

5 Great Moments in Science: A lecture for students and Teachers in Science Extension.

1. Introduction: Science & Observation

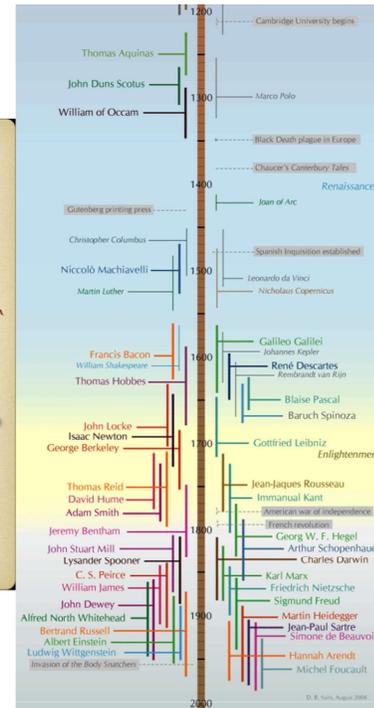
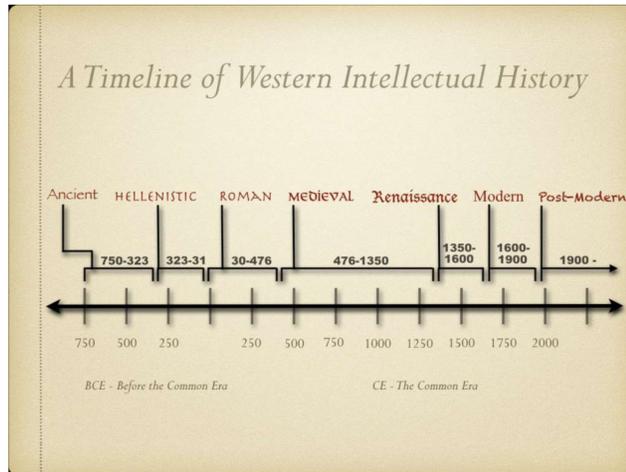
2. The Science Extension Course

- Our idea with 5 moments in science
- The syllabus dotpoints and the notation used during the lecture
- What we hope might be the value in this series

3. The History of Science

- **Indigenous Cultural Knowledge (1.1.7)**
 - Indigenous communities have for centuries drawn on native scientific knowledge to help them understand the world around them. Known popularly as Traditional Knowledge, this observational evidence is verified by elders and passed on to successive generations, largely as an oral tradition.
 - Indigenous Constellations - The Emu in the Sky is a well-known Kamilaroi dreaming story which is one example of Aboriginal and western astronomy connect. The Emu appears around late April to May as the dark spaces between the stars in the Milky Way. When the emu starts to rise in the sky, it signifies to the Kamilaroi Aboriginal people that it is time to collect emu eggs for food. The celestial emu starts to disappear around early June which indicates that the emu eggs have hatched and the resource is no longer available.
 - Seasonal Calendars -
 - Wurdi Youang site in Victoria - built to mark the position of the setting Sun at solstices (midwinter, midsummer) and the equinoxes. The sun sets over the three prominent stones at the apex.
 - Only Aboriginal site known to indicate significant astronomical positions on the horizon other than the cardinal points. A survey study shows that these alignments are accurate to within a few degrees.
 - Nearby sites have been carbon dated 11,000 years which would make it the oldest astronomical observatory in the world.
- **Egyptian**
 - Water clock (Amenemhat created the first water clock in the time of Amenhotep the First. The water clock enabled the Ancient Egyptians to measure the passing of every 12 hours, both night and day, winter and summer)
 - Rope trusses in sailing boats
- **Greek Knowledge**
 - Thales of Miletus, about 600 BCE first developed the idea that the world can be explained without resorting to supernatural explanations.
 - Anaximander, argued that since human infants are helpless at birth, if the first human had somehow appeared on earth as an infant, it would not have survived. Anaximander reasoned that people must, therefore, have evolved from other animals whose young are hardier.
 - Pythagoras' Theorum
 - Aristotle & Plato
 - Provoking Question: Were Aristotle & Plato the father's of modern science or were they a hindrance to it? Answer this question using your understanding of entrenched orthodoxy and paradigm shifts....
- **Chinese (gunpowder, printmaking, clocks, compass)**
 - Early in 14th century BC, decimal or base ten system was first developed by Chinese.
 - The first recorded observations of comets, solar eclipses, were made in China.

