

The Ninth Conference on the

INSPIRATION OF ASTRONOMICAL PHENOMENA

Gresham College, Holborn, London, EC1N 2HH, England
24-27 August 2015

www.insap.org

Programme and Abstracts

August 2015

Local Organizing Committee

Dr. Nick Campion
Dr. Valerie Shrimplin
Professor Paul Murdin
Professor Chris Impey

University of Wales Trinity St David
Gresham College, Independent Art Historian
Institute of Astronomy, Cambridge
University of Arizona, Tucson, USA

Executive Committee members

Dr Nick Campion
Professor Chris Impey
Professor Ron Olowin
Dr Richard Poss
Dr Rolf M Sinclair
Dr Valerie Shrimplin
Dr Gary Wells

University of Wales Trinity St David
University of Arizona, Tucson, USA
St Mary's College, Moraga, San Francisco, USA (Chair)
University of Arizona, Tucson, USA
Centro de Estudios Científicos, Valdivia, Chile
Gresham College, Independent Art Historian
Ithaca College, New York State, USA

Acknowledgements

The INSAPIX conference gratefully acknowledges sponsorship from Gresham College and from the Sophia Centre for the Study of Cosmology in Culture, School of Archaeology, History and Anthropology, University of Wales Trinity Saint David.



Coat of arms of Sir Thomas Gresham (1519-79), with stars and comets, demonstrating his interest in astronomy

***Welcome to the Ninth Conference on
the Inspiration of Astronomical Phenomena!***

INSAPIX

The Conference will explore humanity's fascination with the sky by day and by night, which has been a strong and often dominant element in human life and culture. It provides a meeting place for artists and scholars from a variety of disciplines (including Archaeology and Anthropology, Art and Art History, Classics, History and Prehistory, the Physical and Social Sciences, Mythology and Folklore, Philosophy, and Religion) to present and discuss their studies of the influences that astronomical phenomena have had on humanity.

Previous INSAP conferences have successfully brought together people from just such a range of disciplines to address topics of common interest. The main theme and avowed aim of the conference series is to provoke interdisciplinary debate and to attempt in some measure to break down the barriers between subjects, disciplines and cultures – across institutions, media and conventional chronological periods. Many of the sessions therefore cut across not only science and the humanities but also across subject disciplines, and national boundaries, bringing together scholars from areas of activity that are often maintained as distinct and separate.

Speakers have been included from a wide range of countries and from varying academic, professional and institutional backgrounds. Sessions range chronologically from the ancient world to the present day, and even into the future. Geographically the themes span from America to China, Australasia and the Middle East (global, rather than Western or Eurocentric) - but also to some of the furthest points of the universe, as befits the nature of the conference. The programme includes a rich and varied choice of visiting speakers and specially organised receptions. Papers will be published in the proceedings of the conference.

We hope you enjoy the Conference and that you will also have time to enjoy at least some of what London itself has to offer.

Welcome by Professor Ron Olowin, Chairman of INSAP

As Chair of the INSAP International Organizing Committee I should like to welcome you all to this, the *Ninth Conference on the Inspiration of Astronomical Phenomena*.

As explained on the INSAP website, there have long been scholarly discussions on an enormous range of aspects in all areas of the arts – painting, architecture, sculpture, literature, philosophy and spiritual themes. However, as the founder members of INSAP (Dr. George V. Coyne, S.J., Dr. Rolf M. Sinclair and Professor Raymond E. White) came to realize some years ago after some literature searching, there had never been a conference over the many and varied cultural impacts of the perceptions about the day and night-time sky.

Certainly there had never been such a conference providing a mechanism for a broad sampling of artists, historians, philosophers, and scientists to get together, compare notes, and to have the chance to ask those questions of one another about each others' work which may have been simmering away for decades. This lack, in the face of a burgeoning technological era which more and more isolates the general public from an understanding of 'what are those guys (scientists/artists) doing now?', cried for redress. Thus, the idea for a triennial (or so) series of scholarly discussions over *The Inspiration of Astronomical Phenomena* (INSAP) was born – as Ray White, Rolf Sinclair and George Coyne expressed it 'practically as full-grown as Botticelli's Venus, stepping daintily out of her shell'.

The first three meetings took place at the Vatican Observatory, Castel Gandolfo (1994), Malta (1999) and Palermo (2001). In 2003, Magdalen College, Oxford provided the location for the fourth. The fifth meeting was held at the Adler Planetarium in 2005, with its spectacular setting in Chicago on a peninsula in Lake Michigan. INSAP returned to Italy in October 2009, as the sixth meeting was hosted by the University of Padua and held in Venice on the Grand Canal at the Istituto Veneto di Scienze, Lettere ed Arti; and then INSAP VII was held at the Bath Royal Literary and Scientific Institute in October 2010. The last meeting, INSAP VIII, was held at the American Museum of Natural History in New York City in July 2013. Information about the History of INSAP and all the meetings and proceedings may be found on the conference website: www.insap.org.

Ron Olowin
Saint Mary's College
San Francisco
California

CONTENTS

Welcome	4
INSAPIX at Gresham College	6
Keynote and Invited Speakers	6
Timetable/conference schedule	9
Practical information	13
Abstracts for Academic sessions (in order of programme)	14
Summary Programme	on coloured sheet
Index	

INSAPIX at Gresham College

It is with great pleasure and anticipation that INSAP IX is being held at Gresham College, London, 24-27 August, 2015. Gresham College is named after Sir Thomas Gresham (1519-1579), an English merchant and financier who worked for the great Tudor monarchs: Henry VIII, Edward VI, Mary and Elizabeth I. Descended from an old Norfolk family, Thomas Gresham was born in London and studied at Cambridge. He operated as a merchant and financier, living mainly in Antwerp where he succeeded as a merchant and became a principal adviser to the Tudor monarchs. He was so successful as overseas financial agent of the crown - negotiating loans, and procuring funds and goods (including munitions to defend the realm) - that his advice was continually sought on a wide range of financial difficulties, and he was frequently employed in diplomatic missions. In 1565, Gresham built the Royal Exchange at his own expense, modelled on the Antwerp Bourse. It was of immense benefit to the general good of the merchants, but also to Sir Thomas himself who received the rentals from the shops. Gresham also acted as ambassador and was well rewarded with a salary, grants of lands and a knighthood, in 1559, becoming one of the richest men in England. His heraldic device of a 'golden grasshopper' became well known.

Sadly, Sir Thomas's only son and legitimate heir died in 1564. As a result, apart from some small sums left to various charities, Gresham bequeathed his estate to his widow, with the proviso that after her death, his mansion in Bishopsgate Street and the rents from the Royal Exchange should be vested in the Corporation of London and the Mercers Company, for the purpose of founding a College in London. Seven Professors were to be appointed to read lectures daily - in Divinity, Astronomy, Music, Geometry, Law, Physic and Rhetoric. Chairs in Commerce, the Environment and Information Technology were added later.

The College was based at Sir Thomas's mansion in Bishopsgate until 1768 and it was at Gresham College that the Royal Society was founded in 1660 by a group of Gresham Professors, amongst them Sir Christopher Wren. The early period of the College saw the appointment of many distinguished Professors, a tradition that has continued up to the present day. Later on, lectures were given in various locations until a new Gresham College opened in Gresham Street in 1842. The College has been based at Barnard's Inn Hall since 1991.

Barnard's Inn, built on land recorded from 1252, was established as an Inn of Chancery associated with Gray's Inn in 1542. It is described by Charles Dickens in *Great Expectations*. In 1892 it was bought by the Mercers' Company and housed the Mercers' School until 1959. The Hall itself is 14th century, but the chalk and tile foundation preserved in the wall of the Council Chamber below is much older, probably dating from the Saxon or early Medieval period. The gatehouse and other buildings date from 1770.

Gresham College, established as the first institution of higher learning in London, today continues to provide free education in accordance with its mission and objectives: to provide free public lectures of the highest standard, in an extensive range of academic disciplines, in accordance with the Vision of Sir Thomas Gresham as expressed in his Will in 1575; to provide free and open access to new learning of contemporary relevance and interest in the widest possible international sense; and to contribute to society through the provision of stimulating free education, learning and debate, linked to the core value of freedom of thought and expression.

All Gresham Lectures are recorded and made available on the Gresham website, together with written transcripts. Some 1800 lectures are available on the internet in this way, currently achieving almost 7 million hits/views each year. The College receives no government funding but continues to expand, supported by its sponsors, the Worshipful Company of Mercers and the City of London Corporation.

Keynote and Invited Speakers

We are most fortunate in being able to draw on a number of well known experts who are able to attend, make presentations and also engage in discussion. First and foremost, Lord Rees of Ludlow will be presenting a public lecture as part of the conference and also as a Gresham Event. He will be joined on stage for debate and discussion by a number of other former Gresham Professors of Astronomy on the evening of 25 August 2015 – a truly historic event. Information on former Professors is provided below, in order of tenure at Gresham College.

Martin John Rees, Baron Rees of Ludlow (Gresham Professor of Astronomy 1975-1976), our keynote speaker for INSAPIX, is a British cosmologist and astrophysicist. His positions have included Astronomer Royal, President of the Royal Society, Plumian Professor at Cambridge, and Director of the Institute of Astronomy. *Inter alia*, he has made important contributions to the origin of cosmic microwave background radiation, as well as to galaxy clustering and formation. His studies of the distribution of quasars led to the final disproof of Steady State theory. He is a leading author of books on astronomy and science intended for the lay public and gives many public lectures and broadcasts, such as the 2010 Reith Lectures for the BBC, published as "From Here to Infinity: Scientific Horizons". As well as expanding his scientific interests, Rees has written and spoken extensively about the challenges of the 21st century and the interfaces between science, ethics, and politics.

Michael Rowan-Robinson (1981-1982) is an astronomer and astrophysicist associated with the Astrophysics Group at Imperial College London and sometime president of the Royal Astronomical Society. His research interests include the Spitzer Space Telescope 'SWIRE' project, the European Large Area ISO Survey and the Herschel Space Observatory 'SPIRE' instrument among others. He was awarded the 2008 Hoyle Medal by the Institute of Physics for his pioneering research in infrared and submillimetre astronomy, and observational cosmology.

Andrew Christopher Fabian (1982-1984) is an astrophysicist and Head of the X-ray astronomy group at the Institute of Astronomy, Cambridge. President of the Royal Astronomical Society (2008 - 2010) his current and recent areas of research include galaxy clusters, active galactic nuclei, strong gravity, black holes, and the X-ray background. Much of his research involves X-ray astronomy and high energy astrophysics for which he has been awarded a number of international prizes including the Gold Medal of the Royal Astronomical Society (2012).

Ian Morison (2007-2011) spent much of his astronomy career at the Jodrell Bank Observatory, teaching astronomy and cosmology at the University of Manchester. He has written two books for amateur astronomers, a university textbook on astronomy, and writes regularly for the *Astronomy Now* magazine on telescope related topics. He has escorted groups world wide to carry out stargazing and observe solar eclipses.

Carolin Susan Crawford (2011- 2015) has just finished her four year term as Gresham Professor of Astronomy. She is a well known communicator of science, astrophysicist researcher, and lecturer based at the Institute of Astronomy and Emmanuel College, Cambridge – a position that she holds in conjunction with her role as Outreach Officer at the Institute of Astronomy. Crawford's primary research interests are in combining X-ray, optical, and near-infrared observations to study the physical processes occurring around massive galaxies at the core of galaxy clusters. She delivers public lectures, talks, broadcasts, workshops, and debates throughout the UK and beyond on wide range of topics within astronomy.

The discussion panel on 25 August 2015 will be Chaired by **Professor Chris Impey** of the University of Arizona. He has been appointed as an invited speaker at Gresham College where he will be giving a lecture in April 2016. Apologies were received from former Gresham Professors of Astronomy unable to attend: Professor John Barrow and Professor Frank Close, and by the new Gresham Professor, Joseph Silk, who will be presenting lectures at Gresham College from September 2015.

The full list of Gresham Professors of Astronomy since 1597 is:

Edward Brerewood	1596-1613
Thomas Williams	1613-1620
Edmund Gunter	1620-1626
Henry Gellibrand	1627-1636
Samuel Foster	1636-1636
Mungo Murray	1637-1641
Samuel Foster	1641-1652
Laurence Rooke	1652-1657
Sir Christopher Wren	1657-1660
Walter Pope	1660-1687
Daniel Man	1687-1691
Alexander Torriano	1691-1713
John Machin	1713-1751
William Romaine	1751-1752
William Cockayne	1752-1795
Peter Sandiford	1795-1833
Joseph Pullen	1833-1875
Edmund Ledger	1875-1908
Samuel Arthur Saunder	1908-1912
Arthur Robert Hinks	1913-1941
William Herbert Steavenson	1946-1964
Sir John Carroll	1964-1968
Sir Martin Ryle	1968-1969
Roger John Tayler	1969-1975
Sir Martin Rees	1975-1976
David W. Dewhirst	1976-1980
Michael Rowan-Robinson	1981-1982
Andrew C. Fabian	1982-1984
Raymond Hide	1984-1990
Lord Porter of Luddenham	1990-1993
Heather Couper	1993-1996
Colin Pillinger	1996-2000
Frank Close	2000-2003
John D. Barrow	2003-2007
Ian Morison	2007-2011
Carolyn Crawford	2011-2015
Joseph Silk	2015

For further details see the paper on Gresham professors which is available. The Gresham Astronomy lectures have been video-recorded since the 1980's and the most recent ones are available on the Gresham College website (www.gresham.ac.uk).

