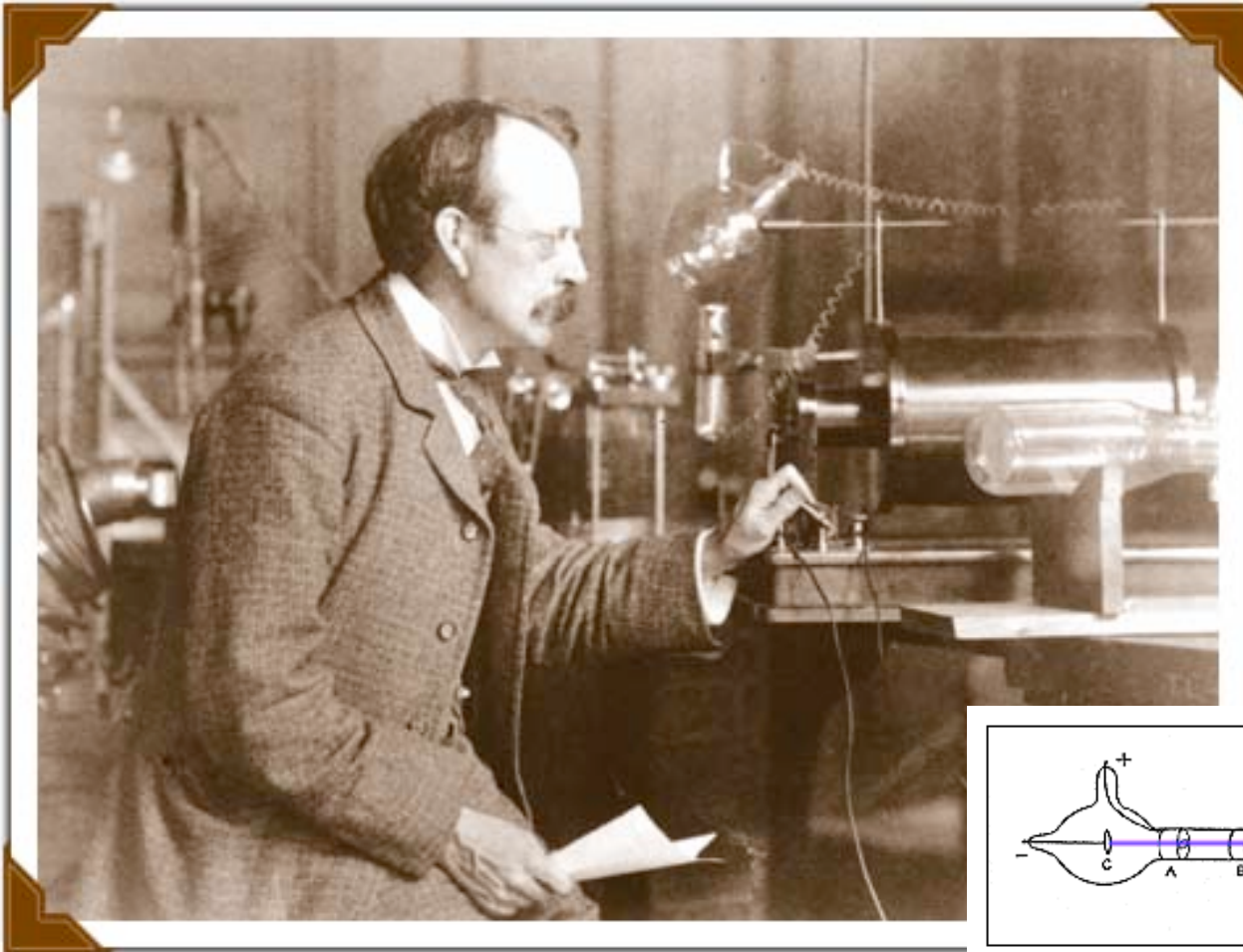


UNIVERSITY OF OREGON

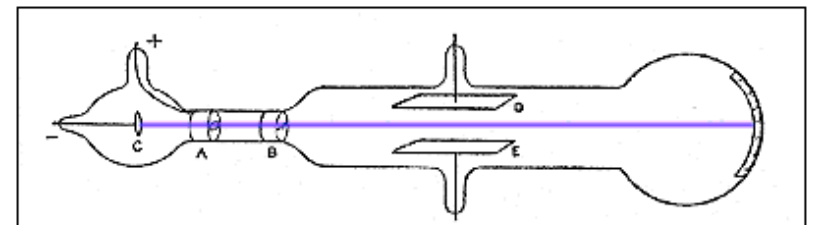


Center for High Energy Physics

1897 - J.J. Thomson - Electron

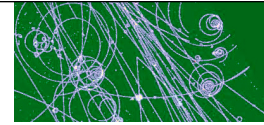


Credit: American Institute of Physics



September 12, 2008

Large Hadron Collider - J. Brau



J.J. Thomson, Speaking in 1934

Could anything at first sight seem more impractical than a body which is so