GAME CHANGERS & CHANGE MAKERS

Moments of discovery

–game changers and change makers through the ages

national science week 2018

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Australian Science Teachers Association

An Australian Government Initiative

Inspiring Australia

Suggested ideas for how to use the 'Moments of discovery - game changers and change makers through the ages' chart

This resource has been created to provide teachers with practical ideas to use in conjunction with the 'Moments of Discovery – game changers and change makers throughout the ages' chart.

Activity 1
Interview with a change maker

"Global trends tell us that the jobs of the future will increasingly require science, technology, engineering and math (STEM) skills, with an estimated 75 per cent of today's fastest growing occupations related to STEM", ASTA President says.

Some of the greatest STEM minds are integrated into the National Science Week 'Moments of discovery' – game changers and change makers throughout the ages' chart.

Investigate some of these people by researching their life and accomplishments, and present your interview with one of them by listing the questions you would want to ask them.

Activity 2
It's all about the data

How can we communicate the data that is captured in the 'Moments of Discovery- game changers and change makers throughout the ages' chart in a way that creates interest?

Your task is to choose a range of data sets and communicate the range of discoveries made by game changers and change makers in a way that creates greater interest.

Choose a range of data visualizations to communicate your findings. For example, a data plot, column graph, line graph, sector graph, divided bar graph, frequency distribution table, or a stem and leaf plot.

Activity 3
How can we use technologies to communicate game changers and their genius to others?

Imagine Galileo Galilei, Madame Curie, Alessandro Volta and others having access to the same technology we have available today.

How far could their discoveries have spread across the world?

In this activity, use the 'Moments of Discovery- game changers and change makers throughout the ages' chart and pick a point in history that was a defining moment for a game changer or change maker, and share their discoveries with your generation.

How might you use today's technologies (for example, email, social media, blogs, Snap Chat, YouTube, virtual reality, or augmented reality) to broadcast your chosen game changer's discoveries?

Activity 4
Comic relief

Show your support for National Science Week and entertain your friends and family at the same time by creating a comic strip or animated video about game changers and change makers throughout the ages.

Activity 5
Build a game

Imagine a video game producer invites you to produce a scenario, develop characters and create a story about five game changers and change makers and their scientific discoveries.

Develop and produce an idea for a video game that features five individuals cited on the 'Moments of Discovery- game changers and change makers throughout the ages' chart.

Might your video game include challenges and rewards?

Activity 6
Chart a timeline

Throughout history there have been many individuals who have become famous for their accomplishments.

Choose individuals in the same scientific field from the 'Moments of Discovery- game changers and change makers throughout the ages' chart, research their accomplishments and make a presentation to a panel using a timeline.

Present ideas about how one discovery (for example, in medicine) helped or improved upon another discovery in the same field.

Activity 7
Project on a page

Each game changer and change maker cited in the 'Moments of Discovery- game changers and change makers throughout the ages' chart had a personal motivation that drove their discoveries, and they used their discoveries to solve real problems and create solutions for their societies.

Use the 'Moments of Discovery- game changers and change makers throughout the ages' chart to find those who created solutions for their societies and create a project on a page that communicates what their solutions led to...perhaps a product, a technology or a system?

Activity 8
Science as art

Game changers like Leonardo da Vinci and Einstein are often regarded both as scientist and artists. Similarly architects and engineers use art to illustrate their theories and designs.

Visualization methods provide an important tool in science for the analysis and presentation of scientific work. Images can often convey information in a way that tables of data or equations cannot convey.

Use the 'Moments of Discovery- game changers and change makers throughout the ages' chart to locate other game changers who may have used art to illustrate their theories, then create your own art work to showcase what you have found.

Moments of discovery–game changers and change makers through the ages

A selection of game changers and change makers and their discoveries can be found below.
These individuals have changed situations, activities and understandings in significant ways.

