Volume 1, Number 4 *September 2011*

Doctoral Student Presents on the Pedagogy of Big History

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The universe, Earth, life, and humanity all have their own "histories" as chronicled by the disciplines that investigate them. Each one of these histories presents unique puzzles, and seeing how those histories fit together is yet another puzzle and a challenge in its own right. This is, at least in part, the project of Big History—figuring out how the pieces, these various natural and human histories, might be put together on the broadest of scales, and making a story out of it.

The Big History course at the University of Michigan, which I have been on the teaching team for, incorporates an innovative assignment that asks students to take up this challenge for themselves. The course, modestly titled "Zoom: A History of Everything," is a relatively large (40-60 students) undergraduate lecture course structured around

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Cosmic Narratives Course Launched

Dr. Barry Wood, an IBHA member and Professor of English at the University of Houston, has this fall for the first time begun to offer a new course, COSMIC NARRATIVES, which is fully enrolled with forty students. This is the first Interdisciplinary Liberal Arts and Social Sciences (ILAS) course at the University of Houston with its own permanent catalog number. By combining the humanities, social sciences, and natural sciences, COSMIC NARRATIVES seeks to unify insights from the two largest colleges, the College of Liberal Arts and Social Sciences (CLASS) and the College of Natural Science and Mathematics (NSM) to present a coherent and meaningful narrative history of the Universe, the Earth, and the human situation.

From the beginning, finding the right home for COSMIC NARRATIVES presented a problem. The subject matter ranged too far outside the literature curriculum to be included in the Department of English junior/senior offerings. No other university had offered a course of this title to provide a precedent. Fortunately, CLASS includes an appropriate non-departmental designation, Interdisciplinary Liberal Arts and Social Sciences (ILAS). Under this rubric, the course has found its way into the university core curriculum. Refinement of learning objectives has qualified the course for cross listing as a sophomore English offering (ENGL 2340) where the emphasis is on research and writing.
COSMIC NARRATIVES unites three primary

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branches of knowledge. (1) Narrative has emerged in the humanities as central to mythology, legend, drama, and literature, with applications in the presentation of history. (2) Narrative has also emerged in the social sciences, specifically cognitive science, where narrative comprehension is now recognized as our primary cognitive endowment. (3) The "cosmic" component of the course refers to cosmology, an amalgamation of several natural sciences. Narrative works as the unifying thread that brings together the disparate insights now emerging as hundreds of scientists seek to unravel the story of the place of humans in the Universe, the stream of life on Earth, and the history of our species.

Cosmic Narratives Bridge "two cultures"

In 1956, the novelist C. P. Snow made reference to a seemingly unbridgeable gap between "two cultures," the humanities and the sciences. Half a century later, this gap remains, reinforced by the allocation of knowledge to various university "departments." Sub-disciplines such as nucleosynthesis have created more precision in methodology and theory but intensified the cultural divide. Interdisciplinary studies are often confined to hybrids such as biochemistry and psychohistory. The enthusiasm over the emergence of a new hybrid in Edward O. Wilson's Sociobiology (1975) was rare indeed.

Curiously, ancient mythological systems provide a model of knowledge unified. The myths of the Sumerians, Greeks, Egyptians, Chinese, Hindus, and others account for the origin of the Sun, Moon, stars, world, people, cultures, and founding of civilizations. The word myth (mythos) means story. It appears that stories or narratives can bridge disparate realms of experience. Early mythological explanations for cosmic events were satisfactory for pre-scientific people. The rise of science since the sixteenth century has put new demands on explanations, but these have generally gone in the direction of complex classification systems, mathematical laws, and taxonomic systems. The demands of relativity, quantum physics, and big-bang cosmology have moved people beyond a perceptual comfort zone. Remarkably, the unifying power of narrative that dominated mythology comes to the rescue, providing a mode of presentation that suits the universal human endowment of narrative comprehension.

This course fulfills Wood's ambition of several decades: to bring to the university classroom a unified world view based on the astonishing developments in the sciences over the past half century — a world view that is founded on empirical evidence, is meaningful for the contemporary student, and is open to new insights in the sciences as they emerge.

Narratives Develop Science Literacy

Science is difficult if students are never led beyond complex equations, physical laws, compilations of data, and huge taxonomies. However, science does not need to be difficult—not if teachers start with the story.