small that its mass is an insignificant fraction of the mass of an atom of hydrogen? -- which itself is so small that a crowd of these atoms equal in number to the population of the whole world would be too small to have been detected by any means then known to science.

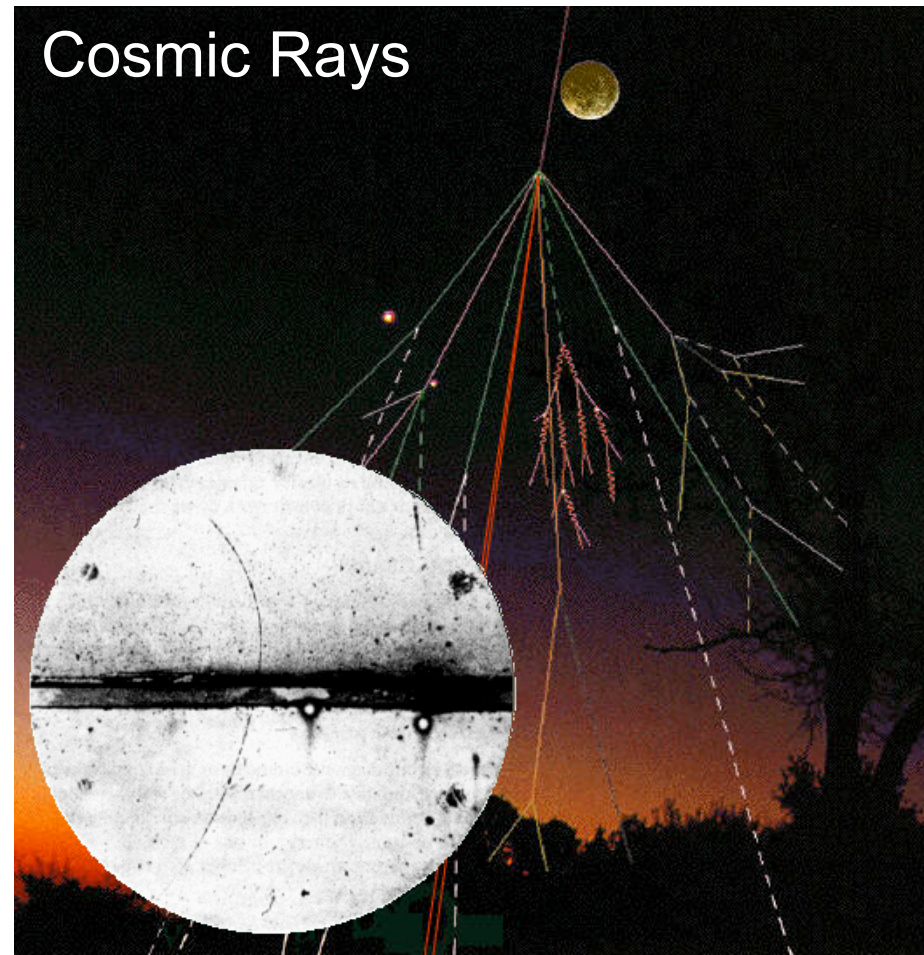


From the soundtrack of the film, Atomic Physics
copyright © J. Arthur Rank Organization, Ltd., 1948.

