**The coming of the age of science and reason: The Scientific Revolution**

The Scientific Revolution refers to a period of historical change when there were remarkable breakthroughs in understanding the nature of the universe hitherto associated closely with magic. The period of the Scientific Revolution covers the sixteenth and seventeenth centuries, with some overlap at the beginning and end of the period. It is generally seen to have begun with the work of Nicholas Copernicus (1473-1543), who asserted a heliocentric (sun-centred) cosmos, and extended to the work of Isaac Newton (1642-1727), who proposed universal laws and a Mechanical Universe.

Before Copernicus there was a clear division between the world and the cosmos, one natural the other supernatural. Magic came from the realm of the supernatural but could have effects on the natural world. Newton joined heaven and earth by uniting terrestrial and celestial bodies under one set of universal laws of motion. This appeared to leave little, if any, room for the supernatural. This led to a growing acceptance amongst the educated elite of scientific experiment to verify or falsify which had a damaging effect on belief in magic and the supernatural.

**MAKING SENSE OF THE UNIVERSE AND ITS IMPACT, C1580–C1750**

Individuals such as Kepler, Galilei and Newton were part of the scientific revolution in Europe which undermined beliefs in magic and witchcraft and developed understanding of the universe. This revolution began with Nicholas Copernicus (1473-1543) and his *De Revolutionibus*, Copernicus' bold claim that the earth moves. This claim clearly ran contrary to tradition, to the authority of the Ancients and to established views in the universities and most church officials. Copernicus claimed that the earth is not fixed and stationary in the centre of the cosmos (geocentric and geostatic) but instead argued that it rotates on its axis each day and revolves around the sun each year.

Johannes Kepler (1571-1630)

* Kepler drew on the new astronomical observations associated with Tycho Brahe (1546-1601).
* Kepler was an astronomer who created a model of the solar system and his new theoretical modifications concerning planetary orbits and their motions developed understanding of the universe. Kepler’s focus on the importance of observation (1609) helped bring to an end belief in the supernatural.
* Like many of the leading figures in the advancement of science and reason Kepler still believed in arcane knowledge and aimed to confirm the power of astrology

Galileo Galilei

* Galilei’s contributions included observational astronomy through developments of the telescope. He argued for a separation of science from philosophy and religion. Scientists such as Galilei and their understandings of the universe were not supported by elites and the Catholic Church condemned Galilei in 1633.

Isaac Newton

* Newton’s *Principia* in 1687 formulated laws of motion and gravitation and built on Kepler’s laws.
* Newton was one of the leading lights in the advance of science and reason who still believed in arcane knowledge. Into the eighteenth century he remained fascinated by arcane knowledge and numerology in the Bible. This shows how many older beliefs current in 1580 lived on side by side with the new approach.

**THE CHANGING APPROACH TO HUMAN UNDERSTANDING AND KNOWLEDGE, C1580–C1750**

Changes in human understanding and knowledge played a significant role in undermining magical beliefs by influencing elite thinkers. Bacon’s empiricism led to the institutionalisation of science, Hobbes’ materialism influenced later sceptical writers such as Webster as well as judges like Sir Joh Holt whilst Locke reinforced a materialistic view of the world. Important publications by Hobbes in the 1650s and Locke in 1690 did much to shape a new consensus on the basis of knowledge

From 1660 changes in understanding and a declining belief in magic went hand-in-hand. It was this influence on the elite that made the changes in human understanding so important in attacking magical beliefs and changing the legal approach to witchcraft.

Francis Bacon and the empirical scientific approach

* Bacon epitomised a belief in empiricism which eradicated many popular supernatural beliefs.
* He also preserved a belief in magic by replacing deductive reasoning with inductive reasoning which was used by those who studied natural magic.
* The rise of a belief in empiricism was a gradual process and Bacon’s publications in 1605 and 1620 were highly significant.
* The growing interest in deductive logic had a damaging effect on many popular supernatural beliefs.

