

## Program Description – Astronomy & Cosmologies – Spring 2009 – 8 June 2009

In this one-quarter program, we studied the science of Astronomy, and cosmologies both ancient and modern. Class met one day per week (in person) for lecture and workshops, which included quantitative calculations, discussions, and hands-on activities. Our primary class texts were Universe by Kaufmann and Freedman (Freeman 2008) and Lecture-Tutorials for Introductory Astronomy by the CAPER Team (Pearson 2008). Seminars met twice per week, usually online (in “Moodle chats”), for discussions of ancient mythology and folklore, to modern cosmology. Our primary seminar texts were Mythology by Edith Hamilton (Back Bay Books 1998) and The State of the Universe: A Primer in Modern Cosmology by Pedro G. Ferreira (Phoenix 2007). Students also researched cosmologies from other cultures and times (not in our texts), and shared them for discussion in seminar.

We used the Finkel model of community building by writing and responding to essays, with shared goals of developing deeper understanding and better communication skills. Each student was to post at least two essays and four responses online during the quarter. Due dates were important so that peers could respond to weekly essays on time, get prompt feedback, and work together toward deeper understanding.

Students met in teams before each seminar to discuss the assignments they had read and to generate “Points, Insights, and Questions” (PIQs). Each team was to post online at least three good PIQs (each) the day before seminar (with sources appropriately referenced by author and page number), in order to stimulate seminar conversations. Student teams were also encouraged to work together on class workshops, end-of-chapter homework, observing outside class, and other activities. We had two observing sessions after class, one naked-eye session to orient students to the sky with planispheres, and one with binoculars and telescopes where we stayed late and found targets of particular interest. Observing guides included Observing the Night Sky with Binoculars: A Simple Guide to the Heavens, by O'Meara (Cambridge 2008) and A Walk through the Heavens: A Guide to Stars and Constellations and their Legends, by Heifetz and Tirion (Cambridge 2004).

Major learning goals - in addition to improved quantitative reasoning, factual knowledge, and understanding of the evolution of knowledge, culturally and historically - included improved critical thinking and understanding of the scientific method. To those ends, student teams undertook research projects and learned how to articulate an interesting scientific question, starting from a mere topic of interest. Teams developed hypotheses for their questions and ideas about how to test them. As a culmination of their learning, they presented their research at Evergreen's Science Carnival at the end of the quarter.

Students were required to take weekly online quizzes provided by the publisher of Universe and a Final Quiz of straightforward questions drawn directly from these. The Universe quizzes provided feedback for deeper learning. Students had unlimited time to take all quizzes, including the Final quiz, and were permitted multiple attempts, so that they might use quizzes as learning opportunities. In a required Final Survey, students were asked to reflect on and evaluate their work and their learning in some depth.

Equivalencies: 16 credits total

- 2 - classes/workshops
- 2 - seminars
- 2 - pre-seminar Points-Insights-Questions
- 2 - short essays
- 2 - responses to peers' essays
- 2- observing
- 2 - quizzes
- 2- team research project