Credit: American Institute of Physics



1932 - Discovery of Anti-Matter

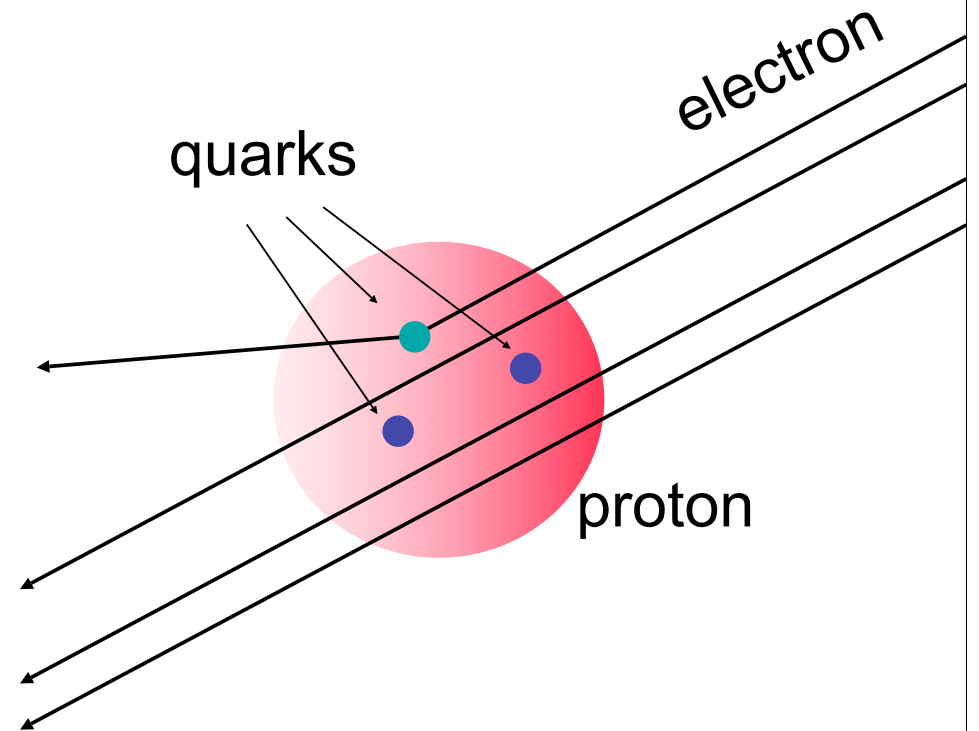


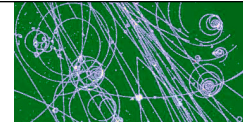
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Large Hadron Collider - J. Brau