*

An Index of speakers is provided and short biographies for each speaker are included together with the abstract for each talk.

***Sessions have been arranged partially in accordance with speakers' availability.
The INSAP Committee reserves the right to make changes to the programme where
necessary due to unforeseen circumstances.***

Timetable/conference schedule

Sessions will be held in Barnard's Inn Hall, unless otherwise stated. Lunch and tea/coffee breaks will be held in the room known and labelled as 'The Headmaster's Study.' Keynote and invited talks by Gresham Professors and INSAP Committee members are indicated in bold.

Monday 24 August 2015

- | | |
|--|--|
| 8.45 – 10.00 | Registration and Welcome by Chairman of INSAP, Ron Olowin |
| Morning Session: Astronomy and Culture: Historical and Local Topics | |
| Chair: Nick Campion | |
| 10.00 – 10.30 | <i>Coffee/Tea (in the 'Head Master's Study')</i> |
| 10.30 – 11.15 | Ron Olowin, INSAP Committee Chairman
<i>Eureka! Cosmic Explorations of Archimedes, Alexander von Humboldt and Edgar Allan Poe</i> |
| 11.15 – 11.40 | Christopher J. Corbally and Margaret Boone Rappaport, Vatican Observatory & University of Arizona
<i>When Hominins First Looked Up and Saw Constellations</i> |
| 11.40 – 12.05 | Harald Groppe, Independent Scholar
<i>Prehistoric Circles from Neolithic Times till Bronze Age: Was there pre-Euclidean geometry?</i> |
| 12.05 – 12.30 | Safari F. Grey, University of Wales
<i>Homer's Odyssey: Astronomy and the Influence of the Near East</i> |
| 12.30 – 12.55 | George Latura, Independent Scholar
<i>Zodiacal Light: Forgotten For A Thousand Years</i> |
| 1.00 – 2.00 | <i>Lunch</i> |
| Afternoon Session: Inspiration and Music | |
| Chair: Ron Olowin | |
| 2.00 – 2.40 | Ian Morison, Jodrell Bank (Invited)
<i>Proving Einstein Right</i> |
| 2.40 – 3.05 | Paolo Molaro, Astronomical Observatory of Trieste
<i>A New Portrait of Galileo Galilei?</i> |
| 3.05 - 3.30 | David Morgan, Ross School Innovation Lab
<i>Einstein, Galileo, and Kepler: The Operas of Philip Glass</i> |
| 3.30 – 3.55 | Angelo Adamo, Bologna Astronomical Observatory
<i>Night is Sound: Concerts for Starry Nights and Orchestra by John Cage</i> |
| 3.55 – 4.20 | <i>Tea/Coffee</i> |
| 4.20 – 4.45 | Marek Kukula, Royal Observatory Greenwich
<i>Science, Beauty and Public Engagement at the Royal Observatory Greenwich</i> |
| 4.45 – 5.30 | Valerie Shrimplin, Gresham College (INSAP Committee)
<i>Sir Christopher Wren: Architect-Astronomer</i> |
| 5.30 – 7.00 | Nick Campion, 'Skyscapes', Book Launch and Reception |

Tuesday 25 August 2015

Morning Session: Pre-Columbian and Other Cultures

Chair: Valerie Shrimplin

- 9.00 – 9.40 **Carolyn Crawford, Institute of Astronomy Cambridge**
When Galaxies Collide
- 9.40 – 10.05 Annette S. Lee, St Cloud State University, Minnesota
The Cosmos As Viewed Through the Lens of a Native-American Astronomer-Artist
- 10.05 – 10.30 Lynda Harris, Independent Scholar
Current Understandings of the Milky Way: Scientific and Spiritual
- 10.30 – 10.50 *Coffee/Tea (in foyer to auditorium)*
- 10.50 – 11.15 Duane Hamacher, University of New South Wales, Sydney, Australia
Dance Machines and Astronomy in Contemporary Torres Strait Islander Traditions
- 11.15 – 11.40 Nandivada Rathnasree, Nehru Planetarium, New Delhi, India (by video)
Inspiration of Celestial Phenomena in the Works of Kalidasa
- 11.40 – 12.05 Tarja Trygg, Aalto University, Helsinki, Finland
Invisible / Visible
- 12.05 – 12.30 Roberto Trotta, Imperial College London
The Power of Simplicity

1.00 – 2.00 *Lunch*

Afternoon Session: Planetaria and Outreach

Chair: Chris Impey

- 2.00 – 2.40 **Andrew Fabian, Institute of Astronomy Cambridge**
Serendipity in Astronomy
- 2.40 – 3.05 Reza Assasi, McGill University, Quebec, Canada
Mithraeum as a Symbolic Planetarium
- 3.05 - 3.30 Daniel Brown, Nottingham Trent University
Memories Unlocked and Places Explored: Stellarium, A canvas to Explore the Temporality of Skyscapes
- 3.30 – 3.55 Melanie Vandenbrouck, Royal Museums, Greenwich (*in absentia*)
Contemporary Art for the Royal Observatory Greenwich
- 3.55 – 4.20 *Tea/Coffee*
- 6.00 – 8.00 **Lord Rees of Ludlow, Keynote Speaker**
A Cosmic Perspective: Four Centuries of Expanding Horizons

This event will be held in the Large Lecture Theatre at the Royal College of Surgeons, followed by panel discussion and a reception

Wednesday 26 August 2015

- 8.45 – 9.00 Announcements
- Morning Session: Philosophical, Religious and Spiritual Themes**
Chair: Richard Poss
- 9.00 – 9.40 **Nicholas Campion University of Wales (INSAP Committee)**
The Moral Philosophy of Space Travel
- 9.40 – 10.05 José Funes, Vatican Observatory, Vatican City
A Cosmic End: from the Earth to the Universe
- 10.05 – 10.30 Elizabeth Wallace, Giraffe 'n' Ant Productions, Maryland, USA
Effect of an Astronomical Narrative on the Brain
- 10.30 – 11.00 *Coffee/Tea*
- 11.00 – 11.25 Howard Carlton, University of Birmingham
Condensing from a Fluid Haze: John Pringle Nichol, the Nebular Hypothesis and Nineteenth-century Cosmogony
- 11.25 – 11.50 Rafael Gil Brand, Head of DAV School in North Germany
The Golden Mean, an Unexpected Rationale Underlying Ancient Astrological Patterns
- 11.50 – 12.40 **Michael Rowan-Robinson, Imperial College**
Shakespeare's Astronomy: from Aristotle to the new Copernicans
- 12.40 - 2.00 *Lunch*
- Afternoon Session: Space Travel, 'Otherworlds' and the Unusual**
Chair: Rolf Sinclair
- 2.00 – 2.40 **Chris Impey, University of Arizona (INSAP Committee)**
Dreams of Other Worlds
- 2.40 – 3.05 Clive Davenhall, Royal Observatory Edinburgh
Mars and the Mediums
- 3.05 – 3.30 Jay M. Pasachoff, Williams College Massachusetts and Kevin J. Kilburn, Manchester Astronomical Society, UK
John Bevis's 18th-century Atlas Celeste: An Oft-Overlooked Treasure
- 3.30 – 3.55 Michael Geffert, Bonn University, Germany
The Photographic Plate Archive as an Inspiration for Art Projects
- 3.55 – 4.20 *Tea/Coffee*
- 4.20 – 4.45 Alastair Bruce and Members of the Royal Observatory Edinburgh
The Oculus Rift Planetarium Project

Thursday 27 August 2015

- Morning Session: Astronomy and the History of Art**
Chair: Gary Wells
- 9.00 – 9.40 **Richard Poss, University of Arizona (INSAP Committee)**
The Cosmological Compass in Western Art
- 9.40 – 10.05 Frank Keim, University of Ulm, Germany
The Astronomical Meaning of Botticelli's 'Birth of Venus'
- 10.05 – 10.30 Giangiaco Gandolfi, Rome Planetarium
The Strange Case of Raphael's Planetary Hours: How Astronomy and Iconography Reveal a Neoclassical Forgery
- 10.30 – 10.50 *Coffee/Tea*
- 10.50 – 11.15 Liana De Girolami Cheney, Università di Aldo Moro, Bari, Italy
Galileo Galilei's Commemorative Tomb in Santa Croce: Art, Light and the Stars
- 11.15 – 11.40 Michael Mendillo, Boston University and Ethan Pollock, Brown
Christ and the Celestial Sphere: A Unique Mosaic in St. Isaac's Cathedral?
- 11.40 – 12.05 Catherine Blackledge, Independent Scholar
When the Luminaries Meet
- 12.05 – 12.30 John Hatch, Western University, London, Canada
East Meets West: Shi Zhiying's Picturing of Italo Calvino's 'Mr. Palomar'
- 12.30 – 12.55 Aimé Dafon Segla, Université d'Abomey-Calavi, Benin Republic, W Africa
Yoruba Cosmological Incorporations 'here and there' in Fon Culture
- 1.00 – 2.00 *Lunch break (no organized lunch)*
- Afternoon Session: Astronomy and the History of Art (continued)**
Chair: Ron Olowin
- 2.00 – 2.40 **Gary Wells, Ithaca College, New York (INSAP Committee)**
Balla's 'Transit of Mercury' and the Modernist Sun
- 2.40 – 3.05 Rolf Sinclair (founder and former INSAP Chairman)
Centro de Estudios Científicos, Valdivia, Chile
Conference Summary and Commentary
- 3.05 – 3.45 Discussion on the future aims, direction and meetings of INSAP
Led by Chris Impey (INSAP Committee member)
- 3.45 – 6.00 *The Hall will be set up for dinner and will not be available*
- 6.00 – 7.00 Drinks reception in the Courtyard (weather permitting)
- 7.00 – 9.00 Conference Dinner (only those who booked in advance)
With closing and concluding remarks by Ron Olowin INSAP Chairman

Practical Information

General announcements

There will be short 'housekeeping' announcements every morning in the Hall at 8.45 am, prior to the commencement of the daily programme which will commence punctually and be strictly adhered to for each session. Conference badges must be worn by delegates for admittance to all sessions in the Hall, refreshments etc.

Book Launch and Reception, Monday 24 August 2015

The launch of Dr Nick Champion's book, will take place in the Hall with an overview followed by a reception kindly hosted by the University of Wales.

Public Lecture by Lord Martin Rees, Tuesday 25 August 2015

The Public lecture will be held at the Royal College of Surgeons (see fold-out Map in the Gresham Programme Booklet) since it is a suitably larger venue. Tickets are included in conference bags for registered conference attendees. A large number of tickets have also been released to the general public so you are advised to get there by 5.30 pm. (It takes about 10 minutes to walk there from Barnard's Inn Hall. The lecture will be followed by a discussion panel comprised of former Gresham professors of Astronomy.

Meals and refreshments

Teas/coffees and sandwich lunches will be served to conference delegates at the times indicated, in the room adjacent to the Hall, known as the Headmaster's Study from the time when the buildings were used as a school – with spillage into the courtyard outside (weather permitting). In order to save expenses to individuals, not all meals were included in the package, so you are at liberty to make your own arrangements where these are not included. There are many eating places, snack bars, and supermarkets nearby.

Conference Dinner, Thursday 27 August

On the last evening, there will be a special dinner in Barnard's Inn Hall, preceded by a drinks reception in the Courtyard (the English weather permitting!). Included for paying delegates and prebooked only; and any special requirements must be notified in advance. The Hall must be vacated during the afternoon for setting up.

Transport

Advice has already been provided on the website about transport from various airports and locations in the UK. No transport has been arranged to go to the Royal College of Surgeons for the Tuesday evening lecture since it is so close. If you have any mobility difficulties please let one of the organisers know. Delegates are advised not to bring a car.

Telephone, email and wifi facilities and contact details

The use of the College telephones is not permitted except in emergency. There is wifi available. The Council Chamber (below the Hall) can be used for own laptops etc.

Photography, audio and video taping.

