

# Astronomy and astronautics lecture titles 2008 – 2009

**Dr Mike Leggett FRAS FBIS**

Astronomy and space technology lecturer and writer

## Contents

---

### Lecture titles with summaries including formats available

	Page
1 <b>Astronomical history:</b> Astronomy in the ancient world – Astronomy in the medieval world – Astronomical instrumentation before the telescope – The Copernican evolution – Stukeley and Stonehenge – The Wing Dynasty	2
2 <b>Origins:</b> Origin and discovery of the elements – Origin of the Solar System – Origins of life	3
3 <b>Electromagnetic spectrum and astronomy:</b> Light and the electromagnetic spectrum – Probing the planets: Instrumental analysis for space exploration – Infrared astronomy – Microwave astronomy	3
4 <b>Planetary sciences:</b> Astronomy and climate – Atmospheres of the planets – Exploration of the Moon – Exploration of Venus – Exploration of Mars – Exploration of Jupiter – Exploration of Saturn – Uranus and Neptune – Pluto and the outer Solar System – Search for extrasolar planetary systems	4
5 <b>Astrobiology:</b> Astrobiology - Search for extraterrestrial intelligence (SETI) – Life on Mars?	5
6 <b>Astronautics:</b> Rocketry and spaceflight – Space stations – The future of spaceflight – Bioethics: An extraterrestrial perspective	6
7 <b>Astronomical surveys:</b> Some aspects of Lincolnshire Astronomy – Some aspects of Buckinghamshire astronomy	6

### Appendices: General and supplementary information

	Page
A     Format of lectures and facilities required	7
B     Expenses	7
C     Publicity and articles	8
D     Speaker information and contact details	8

## **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.

**Formats available:** PowerPoint or OHP transparencies; in addition, 35 mm slides essential with the OHP version and recommended with the PowerPoint version.

#### **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.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint presentation available from June 2009.

#### **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.

**Formats available:** PowerPoint or OHP transparencies; in addition, 35 mm slides essential with the OHP version and recommended with the PowerPoint version.

#### **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.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

#### **1.5 Stukeley and Stonehenge**

Introduction: William Stukeley, Stonehenge and archaeoastronomy. William Stukeley: his life and work. Stonehenge: before and after Stukeley. Stukeley and the mythology of Stonehenge. Astronomers and the archaeoastronomy of Stonehenge.

**Formats available:** PowerPoint with 35 mm slides recommended.

#### **1.6 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.

**Formats available:** New lecture in preparation as a PowerPoint presentation to be available from Spring 2009.

## **2. Origins**

### **2.1 Origin and discovery of the elements**

Historical background. The four elements of the ancient and medieval world. Discovery of Oxygen. Dalton and the atomic theory. Mendeleev and the Periodic Table. The Big Bang and the origin of hydrogen. Stellar processes and nucleosynthesis. Radioactivity.

**Formats available:** PowerPoint version available on request.

### **2.2 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.

**Formats available:** PowerPoint or OHP transparencies; in addition, 35 mm slides essential with the OHP version and recommended with the PowerPoint version.

### **2.3 Origins of life**

What is life? Astronomical and chemical requirements for life. Views in the ancient world: creation and spontaneous generation. Pasteur and the fall of spontaneous generation. Darwin and evolution. Oparin and the origin of life. Chemical evolution. Mineral origins of life. Panspermia and directed panspermia. Life on Earth: Environment, evolution and mass extinctions.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

## **3. Electromagnetic spectrum and astronomy**

### **3.1 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.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **3.2 Probing the planets: Instrumental analysis for space exploration**

Principles of analytical methods. Electromagnetic spectrum and spectroscopy. Analytical signals: absorption, emission spectra. Spectroscopy, spectrometry and spectrophotometry. Separation techniques. Examples of applications in astronomy and astronautics, including gas chromatograph mass spectrometry, X-ray fluorescence spectrometry and Mossbauer spectroscopy.

**Formats available:** PowerPoint version available on request.

### **3.3 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 from IRAS to the Spitzer Space Telescope. Results of IR astronomy.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **3.4 Microwave astronomy**

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

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

## **4. Planetary sciences**

### **4.1 Astronomy and climate**

Sources of short and long-term climate change. Solar flux and the expected Earth temperature. Terrestrial atmosphere and the greenhouse effect. Orbital characteristics and climate. Ice ages. Other factors: meteoritic impacts, volcanic processes and galactic orbit.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **4.2 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.

**Formats available:** PowerPoint or OHP transparencies; in addition, 35 mm slides essential with the OHP version and recommended with the PowerPoint version.

### **4.3 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.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **4.4 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.