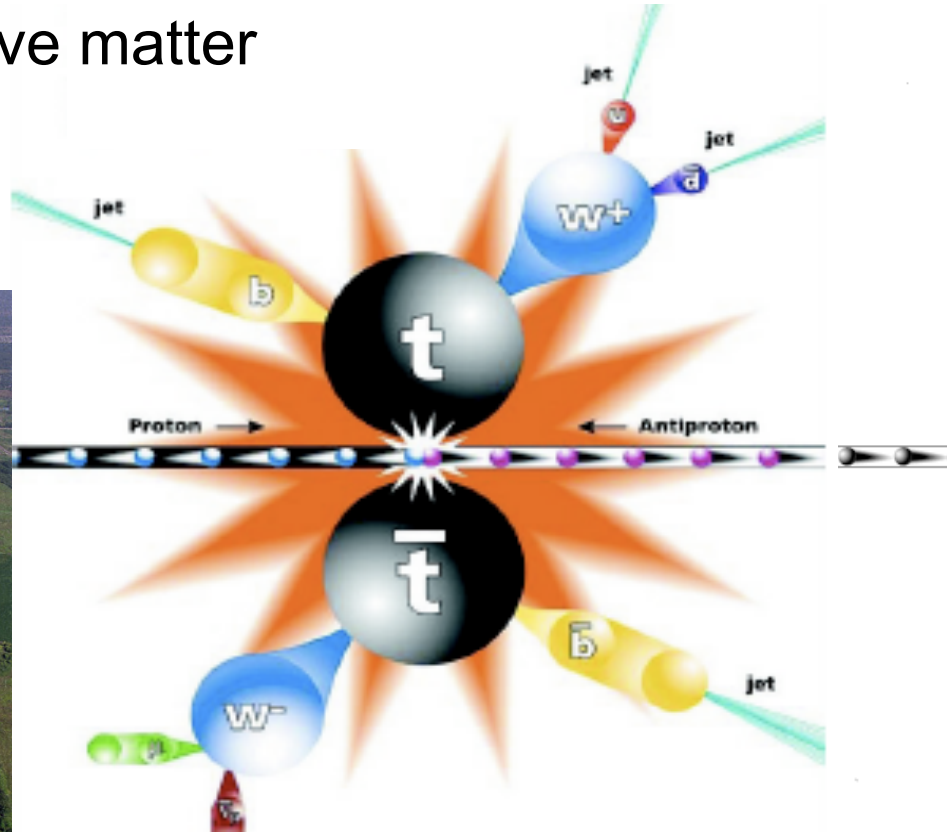
1969 - Quarks discovered (inside atomic nucleus) Stanford





1995 - Top Quark Discovered at Fermilab

Creation of massive matter
($E=mc^2$)