Due to copyright and data protection legislation, no photography of art works, or audio and/or video taping of oral or poster presentations for professional usage may be made without the written consent of the presenter. The lecture by Lord Rees will be video-recorded and posted on the Gresham College website. A transcript of the session will be made available in due course.

Emergencies

Since this is a relatively small conference with no administrative support, once initial registration has taken place, the registration desk will not be staffed daily.

Urgent messages

Messages for delegates can be left at Gresham College (44) (0) 0207 831 0575, if urgent - or by contacting Valerie Shrimplin or Nick Champion (details to be provided to delegates).

Astronomy and Culture: Historical and Local Topics

Eureka! Cosmic Explorations of Archimedes, Alexander von Humboldt, and Edgar Allan Poe

Ronald Olowin

Archimedes of Syracuse (c. 287 BC–c. 212 BC) was an Ancient Greek mathematician, physicist, engineer, inventor, and astronomer. Although few details of his life are known, he is regarded as one of the leading scientists in classical antiquity.

Kosmos (usually referred to in English as 'Cosmos') is an influential treatise on science and nature written by the German scientist and explorer Alexander von Humboldt. Humboldt's text has made many contributions to scientific progress in his conception of the unity of science, nature, and mankind.

Eureka (1848) is a lengthy non-fiction work by American author Edgar Allan Poe (1809–1849), which he subtitled 'A Prose Poem', although it has also been subtitled as 'An Essay on the Material and Spiritual Universe', and is dedicated to the German naturalist and explorer Alexander von Humboldt (1769–1859). Although it is generally considered a literary work, some of Poe's ideas anticipate discoveries of the 20th century. Indeed a critical analysis of the scientific content of *Eureka* reveals a non-causal correspondence with modern cosmology due to the assumption of an evolving Universe.

This presentation will weave a common thread of insight and invention of three remarkable innovators who defined and refined modern cosmology.

Biography

INSAP International Executive Committee Chair.

When Hominins First Looked Up and Saw Constellations

Christopher J. Corbally and Margaret Boone Rappaport

Enrico Calzolari presented on constellations dating back to 5500 BC, at INSAP III, Palermo, 2001, in his paper, 'Paleo e Archeoastronomia'. Others have found astronomical images in archaeological sites dating around 30,000 to 31,000 years ago in Europe. Since 2001, scholars have begun to integrate archaeology with cognitive science and psychoneurology. We (co-authors Corbally and Rappaport) review the cognitive capacities needed for hominins in the genus *Homo* to interpret the skies as constellations. Until they could project their religious beliefs on the 'flat surface' of the sky dome, as on the walls of a cave, they could not interpret collections of attached stars as animals or mythological beings. We point to cognitive analogues in the archaeological literature that might suggest a capacity to interpret stars as constellations. While incorporating the critique of archaeologist Wynn and psychologist Coolidge (2009, 2010), we consider whether the making and stringing of beads is such an analogue. Beads are found widely in sites from Africa's Middle Stone Age. We ask: what are the cognitive capacities that beads imply? We borrow from the cognitive and psychoneurological literatures on modern use of beads in mental testing, and ask if bead-stringing could be transferred to constellation-making by the early human mind, much as we transpose writing on paper to writing on a blackboard. When did bead-making and stringing evolve, and for what purposes? Finally, are the images of constellations in the Caves at Lascaux probably the very earliest we can expect to find, or are other findings of archaeological depictions of constellations likely?

Biography

Christopher J. Corbally, SJ, PhD, is a Jesuit priest and an astronomer with the Vatican Observatory Research Group, for which he has served as Vice Director, and liaison to its headquarters at Castel Gandolfo, Italy. He is an Adjunct Associate Astronomer at the Department of Astronomy, University of Arizona, and ministers to a wide variety of Catholics, including Native Americans, in Tucson, Arizona. He earned his doctorate in Astronomy at the University of Toronto in 1983. His dissertation was on, 'Close Visual Binaries: MK Spectral Classification and Evolutionary Status' Dr. Corbally is an active member and past-president of the Tucson Masterworks Chorale.

Margaret Boone Rappaport, PhD is a cultural anthropologist who works as a futurist, lecturer, and science fiction novelist in Tucson, Arizona. As President, Policy Research Methods, Incorporated, Falls Church, Virginia, she was a contractor to federal and state agencies for over twenty years. She lectured in Sociology and Anthropology at Georgetown and George Washington Universities. She earned her doctorate at the Ohio State University in 1977. Her dissertation was on the adjustment of Cuban refugee women and families. Dr. Rappaport is a prize-winning short story and poetry writer.

Prehistoric circles from Neolithic Times till Bronze Age: Was there pre-Euclidean geometry?

Harald Gropp

This talk will be on circles in the early history of humans. Concerning the human environment the earliest cycles were astronomical ones, the disks of the sun and the moon. The disks of the planets are more recognized as points or stars. In early human drawings circles appear in various contexts.

In a rather more abstract sense the movement of celestial bodies are based on circles of different kinds. At the end of the Neolithic period the idea of a circle is materialized as the construction of wheels and wagons.

The second part will be more theoretical discussing different kinds of geometry. If we call our current geometry Euclidean, we should ask how did geometry look before Euclid and Ptolemy and Hipparchos. A singular but probably useful piece of evidence could be the sky disk of Nebrass which is usually dated as 1600 BC. Its interpretation may help to understand the importance of circles for prehistoric humans.

Biography

The author's interest of research is in mathematics as well as in the history of mathematics and astronomy. The focus in mathematics is on combinatorics and finite geometry and other graph like structures, mainly in configurations. These structures were born in the nineteenth century in the revolutionary period of geometry.

The focus of interest in the history of science is on foreign cultures such as the Celts or pre-Columbian America as well as on calendars and biographical studies of scholars of different centuries or cultural studies of, for instance, the Mandaeans.

Homer's Odyssey: Astronomy and the influence of the Near East

Safari F. Grey

There has been a trend in scholarship, especially over the past two decades, examining the substantial influence of Mesopotamian culture and its literary tradition upon the writings of Homer. Whilst Homer's *Odyssey* is widely recognised as one of the earliest pieces of Western literature, its written form represents a long oral tradition which, according to this recent scholarship, is likely to have been influenced by the culture of the Near East. One of the primary aspects of Mesopotamian culture, especially within its religious expression, is astrotheological belief and the practice of astronomy. It therefore seems likely that if Homer's epics were influenced by Near Eastern culture that there should also be astronomical or astrotheological content within the epics as well. This paper argues that there is not only some astronomical influence on Homer's *Odyssey*, but that the text itself is, in actuality, a fundamentally astronomical text, and that the twelve adventures of Odysseus have deep and intimate connections with the twelve signs of the zodiac. Using select examples from the text this paper aims to demonstrate a comprehensive astronomically influenced narrative within Homer's *Odyssey*, sharing in a tradition of celestial narrative which is also found in the Eastern Epic of Gilgamesh.

Biography

I am currently reading an MA in Cultural Astronomy and Astrology at the University of Wales Trinity St David Sophia Centre under the supervision of Dr. Nicholas Campion. I graduated with a First-class BA (Hons) in Humanities with Classical Studies from the Open University in 2013, and with an Upper Second-class BA (Hons) in Classical Civilisations from the University of Warwick in 2012. To date I have also received a Postgraduate Certificate (Merit) in Cultural Astronomy, specialising in Astral Religion and Cosmology, Magic and Divination in the Classical World. My areas of specialist interest are astral theology, Greek and Roman literature, and astronomical architecture. I have also published a paper in proceedings from AMPAL 2013, and a book on astrotheological symbolism in early religions in 2012.

Zodiacal Light: Forgotten For A Thousand Years

George Latura

The zodiacal light was known in ancient Egypt for thousands of years. The earliest Pyramid Texts describe a ladder to the sky (Allen 2005, 50) assembled by the Sun for the Pharaoh, best explained as the zodiacal light that is composed of interplanetary dust illuminated by the Sun while it is below the horizon. This ethereal glow envelops planets along the ecliptic like steps on a celestial stairway, and the ladder to the sky would still be found in the Coffin Texts and in the Book of the Dead, spanning millennia. In 'Stargazing in Ancient Egypt,' Patricia Blackwell Gary and Richard Talcott suggest that the triangular shape of Egyptian pyramids that promised a celestial ascent was inspired by the appearance of the zodiacal light (Astronomy Magazine, June 2006). Islamic tradition on the timing of the morning prayer warns against the 'false dawn' or the 'tail of the wolf' that is vertical (zodiacal light) rather than horizontal like the true dawn. The paper 'Plato's X & Hekate's Crossroads: Astronomical Links to the Mysteries of Eleusis' (Latura, SEAC 2013 Proceedings) posits that the Lesser and the Greater Mysteries, celebrated for centuries at opposite seasons of the year, align with the zodiacal light that is best seen, in temperate zones, at the equinoxes. Once Theodosius shut down the Mysteries in 392 AD, the zodiacal light disappeared from the Western mind until Kepler and Cassini re-discovered it in the 1600s.

Biography

1985-2005 - Time Inc.

2005-2015 - Independent research

2013 - Published in SEAC 2012 Proceedings

2013 - Numismatic Literary Guild Award (article)

2014 - Numismatic Literary Guild Award (book)

2014 - Published in SEAC 2013 Proceedings

2015 - To be published in INSAP 2013 Proceedings

Inspiration and Music

Proving Einstein Right

Ian Morison

A gentle introduction to Einstein's theory of gravity and how, over the last 100 years astronomers have been testing its predictions to very high accuracy.

Biography

Ian Morison began his love of astronomy when, at the age of 12, he made a telescope out of lenses given to him by his optician. He went on to study Physics, Mathematics and Astronomy at Hertford College, Oxford. In September 1965, he became a research student at the University of Manchester's Jodrell Bank Observatory. In 1970 he was appointed to the staff of the Observatory and teaches astronomy at the University of Manchester.

In 1990 he helped found the Macclesfield Astronomy Society which meets at the Observatory and later became president of the Society for Popular Astronomy, the UK's largest astronomical society. He remains on the Society's Council and holds the post of instrument advisor helping members with their choice and use of Telescopes.

He lectures widely on astronomy, has co-authored books for amateur astronomers and writes regularly for the UK astronomy magazines *Astronomy Now* and *Sky at Night*. He also writes a monthly sky guide for the Observatory's web site and produces an audio version as part of the Jodrell Bank Podcast. He has contributed to many television programmes and is a regular astronomy commentator on local and national radio. Another activity he greatly enjoys is to take amateur astronomers on observing trips such as those to Lapland to see the Aurora Borealis and, last year, to Turkey to observe a total eclipse of the Sun.

In 2003 the Minor Planets Committee of the International Astronomical Union named asteroid 15,727 in his honour citing his work with MERLIN, the world's largest linked array of radio telescopes, and that in searching for intelligent life beyond our Solar System in Project Phoenix.

Ian regarded his time as Gresham Professor of Astronomy as a real challenge which played a major role in his life as he gave a wide variety of illustrated lectures ranging from how our understanding of the Universe has grown over the centuries to a gentle introduction to Einstein's theory of Gravity - tested to extreme accuracy by astronomers at Jodrell Bank.

A New Portrait of Galileo Galilei?

Paolo Molaro

We present the possible discovery of a portrait of Galileo Galilei described in Molaro (2012 AN 333, 186) together with more recent studies. The man in the painting reveals clear resemblance with Galileo's portrait made by Domenico Tintoretto and with the engraving made by Giuseppe Calendi from a lost portrait made by Santi di Tito in 1601. The painting is not signed and the identification is physiognomic although corroborated by sophisticated PCA face analyses. 'Galileo' looks to be about 20–25 years of age when he was at the beginning of his career and before reaching a worldwide fame. The eyes are clear and the expression intense and appealing. Rather interestingly, there is the possibility of a self-portrait whose existence is mentioned in the first biography of Galileo by Salusbury in 1664 as reported by Drinkwater in 1829.

Biography

Dr. Paolo Molaro was born in Artegna (Ud) in 1955 and is married and the father of four children. He is Professor astronomer at the Astronomical Observatory of Trieste INAF, of which he was director. He graduated from the University of Trieste with Margherita Hack and did his doctorate at SISSA with Dennis Sciama. He is the author of over 300 publications with interests ranging from observational cosmology to the variability of the fundamental physical constants, to the astronomical instrumentation.

Einstein, Galileo, and Kepler: The Operas of Philip Glass

David Morgan

Over the course of his career, contemporary composer Philip Glass has written three operas featuring physicists and astronomers as both symbolic inspiration and narrative vehicles. In addition to his influential 1976 minimalist work 'Einstein on the Beach', he has composed operas inspired by the lives of Galileo Galilei (2002) and Johannes Kepler (2009). In this presentation, I will try to convey a sense of these two more recent operas through audio, visual, and textual excerpts from the works. I will also discuss ways in which the technical astronomical achievements of Galileo and Kepler are presented by Glass, the ways in which their characters are portrayed through the music, and the ways in which the science of these two towering historical figures in astronomy is utilized for its symbolic and metaphorical value.