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Middle Eastern people make bricks from clay and also fire them in a kiln to make them hard and waterproof. Before this, bricks were made from mud and straw.	c. 3500 BC	
	c. 3000 BC	People of the Indus Valley discover how the fibres attached to cotton plant seeds could be woven into a fine fabric. They invented cotton cloth.
Ancient Egyptians design and make chairs with padded seats and four legs.	c. 2600 BC	
	c. 2000 BC	Mesopotamian people design and produce wheels with a rim, hub, and spokes.
Democritus suggests the existence of atoms, which are one of the smallest units of matter in the universe.	c. 440 BC	
	c. 355 BC	Pythias, a Greek biologist and embryologist, works on an encyclopaedia of specimens of living things.
Aristotle classifies, or groups, most of the animals known at that time.	c. 350 BC	
	c. 240 BC	Eratosthenes works out the size of the Earth.
Archimedes uses his discoveries in science to build war machines.	c. 213 BC	
	132	Zhang Heng invents an instrument for detecting earthquakes.
Hypatia of Alexandria is a Greek mathematician, astronomer, inventor and philosopher who lives in Egypt.	400	
	830	Muhammad Al-Khwarizmi publishes the first textbook about modern algebra. (Although he did not employ the kind of algebraic notation used today, he used words to explain the problem, and diagrams to solve it.)
Avicenna makes a complete guide to medicine.	1000	
	1250	Roger Bacon invents the magnifying glass.
Alessandra Giliani is an Italian scientist who is the first woman to be recorded in historical documents as practicing anatomy and pathology.	1320	
	1300s	Mercuriade is a female Italian physician and surgeon who is one of the first medical authors in the Middle Ages.
Nicolaus Copernicus publishes his theory that the Earth goes around the sun.	1543	
	1572	Tycho Brahe discovers a supernova, which is an exploding star.
Sophia Brahe makes astronomical observations that become the basis for modern planetary orbit predictions.	1573	
	1600	William Gilbert proves that the Earth acts like a magnet.
Marie Crous introduces the decimal notation to France.	1641	
	1609	Galileo Galilei observes moons through a telescope and proves that the Earth goes around the sun.
Johannes Kepler proves that the planets go around the sun in oval-shaped paths called orbits.	1609	
	1628	William Harvey proves that the heart pumps blood around the body.
Christiaan Huygens describes the rings around the planet Saturn.	1656	

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1673 — Antonie van Leeuwenhoek discovers microorganisms, which are tiny life forms.

1687 — Isaac Newton works out his laws of gravity (the force that holds you to Earth) and motion, also known as movement.

1690 — Elizabeth Hevelius is an astronomer who completes and publishes *Prodromus Astronomiae*, a catalogue of 1,564 stars and their positions.

1700 — Eleanor Glanville is an entomologist who collects some of the earliest specimens of butterflies, many of which survive in the Natural History Museum in London.

1715 — Sybillia Righton Masters invents and patents the corn mill.

1735 — Carl Linnaeus works out a way to group and name all living things.

1772 — Antoine Lavoisier shows that oxygen is needed for breathing and burning things.

1776 — Alessandro Volta discovers methane gas at Lake Maggiore, Italy.

1781 — William Herschel discovers the planet Uranus.

1785 — James Hutton establishes geology, which is the study of the Earth.

1786 — Caroline Herschel discovers her first comet. She went on to discover seven more.

1791 — Pierre-Simon de Laplace builds a mathematical model of the solar system.

1808 — John Dalton invents modern atomic theory based on the idea that all matter is made up of atoms.

1800 — Alessandro Volta invents the electrical battery.

1810 — Nicholas Appert discovers how to preserve food.

1811 — Mary Anning discovers the first complete Ichthyosaur (a fish-like marine reptile) with her brother Joseph.

1817 — Baron Karl von Drais de Sauerbrun invents the 'draisienne', the first two-wheeled, rider-propelled machine.

1823 — Mary Anning discovers the Long-Necked Plesiosaurus—the sea dragon.

1831 — Michael Faraday invents the electric motor and the dynamo.

1842 — Richard Owen invents the term 'dinosaur' for a group of reptiles that are no longer living.

1844 — John Gorrie builds a machine that uses compressed air to provide a cooling breeze. It eventually becomes the refrigerator.

1845 — Sarah Mather patents the first underwater telescope.

1849 — Walter Hunt invents the modern safety pin.

1851 — Lorenzo Langstroth develops the bee hive that is still used today.

