

Introduction: This is a very exciting time in physics. Currently we are seeing a merger of the very large, cosmology, and the very small, particle physics. A number of teachers from around the country were invited to listen to current topics in cosmology, particle physics as they related to the Large Hadron Collider (LHC).

The following lesson plan is an overview of four of the lectures given at the Kavli Institute of Theoretical Physics (KITP) at the University of California at Santa Barbara (UCSB), on May 31, 2008. The lesson plan attempts to summarize these lectures, which can be found at [http://online.kitp.ucsb.edu/online/lhct\\_c08](http://online.kitp.ucsb.edu/online/lhct_c08). Below is a list of the names of four of the speakers included in the lesson.

1. Ayana Holloway Arce  
(UC Berkeley)  
2. Raman Sundrum  
(Johns Hopkins Univ.)

3. Kevin McFarland  
(University of Rochester)  
4. James Wells  
(CERN & Univ. of Michigan)

Objectives of Lesson:

1. To understand what the LHC is
2. To learn the major categories of sub atomic particles
3. To understand what the ATLAS detector is and how it works
4. To understand what mass might be and how this might be solved at the LHC
5. To understand what the Hierarchy principle is and how this might be solved at the LHC
6. To understand the asymmetries of matter and antimatter and how this problem might be solved
7. To understand what dark matter might be and how it might be found

Rational: This lesson plan is designed as a one day overview of current research in cosmology and particle physics, with a link to the LHC. There are many references in the last two slides that can be used to supplement this lesson plan. Since there is so much material, the order of the material allows it to be broken up into smaller sections if desired. The order of the lesson plan is also aligned with the talks.

I would suggest that students go through the particle adventure worksheet (also attached), before the lesson is given.

Teachers could easily use Peer Instruction to discuss any number of issues presented in this lesson.

Homework Activities: You will find an attached document with some homework and lab suggestions.

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