Biography

David Morgan has a Ph.D. in particle physics from The College of William and Mary and for 10 years was a professor of physics and astronomy at The New School in New York City. He is currently the academic director of the Ross School Innovation Lab, an academy for advanced high school students in STEM fields. In 2004, he received a Sloan Foundation/EST commission to co-author a play titled 'The Osiander Preface' which explored the publication of Copernicus's 'On the Revolutions of the Heavenly Spheres'. He is also an amateur composer and pianist with a fondness of the solo piano repertoire of Philip Glass. Dr. Morgan was an attendee at the Second INSAP Conference in Malta.

Night is Sound: Concerts for starry nights and orchestra by John Cage

Angelo Adamo

The year 2012 marked 100 years from the birth of composer John Cage. In this contribution I will discuss an aspect of his artistic production which has often, in my view, been neglected: his fascination with astronomy, which led him to write four compositions (or possibly five, as I hope to be able to explain in my talk) inspired by the starry sky. I will describe the origins of these compositions, starting from the star catalogs used by Cage and how they represent a turning point in his productions and in the history of 20th century music. When compared to the productions of other artists, I am convinced that they offer a novel approach in the discussion on the relationship between astronomy, music and painting, and in general between science and art.

Biography

I work as outreach officer at the Bologna Astronomical Observatory and I'm attending the PhD course in Astrophysics at Insubria University in Como, Italy, working on Cherenkov Telescope Array (C.T.A.). Apart from this, my main interests concern cultural astronomy, philosophy of science and the relationships between science and art. In addition to the bachelor in astronomy, I took also:

- The title of 'Master in Science Communication' at the I.S.A.S. Centre in Trieste, Italy
- A degree in 'Music for Multimedia Applications (composition and comping)' at the Bologna Conservatory
- A degree in 'Comics' at the Fine Arts Department of the same City.

I work also as an illustrator, a comic-stripe drawer and as musician (my main instrument is the chromatic harmonica). I have published two books:

- *Planets Among Notes*, Springer 2009;
- *Tales of Suns and Moons*, Giraldi, 2009.

I have presented both in the Poster Session of INSAP VI (Venice, 2009). In addition, I have also illustrated *Astrokid*.

Visions of the Universe & Astronomy Photographer of the Year: Science, Beauty and Public Engagement at the Royal Observatory Greenwich

Marek Kukula

The Royal Observatory Greenwich is one of London's leading tourist attractions and an internationally recognised centre of excellence for public engagement with astronomy. As a museum of the history of astronomy, navigation and timekeeping, as well as a modern science centre and planetarium, the ROG welcomes hundreds of thousands of visitors to its galleries each year and reaches millions more through its online and media activities. The observatory has always used astronomical images as powerful tools for explaining scientific ideas but in recent years we have increasingly been working with art historians and contemporary artists to explore the aesthetic appeal of space imagery as part of our public programme. Two prominent examples of this approach are the Insight Astronomy Photographer of the Year competition, now in its seventh year, and the 'blockbuster' exhibition Visions of the Universe, which is currently touring and has reached over 80,000 people. These projects give equal weight to the artistic and scientific aspects of astronomical images and have proved to be invaluable new tools for public engagement, both by giving a fresh perspective to traditional astronomy audiences and by reaching out to new audiences who would not normally attend a science-related event. This talk will describe our experiences and explore how they have had a powerful impact on the Observatory's public engagement strategy.

Biography

Marek Kukula obtained his PhD in Radio Astronomy from Jodrell Bank Observatory then carried out research into galaxy evolution at a number of institutions including the Space Telescope Science Institute, home of the Hubble Space Telescope, and the University of Edinburgh. As the Public Astronomer at the Royal Observatory Greenwich he works alongside a team of astronomy education and outreach specialists to engage with the general public, schools and the media. In the Observatory's exhibitions and public programmes he works extensively with scientists, historians and artists to explore the cultural as well as the scientific impact of astronomical research.

Sir Christopher Wren: Architect-Astronomer

Valerie Shrimplin

Significantly for the current conference held at Gresham College in the City of London, the first Professor of Astronomy in England was appointed at Gresham College in 1596, predating the founding of Chairs in astronomy at Oxford and Cambridge by more than 20 years. A continuous line of thirty-six Gresham Professors of Astronomy has followed up to the present day and the collective contribution of 'Greshamite' men and women to the study of Astronomy is immense. Amongst the most famous holders of this position, Sir Christopher Wren is in many circles better known as an architect rather than astronomer, having designed St Paul's Cathedral and another 51 parish churches in London, following the Great Fire of London in 1666. Drawing on Wren's role as Gresham Professor of Astronomy (and details that survive of some of his lectures), this paper will aim to bridge the gap between these two major aspects of Wren's career, focusing on the astronomical elements that he transferred over to his later architectural works, focusing in particular on the astronomical symbolism and significance of St Paul's Cathedral (within walking distance of the College) and other selected Wren churches in the City of London.

Biography

Dr Valerie Shrimplin has specialised in particular in Renaissance history and art history, her major publication being on the influence of Copernican heliocentricity on Michelangelo's *Last Judgment* in the Sistine Chapel (*Sun-Symbolism and Cosmology in Michelangelo's Last Judgment*, Truman State University Press and *Michelangelo, Copernicus and the Sistine Chapel*, Lambert Academic Publishing). She is a member of the International Executive Committee of INSAP and has presented papers on Byzantine, Medieval and Renaissance art and cosmology at previous conferences in the INSAP series. She is Academic Registrar and Company Secretary of Gresham College (see www.gresham.ac.uk).

Pre-Columbian and Other Cultures

When Galaxies Collide...

Carolyn Crawford

There is a whole Universe of different shapes, sizes and colours of galaxies. We shall look at some of the 'ordinary' galaxies and then move on to consider the more peculiar systems, discussing quite how and why they came to morph into such strange shapes.

Biography

Gresham Professor of Astronomy and Outreach Officer at the Institute of Astronomy and Fellow of Emmanuel College, University of Cambridge, Professor Carolyn Crawford is one of Britain's foremost science communicators.

After receiving her PhD from Newnham College, Cambridge, Professor Crawford went on to a series of fellowships from Balliol College, Oxford, Trinity Hall, Cambridge and the Royal Society. In 2004 she was appointed as a Fellow and College Lecturer at Emmanuel College, Cambridge, where she is now also the undergraduate Admissions Tutor for the Physical Sciences. Since 2005 she has combined her college role with that of Outreach Officer at the Institute of Astronomy at the University of Cambridge.

Professor Crawford's primary research interests are in combining X-ray, optical and near-infrared observations to study the physical processes occurring around massive galaxies at the core of clusters of galaxies. In particular, she observes the complex interplay between the hot intra-cluster medium, filaments of warm ionized gas, cold molecular clouds, star formation and the radio plasma flowing out from the central supermassive black hole.

In 2009 Professor Crawford's outstanding abilities at science communication were recognized by a *Women of Outstanding Achievement* Award by the UK Resource Centre for Women in Science, Engineering and Technology, presented for "communication of science with a contribution to society."

Appointed as the 36th Gresham Professor of Astronomy in 2011, Professor Crawford delivered a series of free public lectures where she carried out her intention "to showcase the very latest developments and ideas in astronomy and cosmology, whilst putting them into the context of the process of scientific discovery."

The Cosmos As Viewed Through the Lens of a Native-American Astronomer-Artist

Annette S. Lee

In Ojibwe the Morning Star is called 'kwe Anung', (Women's Star). In D(L)akota the same planet, Venus, is called 'Anpetu Luta' (Red Star). Both cultures have rich and interesting understandings of Venus that relate to other indigenous cultures throughout the world. Yet tragically the Native American star knowledge is disappearing.

My research and programming, 'Native Skywatchers', focuses on revitalizing the Ojibwe and D(L)akota star knowledge and bringing it back to our communities. Ojibwe elder, Paul Schultz, shared this vision of the native star knowledge returning, especially through the youth. He called them 'star readers'.

As an astronomer, I am deeply inspired by and fascinated by the cosmos. As an artist, I am passionately engaged in creating art that aids in our perception of the cosmos, to see things that can't or aren't seen by the naked eye by most people today. This might be native constellations like 'Maang' (Loon) or 'Wakiyan' (Thunderbird) or patterns in the motion of celestial objects, like the Dance of Venus....or it might be the teaching of 'Kapemni' (As it is above; it is below.) Looking at the cultural and historical knowledge, specifically the Ojibwe and D(L)akota star knowledge, remembering it and honoring it, I use it to inspire the present and guide the future.

I will present here selected paintings that speak to the idea of transforming the human experience through a relationship with the cosmos as viewed through the lens of a native-American astronomer-artist.

Biography

Annette Lee is an astrophysicist and artist who leads the Native Skywatchers research project, which seeks out and celebrates indigenous peoples' connection to the stars. She works closely with Ojibwe and D(L)akota elders and community members to document Native star knowledge. Currently Annette is an Associate Professor of Astronomy & Physics at St. Cloud State University (SCSU) in St. Cloud, Minnesota and Director of the SCSU Planetarium.

B.S. Applied Mathematics, 1992 University of California-Berkeley; B.A. Painting 1998 University Illinois-Urbana; M.F.A. Painting 2000 Yale University; MS Astrophysics 2008 Washington University-St. Louis; Academic specialties include extrasolar planets, Native American star knowledge, science/math education.

Current Understandings of the Milky Way: Scientific and Spiritual

Lynda Harris

My presentations at INSAP VI and VII looked at various ways in which tribal and ancient cultures visualised the Milky Way and its place in the afterworld. During these periods, people believed that the physical universe and the next world were a single, integrated cosmos. This cosmos was often pictured as layered, and the Milky Way could be seen as a route along which souls travelled towards or through the various levels of the skies. As is well known, the scientific revolution changed this ancient understanding of the cosmos. After the discoveries of Copernicus, Galileo, Hubble and others, the physical universe could no longer reasonably be seen as a location for the after-death world. The Milky Way also lost its ancient role as the soul's path to the spiritual heavens. By the 17th century the incompatibilities between the physical cosmos and the spiritual one had become established by science, though they were not always discussed or accepted by religious communities.

Nevertheless, there are ways in which the ancient images of the next world do not conflict with recent scientific discoveries. With the development of Spiritualism and Theosophy in the 19th century, a vision of an inner universe has been developed. This, like the ancient afterworld, is layered and grows brighter and more refined as the soul ascends to levels with higher frequencies. The route leading to it can be pictured as a tunnel, as frequently described in near-death experiences. This tunnel can be seen as a parallel to the Milky Way.

The talk will be illustrated with slides.

Biography

Lynda Harris has degrees from Bryn Mawr College, Boston University and The Courtauld Institute of Art. She taught extra-mural diploma classes for the University of London for seventeen years, and has also given single lectures at the Theosophical Society, Talisman Arts and other venues. Publications include *The Secret Heresy of Hieronymus Bosch* (Floris Books 1995 and 2002), and *The Cathars and Arthur Guirdham* (Pyspioneer 2001, with addenda 2014). She has also contributed articles to the Theosophical periodicals *Insight* and *The Quest*.

Dance Machines and Astronomy in Contemporary Torres Strait Islander Traditions

Duane Hamacher

Song and dance are an important component of oral tradition in the Torres Strait Islander cultures of Australia. These dances have evolved in the last century to include mechanical dance-machines (Zamiyakal), which portray an additional motion in the performance. Since astronomical knowledge is centre to Islander cultures, many of these dances focus on astronomical phenomena, such as meteors, comets, eclipses, and constellations. Knowledge about the practical aspects of astronomical knowledge (such as navigation, hunting, fishing, and agriculture) are encoded in these performances. This talk will explore the nature, evolution, and purpose of astronomically themed dance machines in modern Islander cultures based on ethnographic work with artists and elders.

Biography

Duane Hamacher is a Lecturer and ARC Discovery Early Career Research Fellow in the Nura Gili Indigenous Programs Unit at the University of New South Wales in Sydney, Australia. His teaching and research focus on cultural astronomy. His Australian Research Council grant involves studying the astronomical knowledge of Torres Strait Islanders. He leads the Indigenous Astronomy Group at Nura Gili and works as a consultant curator at Sydney Observatory. He earned graduate degrees in astrophysics and Indigenous studies, with a doctoral thesis on Australian Aboriginal astronomy.

Inspiration of Celestial Phenomena in the works of Kālidāsa

Nandivada Rathnasree

Many of the literary tools utilised by Kālidāsa (4th-5th century AD), show an extreme sensibility towards human interactions on the one hand, and the sanctity of nature on the other. His works are scattered with astronomical references all through, although linguistic scholars do not find these references to be as finely drawn, from a literary point of view, as other references to natural phenomena.