COSMIC NARRATIVES locates the narrative components in the major sciences—especially those that provide a continuous story covering the 13.7 billion-year history of the Universe, the 4.6 billion-year history of Earth, and 2500 million-year history of life on Earth. Genealogists trace their lineages through parents, grandparents, and ancestors as far as the records will allow. COSMIC NARRATIVES unfolds a richer genealogy in which humans discover ancestral origins at least 2500 million years deep on Earth and elemental origins tracing back as many as 12 billion years to the interior furnaces in the stars.

Big History Spreads Worldwide

After formulating COSMIC NARRATIVES, Wood discovered innovative and adventurous historians who were teaching "big history": the history of the Universe and the world from the Big Bang to the present. He learned that in summer 2010, a group of historians founded the International Big History Association (IBHA) with the stated goal of promoting Big History around the world. While their first dedicated meeting will not occur until summer 2012, this group gathered for paper presentation and discussion this summer (July 7-10, 2011) in Beijing,

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Cosmic Narratives continued

China, under the auspices of the World History Association (WHA). Several papers presented by faculty from around the world indicate a variety of approaches to Big History. A subsection emphasizing big-history theory provided an opportunity to introduce narrative as a basic cognitive endowment, an easily accessible ordering principle for scientific information, and an appropriate mode of delivery for Big History.

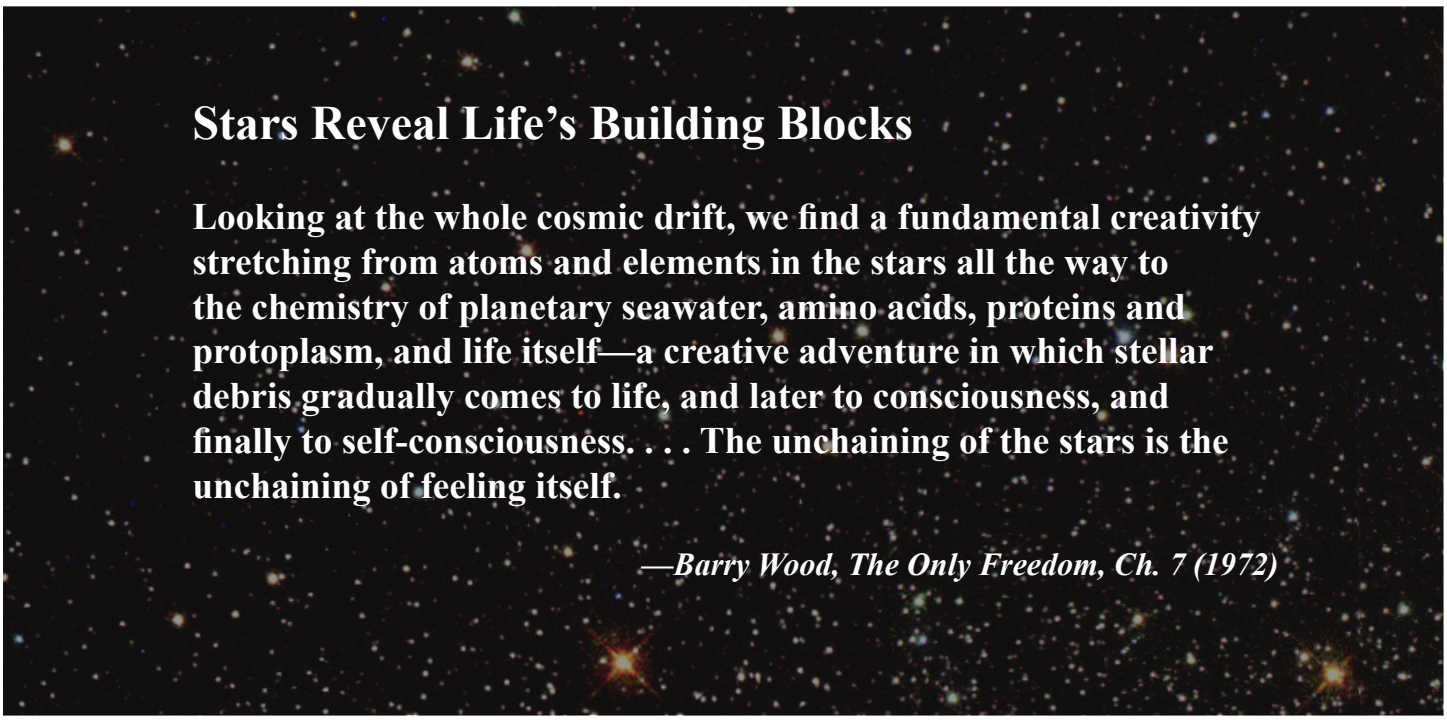
Native American Cosmic Narrative Explains Origin of Great Smokies

