Art and Science in LACMA's *Cosmologies* Exhibition

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Abstract. This paper presents an overview of the *Cosmologies* exhibition that will be presented by the Los Angeles County Museum of Art (LACMA) in late 2024 – early 2025. Created in collaboration with scientists at the Carnegie Observatories and the Griffith Observatory, and a global array of consulting scholars, *Cosmologies* presents a group of one hundred twenty rare artworks, stone, ceramic, and metal sculptures; paintings; works on paper; manuscripts; astronomical instruments; and computer visualizations. The exhibition's goal is to explore the variety of human attempts to explain the universe's origins, mechanics, and meaning. *Cosmologies* is an aesthetically and intellectually ambitious exhibition that explores the history of multiple cosmologies around the globe from the Neolithic period to the present day, as they have developed across a wide range of regions and cultures, including Indigenous North and South America, Mesoamerica, Neolithic Europe, Mesopotamia, Greece, Rome, South and Southeast Asia, East Asia (China, Korea, and Japan), the Islamic Middle East, Europe, and the United States, ending with an exploration of the current and future state of cosmology. The exhibition explores the development of cosmologies not only as scientific (i.e., astronomical and observable) systems of understanding, but also as ontological systems of belief that provided models for human beings' place and purpose in the cosmos.

Introduction

As a part of the 2024 Getty Pacific Standard Time series of exhibitions, the Los Angeles County Museum of Art (LACMA) is creating an ambitious exploration of cosmologies across human history, from the Neolithic Period to the present. The exhibition's primary goals are to explore cosmologies that have contributed to the evolution of human consciousness, using extraordinary works of art as the primary vehicles of understanding, and to demonstrate that all cosmologies are temporary and undergo continual evolution. The exhibition will examine the development and function of observational astronomy as mirrored in the mapping of the heavens and the creation of conceptual matrixes for understanding time,

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space, and cosmic origins. It will also explore ways in which cosmology creates the foundation for ontology (in general terms, the understanding of the nature of existence and, in the context of this exhibition, the understanding of humans' place in the universe) through the prism of art, architecture, and design. Every ancient culture has seen the heavens as a mirror of cosmic structure and process, as well as a mirror of the terrestrial world. Measurements of time were directly influenced by the appearance and movement (both real and apparent) of heavenly bodies. As religions evolved from early times, many cultures conceived of and gave visual (anthropomorphic or zoomorphic) form to cosmogonic and other celestial deities whose homes were in the stars.[1]

[1] For further reading, please see: Anthony F Aveni. and Gary Urton, eds, *Ethnoastronomy and Archaeoastronomy in the American Tropics* (New York: The New York Academy of Sciences, 1982); Carmen Blacker, et al., *Ancient Cosmologies* (London: Allen and Unwin, 1975); Ronald Brashear and Daniel Lewis, *Star Struck: One Thousand Years of the Art and Science of Astronomy*, exh. cat. (San Marino: Huntington Library, 2001); Markham J. Geller and Mineke Schipper, eds, *Imagining Creation* (Leiden & Boston: Brill, 2008); Norriss S. Hetherington *Encyclopedia of Cosmology: Historical, Philosophical, and Scientific Foundations of Modern Cosmology* (New York & London: Garland Publishing, Inc., 1993); Catherine Hofmann and François Nawrocki, eds., *Le Monde en Sphères* (*The World in Spheres*), exh. cat. (Paris: Bibliothèque National de France, 2019); Wayne Horowitz, *Mesopotamian Cosmic Geography* (Winona Lake, Indiana: Eisenbrauns, 2011); Alexander Jones, ed., *Time and Cosmos in Greco-Roman Antiquity*, exh. cat. (New York: Institute for the Study of the Ancient World at New York University, 2016); Nick Kanas, *Star Maps: History, Artistry, and Cartography*. 3rd edn (New York: Springer, 2019); E.C. Krupp, *Echoes of the Ancient Skies: The Astronomy of Lost Civilizations* (New York & Oxford: Oxford University Press, 1983); Samuel L. Macey, ed., *The Encyclopedia of Time* (New York & London: Garland Publishing, Inc., 1994); Alexus McLeod, *Astronomy in the Ancient World: Early and Modern Views on Celestial Events* (New York: Springer, 2016); David W. Pankenier, *Astrology and Cosmology in Early China: Conforming Earth to Heaven* (Cambridge: Cambridge University Press, 2013); David Pingree, *From Astral Omens to Astrology, from Babylon to Bīkāner* (Rome: Istituto Italiano per l'Africa e l'Oriente, 1997); Clive Ruggles, ed., *Ancient Astronomy: An Encyclopedia of Cosmology and Myth* (Santa Barbara, CA: ABC-CLIO, 2005); Clive Ruggles, ed., *Handbook of Archaeoastronomy and Ethnoastronomy*, 3 vols (Berlin: Springer, 2015); Clive Ruggles and Gary Urton, *Skywatching in the Ancient World - New Perspectives in Cultural Astronomy* (Boulder, CO: The University Press of Colorado, 2007); Helaine Selin, ed., *Astronomy Across Cultures: The History of Non-Western Astronomy* (Dordrecht: Springer, 2000); John M. Steele, *A Brief Introduction to*