However, a look at his references to various celestial phenomena like eclipses, conjunctions, the occultation of Aldebaran around a lunar eclipse, the annual motion of the Sun, light pollution by the Moon, one unchanging star in reference to the North, perhaps the movement of a comet across the sky (with specific reference to its conjunction with Pleiades) etc., indicate that he had a keen interest in observing the skies, and some of these observations entered as contexts in his poetry. Moreover, his reference to the retrograde motion of Mars in his first play *Malvikagnimitram* implies relatively rigorous amateur astronomy observations on his part, without which such a telling simile as used here would not have been arrived at. Most such references in the works of Kālidāsa would indicate some actual observations of these events on his part. He was a poet, not an astronomer, but he would surely qualify as an amateur astronomer based on these observations. His works are replete, of course, with hauntingly beautiful portraits of atmospheric phenomena like clouds, haloes around the Sun and so on.

Biography

I currently work as Director of the Nehru Planetarium, Nehru Memorial Museum and Library, New Delhi, India. My work consists of astronomy education and outreach for the most part, and some archaeoastronomy research. I am particularly interested in interdisciplinary celebrations of astronomy.

I have a doctorate in theoretical astrophysics from the Tata Institute of Fundamental Research, Mumbai, India, where my work was on massive star evolution in binary systems. My postdoctoral work was in the field of radio pulsar studies. Subsequently, I have been working in the field of astronomy education at the Nehru Planetarium, New Delhi.

I have been working towards participation by students and the general public in actual hands-on observations using the historical Jantar Mantar observatories in India.

Invisible / Visible

Tarja Trygg

Astronomical phenomena have provided inspiration for many artists. Curiosity and the desire to see more than our eyes are capable of doing. It is a human being's feature in trying to understand our own position in the whole universe. The conference of Helsinki Photomedia 2014 concentrated on photographic powers. In my research on solargraphy the most fascinating and meaningful photographic power is in photography's ability to make the invisible motions of the Sun trails visible in diverse fields. In this presentation I will start to speak first about curiosity and desire to see more than our eyes are capable of doing. Secondly I pick up some examples of how photography can show us something we never have seen before. Sometimes we cannot believe what we see. It is quite common for us to try to find some explanation. What motivates people to get intrigued in some unknown novelty? Some photographs awake our suspicion: is it true or false, real or unreal or a joke or a fake? The last but not the least part of this presentation is to demonstrate some artistic ways to better understand the rotation of the Earth and to make the invisible visible in their works of art.

Biography

Tarja Trygg is a Finnish artist, licentiate of Arts and a doctoral student in the Department of Art at Aalto University, School of Arts, Design and Architecture, Helsinki Finland, where she has worked as a senior lecturer and taught photography many years. She is still interested in solargraphy for making the invisible movements of the Sun paths visible in sceneries at various latitudes. Tarja Trygg has been invited to take part in the international projects as the Spanish project Time in a Can. Its exhibition was in Madrid, Spain 2013 and in Mühlheim, Germany 2014. Furthermore, participating in the Australian projects Sky Lab, curated Felicity Spear, in 2011, 2013 and 2015, has been her pleasure. The newest exhibition of Sky Lab 4: Lines of Sight and Forces of Attraction is coming to the Counihan Gallery in Brunswick (30 July–30 August 2015) and will coincide with National Science Week.

The Power of Simplicity

Roberto Trotta

Can the universe be described in simple English? This paper will explore lessons I learnt for public engagement from the radical experiment of my book, "The Edge of the Sky". Published last September, the book explains the entire Universe using only the most common 1000 words in English. Would you try to cross the South Pole wearing only flip-flops? Or row across the Atlantic on an inflatable swimming pool? Or describe the beauty and mystery of the universe using only the most common 1,000 words in English? In my book "The Edge of the Sky " I set out to achieve something seemingly impossible with the simplest of means: to rethink our understanding of the universe using only a handful of different words (707, to be precise). My aim, as an astrophysicist, was to discuss some of the biggest questions in science today, in a language that is accessible to everybody. I was shocked to discover that many of the words I would have liked to use were not available to me. For example, I couldn't use 'universe' 'galaxy', 'particle', 'planet', 'earth', or 'scientist'. It seemed hopeless! But as I persevered, something unexpected happened.

My translation of complex cosmological ideas into very simple English tries to subvert the inadequacy of natural language, when compared with mathematics, by reducing it to the smallest number of atoms. Just like the periodic table of the elements can explain the entirety of the chemistry we see around us, so I imagined that the most common 1,000 words could provide the building blocks for a new description of the complexities of the universe.

Biography

Roberto Trotta is an astrophysicist at Imperial College London, where he studies dark matter, dark energy and the Big Bang. His award-winning book for the general public, "The Edge of the Sky " explains Universe using only the most common 1,000 words in English. He was named as one of the 100 Global Thinkers 2014 by Foreign Policy, for "junking astronomy jargon". Here he describes the challenge of describing the universe and its mysteries in 707 words and asks if we need a new language for science...

Roberto is a passionate science communicator and the recipient of numerous awards for his research, outreach and art and science collaborations, including the Lord Kelvin Award of the British Association for the Advancement of Science and the Michelson Prize of Case Western Reserve University.

www.robertotrotta.com

Planetaria and Outreach

Serendipity in Astronomy

Andrew Fabian

Astronomy is an observationally-driven subject in which serendipity places an important role. This will be illustrated by examples drawn from a wide range of topics from the discovery of active volcanoes on a Jovian moon to the accelerated expansion of the Universe. Implications for the selection and planning of future projects and telescopes will be briefly considered.

Biography

Andrew Christopher Fabian, OBE, FRS was educated at King's College London (BSc, Physics) and University College London (PhD). He is Director of the Institute of Astronomy, University of Cambridge. He was a Royal Society Research Professor from 1982 to 2013 and Vice-Master of Darwin College, Cambridge. He was the President of the Royal Astronomical Society from May 2008 through to 2010. He was Professor of Astronomy at Gresham College 1982-84, a position in which he delivered free public lectures within the City of London. He was also editor-in-chief of the astronomy journal *Monthly Notices of the Royal Astronomical Society*.

His current areas of research include galaxy clusters, active galactic nuclei, strong gravity, black holes and the X-ray background. Much of his research involves X-ray astronomy and high energy astrophysics. His notable achievements include his involvement in the prediction and discovery of broad iron lines emitted from active galactic nuclei, for which he was jointly awarded the Bruno Rossi Prize. He is author of over 1000 refereed articles and leads the X-ray astronomy group at the Institute of Astronomy. Fabian was awarded the Dannie Heineman Prize for Astrophysics by the American Astronomical Society in 2008 and the Gold Medal of the Royal Astronomical Society in 2012.

Mithraeum as a Symbolic Planetarium

Reza Assasi

The architecture of Mithraea is of a unique and stable design. A Mithraeum is commonly a basilica-type, vaulted, cave-like dark chamber portraying the tauroctony (the mithraic bull-slaying scene) at one end. Porphyry reports that the Mithraeum is designed like a cave because the cave conveys an image of the cosmos. Regardless of the prior existence of the possible graphics of stars and cosmos on the ceiling, the most dominant element of the Mithraeum is tauroctony at the center of the corridor and the arch on top of the tauroctony portraying the zodiac or the celestial clouds aligned with the vault of the Mithraeum. The author suggests that the figure of Mithras on the tauroctony represent the north ecliptic pole and argues for the importance of this astronomical reference in the Mithraic iconography and mythology.

The author also demonstrates the possible relation of his proposed astrological model to the geocentric understanding of the axial precession around the ecliptic pole, where the Roman bull-slaying Mithras could be visualized in the form of a Mithraic constellation. The author emphasized on the architectural concept of vaulted shape of Roman Mithraea in relation to Mithraic iconography as a symbolic representation of the cosmos revolving around the north ecliptic pole.

Biography

Dr. Reza Assasi is an Architect and Archaeoastronomer and has a PhD in Architecture History and Theory from McGill University. His research interests include Origins of Architecture Geometry, Roman Architecture, and Mithraic Studies.

He also has professional and post-professional Masters of Architecture and is member of Ontario Association of Architects and Royal Architectural Institute of Canada.

Memories unlocked and places explored: Stellarium a canvas to explore the temporality of skyscapes

Daniel Brown

Skyscapes are the combination of landscape, sky and people. As a viewer explores their environment they start to realise how they dwell in a location filled with meanings, emotions and memories. This connection to Skyscapes occurs most powerfully when temporality is encountered not only through task and landscape exploration, but also by watching cosmic rhythms unfolding in the skies above.

This presentation will illustrate how the planetarium software stellarium allows to simulate long term cycles of celestial motions but has the powerful potential to include panoramic landscapes. Rather than constituting photo realistic imagery they should be seen as a canvas onto which one can express the place experience encountered. This allows for a creative and imaginary approach to express temporal aspects of the landscape, shaped by a dialogue between people, culture, seasons and the sky.

Overall this presentation calls for artist to include Stellarium into their work to explore Skyscapes.

Biography

I am a professional astronomer who graduated from Ruhr-Universitaet Bochum, Germany, and carried out my PhD at the Liverpool John Moores University, UK. I am working at Nottingham Trent University and its on-site observatory, where I am supporting astronomy teaching and outreach work with the general public and schools. This includes working with creative practitioners and theatre groups. The focus of my outreach work is based on archaeoastronomy and the use of the outdoor classroom. Furthermore, I am a founding member of the 'Horizontastronomie im Ruhrgebiet e.V.', a German private initiative promoting astronomy outreach based on an EU funded Science Park located within the Ruhr area.

Collecting Cosmic Aesthetics: Contemporary Art for the Royal Observatory Greenwich

Melanie Vandenbrouck

As the home of the National Maritime Museum, Queen's House and Royal Observatory, the key aims of Royal Museums Greenwich are to stimulate curiosity and transform our understanding of the sea, ships, time, the stars, and their relationship to people. Contemporary art is a powerful tool to engage audiences and strengthen the institution's relevance to the present. Formulating a (thus far overlooked) contemporary collecting policy offers the means to explore new perspectives into the Museum's historical collections and core themes.

In the 1970s, the Royal Observatory Greenwich effected a transition from a working observatory to a centre of learning and public engagement. As part of Royal Museums Greenwich, the observatory is also developing a collection, which reflects the relationship between representation and understanding. Objects relating to the cultural impact and dissemination of astronomy show the penetration of astronomical ideas into the broader history and culture of the period in which they were made.

While in the past, the fine arts have been used as a way to record scientific information and the work of astronomers, I shall argue that contemporary artists' fascination with the cosmos and our place within it enable varied audiences to engage differently with these sciences, but also encourage scientists to connect with art. These considerations imply other, pragmatic, curatorial concerns: How does a national museum devise and implement a coherent collecting policy that has an 'astronomical art' theme? How may such collecting meet the challenges of working in a multidisciplinary museum which encompasses sciences, history and art?

Biography

Melanie Vandenbrouck is Curator of art post-1800 at Royal Museums Greenwich, which involves developing, researching, interpreting, displaying and communicating the Museum's superlative art collection. She is the founder and chair of the museum-wide Contemporary Art Forum, and a judge of the Astronomy Photographer of the Year competition. In discussion with the Public Astronomer and the Curator of the Royal Observatory, Melanie is currently drafting a contemporary arts collecting policy for Royal Museums Greenwich which will include artistic responses and contributions to the field of astronomy. Prior to joining royal Museums Greenwich in 2012, Melanie earned a PhD at the Courtauld Institute of Art, and worked in the Sculpture department of the Victoria and Albert Museum.

Keynote Lecture

A Cosmic Perspective: Four Centuries of Expanding Horizons

Lord Rees of Ludlow, Emeritus Gresham Professor of Astronomy

The 'curious and ingenious' men who met at Gresham College and founded the Royal Society were fascinated by the Sun and Planets; the 'fixed stars' were a distant mystery to them. Over succeeding centuries, cosmic horizons have expanded - largely thanks to ever more powerful instruments. So has our understanding - though each advance brings into focus a new set of mysteries. Following the lecture there will be a discussion on topics of current astronomical interest, with an invited panel of former Gresham Professors of Astronomy.

Biography

Martin John Rees, Baron Rees of Ludlow, Kt, OM, FRS, Hon FEng, F MedSci is a British cosmologist and astrophysicist. He has been Astronomer Royal of the Royal Observatory at Greenwich since 1995, was Master of Trinity College, Cambridge from 2004 to 2012 and President of the Royal Society between 2005 and 2010.

http://en.wikipedia.org/wiki/Martin_Rees,_Baron_Rees_of_Ludlow

The lecture will be followed by a panel discussion involving a number of former Gresham Professors of Astronomy and Chaired by Professor Chris Impey.

