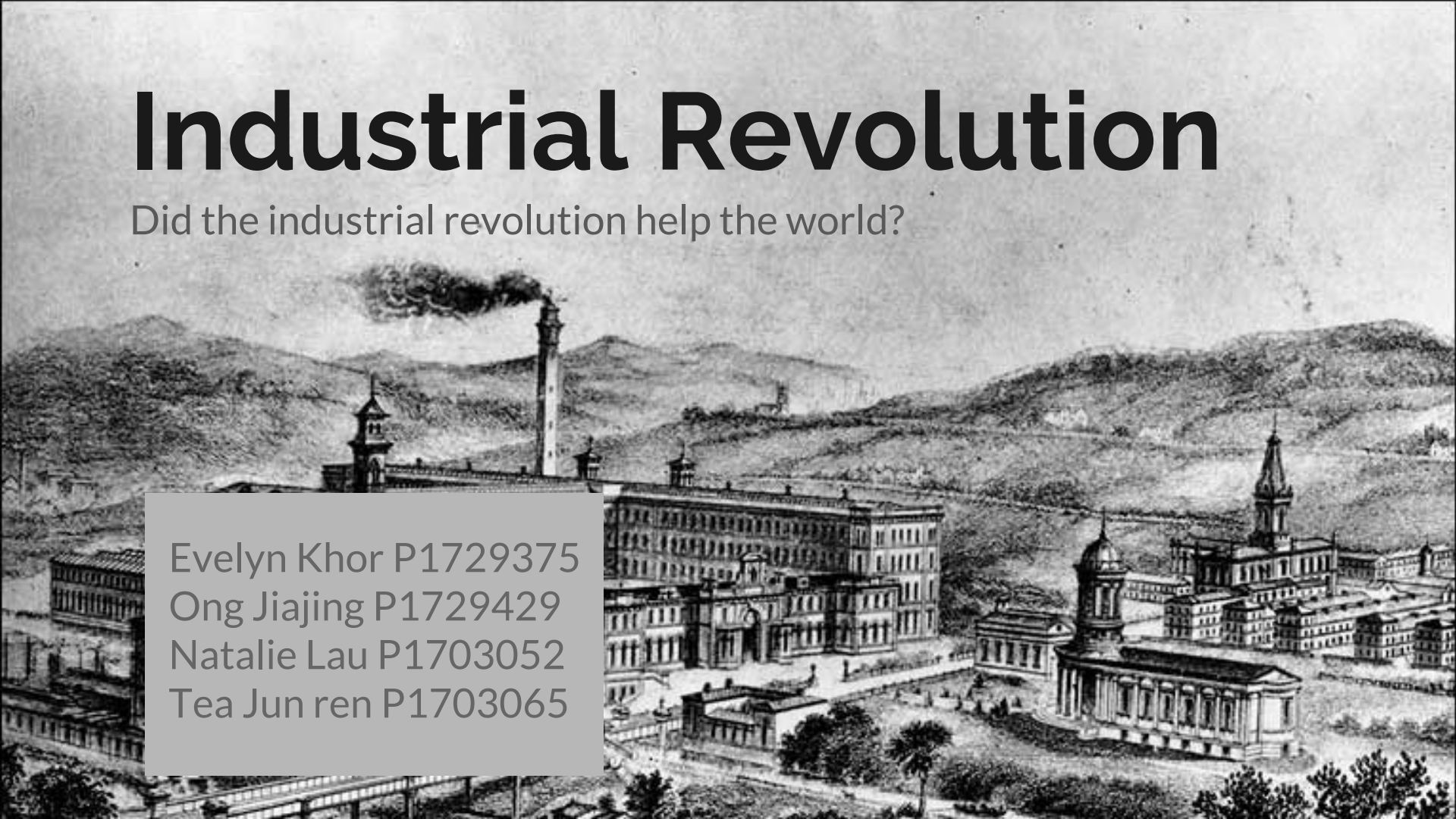


Industrial Revolution

Did the industrial revolution help the world?



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Background

Industrial revolution brought about many impacts - both positive and negative. In five main categories, economical, social, educational, environmental and political. It has brought about drastic changes to the world in terms of the above five categories.