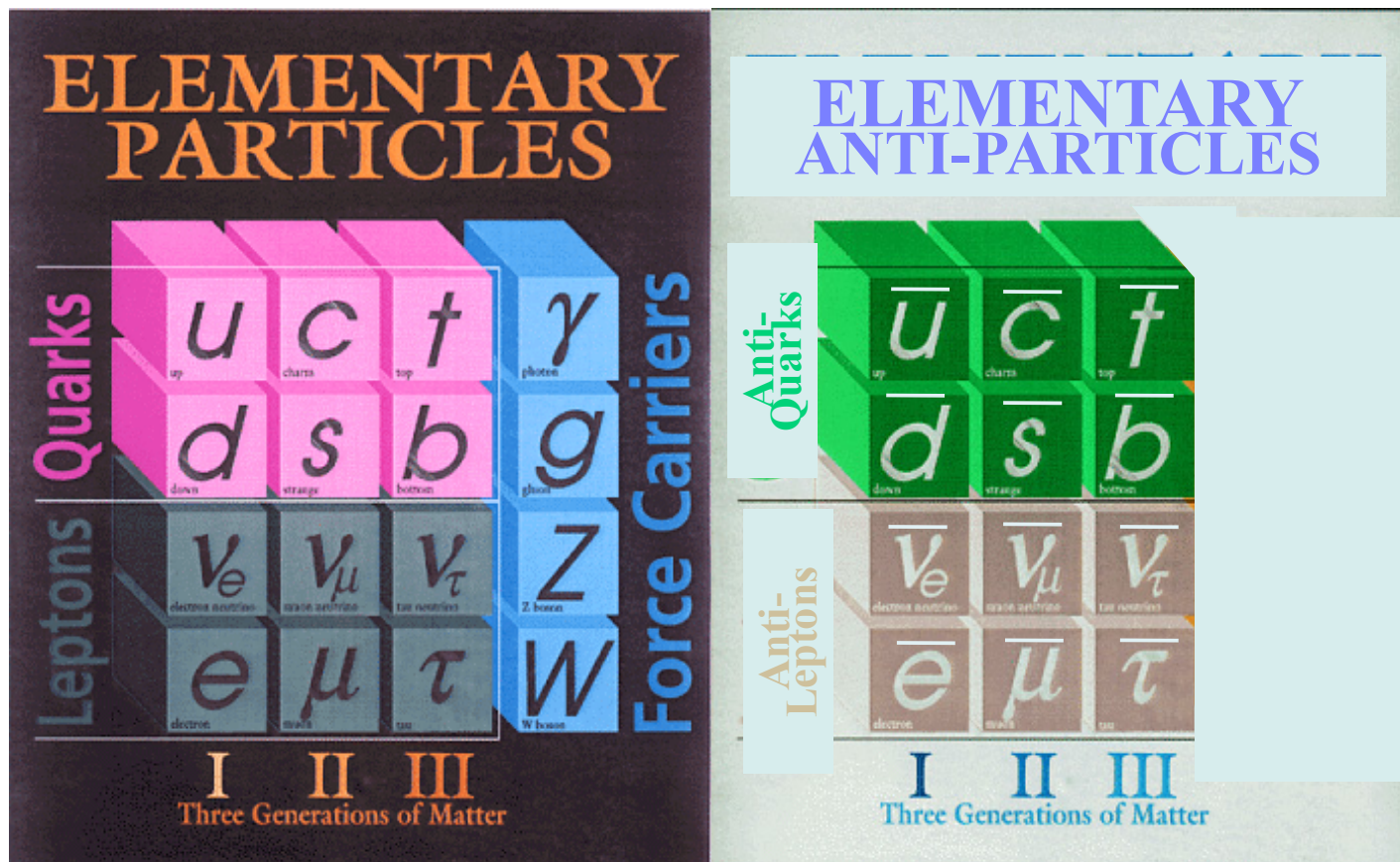


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Large Hadron Collider - J. Brau



Building Blocks of Nature





Next Energy Frontier

- Terascale

- Energy = 1,000,000,000,000 electron-volts

- Equivalent to trillions of household batteries

- Controlled voltage of tens of thousands of lightning bolts



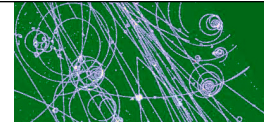
- Scientific Goals at Terascale

- Origin of Mass

- Symmetries of Forces

- Dark Matter





The Large Hadron Collider(LHC)

Largest machine in the world

Fastest racetrack on the planet

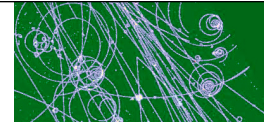
Emptier than space in the Solar System

Hottest spots in the galaxy, but even **colder** than outer space

Biggest and **most sophisticated** detectors ever built

Most powerful supercomputer system in the world

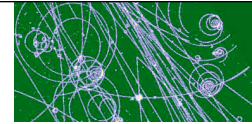




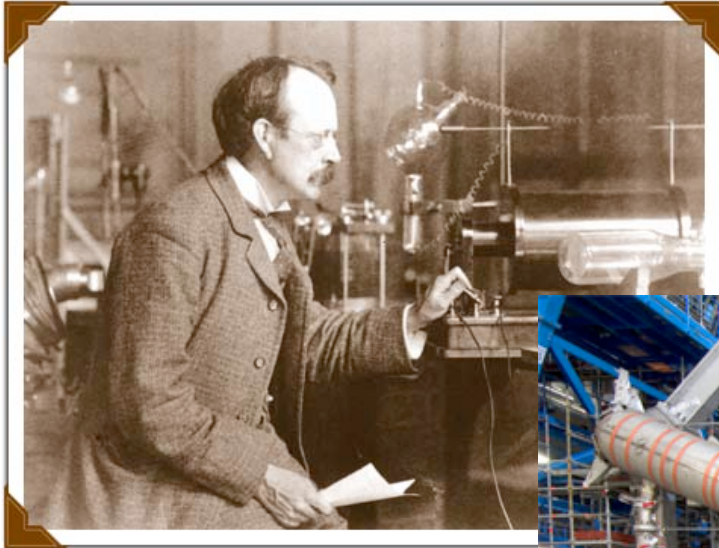
The Large Hadron Collider(LHC)