***This is a public event to be held at a different nearby location
(the lecture theatre at the Royal College of Surgeons).***

Philosophical, Religious and Spiritual Themes

The Moral Philosophy of Space Travel

Nicholas Campion

The space programme is driven by many imperatives, of which the most overt are economic and geopolitical. However, psychological factors are also present, in particular an underlying narrative within many cultures, including western, in which space is represented as a source of wisdom and morality. This is evident in traditional views of heaven as existing beyond the stars) and more recently in the 'Overview Effect', the name given to the experience of many astronauts which has been described as a 'state of grace'. This chapter will consider the philosophical background to concepts of space as related to wisdom and morality with reference to debates in western culture and theories and practices from other China, India, Africa and the Americas. It will touch on the attribution of moral qualities to the stars and planets in India and the ancient Near East, and debates within Christian theology on the soul's journey to the stars. Within the context of western culture it will reference the soul's journey to the stars in Egypt, classical traditions in Plato's Republic and Cicero's Dream of Scipio, Christian debates on the soul's relationship with the stars in St Augustine and Thomas Aquinas, and Jewish Kabbalistic concepts of an ascent to the divine via the stars. In so doing the chapter will provide a valuable historical background for current debates on ethics and space.

Biography

Nicholas Campion is the Director of the Sophia Centre for the Study of Cosmology in Culture, School of Archaeology, History and Anthropology, University of Wales Trinity Saint David.

A Cosmic End: from the Earth to the Universe

José Funes

The question about the end of the universe is one of the big questions transversal to human culture: Where are we? Where did we come from? Where are we going? To address these questions the scientific method is not the only approach but certainly an important one. We can only think the past and the future of the Universe from the its present and from the data we have collected and interpreted and we test our ideas with a reality check. We have a quite a good picture of the early universe. Though there are many unknowns we still have a very good comprehension of the formation and evolution of galaxies, stars and planets. It is a bit uncertain to scientifically predict the future. Our predictions will depend on the different time and space scale that we consider. Thus we can consider the end of Earth, of the Sun, of our Galaxy and of the whole Universe.

In a long-term scenario is obviously hostile to life. This perspective poses many questions. If our location in the universe is crucial for life, will all life will with Earth? Is life a common phenomenon? What will happen with life in trillions and trillions of years when the universe fade? If there are other universes will life survive in those places? What is the Christian perspective on the end of the Universe?

Biography

José Funes is a Jesuit priest, director of the Vatican Observatory, and member of the Pontifical Academy of Sciences. His field of research includes kinematics and dynamics of disk galaxies and star formation in the local universe. He has published about 80 papers in referee journals and conference proceedings. He is co-editor of 3 volumes with the proceedings of two conferences on the formation and evolution of disk galaxies and a study-week on Astrobiology.

Effect of an Astronomical Narrative on the Brain

Elizabeth Wallace

What's the effect of seeing Earth from space on the human brain? While we prepare an abstract for consideration by the ISS to perform EEG's on astronauts while they are in the cupola looking at Earth from space, we would like to work on a smaller project in time for INSAP IX. We presented a 6 minute film, *The Overview Effect: Beyond Borders*, which was well received at INSAP VIII. In it 10-11 year old students narrate astronaut and cosmonaut quotes about what it is like to leave Earth, see her from space and return. (See note.)

Some children say they feel like 'space is real' after watching it. Others say space feels 'emotional'. What goes on in an adult's brain before she exclaims 'that was awesome! Is it on YouTube?'

Only a couple of weeks ago a student told me that her classmate had talked about being an astronaut for a year after seeing the film. This inspired me to go down the path a little further. With the help of neuroscientists we would like to design and execute a preliminary experiment using an EEG to see if differences can be detected between viewing disconnected pictures of outer space and Earth and those in the film connected by narrative. Perhaps there is more to learn about the effect of story on inspiring someone to follow a career in astronomy, space exploration and/or the arts.

Note: Requisite copyright permissions were recently received thanks to new funding.

Biography

Giraffe 'n' Ant Productions is dedicated to encouraging people to follow STEM and arts careers inspired by astronomy and space exploration.

My projects include: The StarryTelling Festival, a 3-day festival which combined the arts and science to introduce astronomy to the Metro DC area; Service on the IYA 2009 Cultural Astronomy Committee; I'm a StarryTeller planetarium show for the National Air and Space Museum with stories by over 40 students; Coaching students to retell NASA stories from Jay O'Callahan's 'Forged in the Stars'; Hands on astronomy workshops in an elder care facility; Presentations at the Next Gen Suborbital Researchers Conference including 'Space Tourism is the New Higher Education'.

For 30 years I owned and operated a visa agency which served international corporate travelers. While I used to help people expand their horizons by getting them across borders, now I would like to help them get 'beyond borders'.

Condensing from a fluid haze: John Pringle Nichol, the nebular hypothesis and nineteenth-century cosmogony

Howard Carlton

A significant astronomical debate of the mid-nineteenth century revolved around competing hypotheses of cosmogony. Traditional explanations held that God had created a static cosmos nearly six thousand years ago. Two credible astronomers, however, had begun to believe that traces of the developmental processes which led to the birth of stars and planets still persisted in the form of the unresolvable nebulae. An evolutionary cosmogony seemed to sit well with emergent long geological timescales and therefore proved attractive to those thinkers who were not persuaded of the correctness of Mosaic chronology and traditional creation stories.

A key figure in this debate was the Scottish political economist and radical polemicist John Pringle Nichol (1804-1859) who was a proponent of what had come to be known as the 'nebular hypothesis'. He was opposed by astronomers and theologians of a more conservative religious and political mien, for whom an evolving universe conflicted with their belief in final causes and also threatened to undermine social stability. Some commentators believed that the claimed resolution of the Orion nebula by Lord Rosse's giant telescope in the mid-1840s had destroyed Nichol's argument for ongoing stellar development. This paper will show how Nichol repurposed the evidence produced by his opponents and proceeded to promote his alternative views to a generally receptive audience. He thus paved the way for an absolute expansion of universal time and distance, the acceptability of evolution and a general move towards rationalist religious views during the later nineteenth century.

Biography

Having spent a number of years as an IT Consultant, Howard Carlton has recently moved into the rather different world of academia. In 2013 he was awarded an MA in the History of Christianity by the University of Birmingham and he is currently studying for a PhD in Modern History at the same institution. His thesis will explore a number of nineteenth-century astronomical controversies in order to examine the relationship between the respective epistemological statuses of religion, metaphysics and science. It will also consider the development of the discipline of astronomy during the nineteenth century and reflect on the extent to which it influenced, and was influenced by, the changing cultural, educational, social and political contexts of Victorian society.

The Golden Mean, an Unexpected Rationale Underlying Ancient Astrological Patterns

Rafael Gil Brand

The golden mean or divine proportion— according to which the larger of two parts is to the smaller one as the sum of both is to the larger part—was a well-known concept in ancient philosophy and art. Greek philosophers called this proportion 'analogia', as it is the mathematical expression of analogy and self-resemblance. In spite of its importance in ancient 'holy arts', the golden mean is nowhere mentioned in astrological treatises. A thorough analysis of several astrological patterns like planetary years, Egyptian terms, planetary exaltations or vedic 'dashas' reveals that the golden mean was one of the main rules on which those numerical and geometrical distributions were built. In my lecture the focus will be on the distribution of the so-called exaltation degrees of the planets, a system which can be traced back to pre-hellenistic astrology.

I will show that the exaltation degree of each planet fits into the golden mean between two other exaltation degrees, the associated planets being related with the former by means of sect and domicile. I will also supply a quite simple explanation for some minor differences between the exaltation degrees found in astrological lore and their position according to the golden mean. Incidentally, this explanation supports the hypothesis of the traditional system having been conceived towards the beginning of the 2nd millennium BC.

Biography

Rafael Gil Brand was born 1959 in Madrid. After his training as an astrologer in Spain, he studied psychology in Hamburg, Germany. Gil Brand is an examined astrologer by the DAV (German Astrologer's Association) as well as by the EVVA (European Association of Vedic Astrologers). Since 1991 he is head of a DAV-school in North Germany, and has been practicing as gestalt-therapist and astrological counsellor. In the 90's he has collaborated in the translation of several medieval astrological manuscripts into Spanish. An expert in traditional and vedic astrology, Rafael Gil Brand regularly lectures on international congresses and writes articles for German and Spanish astrological journals. He has authored the books *Lehrbuch der klassischen Astrologie* (Manual of classical astrology; 2000) and *Himmliche Matrix* (Celestial matrix; 2014).

Shakespeare's Astronomy: from Aristotle to the New Copernicans

Michael Rowan-Robinson

Of all writers Shakespeare demonstrates the greatest interest in and knowledge of astronomy. While many of his reference to astronomy represent the conventional Aristotelian ideas of his day, others show very direct knowledge of the night sky. And a few hint that he was aware of the ideas of the new Copernicans who were his contemporaries.

Biography

Michael Rowan-Robinson was Head of the Astrophysics Group at Imperial College in London from 1993 to 2007. From 2007-12 he continued to teach part-time in the Blackett Lab, Imperial. He was President of the Royal Astronomical Society 2006-8. In addition, he chaired the UK Ground-Based Facilities Review in 2009, and was Chair of the European Southern Observatory's Observation Planning Committee in 2011. From 1981 to 1982, he gave public lectures as professor of astronomy at Gresham College.

Space Travel, 'Otherworlds' and the Unusual

Dreams of Other Worlds

Chris Impey

Humans have dreamed of other worlds for thousands of years. At the dawn of science, over two thousand years ago, some Greek philosophers thought that the Earth might not be unique, but a geocentric cosmology squashed this speculation until the time of Galileo. Gradually, telescopic observations revealed planets and moons to be worlds in space, and robotic space probes in the past fifty years sharpened this awareness. In 1995, the first exoplanet was discovered. In twenty years, the inventory has grown to over 3500, of which hundreds are Earth-like and dozens may be habitable.

Astronomers project roughly a hundred million habitable "Earths" in the Milky Way and the search for life on those worlds is one of the most compelling projects in science. Meanwhile, cosmologists paint a picture of an expanding universe where space-time we can see holds 10^{23} stars and their likely attendant planets. If inflation occurred, then other space-times are likely to exist, with properties that may or may not be hospitable to life. Artists and scientists have seized on these discoveries to visualize other worlds. The potential of a boundless, biological universe recasts what it means to be human.

Biography

Chris Impey is a University Distinguished Professor and Deputy Head of the Department of Astronomy at the University of Arizona. He has over 170 refereed publications on observational cosmology, galaxies, and quasars, and his research has been supported by \$20 million in grants from NASA and the NSF. He has won eleven teaching awards, and he is currently teaching an online class with over 13,000 enrolled. Impey is a past Vice President of the American Astronomical Society and he has been an NSF Distinguished Teaching Scholar and the Carnegie Council's Arizona Professor of the Year. He has written over 40 popular articles on cosmology and astrobiology, two introductory textbooks, a novel, and five popular science books: *The Living Cosmos* (2007, Random House), *How It Ends* (2010, Norton), *How It Began* (2012, Norton), *Dreams of Other Worlds* (2013, Princeton), and *Humble Before the Void* (2014, Templeton).

Mars and the Mediums

Clive Davenhall

Spiritualism began, in its modern incarnation, in the mid-nineteenth century and its heyday was during the late nineteenth century and the first part of the twentieth, when it was a worldwide movement with several million adherents. The Martian 'canal craze' occurred during much the same period. Following the observations of Schiaparelli, initially during the 1877 opposition, Mars was seen to be criss-crossed by a network of fine lines: the famous 'canals'. One interpretation of these features was that they were artificial waterways, constructed by intelligent beings to stave off extinction by husbanding their scarce and dwindling water supplies. The nature of the canals, and in particular any artificial origin, were always problematic amongst astronomers (and in the event they proved to be optical illusions). However, the artificial origin hypothesis was widely and persuasively publicised in a blizzard of newspaper and magazine articles, particularly because of the advocacy of Percival Lowell and Camille Flammarion.

There was some common ground between these two sets of ideas, with some spiritualists reporting communication with Martians or making astral journeys to the planet (or, less often, elsewhere in the solar system or further afield). This paper will discuss this unlikely conjunction. It will review some notable examples, investigate how contemporary astronomical understanding of Mars is reflected in spiritualist's accounts and discuss the reasons behind this apparently surprising confluence of supernatural and scientific (or at least materialistic) ideas.