Although I am now an art historian specializing in East Asian art, I was once an undergraduate in Carl Sagan's Center for Radiophysics and Space Research at Cornell University, where as part of a work-study job I was assigned in 1973 to assist the late Professor James Elliot in his study of the periodicity of the visible light coming from the interactions of Cygnus X-1 (the first discovered black hole) and its binary companion, the blue supergiant variable star HDE 226868. Ever since then I have maintained a deep interest in astronomy and cosmology. When I arrived in Los Angeles in 2011, LACMA's Director Michael Govan and I discussed organizing a major exhibition on the history of cosmology. To my knowledge, such an exhibition has never been presented in an art museum.

The Los Angeles County Museum of Art (LACMA) will host the exhibition in late 2024 – early 2025; opening dates and admission information will be available from closer to the time on their website.[2]

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Scope of the Exhibition

The exhibition will begin by illustrating early awareness of celestial events as demonstrated by the astronomical alignments of several prehistoric monuments, illustrated with models, vintage photographs, and possibly VR (virtual reality) projections. One of the earliest of these is the stone circle at Nabta Playa in the Nubian Desert of southern Egypt, dating to the Middle Neolithic Period (c. 6000–5500 BCE). This stone circle is situated close to the Tropic of Cancer and was aligned with the rising Sun at the summer solstice, and may further have been aligned with the stars Arcturus in Boötes, Sirius in Canis Major, and Alnilam in Orion's belt. Similarly, early megalithic structures in Northern Europe with clear astronomical alignments include Brú na Bóinne (Newgrange) in Ireland, Bryn Celli Ddu in Wales, Clachan Chalanais on Lewis in the Outer Hebrides, Scotland, Dons Meyn in Cornwall (Fig. 1), and Stonehenge in Wiltshire.

Astronomy in the Middle East (London: Saqi, 2008); Xiaochun Sun and Jacob Kistemaker, *The Chinese Sky During the Han* (Leiden: Brill, 1997); Christopher Walker, ed., *Astronomy Before the Telescope* (London: British Museum Press, 1996).

[2] Los Angeles County Museum of Art (LACMA), https://www.lacma.org.

Fig. 1. The Neolithic ritual circle of Dons Meyn ('Dance of Stones') at Boscawen-ûn in Cornwall, England, c. 2500–1500 BCE, aligned with both the summer and winter solstices.

While the exhibition will focus primarily on works of cosmological art from polytheistic cultures (e.g., Mesoamerica, Mesopotamia, Egypt, Greece, Rome, India, and China, to name a few), which have had the largest numbers of celestial deities, both male and female, it will also include artworks from monotheistic cultures in which the creation of the universe is credited to a single deity. In most early cultures the creation is credited to a deity (or deities), but there have also been cultures in which the universe is believed to have been spontaneously 'self-born', without any deity's agency; this is true, for example, in the Chinese Daoist (Taoist) tradition. *Cosmologies* will explore the deification of cosmic and celestial entities, the visualization of planets, stars, and constellations as homes and embodiments of male and female deities (e.g., the Egyptian deity Isis as embodied by the star Sirius, Osiris by the constellation Orion, and the sky-goddess Nut by the span of the Milky Way from Gemini to Cygnus, often depicted on the inner lids of sarcophagi and the ceilings of tombs), the correlation of ancient calendars with asterisms and celestial events, and concepts of time and space and how these were depicted in works of art and sacred diagrams. The exhibition will also explore the links between cosmogonic and celestial deities and terrestrial rulers' political power. Isis

and Osiris were, for example, among the most powerful deities in ancient Egypt on both the cosmological and political levels; a personal relationship with these deities played a critical role in establishing and maintaining a long succession of pharaohs' political power and legitimacy.