1856 — William Thompson takes the first underwater photo using a watertight box.

1859 — Charles Darwin publishes his theory of evolution, which explains how species change gradually over time.

1859 — Gustav Kirchhoff improves our understanding of heat and light.

1864 — James Clerk Maxwell works out the laws of magnetism and electricity.

1865 — Claude Bernard shows how the body works as a system.

1865 — Gregor Mendel studies how plants pass on different characteristics, such as flower colour.

1866 — Alfred Nobel invents dynamite.

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1869 — Dimitri Mendeleev arranges the elements—chemicals made up of one sort of atom—to create the Periodic Table.

1872 — Ludwig Boltzmann publishes a mathematical theory relating particle motion to heat.

1876 — Martha Coston invents the signal flare.

1877 — Robert Koch proves that each disease is caused by its own particular germ.

1880s — Thomas Crapper mass produces the flush toilet.

1882 — Antoni Gaudi begins designing the La Sagrada Familia Cathedral in Barcelona, Spain and it still isn't finished.

1882–83 — Emily Warren Roebling is an American civil engineer who contributes to the completion of the Brooklyn Bridge.

1886 — Josephine Cochrane invents and patents the first mechanical dishwasher.

1891 — Eugene Dubois discovers the fossil of a human-like animal, which was probably our ancestor.

1892 — Washington Sheffield produces the first toothpaste sold in tubes.

1895 — Wilhelm Röntgen discovers X-rays, which allow us to see inside our bodies.

1897 — Joseph J Thomson discovers the electron, a tiny particle found in all atoms.

1898 — Marie and Pierre Curie discover the elements of radium and polonium, which lead to advances in medicine.

1899 — Johanna Mestorf becomes the first female professor of archaeology in Germany.

1900 — Max Planck discovers that energy exists in lumps, which he calls quanta.

1903 — Mary Anderson invents windscreen wipers.

1905 — Albert Einstein comes up with the theory of relativity, changing the way we think about time and space.

1907 — Ernest Rutherford shows that an atom has a tiny hard core, called a nucleus.

1907 — Alva Fisher invents the first electric washing machine.

1908 — Melitta Bentz invents the first coffee filter.

1912 — Alfred Wegener suggests that Earth's big land masses, the continents, have drifted apart over millions of years.

1913 — Niels Bohr develops a theory that explains the structure of atoms.

1914–15 — Alice Ball develops the chemistry behind the first modern treatment for leprosy.

1914–18 — Frances Micklethwait is an English chemist, who is among the first to study and seek an antidote to mustard gas during the First World War.

1919 — Alice Parker invents a system of gas-powered central heating.

1922 — Annie Jump Cannon develops the Harvard Classification Scheme for stars.

1925 — Erwin Schrödinger develops a mathematical theory about quanta, which are lumps of energy.

1925 — Werner Heisenberg proves that measurements of tiny objects cannot be exact.

1925 — Richard Bruce produces sticky tape by coating cellophane with glue.

1927 — George Lemaître develops a theory, later known as the Big Bang Theory, explaining the start of the universe.

1928 — Alexander Fleming discovers penicillin, a life-saving medicine used to treat infections.

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1929 — Edwin Hubble helps prove that the universe is expanding.

1930 — Linus Pauling discovers how atoms are bonded together.

1932 — Paul Dirac suggests that there is a material called antimatter, like matter, but with an opposite charge.

1936 — Inge Lehman discovers that the Earth has an inner core.

1939 — Otto Frisch and Lise Meitner discover that the core of an atom can be split into smaller parts.

1942 — Enrico Fermi builds the first nuclear reactor, helping to bring about nuclear power.

1945 — Percy LeBron invents the microwave oven.

1947 — Maria Telkes and Eleanor Raymond invent and design the first house powered by solar energy.

1948 — Richard Feynman develops an accurate version of quantum theory, which looks at matter and energy.

1951 — Barbara McClintock carries out pioneering work on genes, the biological instructions that make us what we are.

1951 — Rosalind Franklin is instrumental in the discovery of the structure of deoxyribonucleic acid (DNA).