Biography

Clive Davenhall has a long-standing interest in the history of astronomy. Since 2004 he has been the Editor of the Society for the History of Astronomy's Bulletin (previously Newsletter) and is currently a member of that Society's Council. He contributed to a previous INSAP meeting (VII) and has written entries for the Biographical Encyclopaedia of Astronomers. In real life he is a Project Manager and Software Developer in the Wide Field Astronomy Unit, Institute for Astronomy, University of Edinburgh, based at the Royal Observatory Edinburgh. He has degrees from the universities of London and St Andrews.

John Bevis's 18th-century Atlas Celeste: An Oft-Overlooked Treasure

Jay M. Pasachoff and Kevin J. Kilburn

John Bevis's star atlas, technically unpublished but available mid-18th-century, ranks with Bayer's 1603 Uranographia, Hevelius's 1690 Firmamentum Sobiescianum sive Uranographia, Flamsteed's Atlas Coelestis (1729), and Bode's 1801 Uranographia as the most beautiful and influential celestial atlases. Bevis's atlas contains large-scale 52 engraved plates.

In 1997, a Uranographia Britannica (or Atlas Celeste) belonging to the Manchester Astronomical Society was found at the Godlee Observatory, Manchester University; it has been studied especially by one of us (KK). (A copy is available on a DVD, recently updated, 2014.) Another copy of the atlas was purchased in London in 2001 from bookseller Rick Watson by the other of us (JMP). These examples and the two-dozen others known have been the subject of ongoing study by the authors, and a website with a full list of known copies is kept up-to-date. We (Kilburn, Pasachoff and Harvard-Smithsonian Center for Astrophysics astronomer Owen Gingerich) published an article about it in the Journal for the History of Astronomy in 2003, following an earlier article by William Ashworth of the Linda Hall Library; updates (KK) have since appeared several times in the Royal Astronomical Society's magazine *Astronomy & Geophysics* as new information has come to light. In 2011, a 'missing' Uranographia was identified at Chatsworth in the library of Henry Cavendish (KK, A&G, Feb 2012).

We contrast the modern uranography of the Dutch celestial cartographer Wil Tirion, whose work is in the Field Guide to the Stars and Planets (JMP) and elsewhere.

Biography

Jay M. Pasachoff is Field Memorial Professor of Astronomy, Williams College, and is currently Past Chair, Historical Astronomy Division of the American Astronomical Society. He received the Education Prize from the American Astronomical Society and the Janssen Prize from the Société Astronomique De France. He is also Chair of the Working Group on Solar Eclipses of the International Astronomical Union.

Kevin J. Kilburn is Vice President, Manchester Astronomical Society, and is currently Acting Chairman, the Society for the History of Astronomy. His discovery of the Manchester Astronomical Society's copy of the Bevis atlas has led to the decades-long investigation of all the Bevis atlases and unpublished versions and plates around the world.

The Photographic Plate Archive as an Inspiration for Art Projects

Michael Geffert

The 'Sammlung Historischer Himmelsaufnahmen' of Bonn University is a collection of some 15,000 photographic plates taken between 1899 and 1990. While scientific and didactic use of the material is in progress, also projects with artists, musicians and others have been started. There is a great interest of non-astronomers in the unique old glass plates. People are fascinated by the combination of the age of the plates and the large amount of information of these plates. They were not only used as artworks in exhibitions, they also motivate artists to produce themselves new pieces of art.

In the beginning, concerts and art-exhibitions including the plates were organized at Hoher List Observatory (e.g., <https://astro.uni-bonn.de/~geffert/hl/AUSSTELL.pdf>). After the closure of the observatory, we moved the plates to the Argelander-Institut in Bonn. Recently an interdisciplinary project 'Dialog der Sterne' has been started with an exhibition and outreach events in the rolling mill in Pulheim near Cologne (http://www.sfb956.de/events/DdS_2015).

In this talk we will give an overview over several outreach projects mainly related to the plate archive of University of Bonn.

Biography

Michael Geffert is astronomer at the Argelander-Institut of Bonn University. He has published over years in astronomical journals like *Astronomy* and *astrophysics* and is now responsible for the public outreach activities of the institute.

In 2009 Geffert was the coordinator of the German activities of the IYA 2009. He has been working also as an artist (woodcut, painting, installation) with exhibitions in the region of Bonn. Michael Geffert is member of the German organization of artist (BBK).

The Starsight VR development project

Alastair Bruce and Members of the Royal Observatory, Edinburgh

An exciting new project at the Royal Observatory Edinburgh aims to modify the Stellarium planetarium software to work over the Internet and to display on Oculus Rift virtual reality headsets. The idea is to deliver planetarium shows to a geographically dispersed audience via the internet. In this way, StarsightVR aims at running live virtual reality stargazing shows.

The project got a start with a small grant from the Science and Technology Facilities Council - a UK government body that carries out civil research in science and engineering, and funds UK research in areas including particle physics, nuclear physics, space science and astronomy. This grant enabled the adaptation of the Stellarium planetarium software to be used, as planned, with the Oculus Rift virtual reality headset. It also allowed the addition of features so that we can run a presenter-led astronomy show from Edinburgh, with viewers anywhere else in the world.

Frustrated by cloudy skies or bright street lights? Have you ever seen the Milky Way from where you live? Interested in the stars but don't know where to start? Now you can see the starry sky all around you, from the comfort of your own home, and even have an astronomer show you around. Right now we have a working prototype... watch this space!

The Royal Observatory Edinburgh

The Royal Observatory Edinburgh, often known as ROE, is the location of two very active major scientific organisations - the UK Astronomy Technology Centre, and the Institute for Astronomy.

However, it is also a historic site of considerable importance. The Trust is a registered charity whose purposes are to protect, preserve and showcase the historical heritage connected with the ROE, and to promote and encourage public interest in Astronomy.

Astronomy and History of Art

The Cosmological Compass in Western Art

Richard Poss

A famous painting illustrates the medieval image of God as the creator of an ordered cosmos. The frontispiece to a 13th century Bible Moralisée, now in the National Library of Austria, is a favorite in history of astronomy lectures as it enforces the notion of a theocentric universe ruled by laws of nature. There are frequent manuscript illustrations of God holding mason's dividers, an image that becomes a symbol of the application of reason and mathematics to the world.

This paper examines the God-with-a-compass image, from its origin in Proverbs through its appearance in Dante and Petrarch, and in a multitude of works of visual art and sculpture from 10th century illuminated manuscripts to the Romantics in England. In between we will encounter medieval visionary imagery, Renaissance Humanist allegories, and Neoclassical drawing room satire.

New discoveries in astronomy change the cosmological model, and the function of the compass image evolves from Dante's Paradiso 19 and Petrarch's 'Triumph of Time' to the Humanist iconography of Durer, Lotto, and Hans Holbein the Younger. The Enlightenment period had its own uses for the image, and we see Voltaire and others use it to praise Isaac Newton as a symbol for the triumph of the new science. William Blake uses this symbol in several works and restores the image to its original power, to its spiritual potency as a symbol. Conclusions about the importance and function of this image will be presented.

Biography

Richard Poss is an Associate Professor of Astronomy, and former Director of the Humanities Program at the University of Arizona. His research examines the role of astronomical themes in European poetry, and he has published articles on Petrarch, Dante, Veronica Gambara, Walt Whitman, and on the exploration of Mars. He teaches courses on the history of astronomy and the relations between astronomy and the arts, and is a frequent instructor with the university's Humanities Seminars program. He is co-founder of the popular lecture series "Astrobiology and the Sacred: Implications of Life Beyond Earth," sponsored by a grant from the Templeton Foundation. He has won a variety of major university teaching awards, including the UA Foundation Leicester and Kathryn Sherrill Creative Teaching Award 1994, the Provost's General Education Teaching Award 2001, several Humanities Seminars Superior Teaching Awards (1996, 2002 and 2008), and two Provost's Teaching Improvement Awards (1991 and 1992).

The Astronomical Meaning of Botticelli's *Birth of Venus*

Frank Keim

In the fresco study of Saint Augustine (c. 1480) we find first measurements of elongation angles of inner planets. The painting *Birth of Venus* (c. 1483-85) depicts the three phases of the inner planets: inferior conjunction, superior conjunction and greatest elongation (Mercury and Venus). At the superior conjunction the planet is fully illuminated by the Sun, the phase angle is 0° . The *Venere nuda* shows the angle 23.5° for the Earth. The Venus is in line with the Sun and the Earth, located behind the Sun. At the greatest elongation, the phase angle is exactly 90° , the elongation angle about 45° . For Mercury, Botticelli plotted the angle of 22° . Furthermore, he painted the two figures in such a way, that there is a balance between the covered and the uncovered parts of their bodies. Finally, at inferior conjunction, there is— seen from Earth—only a small sickle: the Venus is completely clothed. The phase angle here is 180° . But this figure still shows another phase : that of the maximum brightness of the planet that will be achieved at about 39° .- Therefore, this painting is the first known allegory of the heliocentric system in the Quattrocento.

Biography

Frank Keim was a speaker at INSAP VII Conference, Bath 2010. He has worked since 1991 at the Communication and Information center, University of Ulm.

The Strange Case of Raphael's Planetary Hours: How Astronomy and Iconography Reveal a Neoclassical Forgery

Giangiaco Gandolfi

Due to the lack of information about their provenance and to their unmistakable Renaissance flavor, the so-called 'Hours of Raphael' set of engravings has baffled art connoisseurs for a long time, although critical voices on their authenticity have been sometimes raised. Still, in 2012 the historian Mary Quinlan-MacGrath insisted on it on the base of a very rare Vatican engraving, representing the Hours in the vault of the Sala dei Pontefici. My research, based on the incongruity of planetary association and on comparative iconography, reveals now a fascinating and very intricate story of forgery in the rising milieu of art counterfeit in Rome and Naples at the beginnings of the nineteenth century. The Hours of Raphael are definitely an astute pastiche of various figures painted by the School of the old Master, brought together following the instructions for allegorical representations contained in the famous iconological manual of Cesare Ripa.

Biography

I am a planetarian, science communicator and member of Società Italiana di Archeoastronomia (SIA), interested in the connection between astronomy and astrology and art, as of late especially visual arts. Since 2012 I have worked on Renaissance astral iconography and presented at workshops and congresses talks about 1) Raphael's controversial horoscope of Jules II in the Stanza della Signatura (SEAC 2013), 2) a new reading of astrological symbols in Giorgione's Frieze in Castelfranco Veneto (TV) (SIA 2013), 3) the evolution and diffusion of the so-called 'astrologer', an engraving by Giulio Campagnola (SIA 2012), and 4) the first complete interpretation of the puzzling astrological fresco in the Duomo of Montagnana (PD) (SIA 2014).

Galileo Galilei's Commemorative Tomb in Santa Croce: Art, Light and the Stars

Liana De Girolami Cheney

After his death in 1642, Galileo Galilei's corpse could not be buried on consecrated ground because he was condemned by the Inquisition of the Catholic Church for his support of Copernicus' heliocentric notion and his theory on the motions of the earth. Challenging the church refusal, Ferdinand de' Medici, Grand Duke of Tuscany, and devoted patron of Galileo, was able to obtain a humble burial for Galileo's remains in Santa Croce. Many years later, in 1703, Galileo's pupil Vincenzo Viviani, after his death, bequeathed a substantial endowment to build a monumental memorial for both Galileo and himself in Santa Croce. In 1737, the commemorative structure was designed and built by the Foggini family, the sculptor Girolamo Ticciati, and the architect Giovan Battista Nelli.

This paper will analyze the originality of Galileo's tomb in terms of its Renaissance composition and astral symbolism, a remarkable funerary monument celebrating the accomplishments of Galileo Galilei (Pisa 1564-Arcetri 1642), the Father of Modern Science, a Tuscan artist, an astronomer, a mathematician, a physicist and a philosopher. His renowned innovations and discoveries paved the way to the scientific understanding of the universe in the modern era, namely, the sector, a navigational compass, improvement of the telescope, the four moons surrounding Jupiter, the nature of the Milky Way, the rings around Saturn, the phases in the planet Venus and sunspots in the Sun.

Biography

Prof. Liana De Girolami Cheney is presently a Visiting Scholar in Art History at the Università di Aldo Moro in Bari, Italy, and Investigadora de Historia de Arte, SIELAE, Universidad de Coruña, Spain. Dr. Cheney received her BS/BA in Psychology and Philosophy from the University of Miami, Florida, her MA in History of Art and Aesthetics from the University of Miami, Florida, and her Ph.D. in Italian Renaissance and Baroque from Boston University, MA.

Dr. Cheney is a Pre-Raphaelite, Renaissance and Mannerism scholar and author, and coauthor of numerous articles and books, including: *Neoplatonism and the Arts*; *Neoplatonic Aesthetics in Literature, Music and the Visual Arts*; *The Homes of Giorgio Vasari (English and Italian)*; *Giorgio Vasari's Teachers: Sacred and Profane Love*; *Giorgio Vasari's Prefaces: Art and Theory*; *Giorgio Vasari's Artistic and Emblematic Manifestations*, *Agnolo Bronzino: The Florentine Muse*; and *Edward Burne-Jones' Mythical Paintings*.