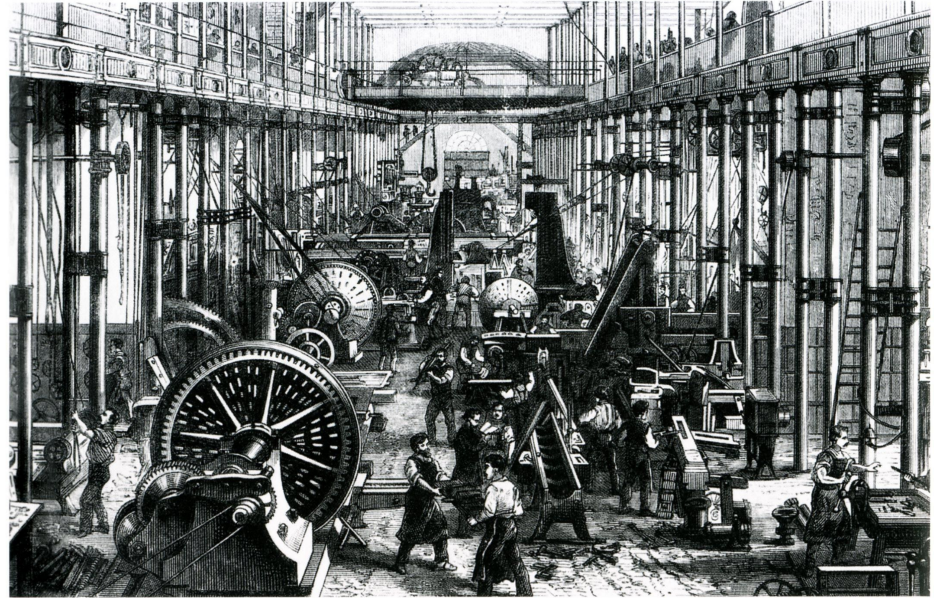
When? Mainly 18th to 19th century (it is ever ongoing)

Where? Started from europe (now, everywhere in the world)

What? Mostly technological and medical advancements

Industrial Revolution

- Industrial Revolution was confined to Britain
- The British forbade machineries created to travel overseas
- Profits were then made to use these machineries overseas



Industrial Revolution

- William and John Cockerill started industrial revolution in Belgium
- Belgium then became the first European country to become developed



ECONOMICAL

+ve: definitely helped the world's economy as it has reduced its reliance on man power which means they have more gain than loss.

Developments

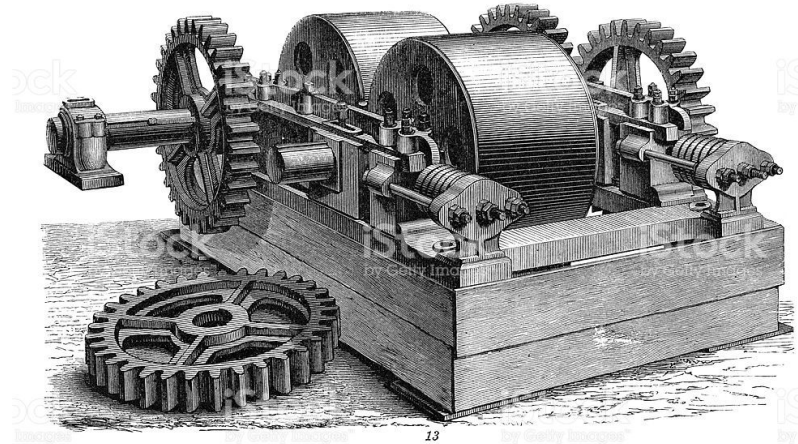
There were new organizational strategies to increase productivity.



BEFORE	Outwork System - Small parts of a larger production process were carried out in individual homes. - Mostly for the production of shoes and boots.	Market - Mainly homemade and hand-crafted products - Limited amount
AFTER	Factory System - Work was performed on a large scale in a centralised location. - For businessmen to hire people to operate machines in their factories.	Shopping centre - Mass produced, machine made products - Comes in masses

#1 Innovative Changes

- Invented things that were **powered (machines)** so that the rate of mass production could be increased (more things can be made at a faster rate)
- **Technologies** to produce/make raw materials that were difficult to acquire . (highly sought after)