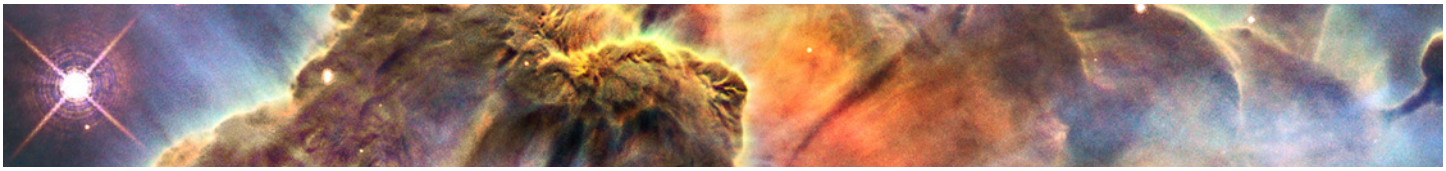
Ancient cosmic narratives (myths) usually feature the Sun (Helios), Moon (Diana), constellations (Orion), landscape (mountains, rivers, valleys), life necessities (corn, buffalo, fish), human accomplishments (knowledge, skills, culture), and origin stories of specific societies (Greek, Hindu, Hebrew, Chinese, Native American, etc). Myths are stories that appeal and convince through metaphor and feeling but have little or no historical or factual basis; nevertheless, they provided meaning and emotional satisfaction for early societies.

Professor Wood begins his course by discussing traditional origin myths or stories. One of these is from the Cherokees, the largest Native American tribe from the American Southeast, who inhabited Tennessee, Northern Georgia, and the Carolinas. At the center of their territory lay the Great Smoky Mountains, now part of the most visited national park in the U.S. The Cherokees told a narrative of Great Buzzard that flew over the land: each time his wings went up, mountains appeared; when his wings came down on the soft earth, a valley was formed. Fearing that the land would be all mountains, the animals cried out for him to stop, but by that time the land of the Cherokees was already full of hills and mountains.

This narrative was local, accounting for the formation of the land where the Cherokees lived. Today, we have developed new cosmic narratives that explain hills in terms of the folding and uplift of the Earth's crust, valleys as eroded by rivers, and mountains as caused by forces of upthrust deep in the Earth, vulcanism, or the collision of tectonic plates—processes much longer by many millions of years than the flight of Great Buzzard over the land. The modern narrative of Earth history includes the assembly and breakup of super-continents millions of years ago, seafloor spreading, seabed subduction, and deep-Earth forces that unleash volcanoes, earthquakes and tsunamis of gigantic proportions, destroying cities and causing deaths in the thousands.

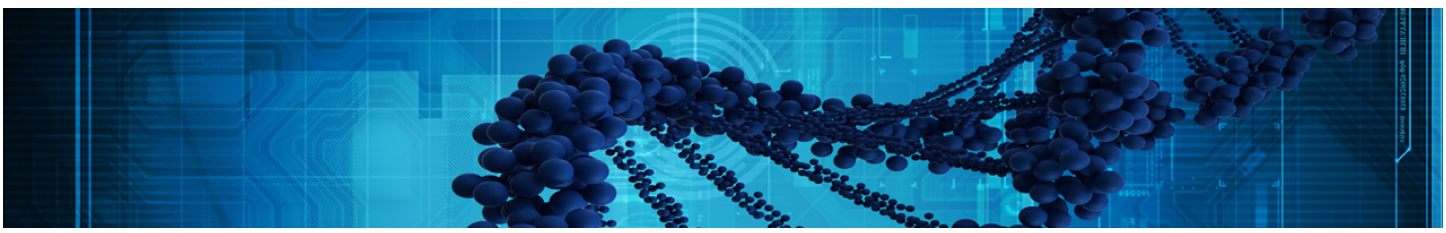
Science has introduced cosmic narratives based on