- The earliest inventions were abacus - base 10 numeral system
- Flying machines such as kites
- Kongming lanterns
- Clocks



4. Great Moment 1: A Cholera story (1.1.5; 1.1.8; 1.2.1)

- Dr John Snow and the Broad St Pump in 1854
- Paradigm shift

5. Great Moment 2: Michelle Simmons (1.2.1)

- In 2012, Michelle and her team created the world's first transistor made from a single atom, along with the world's thinnest wire.
- At the forefront of what she calls the "space race of the computing era", Michelle aims to build a quantum computer able to solve problems in minutes that would otherwise take thousands of years.
- This research has the potential to revolutionise drug design, weather forecasting, self-driving vehicles, artificial intelligence and more

6. Great Moment 3: Rosalind Franklin and Photograph 51 (1.1.5; 1.1.6; 1.2.1)

- Kings College London working on the X-ray crystallography of DNA
- Franklin died of cancer age 47 and was not awarded the Nobel Prize for the structure of DNA alongside Watson and Crick

7. Great Moment 4: Science and War – The Haber-Bosch process (1.2.1; 1.2.2)

- Fritz Haber was able to develop a process to break the trivalent bond and extract Nitrogen from the air. The opposite reaction made weapons.
- Carl Bosch upscaled the process for industry
- Issues of ethics in research

8. Great Moment 5: Stomach Ulcers (1.1.2; 1.1.5; 1.2.1)

- Australian Nobel Prize winning research conducted in the 1980s and awarded in 2005

9. Concluding remarks

Lecture 2, Monday 28 October

The philosophy of science: Epistemology and Scientific reasoning. – Dr Matthew Hill
RSVP essential - [RSVP here](#)

From <<http://www.barkerinstitute.com.au/Events/year-12-science-extension-public-lecture-one>>

Resources/ Reading List

Further reading & image sources relating to the history of Science

<http://www.localhistories.org/sciencetime.html>

<https://theconversation.com/confirmation-bias-a-psychological-phenomenon-that-helps-explain-why-pundits-got-it-wrong-68781>

Further reading & image sources relating to Indigenous Knowledge

<http://theconversation.com/aboriginal-people-how-to-misunderstand-their-science-23835>

<http://www.bom.gov.au/iwk/culture.shtml>

<https://blog.csiro.au/five-ways-indigenous-science-is-helping-us-understand-the-world-around-us/>

<https://www.australiangeographic.com.au/topics/science-environment/2017/07/a-guide-to-aboriginal-astronomy/>

<https://services.anu.edu.au/campus-environment/trails-tours/mt-stromlo-heritage-trail/australias-first-astronomers>

<https://www.biblesociety.org.au/publishing/our-mob-god-s-story/>

Further reading & image sources relating to Egyptian Cultural Knowledge

<https://www.museedelhistoire.ca/cmce/exhibitions/civil/egypt/egcs01e.html#targetText=Egyptian%20civilization%20%2D%20Sciences&targetText=While%20much%20of%20the%20world,their%20knowledge%20to%20monumental%20architecture.>

<http://www.ancientegyptianfacts.com/ancient-egyptian-clocks.html>

http://www.eternalegypt.org/EternalEgyptWebsiteWeb/HomeServlet?ee_website_action_key=action.display.module&module_id=5&language_id=1&story_id=19&ee_messages=0001.flashrequired.text

Further reading & image sources relating to Greek Cultural Knowledge

https://www.ancient.eu/Greek_Science/

<https://www.khanacademy.org/humanities/world-history/ancient-medieval/classical-greece/a/greek-culture>

Further reading & image sources relating to Asian Cultural Knowledge

https://www.newworldencyclopedia.org/entry/History_of_science_and_technology_in_China

Further reading & image sources relating to John Snow and the Broad Street Pump

<https://www.pastmedicalhistory.co.uk/john-snow-and-the-1854-cholera-outbreak/>

<https://www.ph.ucla.edu/epi/snow/snowcricketarticle.html>

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(08\)60978-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(08)60978-2/fulltext)

Further reading & image sources relating to Michelle Simmonds and Quantum Computing

<https://www.cio.com.au/article/666855/food-traceability-its-own-just-boring-fsc-co-founder/>

<https://www.abc.net.au/news/science/2019-07-19/quantum-computing-silicon-two-qubit-gate/11325424>

Further reading & image sources relating to Dr Rosalind Franklin and Photograph 51

<https://www.bbc.com/news/health-18041884>

<https://www.pbs.org/wgbh/nova/photo51/>

<https://www.explainthatstuff.com/great-physics-experiments.html>

Further reading & image sources relating to Haber Bosch Process

<https://ourworldindata.org/how-many-people-does-synthetic-fertilizer-feed>

<https://easychem.com.au/monitoring-and-management/maximising-production/history-of-the-haber-process/>

<https://www.sciencehistory.org/historical-profile/fritz-haber>

<https://medium.com/the-mission/the-tragedy-of-fritz-haber-the-monster-who-fed-the-world-ec19a9834f74>

Further reading & image sources relating to Dr Barry Marshall & Dr Robin Warren - 2005 Nobel Prize in Physiology or Medicine

<https://www.nobelprize.org/prizes/medicine/2005/press-release/>

<https://www.science.org.au/learning/general-audience/history/interviews-australian-scientists/professor-barry-marshall>

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(05\)67587-3/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(05)67587-3/fulltext)