The foundation of Gresham College 1597

* The work of Gresham College and particularly the Invisible College (1645) contributed to the foundation of the Royal Society.

The foundation of the Royal Society 1662

* The Royal Society enjoyed enormous prestige and attracted the membership of the social and intellectual elite of England including the King.
* The Royal Society advanced the belief in experimental knowledge and was an effective propagandist for this approach. *Philosophical Transactions* (1665) shared scientific ideas both nationally and internationally. Sprat’s *History* stated astrologers deceived people and alchemists were fraudulent.
* One of its most important members was Isaac Newton and the Royal Society was responsible for the printing of his *Principia Mathematica* in 1687
* The Royal Society showed considerable interest and gave encouragement to the empirical study of mortality tables by Petty and Halley. Statistics and probability theory received a boost.
* Members of the Royal Society combined a belief in science with a belief in witches and demons. The Case of the Demon Drummer of Tedworth led to the publication in 1668 of a book defending belief in witchcraft by Joseph Glanvill, a member of the Royal Society. Other members such as Newton and Aubrey had magical interests.

Thomas Hobbes’s deductive reasoning and materialism

* Thomas Hobbes – deductive reasoning and materialism – agreed with Descartes that knowledge should be based on indisputable principles – materialism allowed no room for belief in the supernatural or magic – influenced Webster, Bekker and Holt
* Thomas Hobbes held a mechanistic view of nature, which was incompatible with a belief in witches and left no room for magic and the supernatural.
* Thomas Hobbes’ belief in materialism influenced the writing of John Webster and Balthasar Bekker who wrote sceptical books about witches in 1677 and 1691 respectively.

John Locke and his Essay Concerning Human Understanding 1690

* John Locke’s *Essay concerning Human Understanding* detailed the workings of the mind. Locke believed experience is the most important source of human knowledge.
* Like Hobbes he was a materialist and therefore made no allowance for the supernatural but said it was impossible to have certain knowledge of spirits.
* John Locke's Essay Concerning Human Understanding (1690) discounted the supernatural as it could not be proved
* John Locke shared Thomas Hobbes' belief in materialism, which led to a decline in belief in magic and witchcraft.

**THE COUNTER-ARGUMENT**

Despite the growth in knowledge about the universe and the changing approach to human understanding the Scientific Revolution cannot completely explain the decline in magical beliefs. Other factors besides the growth in scientific knowledge meant fewer accusations of witchcraft were made. Furthermore there is no simple direct correlation between science and the decline of magic.

* The decline in the years 1580-1750 was not steady – the decline was much more rapid after 1660 than before, but even in the 1660s the picture was confused with writers such as Joseph Glanville, a member of the new Royal Society, defending demonic intervention in the world.
* Scepticism existed before the writings of Newton, Hobbes and Locke, e.g. Reginald Scot’s *The Discoverie of Witchcraft* (1584)
* There remained widespread popular belief in magic and the supernatural. The Salem Witch trials in 1692 suggest that understanding of the universe was not widespread.
* Other factors besides the advance of understanding of the natural world contributed to a decline in beliefs in the supernatural such as the greater security brought about by the spread of insurance and improved economic wellbeing.
* Witchcraft acts continued to be enforced throughout the period showing that elites were slow to act on the findings of the scientists. Indeed the 1604 statute in England was not repealed until 1736.

**Key terms**

Empiricism – the idea that knowledge can only come about as a result of experience e.g. experiments.

Inductive reasoning – based on evidence – allows an original hypothesis to be proved false.

Deductive reasoning – conclusions are based on something already known or assumed – a rule that applies to one instance would apply to all instances – Aristotle is known as the father of deductive reasoning.

Materialism – the idea that everything is created by matter: a physical substance that occupies space and has a mass.

**Possible essay question**

‘Belief in magic and the supernatural declined steadily as genuine understanding of the natural world increased.’ How far do you agree with this statement about changing beliefs and ideas in Britain in the years c1580–c1750?