For each culture and time period explored, *Cosmologies* will pose the following questions:

- How was the universe created?
- How is space conceived?
- How is the universe mapped?
- What is the structure of the universe? What is it made of, and how do its different parts function?
- How is time conceived? How does it move? Is it linear or cyclical? Can it bend? Is time the same everywhere? Can it move backwards?
- What is the relationship between the earth and the sky?
- What is the relationship of cosmology and political and religious power?
- What is the relationship between and cosmology and divination?
- What is the relationship of astronomy and cosmology to healing and medicine?

The exhibition's goal is to explore these questions by weaving together a series of narratives using roughly one hundred twenty works of art. The project's success will hinge on the quality of these narratives that flow through the exhibition like leitmotifs, and the visual quality of the works of art chosen for inclusion. In the development of the exhibition, we are excited to be working with Dr E.C. Krupp, Director of the Griffith Observatory, Los Angeles, and Director Dr John S. Mulchaey, Astrophysicist Dr Juna Kollmeier, and Strategic Initiatives Coordinator Erica Clark at the Carnegie Observatories in Pasadena, all of whom have provided invaluable guidance. Within LACMA we are working with a small team comprising myself, Director Michael Govan, and curators from the Ancient Americas and Egyptian departments. During the research phase we have also consulted several experts in the fields of Mesopotamian, Islamic, and South Asian astronomy and cosmology. Given the subject's enormous breadth and depth, rather than presenting a comprehensive visual history of cosmology, the exhibition will focus on a carefully selected group of artworks from some twenty cultures and

periods to explore the sheer variety of human beings' attempts to explain the universe's origins and mechanics.

Ancient Cosmology

The *Cosmologies* exhibition will examine Mesopotamian cosmology and the roles of several key celestial deities, including Marduk (Jupiter), Shamash (the Sun), Sin (the Moon), and Ishtar (Venus), the last originally known in Sumerian times as Inanna. As the goddess of love and war, she was the most powerful female deity in the Mesopotamian pantheon. Similarly, special attention will also be paid to key astronomical and cosmological deities of the ancient Egyptian pantheon. Here, as elsewhere, the exhibition will explore the links between cosmogonic and celestial deities and terrestrial rulers' political power. In this vein, the exhibition will examine numerous examples of the relationship between cosmology and power, and will explore cosmological systems that proved to be politically useful for rulers. The few celestial diagrams painted on ceilings of ancient Egyptian tombs cannot be brought to Los Angeles, so we will present one of them – from the Tomb of Pharaoh Seti I (r. 1290–1279 BCE) – as a large ceiling-mounted rear-projection image (Fig. 2).

One of the actual ancient Egyptian works that we hope to include in the exhibition is a bronze and electrum *merkhet* (c. 600 BCE), a device for measuring space and time, now in the Science Museum, London, having been donated in 1929 by Howard Carter, discoverer of the tomb of Tutankhamen.

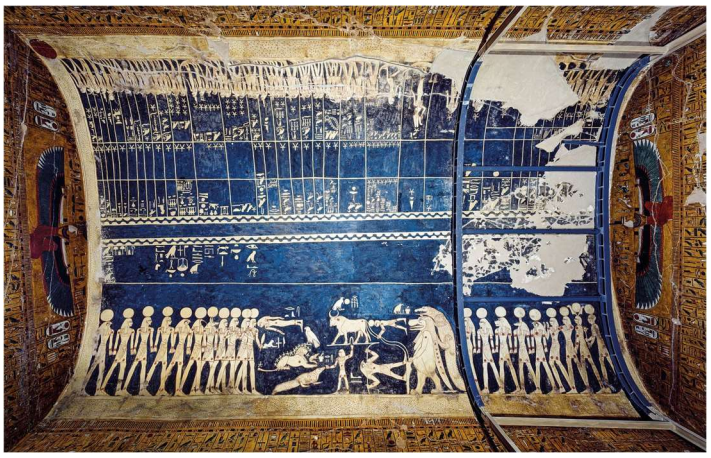

Fig. 2. Astronomical Ceiling in the Tomb of Pharaoh Seti I (r. 1290–1279 BCE), Valley of the Kings, Luxor, Egypt.