1952 — Grace Hopper developed the first compiler for the A–0 System programming language.

1953 — James Watson, Francis Crick and Rosalind Franklin discover how DNA tells a body to grow.

1953 — Stanley Miller and Harold Urey recreate the conditions for life in a model of the early Earth.

1955 — Jonas Salk finds a vaccine for polio, an infectious disease.

1957 — Gertrude Elion and George Hitchings make a drug that allows doctors to transplant organs.

1959 — Frank Lloyd Wright designs the Guggenheim Museum in New York and it is constructed in 1959.

1960s — Doug Waterhouse of the CSIRO invents the insect repellent 'Aerogard'.

1960s — Stephanie Kwolek—develops Kevlar, a synthetic fibre that is used in bullet-resistant vests and crash helmets as well as sails used on sailing boats.

1961 — Yuri Gagarin is the first human to journey into outer space.

1962 — Rachel Carson fights for awareness and change in chemical regulations and government practices and publishes her book *Silent Spring*.

1963 — Valentina Tereshkova becomes the first woman in space.

1964 — Murray Gell-Mann further develops our understanding of the atom.

1965 — Arno Penzias and Robert Wilson observe radio waves that prove the Big Bang Theory.

1966 — Luna 9 lands on the moon and sends back the first close-up images of the moon's surface.

1967 — Jocelyn Bell Burnell and Anthony Hewish discover the first pulsar, a type of star.

1968 — CSIRO's research into polymer bank notes begins.

1969 — Neil Armstrong and Buzz Aldrin lands and walks on the moon's surface.

1970 — Venera 7 makes the first successful landing on Venus.

1971 — Ray Tomlinson devises a computer program for sending messages on the ARPAnet network. This would become email.

1973 — Jørn Utzon designs the Sydney Opera House and it is opened in 1973.

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1974 — Stephen Hawking proves that black holes in space 'glow', emitting a form of radiation.

1977 — Voyager 1 and Voyager 2 study the outer planets of the solar system.

1977 — Renzo Piano and Richard Rogers design the Pompidou Centre in Paris and it is opened in this year.

1981 — Gail Martin discovers a way to isolate embryonic stem cells and cultivate them in-vitro.

1983 — Francoise Barre-Sinoussi identifies the cause of AIDS.

1984 — Michael Green and John Schwarz develop 'string theory'. It aims to link quantum physics and relativity.

1986 — Adele Green undertakes landmark studies in the relationship between applying sunscreen and getting melanomas.

1988 — Harvard University received the first patent for a genetically modified animal.

1989 — Tim Berners-Lee creates the first part of the World Wide Web.

1990 — Thelma Estrin is a computer scientist and engineer who develops the pioneering work in biomedical engineering and is the first to apply computer technology to healthcare and medical research.

1995 — Michel Mayor and Didier Queloz discover the first planet travelling around a star other than our sun.

1996 — CSIRO's WLAN Project Team is granted a US patent for their wireless invention 'WiFi' that connects computers without wires.

1997 — James Dyson notices that the dust bags in conventional vacuum cleaners clog up quickly, and a few years later he markets the first bag-less vacuum cleaner.

1998 — Apple launches the Apple iMac with just two steps to set up Internet access.

2000 — Nance Dicciani designs the development of ultrasonic scanners for examining pregnant women.

2003 — NASA works out the age of the universe as 13.7 billion years.

2004 — Jerri Ellsworth invents the autodidactic (self-learning) computer chip.

2010 — Linda Spilker leads the Cassini mission's scientific investigations.

2013 — Takanori Takebe and colleagues grow a working liver from a single cell, the biological unit of living organisms.

2014–15 — CSIRO and Victorian biotech company Anatomincs produce a titanium heel bone implant using CSIRO's state-of-the-art Arcam 3D printer.

2015–16 — CSIRO scientists discovers lenses of interstellar gas in our galaxy.

2016–17 — CSIRO scientists design and build the Australian Square Kilometre Array Pathfinder.

2016–17 — CSIRO scientists develop an eReefs modelling framework that simulates and predicts the physical health of the Great Barrier Reef.

2017 — CSIRO scientists produce Australia's first carbon fibre.

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