Course Outline of Cosmic Narratives

One	What are Cosmic Narratives? Origin Stories Ancient (Myths) and Modern (Scientific)
Two	Structures Large and Small: From Atoms to Galaxy Clusters: Astonishing Facts Behind the Narratives
Three	Human Limitations and Narrative Solutions: Narrative as Cognitive Endowment
Four	The Expanding Universe: Early Clues for a Narrative Framework
Five	Narrative Startup: The Big Bang Renamed: The Initial Moment of Emergence (TIME)
Six	Evidence for the Big Bang: Cosmic Background Explorer (COBE), Cosmic Microwave Background (CMB)
Seven	Star Narratives 1: From Dust Clouds to Stars, Galaxies, and Galaxy Clusters
Eight	Star Narratives 2: The Life Cycle of a Main Sequence Star
Nine	Star Narratives 3: Fusion, Origin of the Elements, and Supernovas
Ten	Cosmic Narrative Themes: Emergence, Transformation, and Complexity
Eleven	Earth Narratives 1: Planetary Formation: Radioactivity; Radiometric Dating; Measuring the Age of Earth
Twelve	Life Narratives 1: Origins of Life: Amino acids, Bacteria, Cells; DNA as an Information Template
Thirteen	Life Narratives 2: The Fossil Record: Stromatolites, Trilobites, and Land Invasions
Fourteen	Life Narratives 3: Vertebrates: Amphibians, Dinosaurs, Birds, and Mammals
Fifteen	Earth Narratives 2: Asteroids and Extinction of Species: End of the Dinosaurs 65 mya
Sixteen	Life Narratives 4: The Emergence of Primates, Toolmaking, and Intelligence
Seventeen	Life Narratives 5: Human Emergence: Lucy (3.2 mya), Ardi (4.4 mya), Homo sapiens (200,000 BP)
Eighteen	Journey out of Africa: The Peopling of the World since 100,000 BP
Nineteen	Paleolithic Lifeways: Proxies for the Narrative Organization of Experience—Fire, Food, Axes, and Art
Twenty	Information Narrative 1: Culture as Information Storage and Transmission
Twenty-one	Earth Narratives 3: Sedimentation, Erosion, Unconformities, the Rock Cycle
Twenty-two	Earth Narratives 4: Seafloor Spreading, Plate Tectonics, Earthquakes, Volcanoes, Tsunamis
Twenty-three	Earth Narratives 5: The Wisconsin Glaciation and Its Effects—geological and human
Twenty-four	The Origin of Narrative Entities: Tylor, Spirits, Souls, and Fictional Narrative Entities
Twenty-five	Information Narratives 2: The Agricultural Revolution—accidental information accumulation
Twenty-six	Information Narratives 3: The Industrial Revolution—exponential complexity & transformation of energy
Twenty-seven	Information Narratives 4: Electronics—the globalization of information
Twenty-eight	Ecozoic Necessity in the Anthropocene Era: Energy Flow and Transformation at the Breaking Point



observation, fact, and testable theory. Such narratives were never imagined in ancient times (the big bang, galaxy formation, fusion of the elements in stars, history of life on Earth, plate tectonics, hominid emergence, worldwide migrations of people) nor were themes of natural selection and emergent complexity. Through this course, ancient mythic origin stories will be discussed in the context of modern cosmic narratives. The focus, however, is the unifying narrative emerging from the sciences. Narrative as a unifying mode of presenting the past is one among several approaches to the Universe Story or Big Science. Parallel approaches are termed Big History and Cosmic Evolution.

COSMIC NARRATIVES is our particular version of what is called Big History. This is defined as the interdisciplinary study of the Cosmos, Earth, Life, and Humanity. About 20 universities worldwide offer a course in Big History; ours appears to be one of about 10 in the U.S. and the only one to structure the course as a series of narratives.

BIG HISTORY IN THE HIGH SCHOOLS: Bill Gates is supporting the innovative "Big History Project" to develop a free online Big History curriculum for high schools, piloting in a dozen schools in fall 2011 with full release in 24-48 months. A number of informative websites detail these developments and include online videos. See, for instance, the Charlie Rose interview with Bill Gates and David Christian's TED (Technology, Entertainment, Design) presentation, a 17-minute history of the Universe.

Assigned Resources for the Course

Numerous books provide an overview of cosmic history from the Big Bang 13.7 billion years ago (bya), the accretion of Earth 4.6 bya, the emergence of life 3.8 bya, to the final peopling of the planet (100,000 to 15,000 years ago). There are also many books on specific aspects of this history: the Big Bang, galaxy and star formation, the evolution of the elements, the rise of life, the emergence of primates and humans, and the migration of humans out of Africa. In addition, substantial numbers of documentaries from the History Channel, Discovery Channel, and National Geographic have treated aspects of this history. The following annotated list includes books assigned for the initial (Fall 2011) offering of ILAS 2360 / ENGL 2340: Cosmic Narratives (TTh 10-11:30; Room—H 34).