The section on Greece and Rome will present the contributions to astronomy and cosmology by such ancient thinkers as Pythagoras of Samos, Eratosthenes, Aratus of Soli, Aristarchus of Samos (who in the third century BCE posited a heliocentric model for the Solar System centuries before similar models were proposed in Renaissance Europe), Hipparchus of Nicea, and Claudius Ptolemy in Roman Egypt. We will include a model of the now-famous Antikythera Mechanism (c. 70–60 BCE, National Archaeological Museum, Athens), a complex hand-powered orrery and the first known analogue computer used to predict astronomical positions of the planets and eclipse timings for calendrical and astrological purposes. A superb example of the influence of the Greek mapping of the celestial realm on Egyptian astronomy is the stone ceiling from the Osiris Chapel of the Temple of Hathor at Dendara (50 BCE; now in the Louvre Museum, Paris), which superimposes the twelve symbols of the Greek zodiac on the corresponding asterisms of the ancient Egyptian heavens; this will be represented by large and accurate French reproduction published in 1817.[3]

Islamic Cosmology

An important section of the exhibition will examine key developments in astronomy and cosmology in the Middle East from the eighth through the fifteenth centuries. These include the contributions of astronomers and cosmologists in the Islamic world in translating (and thus preserving), refining, and improving upon the achievements of such ancient astronomers as Ptolemy, and the significance of the four great observatories of the Middle East and India: Hulegu Khan's observatory in Maragha, Iraq (1258), Ulugh Beg's observatory in Samarqand (in modern Uzbekistan, early 1400s), Taqi al-Din's observatory in Ottoman Istanbul (1575), and Jai Singh II's Jantar Mantar observatory in Jaipur, Rajasthan (early eighteenth century). Among the famous astronomers of the Islamic world whose contributions will be explored here are Yaḥyá ibn Ghālib Khayyāṭ (early ninth century, whose *Kitāb al-Mawālīd* [*Book of the annual revolution of nativities*] was translated into Latin by Plato of Tivoli in 1136 and by Johann Hispalensis in 1153), al-Farghānī (ninth century, whose *Kitāb fī Jawāmiʿ ʿIlm al-Nujūmi* [*Elements of astronomy on the celestial motions*] influenced the work of Copernicus), 'Abd al-Rahman al-Sufi (903–986) author of the *Kitāb ṣuwar al-kawākib* (*Book of the*

[3] Illustrated in *Description de l'Egypte, ou Recueil des observations et des recherches qui ont été faites en Egypte pendant l'expédition de l'armée française* (Paris: l'Imprimerie impériale, 1817).

Constellations of Fixed Stars; Ibn Bajja (c. 1085–1138), Fakhr al-Din al-Razi (1150–1210), who significantly also proposed the concept of the multiverse), the Persian astronomers Nasir al-Din al-Tusi (1201–1274), and the Ottoman Taqi al-Din (1526–1585).

The impact of the Islamic astronomers' works is beautifully symbolized by the inclusion in Albrecht Dürer's 1515 woodcut-printed map of the constellations of the northern celestial hemisphere (Fig. 3), from the National Maritime Museum, Greenwich, in the four corners of which are imaginary portraits of the authorities on whom the map is based: Aratus Cilix (Aratus of Soli), Ptolemaeus Aegyptus (Ptolemy), M. Mamlius Romanus (Marcus Manilius), and, notably, Azophi Arabus (the Persian astronomer al-Sufi).

Fig. 3. Albrecht Dürer (1471–1528), *Imagines coeli septentrionales cum duodecim imaginibus zodiaci*, 1515. Etching; 48.4 x 44.1 cm**.** National Maritime Museum, Greenwich, England.

The exhibition will include a manuscript copy of al-Sufi's *Book of the Constellations of Fixed Stars*; Bibliothèque Nationale de France, Paris), in addition to a group of astronomical instruments from the Islamic Middle East, including astrolabes, armillary spheres, celestial globes, and quadrants, and their later European counterparts. Because of the enormous influence of the Islamic astronomers on Renaissance and later European astronomers, this section will lead directly into an examination of the scientific advances of Nicolaus Copernicus, Tycho Brahe, Johannes Kepler, Galileo Galilei, Johann Bayer, Isaac Newton, Charles Messier, and Sir John Frederick William Herschel. This section will include such magnificent illustrated books as Johann Bayer's *Uranometria* (1603 – a copy from Isaac Newton's library is owned by the Huntington Library in San Marino), Johannes Kepler's *Mysterium Cosmographicum* (1621), Andreas Cellarius's *Harmonia Macrocosmica* (1660), and Charles Messier's list of over 100 star clusters and nebulae published in *Connaissance des temps* in the early 1780s.