Case Study: More Raw Materials

Bessemer process

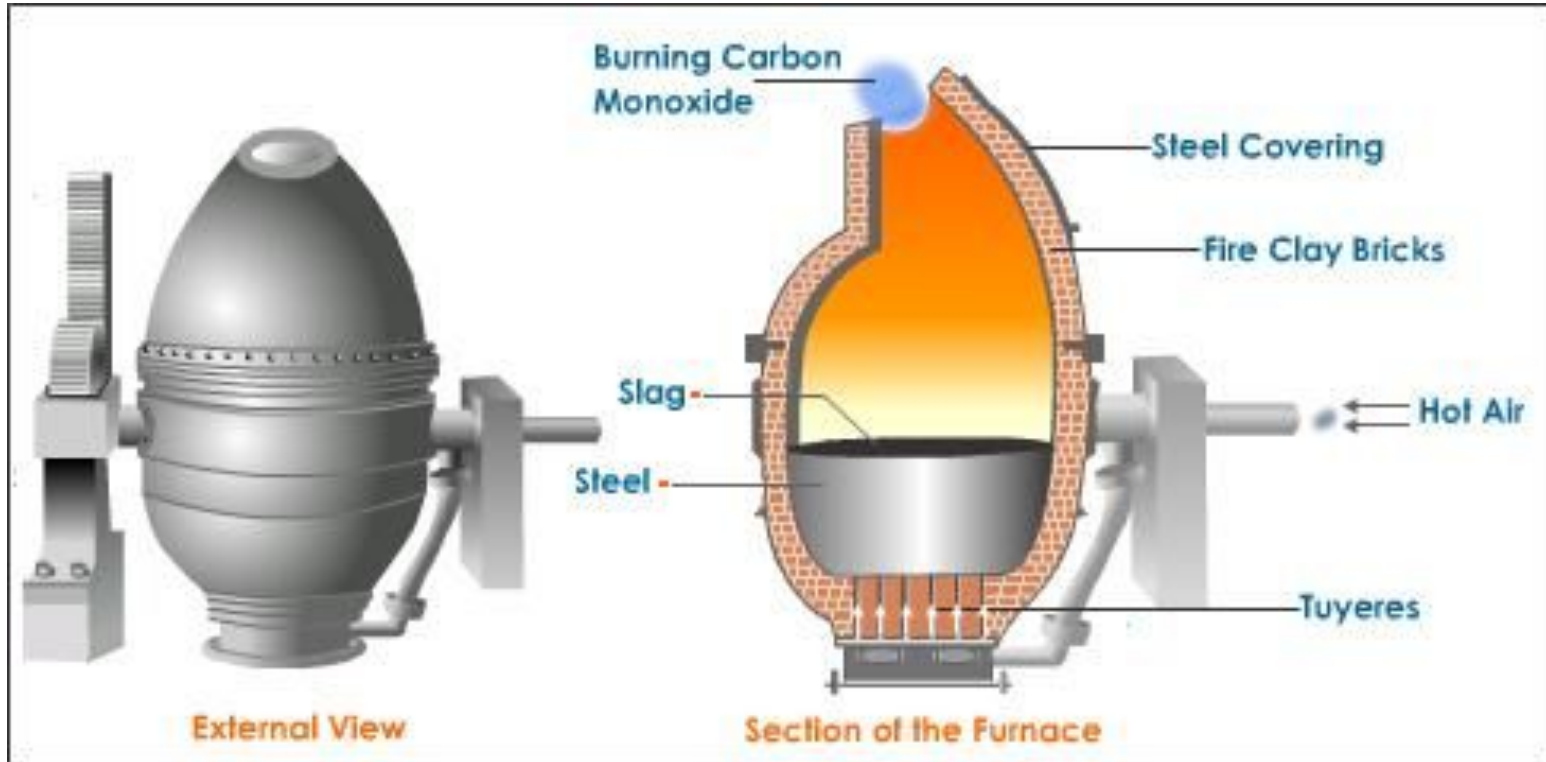
- Mass production of steel from pig iron by simply removing impurities from molten iron through oxidation

The bessemer process was a important factor in the revolution as it was:

- The key construction materials to significant inventions like machineries, steam engines, ships
- Cheaper than previous

This led to a high demand of steel thus boosted the economic gains of the metal industry.

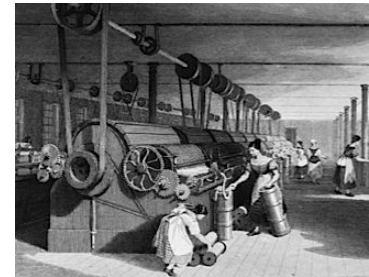
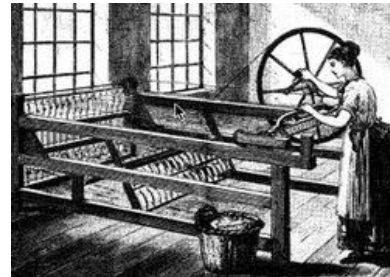
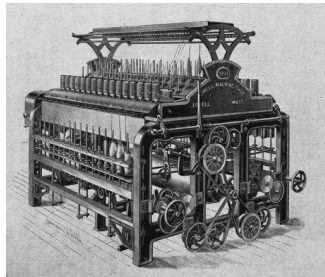
Bessemer converter, invented 1856



