What can we learn about the Universe from the Large Hadron Collider (LHC)?

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- radiation is just particles moving very fast: ordinary matter accelerated to high speeds is radiation, and ordinary matter (such as concrete) stops it like a brake
- discovery of radiation opened up a world of different kinds of subatomic particles to discover, how they turn into each other, a rich and complicated zoo
- search for the "big picture" led to unifying theories and symmetry principles; named the four fundamental interactions
- symmetry between matter and antimatter is close but not exact (I didn't mention the "P" in CP violation)
- most of the matter and antimatter annihilated as the Big Bang cooled (afterglow visible to strong telescopes), slight asymmetry resulting in excess of matter is responsible for our existence
- the key to the asymmetry is in the Weak interaction
- first "fully consistent" theory of the Weak interaction in the 1970's unified it with electromagnetism, so electricity, magnetism, and radiation result from the same underlying principle

- electroweak theory required new W, Z, and Higgs
- described SPS, discovery of W and Z in the early 80's, but no Higgs
- described Tevatron, discovery of top quark as being part of another story, not the one I'm telling here, but no Higgs
- described LEP, high precision validation of electroweak (now called "Standard Model"), still no Higgs
- leads us to the LHC, basic parameters (it's big, high energy, high intensity)
- No-Lose Theorem: Higgs or Standard Model breaks down, either way it's exciting
- briefly described the other things we're interested in: supersymmetry, extra dimensions, dark matter, grand unified theories— all of which give us new particles to look for
- invited questions


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