

Astronomy and astronautics lecture titles 2013

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Lecture titles with summaries including formats available

1. Astronomical history

1.1 Astronomy in the ancient world

Prehistoric astronomy. Astronomy in Mesopotamia and Egypt. Greek and Hellenistic astronomy, including Aristarchus, Aristotle, and Hipparchus. The Great Library at Alexandria: Eratosthenes and Ptolemy. Greek and Roman views on the "plurality of worlds". The transmission of Hellenistic astronomy.

1.2 Astronomy in the medieval world

The transmission of Hellenistic astronomy. Ptolemy and the origin of medieval astronomy. Astronomy in Arabia and Asia. Astronomical phenomena in Anglo-Saxon England. Astronomy in Castile and Spain. Foundation of the Universities: Paris and Oxford. Astronomy in the Holy Roman Empire.

1.3 Astronomical instrumentation before the telescope

Historical background. Observational instruments, including Ptolemy's Rules, Quadrant. Instruments representing the sky, including armillary sphere, astrolabe. Measuring time: Sundials and clocks.

1.4 The Copernican evolution

Introduction: Why evolution not revolution? The Ancient World: Aristarchus and the heliocentric theory. The geocentric model: Eudoxus, Aristotle and Ptolemy. The Medieval World: Responses to the limitations of the geocentric model. Copernicus and the heliocentric model. Galileo, Kepler and Newton.

1.5 The Wing Dynasty

Introduction. The Wing family and their contributions to astronomy. Vincent Wing (1619 – 1668) and the new astronomy of Tycho Brahe and Copernicus. John Wing (1662 – 1726), surveyor and almanac maker. John Wing (c.1673 – 1715), instrument maker. Tycho Wing (1696 – 1750), astronomer and philosopher. Tycho Wing (1726 – 1776), instrument maker and his partnership with Thomas Heath. Tycho Wing (1794 – 1851). The legacy of the Wing Dynasty.

1.6 Huguenot astronomy

Introduction; Historical background. Huguenot refugees to c.1800. Dollond family and optical instrumentation. Demainbray and Rigaud families: astronomy at Kew and Oxford. Contributions of later descendents, including A A Rambaut

1.7 Bryan Donkin FRS: Engineer, Industrialist, Astronomer

Beginning with a brief outline of the life and work of Bryan Donkin FRS, the presentation then focuses on aspects of Donkin's life and work of particular astronomical relevance, including his involvement with the Royal Astronomical Society during its early years and his interests as an amateur astronomer. In addition, manufacture of equipment for astronomical observatories by Donkin's company will also be reviewed.

1.8 Some aspects of Buckinghamshire astronomy

The contribution of selected individuals through history with Buckinghamshire connections is summarised, including William Oughtred, William Herschel and other members of the Herschel family, Dr John Lee, Rev William Rutter Dawes and Rev James Law Challis. The emergence of scientific and astronomical societies, especially in the C20th is outlined. Buckinghamshire observatories past and present are summarised.

1.9 Some aspects of Lincolnshire astronomy

The contribution of selected individuals through history with Lincolnshire connections is summarised, including Henry Andrews, Sir Isaac Newton, Rev Dr William Pearson and Sir Thomas Little Heath. The emergence of scientific and astronomical societies, from the C18th antiquarian societies, especially the Spalding Gentlemen's Society, through the C19th mechanics institutes and finally the astronomical societies in the C20th is outlined. Lincolnshire observatories past and present are summarised.

1.10 Some aspects of Norfolk Astronomy

The contribution of selected individuals through history with Norfolk connections is summarised. In addition, the history of astronomical societies and observatories past and present is outlined.

2. General astronomy

2.1 Light and the electromagnetic spectrum

Basic concepts: speed of light, wavelength and frequency. Wave and particle nature of light. Quantum theory. Eye and vision. Physics and chemistry of colour. Infrared and radio waves. Ultraviolet, X-rays and gamma rays. Astronomy beyond the visible range

2.2 Infrared astronomy

Infrared radiation and the electromagnetic spectrum. Terrestrial IR astronomy. UKIRT. Antarctica and IR astronomy. Airborne infrared observatories: Kuiper Airborne Observatory (KAO) and Stratospheric Observatory for Infrared Astronomy (SOFIA). Astronomical satellites, including IRAS, ISO, Spitzer Space Telescope and Herschel. Results.