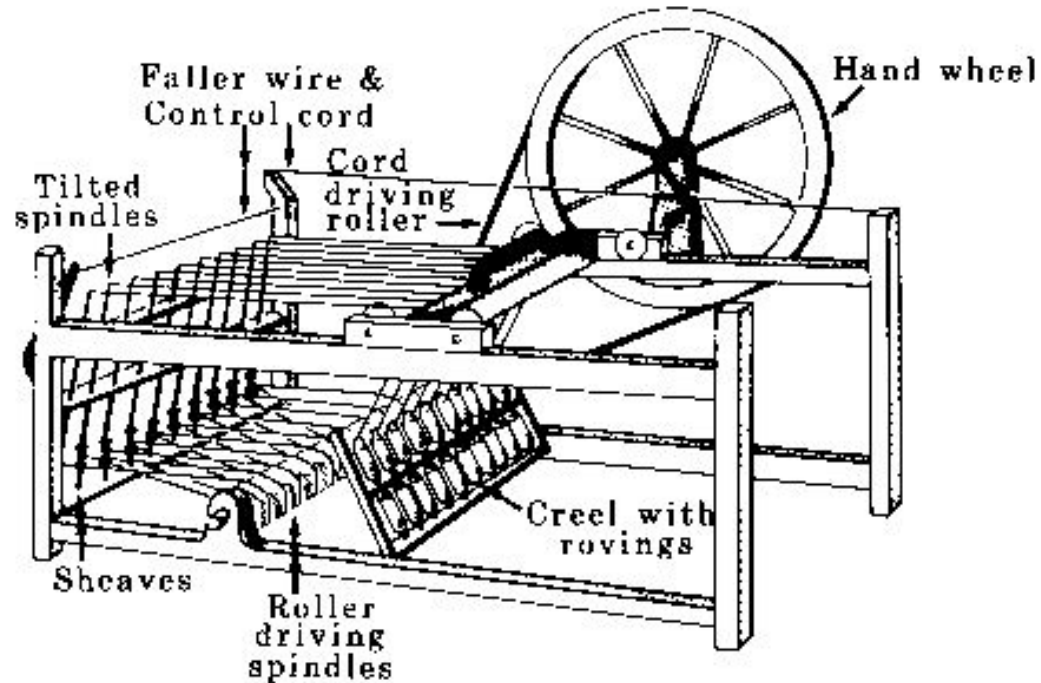
Case Study: increase rate of mass production

Industries such as **textile manufacturing**, **mining**, **glass making** and **agriculture** all had undergone changes.

- Textiles were primarily made of wool and were hand spun.
- The invention of the spinning wheel/loom reduced production time and cotton replace wool in the textile field
- Machines took the place of the artisans



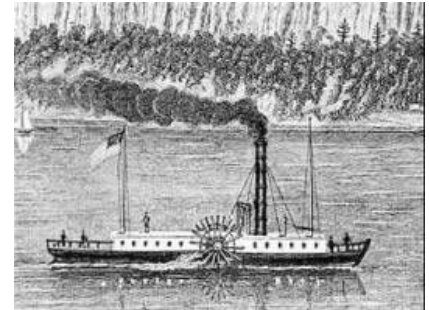
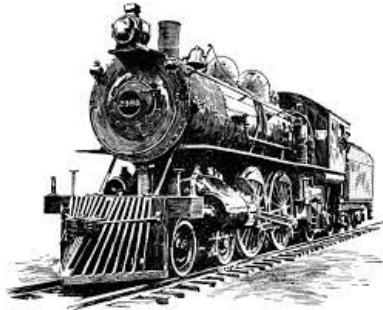
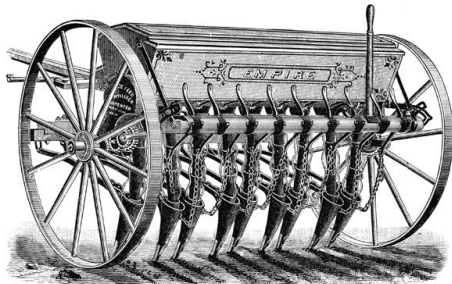
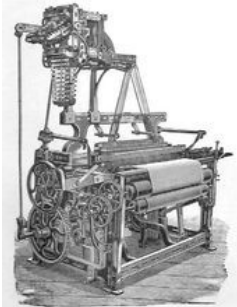
Spinning Jenny, invented 1764



Economic growth

With the use of equipments:

- Product were produced faster
- Affordable and Cheaper products since lesser human labour was needed
- Transportation of materials were also made easier and cheaper
- There were ways to transport items both on land and on sea



#2 Wage Labour

It is when people hire other people to work for money.