- 17 mile circumference
- 9300 Magnets
 - 1600 Superconducting (-456° F)
- Collision energy
 - 14,000,000,000,000 eVolts
- Energy in beams
 - 362 MegaJoules
 - 747 Jumbo Jet on take-off
 - 10,000 MJ in magnets
- Particle Collision rate
 - 600,000,000/second



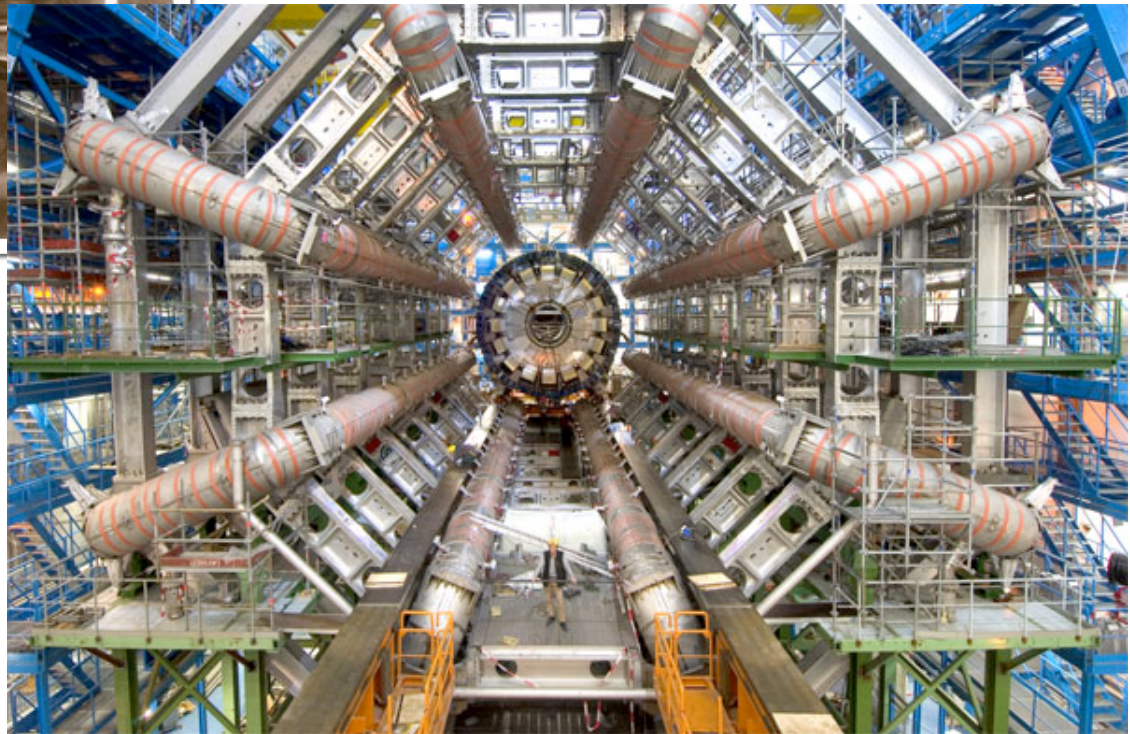


From kilo-electron-volts to the Terascale



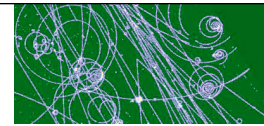
1897
Discovery of
the Electron

2008 +
Discovery
of ??????



September 12, 2008

Large Hadron Collider - J. Brau



Now, Two Experts on the LHC

- Physics Goals of the LHC

- Graham Kribs

- UO Assistant Professor of Physics



- Experiments at the LHC

- Eric Torrence

- UO Associate Professor of Physics



- Then - Questions and Discussion