**Formats available:** PowerPoint with 35 mm slides recommended.

### **4.5 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. Future missions. Atmosphere, structure and composition of Mars.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **4.6 Exploration of Jupiter**

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

**Formats available:** PowerPoint version available on request,

### **4.7 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.

**Formats available:** PowerPoint with 35 mm slides recommended,

### **4.8 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.

**Formats available:** PowerPoint with 35 mm slides recommended,

#### **4.9 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.

**Formats available:** PowerPoint with 35 mm slides recommended.

#### **4.10 Search for extrasolar planetary systems**

Techniques of searching for extrasolar planets. Evidence for the formation of extrasolar planets and results from Hubble Space Telescope. Kepler and other missions. Evidence for the existence of extrasolar planets. Future studies and space missions

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **5. Astrobiology**

#### **5.1 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.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint presentation available from early 2009.

#### **5.2 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.

**Formats available:** PowerPoint or OHP transparencies with 35 mm slides.

#### **5.3 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.

**Formats available:** PowerPoint or OHP transparencies; in addition, 35 mm slides essential with the OHP version and recommended with the PowerPoint version.

## **6. Astronautics**

### **6.1 Rocketry and spaceflight**

Principles of rocket and spacecraft propulsion including chemical, nuclear and ion drive. Pioneers of astronautics, including Tsiolkovsky, Goddard, Oberth and von Braun. History of launch vehicles and spaceflight. Recent developments. Ion Propulsion: Deep Space 1 and SMART-1.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **6.2 Space Stations**

Historical background. Skylab. Salyut. Mir. International Space Station. Space station applications, including astronomy, microgravity research and remote sensing. The Space Station and the development of the space infrastructure.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

### **6.3 The future of spaceflight**

The state of the art. Recent developments as preparation for the future. Requirements for developing the space infrastructure. Advanced launch vehicles, shuttles and OTVs. NASA Advanced Space Transportation Program. Interstellar spaceflight. Warp drives and wormholes: science fiction or future science?

**Formats available:** PowerPoint version only.

### **6.4 Bioethics: An extraterrestrial perspective**

Is it right to use nuclear power systems in spacecraft? Should astronomers oppose mining of the Moon or "terraforming" of other planets? Can the space programme itself be justified in a world, which seems to have so many more immediate needs? A review of these and other related issues, including the following: Human rights and international relations in space. Protection of terrestrial and extraterrestrial environments. Extraterrestrial life and intelligence.

**Formats available:** OHP transparencies with 35 mm slides; PowerPoint version available on request.

## **7. Astronomical surveys**

### **7.1 Some aspects of Lincolnshire astronomy**

The contribution of selected individuals with Lincolnshire connections is summarised, including Henry Andrews, Rev Dr William Pearson and Sir Thomas Little Heath. The emergence of scientific and astronomical societies, from the C18<sup>th</sup> antiquarian societies, especially the Spalding Gentlemen's Society, through the C19<sup>th</sup> mechanics institutes and finally the astronomical societies in the C20<sup>th</sup> is outlined. Lincolnshire observatories past and present are summarised. Undoubtedly, the single most significant person in Lincolnshire astronomy is Sir Isaac Newton and the presentation links together several items from the survey, which have a common theme related to Newton and Lincolnshire.

**Formats available:** PowerPoint version only.

### **7.2 Some aspects of Buckinghamshire astronomy**

The contribution of selected individuals with Buckinghamshire connections is summarised, including William Oughtred, William Herschel and other members of the Herschel family, John Lee, Rev William Rutter Dawes and Rev James Law Challis. The emergence of scientific and astronomical societies, especially in the C20<sup>th</sup> is outlined. Buckinghamshire observatories past and present are summarised.

**Formats available:** PowerPoint version available on request.

## **Appendices: General and supplementary information**

---

### **A Format of lectures and facilities required**

All lectures are illustrated with visual aids and it is requested that suitable projection facilities are available. Lectures are usually available in two formats:

- OHP transparencies with 35mm slides;
- PowerPoint presentation, which in some cases also require 35 mm slides.

Some newer talks are available as PowerPoint only. It is intended to prepare PowerPoint versions of all lecture titles. Where PowerPoint versions do not already exist, they are usually prepared in response to invitations from societies for that specific title to be presented.

Depending upon the format of the lecture, the following facilities are required:

- Data projector and laptop with PowerPoint; (The presentation is usually on a memory stick or CD.)
- Overhead projector;
- 35 mm slide projector; (This is essential with most OHP format talks and is also recommended for many of the lectures that are principally in PowerPoint format.)

It is also possible to present a small number of the lectures with 35 mm slides only. For further information, contact Dr Mike Leggett.

### **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 return<sup>1</sup> 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 return<sup>1</sup> will apply and an offer of overnight accommodation will be required.
- **travel by car:** Expenses are calculated based on a mileage rate of 28 p per mile<sup>2</sup>. 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.

---

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

<sup>2</sup> For lectures booked after 01 June 2008. Expenses for lectures booked before that date will still be calculated as previously agreed at the time of booking the lecture.

## **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.

## **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). He is currently coordinating the Local History of Amateur Astronomy project and, 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 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.

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.

For further details contact:

Dr Mike Leggett

Tel 01908 503692

E-mail: [mike.leggett@fsmail.net](mailto:mike.leggett@fsmail.net)