Hindu and Buddhist Cosmology

Within South Asia the exhibition will explore the closely related cosmologies of Hinduism and Buddhism, which both posited the existence of multiple universes, and the concept that the universe, like reincarnated human beings, goes through a continual cycle of birth, death, and rebirth, along with the concept of the sacred mountain that functions a cosmic *axis mundi*, connecting all levels and realms of existence and around which revolve the Sun and the planets. In Brahmanical Hinduism the universe is often (although not always) cyclically created by the four-headed god Brahma. Nonetheless, an element of doubt regarding to the role of any deity in cosmogenesis is raised in an important passage in the *Rig Veda* (c. 1500–1200 BCE), the earliest of the Vedic texts, which asks the question, 'Whence this creation has arisen – perhaps it formed itself, or perhaps it did not – the one who looks down on it, in the highest heaven, only he knows – or perhaps he does not know'.[4] In the centuries following the conquests of Alexander the Great, Hindu astronomy and cosmology witnessed an influx of astronomical concepts from Greek culture, and later impacted the early development of cosmology in the Islamic world. The cosmologies of the Hindu worlds of South and Southeast Asia will be represented primarily by sculptures of the gods Brahma, Vishnu, and Shiva, each of whom had their own roles to play in cosmogenesis.

[4] Translated by Wendy Doniger O'Flaherty, *The Rig Veda: An Anthology* (New York: Penguin Books, 1981), pp.25–26.

A key theme explored throughout the exhibition is the tension between order and chaos. It was a primary function of many deities to create order out of an inherently chaotic universe. In Vaishnavite Hinduism this is expressed in image of the god Vishnu flying on the back a mythical bird, the *garuda*, whose talons clutch snakes. The snakes represent chaos, here controlled by Vishnu and his avian mount. At the same time, it is noteworthy that neither Vishnu nor the *garuda* kill the snakes; instead, the snakes are perpetually subservient to Vishnu – thus chaos is controlled without being entirely eliminated. World religions are replete with these types of narratives. Many elements of the Hindu vision of the universe's structure were adopted by Buddhism. Two remarkable symbolic maps of the cosmos appear in two Tibetan Buddhist paintings (*thangkas*): one is an image of Mount Sumeru, the cosmic *axis mundi* incorporating both the world of form and the world of formlessness; the other an image of the inner human body as a reflection of the cosmos (Fig. 4).

Fig. 4. *Cosmic Man with Diagrams of Newar Yogic Six Chakra Transformation*. Central Tibet, c. nineteenth century. Thangka; mineral pigments and gold on cotton cloth**,** 175.26 x 104.1 cm. Los Angeles County Museum of Art, Gift of Dr Mark and Dorothy Stern (M.91.118).

Chinese Cosmology

Within East Asia the exhibition will focus on the ancient Daoist cosmology of China, centring on belief in the Dao as an empty void, beyond time and space, beyond the ability of words to describe, that spontaneously generates the cosmos and the forces of *yin* and *yang* that regulate both celestial and terrestrial processes. The beautifully cast back of Tang dynasty (ninth century) bronze mirror in the American Museum of Natural History, New York, is a good illustration of the Chinese Daoist view of the universe's corresponding levels (Fig. 5).

Fig. 5. Mirror with Cosmological Designs. China, Tang dynasty (618–906). Bronze; diameter 26.4 cm. American Museum of Natural History, New York, Berthold Laufer Collection (70/11671).

Starting at the centre, one sees the animal symbols of the Four Cardinal Directions: Dragon of the East (yang), Tiger of the West (yin), Bird (Phoenix) of the South, and the Turtle and Snake of the North. The Center, which is neither yin nor yang but neutral, is represented by a frog which

functions as the mirror's central knob. Moving outward, the next concentric band depicts the twelve animal symbols of the Chinese Zodiac, based on Jupiter's twelve-year orbit of the sun. The next band depicts the Eight Trigrams, a series of ancient graphs symbolizing yin, yang, and the six stages between which are constantly in flux. These trigrams can be traced back to at least the predynastic Western Zhou period (twelfth century BCE) in western China. The next band depicts the Twenty-eight Lunar Mansions, namely the constellations through which the moon moves in a 28-day lunar month, while the outermost band consists of a long incantatory inscription.