Christ and the Celestial Sphere: A Unique Mosaic in St. Isaac's Cathedral?

Michael Mendillo and Ethan Pollock

While celestial imagery appears in many religious paintings, Christ holding a celestial sphere is not commonly seen in Church decorations. St. Isaac's cathedral in St. Petersburg, Russia, was built between 1818-1858, with the decorative phase involving Karl Bryullov (1799-1852), the Imperial Academy of Arts and personal interests of the Tsars. Within a Russian Orthodox Church, special attention is given to the wall (called the iconostasis) that separates the sanctuary from the public portion of the building. In St. Isaac's, the icon to the right of the entry into the sanctuary is a huge mosaic of Christ holding a large glass sphere containing stars and constellations.

The image of a ruler holding a sphere dates to pre-Christian times. Later, when a crucifix was added atop the sphere, the object became known as a Globus Cruciger. From the Middle Ages onward, when Jesus held the Globus Cruciger the motif was called Salvator Mundi.

Renaissance versions of Salvator Mundi range from da Vinci's to the one in the Hermitage by Titian. The designers of the mosaic in St. Isaac's did not copy these in detail, but surely in concept. The Russian artists Timothy A. Neff (1804-1876), Fedor P. Bryullov (1795-1869) and Fedor Bruni (1799-1875) provided the main guidance to the mosaicists, and yet astronomical motifs were not prominent in their prior accomplishments. In this paper, we explore the possible origins of the design used in St. Isaac's that added stars and constellations—most prominently Orion—to the glass sphere held by Christ.

Biography

Michael Mendillo is Professor of Astronomy at Boston University with research programs in Space Physics, Planetary Astronomy and the History of Astronomy.

Ethan Pollock is Associate Professor of History and Associate Professor of Slavic Studies at Brown University. His book *Stalin and the Soviet Science Wars* is in both hardback (2006) and paper (2008) editions.

When The Luminaries Meet

Catherine Blackledge

Eclipses are the greatest of all celestial events and have been understood as the most ominous of messages from the gods since the people of Mesopotamia began observing 'the writing of heaven' in the third millennium BCE (Before the Common Era). The fear and awe that they inspire has led to the creation of elaborate death rituals, stellar safe rooms and the most striking example in British history of the power of prophecy. For the Babylonians, eclipses portended the rise and fall of dynasties.

However, if the divinities were mollified through the practice of *namburbi*—prophylactic rites—a royal death was not inevitable. The state archives of Assyria record the most barbaric rite was the substitute king ritual, in which a commoner and his consort were slaughtered in place of the real sovereign.

Eclipses continued to panic the ruling elite. In Italy, Pope Urban VIII believed solar and lunar eclipses in 1628 signalled his imminent demise and commissioned Tommaso Campanella to build a room at his palace Castel Gandolfo that counteracted malign rays and pulled down benefic ones. In England, the words of the nation's first media celebrity and its greatest astrologer William Lilly about the solar eclipse of 29 March 1652 triggered widespread chaos and brought the country to a standstill. The day became known as Black Monday; its legacy lives on today in the Black moniker we attach to dire financial or shocking days. Lilly's professional organization The Society of Astrologers first met at Gresham College in 1647.

Biography

Dr Catherine Blackledge is an internationally-acclaimed non-fiction author and award-winning journalist whose career and interests span the worlds of science and the celestial realm. Her most recent book is *The Man Who Saw the Future: a biography of William Lilly* (Watkins, February 2015). Her first book *The Story of V: a cultural history of the vagina* (Weidenfeld & Nicolson, 2003) has been translated into ten languages.

Dr Blackledge has a science degree and PhD and has worked as a science writer since 1993. She has been a student of astrology for over a decade, since studying the history of science and magic fanned a fascination with the arcane art.

She has extensive experience of lecturing: appearances include Cheltenham and Manchester science festivals, Glastonbury Goddess festival, and Café Scientifique in Bristol, Newcastle and London. She has given talks, readings, done live radio and television, and appeared in debates nationally and internationally.

East Meets West: Shi Zhiying's Picturing of Italo Calvino's 'Mr. Palomar'

John Hatch

My paper explores an intriguing series of 30 black and white watercolour and ink works by the Shanghai-born artist Shi Zhiying that give visual form to the unusual musings of Mr. Palomar, the title character of Italo Calvino's 1983 book. In the novel by the Italian writer, we are witnesses to a wonderful and often haphazard exploration of the world from its smallest creatures to the majestic universe it inhabits. Palomar's attempts to grasp these, to make sense of them, constantly elude and frustrate him, and he yet he never ceases trying despite the growing realization that his futility is the product of a greater sense of things that promises a far richer appreciation of life. It is not surprising to find that Calvino's writing has been long admired in China as it embraces a contemplation of the world that is more familiar in the Far East than in the West. Shi masterfully demonstrates her grasp of the world of Mr. Palomar with a visual panorama that complements perfectly Calvino's text.

Biography

Dr. John G. Hatch is Associate Professor of Art History at Western University (London, Canada) where he also serves as an Associate Dean for the Faculty of Arts and Humanities. He received his PhD from the University of Essex and his area of research is 20th-century European and American art and theory, with a special focus on the influence of the physical sciences on modern art. Recent publications include the articles 'Wrestling Proteus: The Role of Science in Modern Art and Architecture's New Images of Nature' (2014), 'Seeing and Seen: Acts of the Voyeur in the Works of Francis Bacon' (2012), 'Nature, Entropy, and Robert Smithson's Utopian Vision of a Culture of Decay' (2012), and 'Some Adaptations of Relativity in the 1920s and the birth of Abstract Architecture' (2010).

Yoruba Cosmological incorporations 'here and there' in Fon Culture (West Africa)

Aimé Dafon Segla

The Yoruba and the Fon are neighbouring peoples. The archaeology of the ways both peoples materialize the cosmos as well as the cosmological incorporations into the rationalization of their real life allude to Yoruba main metaphor of original creation. The Yoruba believe 'Olorun' is /Sky owner/ and communicate with through secondary intermediaries deities sent to Earth by the Supreme God. These are Orisha. But Orisha of the Yoruba are also 'Vodun', as appropriated and named by the Fon in Benin Republic. Both Orisha in Yoruba language and Vodun in Fon language having the same meaning: 'what you can not access easily'. However, the Yoruba and Fon have linguistically different languages (Capo 1989; Stewart 1989). And their ancient and more recent histories are also deeply different. Starting from there, we question literature, arts, religion and traditional philosophy: symbolisms, mythologies, rituals, concepts, architectures, calendars and time cycles of both peoples. Arguments are brought from interviews in convents with people whose knowledge and practices remain immune and survived western post colonial hegemony. Data addressed earlier mental constructions, share a lot of claims of aboriginal status with clusters of ancient cults or give evidence of archaic ritual language forms, echoing earlier spoken dialects. As the result, we try to make clearer whether the Fon are proto-Yoruba, or whether they are distinguished differentiated people and, thus, how could this be?

Key words: Cosmology: human culture; Yoruba-Fon; Orisha-Vodun; Concepts: history and logic.

Biography

Aimé Dafon Segla is a former predoctoral researcher at the French Centre National de la Recherche Scientifique (CNRS). After his doctoral degree in Epistemology-History of Science and Technology, he held a fellowship at the Max-Planck Institute for the History of Science in Berlin and joined the Martin-Luther University (Germany). Currently at the Université d'Abomey-Calavi in Benin Republic (West Africa) where he teaches 'Culture, science, technology and innovation studies', his interests in non-western oral culture include 'concepts, belief and knowledge in language and cognition, scientific theory, technologies and embodied tacit/implicit knowledge in mathematics, biology, traditional food industry and medicine'. He has published articles in Springer, SSI Sage Publications, Cahier d'Etudes Africaines, Alliage, ASP (Astronomical Society of the Pacific), the Max-Planck Institute for History of Science Report (Berlin) and is author of books and chapters of books (Springer 201).

Balla's 'Transit of Mercury' and the Modernist Sun

Gary Wells

In November 1914, artist and astronomy enthusiast Giacomo Balla observed the transit of Mercury across the face of the sun. He then painted a series of canvases about the event in the abstract and dynamic style of the Italian Futurist movement, of which he was an important member. Balla's interest in this astronomical event was part of a larger Modernist inclination toward the valorization of new technologies and discoveries, and a celebration of the extended reach of human knowledge. It was also a moment where art began to reimagine and revisit certain astronomical subjects with a new set of expressive and conceptual tools.

This paper will examine Balla's painting in the context of early twentieth century modern art, particularly in its focus upon the image of the sun. Balla was not alone in his interest in the developments of modern science, and many other artists explored astronomical themes derived from the discoveries of the day. The subject of the sun, with its long and rich history in art, was particularly prominent in the work of these artists. For example, Robert and Sonia Delaunay would place the sun at the symbolic center of their 'Orphic' Cubism. Max Ernst would tap into symbolic and scientific associations with the sun in his early Dada and later Surrealist works. And Marcel Duchamp would allude to the alchemical and mystical aspects of astronomical bodies in his cryptic works, which first emerged at the same moment that Balla's transit paintings were being created.

Biography

Gary Wells teaches art history and visual culture at Ithaca College in New York. He has written about the intersections of art and astronomy in the nineteenth and early twentieth centuries, as well as the visual culture of science. He has also published on the applications of chemistry in art historical investigations and conservation. He has presented at the INSAP conferences since INSAP II in Malta.

Conference Summary and Conclusions

Rolf Sinclair

Founder member and former Chairman of INSAP

Biography

Rolf Sinclair (U.S.) has two Physics BSc degrees: from the California Institute of Technology and The Rice University, where he started to focus on theoretical physics and then experimental nuclear physics. He continued with his nuclear research in Westinghouse Laboratories (U.S.), at the University of Hamburg (Germany), and then at the University of Paris (France). Between 1959 and 1969 he was in the University of Princeton, at the Plasma Physics Laboratory from the U.S. Controlled Thermonuclear Program, working on concepts of fusion reactors. From 1969 until his retirement in 1998, he was Program Officer at the Physics Division of the US National Science Foundation (NSF). During this period, he was the NSF Representative for the United Eclipse Expeditions to Canada (1979) and India (1980), and NSF Representative at the Amundsen-Scott South Pole Station in 1995 and 1996. During a sabbatical at Los Alamos National Laboratory (1988-89), he worked with the LANL "Bright Source" laser facility, and as a Professor at the New Mexico State University (1985) and Northern Arizona University (1986). Since 1978 he has been active in studies in archaeoastronomy in Pre-Columbian cultures of the southwest of US, and more recently, in the cultural effects of astronomical phenomena visible to the naked eye. In 1999, he joined CECs, where he is appointed at the Senior Scientific Laboratory of Glaciology and Climate Change.

<http://www.cecs.cl/website/index.php/en/researchers/glaciology-laboratory/23-rolf-sinclair->

Presenters

1. Adamo, Angelo	24
2. Assasi, Reza	37
3. Blackledge, Catherine	60
4. Brown, Daniel	38
5. Bruce, Alastair	53
6. Champion, Nicholas	42
7. Carlton, Howard	45
8. Cheney, Liana De Girolami	58
9. Corbally, Christopher	16
10. Crawford, Carolin	28
11. Davenhall, Clive	50
12. Fabian, Andy	36
13. Funes, José	43
14. Gandolfi, Giangiaco	57
15. Geffert, Michael	52
16. Gil Brand, Rafael	46
17. Grey, Safari F.	18
18. Gropp, Harald	17
19. Hamacher, Duane	31
20. Harris, Lynda	30
21. Hatch, John	61
22. Impey, Chris	49
23. Keim, Frank	56
24. Kilburn, Kevin	51
25. Kukula, Marek	25
26. Latura, George	19
27. Lee, Annette S.	29
28. Mendillo, Michael and Pollock, Ethan	59
29. Molaro, Paolo	22
30. Morgan, David	23
31. Morison, Ian	21
32. Olowin, Ronald	15
33. Pasachoff, Jay	51
34. Poss, Richard	55
35. Rappaport, Margaret Boone	16
36. Rathnasree, Nandivada	32
37. Rees, Martin	40
38. Rowan-Robinson, Michael	47
39. Segla, Aimé Dafon	62
40. Shrimplin, Valerie	26
41. Sinclair, Rolf	64
42. Trotta, Roberto	34
43. Trygg, Tarja	33
44. Vandenbrouck, Melanie	39
45. Wallace, Elizabeth	44
46. Wells, Gary	63