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The Birth of the Universe: The Current State of Cosmology

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How did the Universe begin? What was the early Universe like? What is the Universe made of? How old is the Universe? What is the fate of our Universe? These compelling questions have stimulated thought throughout human history, but it is only within the last half a century that these questions have resided within the respectable pursuits of scientific inquiry.

The study of cosmology attempts to determine the origin and fate of our Universe and the very nature of time and space. Teaching cosmology to high school students offers the perfect opportunity to introduce students to the explorative nature of the scientific approach and the evolution of scientific knowledge. This unit is designed for high school physics courses at varying degrees of mathematical and conceptual sophistication but it can also be simplified conceptually so that it serves as an introduction to cosmology for a freshman general science course.

The current advances in cosmology instill the very nature of the scientific approach and the promise of scientific discovery. It is essential to introduce our students to the wonders of the cosmos as they are currently being discovered and to generate enthusiasm about the remarkable scientific advances. This course will attempt to impart to the students the most contemporary understanding of the state of the Universe. An additional purpose is to discuss and develop the subtle scientific reasoning that allows scientists to make the claims they do about what we currently know.

The unit is written for first year physics courses, comprised of 11th and 12th graders, and can be adapted to different levels by increasing or decreasing the sophistication of the mathematical and conceptual ideas that are presented so that it is appropriate for gifted, honors or general first year physics courses. This unit will be presented at the end of the year once students have covered the basic concepts of Newtonian physics and improved the students' mathematical skills in algebra and geometry. There are supplemental materials and topics for discussion that are particularly intellectually challenging that are meant for an Advanced Placement or second year physics course. By the end of the unit, students will have engaged in a variety of activities and discussions about the fundamental nature of the Universe.

(Developed for Scholars Physics and Gifted Physics, grades 11-12, and General Science, grade 9; recommended for General Physics, Scholars Physics, and Gifted Physics, grades 11-12, and General Science, grade 9)