2.3 Microwave astronomy

The electromagnetic spectrum. Terrestrial microwave astronomy. Interstellar molecules. The "Big Bang" and microwave background radiation. Astronomical satellites, including COBE, WMAP, Planck and the Submillimetre Wave Astronomical Satellite (SWAS). Results of microwave astronomy.

2.4 Astronomers' Guide to the Chemical Elements

Historical background. The Big Bang and the origin of hydrogen. Stellar processes, nucleosynthesis and the origin of heavier elements. Supernovae. Atomic theory and the structure of the atom. The periodic table of elements. Radioactivity.

3. Planetary sciences

3.1 Origin of the Solar System

Methods of study. Origin of the Solar System. Origin of the structure of the Earth. Origin and development of the Moon. Overview of the exploration of the solar system. Comparative planetology: survey of the planets and other Solar System bodies.

3.2 Atmospheres of the planets

Origin, development and composition of terrestrial atmosphere. Summary of atmospheric processes on Earth. Greenhouse effect. Environmental issues. Comparative survey of the atmospheres of the planets and other Solar System bodies.

3.3 Exploration of the Moon

Historical background. Early Russian and US probes. Apollo missions. Lunar Surface and structure. The future of lunar exploration, including European and Japanese plans. Lunar bases. The Moon and the development of the space infrastructure.

3.4 Exploration of Venus

Historical background. Venus before the Space Age. Space missions: Mariner, Pioneer Venus, Venera, Magellan, Venus Express. Atmosphere, structure and composition of Venus.

3.5 Exploration of Mars

Historical background. Mars before the Space Age. Space missions: Mariner, Viking, Mars Pathfinder, Mars Global Surveyor, Mars Odyssey, Mars Express, Mars Exploration Rovers, Mars Phoenix Lander, MSL/Curiosity. Future missions. Atmosphere, structure and composition of Mars.

3.6 Exploration of Jupiter

Historical background. Jupiter before the Space Age. Space missions: Pioneer, Voyager, Galileo, Juno. Impact of Comet Shoemaker-Levy 9. Structure and composition of Jupiter and its satellites.

3.7 Exploration of Saturn

Historical background. Saturn before the Space Age. Space missions: Pioneer, Voyager, Cassini-Huygens. Structure and composition of Saturn and its satellites. Titan.

3.8 Uranus and Neptune

Historical background. Early pre-discovery observations. Discovery of Uranus. Adams, Le Verrier and the discovery of Neptune. Uranus and Neptune before the Space Age. Voyager 2 at Uranus, Neptune and Triton. Recent observations with the Hubble Space Telescope.

3.9 Pluto and the outer solar system

Discovery of Pluto and Charon. Pluto: planet or dwarf planet? Trans-Neptunian Objects. Edgeworth-Kuiper Belt. Kuiper Belt Objects. Plutinos. Cubewanos. New Horizons mission to Pluto, Charon and the Kuiper Belt. Oort Cloud. Comets. The boundary of the Solar System. Pioneer. Voyager Interstellar Mission.

4. Astrobiology

4.1 Astrobiology

Historical background. Definition of astrobiology/bioastronomy/exobiology. Astronomical and chemical requirements for life. Life on Earth. Prospect of life beyond the Earth, especially Mars and Europa. Search for life elsewhere, especially Mars. Nearby Sun-like stars. Panspermia and comets.

4.2 Search for extraterrestrial intelligence (SETI)

Historical background. Summary introduction to astrobiology. Intelligence, civilization and technology. Prospects for the existence of extraterrestrial intelligence. Radio astronomical searches: Project Ozma. SETI@home. Other possible search methods. Methods and consequences of communication with extraterrestrial intelligence. Fermi Paradox.