The accomplishments of later Chinese astronomers of the thirteenth century are seen in a large star chart carved into a stone stele whose date corresponds to 1247, during the Southern Song dynasty. The original stele still stands within the halls of the Confucian Temple (Wen miao) in Suzhou, Jiangsu province, not far from Shanghai. This was the most advanced star chart created anywhere in the world up to that time. It includes over fourteen hundred stars, the celestial equator, the ecliptic, and the Milky Way. It is noteworthy that in this chart the widths of the Lunar Mansions along the celestial equator are accurate to up to half a degree. The most important constellation in the Chinese heavens was *Beidou* (*Northern Dipper)*, identical to the Big Dipper. Since at least the Han dynasty (206 BCE – CE 220) the Northern Dipper has been perceived as a huge celestial clock and seasonal indicator as it rotates through the Twenty-eight Lunar Mansions.

Mesoamerican Cosmology

In pre-Columbian Mesoamerica, cosmology gave shape to everything, both an infrastructure that ordered and a superstructure that governed. Mesoamerican cosmologies gave rise to two primary concerns: creating order out of chaos and maintaining balance (i.e., reciprocity). The world was perceived as chaotic and filled with entities and essences that can imperil humanity. The creator deities created order in both space (the four-cornered universe and sacred centre) and time (daily solar cycles and other celestial movements), and they governed all things which people used to create safe spaces for themselves. For many Mesoamerican peoples, the imperative task was to maintain this order and to reciprocate divine benevolence lest an imbalance fester. The achievements among Mesoamerican cultures in astronomical observations and the rendering of such celestial deities as the Sun, Moon, and Venus are illustrated with such astronomical manuscripts as the Mayan Dresden Codex (Sächsische

Landesbibliothek – Staats- und Universitätsbibliothek Dresden) and the Aztec Codex Borgia (Rome, Biblioteca Apostolica Vaticana), while the political appropriations of cosmological knowledge will be examined through such works as a Mayan stone panel in LACMA's collection referencing the date of the world's creation, and the Aztec *Coronation Stone of Moctezuma II* in The Art Institute of Chicago.

Evolving Traditions and Modern Cosmology

Cosmologies will also illustrate the importance in different cultures of the relationships between the celestial and terrestrial realms in such disciplines as astrology, divination, and healing. In the European Middle Ages and during the Renaissance, for example, the different zodiac signs were specifically correlated to different parts of the human body; these constituted critical aspects of Medieval and Renaissance medical diagnostics, as can be seen in charts from the *Guild-Book of the Barber-Surgeons of York* and *Les Très Riches Heures du Duc de Berry*, both dating to the fifteenth century.

The exhibition will examine several cross-cultural transmissions, adaptations, and appropriations of astronomical and cosmological knowledge around the globe. In the second half of the first millennium BCE, key elements of Mesopotamian astronomy and cosmology were transferred to Greece and ultimately to Rome. Key elements of Greek astronomy and cosmology were transmitted to Egypt, India, and the Islamic Near East. Islamic Near Eastern astronomy and cosmology were transmitted to Europe through translations from Arabic into Latin made in Sicily and in Spain. Key elements of Indian astronomy and cosmology were transmitted to China, and elements of both Indian and Chinese astronomy and cosmology were transmitted to Tibet, Nepal, and Bhutan.

Finally, working in collaboration with the Carnegie Observatories in Pasadena and the Griffith Observatory in Los Angeles, the exhibition will present a survey of modern and contemporary cosmology, including Einstein's theories of relativity and Edwin Hubble's discoveries in the 1920s of other galaxies, and the fact that we exist in an expanding universe. Here we will celebrate the fact that the era of modern cosmology began a century ago with the advent of the large telescopes created by George Ellery Hale in Southern California, and the fact that several of the most significant cosmological discoveries of the early twentieth century were made in Los Angeles.[5]

[5] Marcia Bartusiak, *The Day We Found the Universe* (New York: Vintage Books, 2010).