Contribution ID: **14** Type: **not specified**

Faculty of Science Colloquium: Fundamental Physics and the Large Hadron Collider

Thursday, 11 September 2008 15:15 (1 hour)

With the turn-on of the Large Hadron Collider (LHC) this fall, fundamental physics is on the verge of entering its most exciting era in a generation. The LHC is the biggest experiment in history, in all senses of the word. The machine is a circular ring with a 28 km circumference, in which two beams of protons are accelerated in opposite directions, to speeds approaching 0.99999999 times the speed of light. They are then made to collide with each other, giving us a window into the laws of Nature at 10^(-17) cm, 1000 times smaller than the atomic nucleus, 10 times smaller the tiniest distances we have probed to date. There are strong arguments that dramatic new physical principles await us at these distances. The LHC could extend our usual notions of spacetime by detecting "supersymmetry" or extra dimensions of space, and could directly produce the particles that constitute the Dark Matter of the Universe. In this talk I will describe these ideas, and discuss the solid things we will be able to say about them by the early years of the next decade.

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