4.3 Life on Mars?

Historical survey of views on the existence of Martian life. History of Mars and Earth compared. Viking biology experiments on Mars and results obtained. Could Mars have previously supported life? Antarctic meteorites and "Martian microfossils". Information from recent Mars missions

5. Astronautics

5.1 The Apollo years

Introduction. Early missions. The Moon landings: Apollo 11 – Apollo 17. Apollo after the Moon: Skylab and the Apollo Soyuz Test Project

5.2 The Space Shuttle years

Introduction. The development of the Space Shuttle. Early missions. Particular aspects, including Spacelab, Hubble Space Telescope servicing, and the International space Station. Shuttle losses: Challenger and Columbia. The final missions.

5.3 Space Stations: From Salyut to the International Space Station

Skylab. Salyut. Mir. International Space Station. Space station applications. The Space Station and the development of the space infrastructure.

5.4 The Futures of Spaceflight

Introduction: past visions of the future. Current state of spaceflight in Russia, USA and Europe. Recent developments as preparation for the future. Private enterprise and commercialization of space: private launch vehicles and space tourism. Future plans of emerging nations: China, India and others. Requirements for developing the space infrastructure. Advanced launch vehicles, shuttles and OTVs. Interstellar spaceflight.

5.5 Bioethics: An extraterrestrial perspective

A review of ethical and other related issues as applied to spaceflight, the space environment and the exploration of space, including the following: Human rights and international relations in space. Protection of terrestrial and extraterrestrial environments. Extraterrestrial life and intelligence.

Appendices: General and supplementary information

A Format of lectures and facilities required

All lectures are available only as a PowerPoint presentation, which is usually brought to the meeting on a memory stick or CD. It is requested that a data projector and laptop with PowerPoint are available.

B Expenses

These talks are available to astronomical societies and similar organizations in the London area and in the Midlands and East Anglia on an expenses-only basis. Further information about the expenses charged is available on request and can be discussed at the time of enquiry and booking, but the following general principles apply

- **travel by train in one day:** if the return journey can be completed in one day, standard class day return¹ will apply. (This usually only applies mid-week for talks in the London area and along the West Coast Main Line.)
- **travel by train with overnight stopover:** if the return journey cannot be completed in one day, then standard class ordinary return¹ will apply and an offer of overnight accommodation will be required. (This option is seldom used as it is usually both cheaper and more practical to travel by car).
- **travel by car:** Expenses are calculated based on a mileage rate of 28p per mile. In addition, any supplementary charges for road or bridge tolls and ferry fares may also be charged. For longer journeys an offer of overnight accommodation would be appreciated, though is not always necessary.

C Publicity information and articles

Brief details of each talk, suitable for use in press releases etc, are available on request from Dr Mike Leggett. If you require such information, please arrange this at the same time as the date and title are arranged. In addition, short articles based on these talks and suitable for inclusion in society magazines may be obtained from Dr Leggett. Such articles should be requested, with an indication of word limit, well in advance of the intended copy date.

¹ Or nearest equivalent rail ticket as available from the appropriate train operating company at that time.

D Speaker information and contact details

A Fellow of the Royal Astronomical Society and a Fellow of the British Interplanetary Society, Dr Mike Leggett is also a member of the British Astronomical Association, the Planetary Society and the Society for the History of Astronomy (SHA). As a participant in the SHA Survey of the Astronomical History of the UK, he is currently the coordinator for Buckinghamshire, Lincolnshire and Rutland.

As a founder member of the South Lincolnshire Astronomical and Geophysical Society in 1976, he began to present astronomy talks for his local society. Since that time he has presented lectures for the British Interplanetary Society, at University of Aberdeen evening classes, for the Society for the History of Astronomy and to astronomical societies and other groups throughout the UK. He is currently Publicity Officer for the Milton Keynes Astronomical Society, for whom he has also served as Chairman and Secretary. He is also a Council Member and Publicity Officer for the Society for the History of Astronomy (SHA) and county co-ordinator for Buckinghamshire, Lincolnshire, Norfolk and Rutland in the SHA survey of astronomical history of the UK.

A Graduate in Chemistry and Pharmacology from the University of Nottingham, Dr Leggett also holds a PhD in Chemistry. A Chartered Chemist and a Member of the Royal Society of Chemistry, he is a member of the Astrophysical Chemistry Group. He also holds a Postgraduate Diploma in Technical Authorship and Communication and is Member of the Institute of Scientific and Technical Communicators.

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