Bill Bryson, *A Short History of Nearly Everything* (New York: Broadway, 2003. 544 pages). In the author's own words, Bryson knew very little about how his world worked or its history, so he set aside three years to read and interview those who did. The result is his "short history," which is now available also in an expanded illustrated edition. The book is a tour de force, as hundreds of reader responses on Amazon attest.

Barbara C. Sproul, ed. *Primal Myths: Creation Myths Around the World* (New York: Harper, 1970. 370 pages). This is perhaps the best starting point to explore cosmic narratives in ancient mythology. Sproul's coverage is worldwide with substantial excerpts from Hesiod's Theogony, the Babylonian Enuma Elish, the Old Testament, and the Hindu Upanishads.

Donald Johanson and Maitland Edey, *Lucy: The Beginnings of Mankind* (New York: Simon and Schuster, 1981). Johanson gained fame with the 1974 discovery of "Lucy," a substantially complete hominid skeleton dating to 3.2 million years B.P. His careful analysis of the find provides a fine introduction to the science of anthropology.

Jane Goodall, *In the Shadow of Man* (New York: Houghton Mifflin, 1971). Jane Goodall turned a 1960 assignment to observe chimpanzees in the wild into a Ph.D. dissertation and a half-century study of our closest primate relatives. Goodall's account of her cautious insertion into the chimpanzee world and her groundbreaking observations of their use of tools has revealed a development of chimpanzee social skills prior to the emergence of humans. Goodall is now a world-renowned speaker on her chimpanzee discoveries and a tireless advocate of animal rights. Observations Goodall made fifty years ago have now been filmed: see "Primates," the final episode of the BBC series, Life, narrated by David Attenborough (BBC Worldwide, 2010) Disc Four.

DVD/Video Resources

The History Channel, *How the Earth Was Made* (2007), 94 mins. This DVD (included with the book orders for ILAS 2360/ENGL 2340) provides an overview of the history of Earth and includes a useful printed timeline of Earth's history. Produced

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in 2007, this program appears to be a kickoff to the multi-season series, How the Earth Was Made (not assigned, but highly relevant to the course). The first season in 13 episodes provides a useful demonstration of the scientific method: specific geological evidence leading to specific conclusions. Of note are two episodes ("Iceland" and "The Deepest Place on Earth") that provide an overview of the Mid-Atlantic Rift, continental drift, and subduction of the Pacific seafloor, which together constitute an informative presentation of plate tectonics.

Notes

1. The narrative of Great Buzzard is taken from James Mooney, Myths of the Cherokees (1900) in James Mooney's History, Myths, and Sacred Formulas of the Cherokees (Asheville, 1992) 239.
2. C. P. Snow's characterization of "two cultures" first appeared in a New Statesman essay, October 5, 1956. Subsequently, Snow published a book called The Two Cultures (Cambridge University Press, 1960). This book is considered one of the most important in stimulating academic discourse on the sciences, humanities, and public education.

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guest lectures: 35 of the 40 lectures in the course's most recent edition were given by guest lecturers. As many who have experienced a course with even two instructors can attest, preserving coherence in a course with so many voices presents a real difficulty. While the principal instructor of the course, Central Asia historian Douglas Northrop, makes the most of his own allotment of five lectures to "connect the dots" among all the guest lecturers, we have also found that assignments in this course play a crucial role in supporting and promoting thematic coherence.

To this end, the primary semester-long assignment in Zoom asks students to consider how pieces of material from different lecturers and different disciplines relate to one another. Students form groups centered around particular disciplines: astronomy, chemistry, anthropology, etc. The members of a given disciplinary group then create a set of wiki pages profiling their discipline: what types of evidence it considers, how it goes about evaluating that evidence, and examples of content knowledge that the discipline has produced. (Such an epistemological focus is typical of Zoom, and the possibility of analysis on this level is one of the great advantages of having many disciplines linked together in a single course.) Students collaborate within their groups, both in person and virtually, to produce these pages, and then they collaborate between groups in order to create links—both literal hyperlinks and intellectual connections—between pages and disciplines. Students must thus actively engage in the process of assembling pieces of our past gathered from many disciplines, while trying to understand how, and to what extent, it might all fit into a single vision of Big History.

The assignment fits naturally into the larger goals of the course. In Zoom, we cover some 10 disciplines, 13.7 billion years of history, and 40 orders of magnitude in space, all in 15 weeks of class time. The project, like all work in Big History, is ambitious to say the least. But with the challenge comes a rare opportunity: the chance to see how various fields have used a vast array of techniques and sources of evidence to construct an understanding of the past, present, and future on a dizzying array of scales in time and space.

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