American Museum of Natural History

Seminars on Science

The Solar System

The Solar System is our local neighborhood in space, comprising our closest star, the Sun, along with the matter and radiation that surround it. The origins of the Solar System, its rich diversity and extreme environments, its dynamic nature and its impact upon the evolution and the fate of life on Earth provide some of the compelling themes in this course.

Key Science Concepts:

- **The Sun is the closest star to Earth** and the center of our Solar System. Its gravity organizes the shape of the Solar System and influences its evolution.
- Energy is generated by **nuclear reactions in the Sun's core**. This energy is produced across the wide range of the electromagnetic spectrum that includes visible light, infrared and other forms of radiation.
- **The Universe began with the Big Bang** around 13.7 billion years ago and has been expanding ever since. The Solar System formed 4.6 billion years ago from clouds of interstellar dust.
- **The rocky planets formed closer to the Sun** from more dense material, while lighter materials dominate outer Solar System objects.
- **We explore the Solar System** primarily by analyzing different wavelengths of electromagnetic radiation collected by space and ground-based telescopes. Spectroscopy, the analysis of this light, is the fundamental tool of astrophysics. Additional information comes from evidence collected by space probes and landers and through computer simulation.
- **Atmospheres** - their presence, absence, and composition - play a fundamental role in determining planetary characteristics.
- Through advances in instrumentation, we are rapidly discovering **planets in solar systems beyond our own** - including some that may harbor life.
- **The search for extraterrestrial life** begins with a search for liquid water - on which life as we know it depends. Within our Solar System, Mars is a possibility, as is Jupiter's moon Europa.

Authoring Scientists:

Dr. Denton Ebel is associate curator in the Department of Earth and Planetary Sciences at the American Museum of Natural History. Dr. Ebel's field area is the distant, resource-rich asteroid belt, the source of random debris such as chondrites, the most common kind of meteorites. In his research he continues to model how gas, solid, and melt phases interact at high temperatures and low pressures, and to analyze samples at the finest possible resolution for their chemical, isotopic, textural, and other characteristics. This helps us understand how solids and molten rock droplets first formed in the solar system, a process that eventually led to the accretion of the planet. As the curator of the AMNH meteorite collection, Dr. Ebel loans research specimens to scientists worldwide, and headed up the creation of the new Arthur Ross Hall of Meteorites. "Collections-based research is vital to the exploration of space and a better understanding of our origins," he explains.

Dr. Neil deGrasse Tyson is the Director of the American Museum of Natural History's Hayden Planetarium. Dr. Tyson's professional research interests include star formation, exploding stars, dwarf galaxies, and the structure of the Milky Way. Like his friend Carl

Sagan, Dr. Tyson has played an important role in popularizing astrophysical concepts and discoveries. Dr. Tyson has received nine honorary doctorates and the NASA Distinguished Public Service Medal, the organization's highest civilian honor. The International Astronomical Union recognized him by naming an asteroid "13123 Tyson." Dr. Tyson was named one of Time Magazine's 100 Most Influential People of 2007, and received the 2007 Klopsteg Memorial Award from the American Association of Physics Teachers. Dr. Tyson currently hosts the PBS program NOVA ScienceNow, saying, "I relish the challenge of making science accessible and relevant to many different audiences."