During the industrial revolution period, employers preferred female labour instead of male labour as

- It was a traditional male-dominated period at that time
- Women did not dare to fight back against them
- They can pay women lesser than what they pay men



Enhanced Wealth and Quality of Life

- Mass production reduced the cost of daily item
- New employment opportunities opened. People did not need to depend on land-related problems anymore
- Rising demand for manufactured goods allowed people to earn more money
- Working in factories paid better than farming



SOCIAL

-ve: overpopulating and bad living conditions has led to many diseases.

#1 Population Change

- Population grew by 57%
- Advanced in medical practices
- Improved lifestyle
- Population doubled into 2billion by 1927



#2 Child Labour

- To earn the most out of the business and reduce production cost, people starting outsourcing for cheap labours especially children.
- As kids were smaller in size, maintenance work in smaller areas can be easily done.
- Children were able to do what men did while being paid 1/10 of what men were paid.



#3 Poor public health

- Numerous people were living in the same house, diseases could spread easily.
- Lack of sanitation, as toilets were commonly shared by many people, waste are often left uncleared.
- No access to clean water



The advancement of medical science, cures, vaccinations and immunisation are now available for present day

- **Louis Pasteur, discovered principles of vaccination as well as concept of viruses**
- **Edward Jenner, discovered immunology,**

ENVIRONMENTAL

-ve: brought about destruction of the environment

#1 Air Pollution

- Coal was largely used in the manufacturing processes.
- Smog and soot are produced
- Respiratory related diseases increased
- Acid rain was produced



Case Study: THE GREAT SMOG, 1952

- Pollutants reacted with the fog in London
- The smog was almost opaque
- Dyed commuters face black
- Streets were covered in black goo
- 400 people died over a few days



#2 Water Pollution

- Water streams polluted by industrial waste
- Around 70% of waste are dumped untreated
- 500 Million tons of toxic waste are found in the global supply in 2007



Effects of Water Pollution

- Outbreak of Cholera, causing diarrhea and severe vomiting
- Around 57000 people died due to Cholera infection in Great Britain in 1832-1834



Case Study - China

- At least 70% of the water bodies in China are polluted
- Millions of citizens are forced to rely on these polluted waters



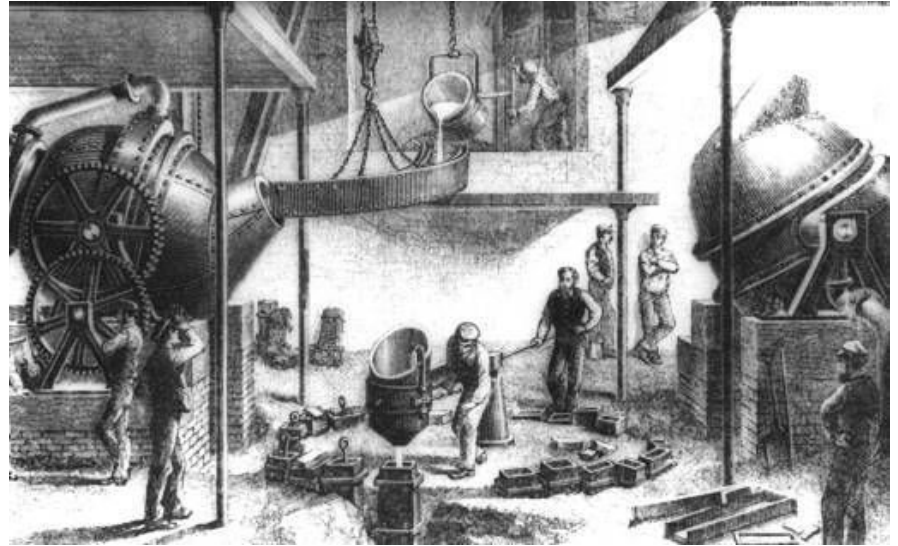
Mining of Coal

- Coal mining started in the 17th Century
- Process of coal mining damages the environment
(Railroads had to be built)
- Over 3000 coal mines were used in the UK in 1900s



Use of Iron

- Highly used in infrastructures
e.g. Railroads
- Coal is needed to produce iron



#3 Genetic Engineering & Our Food

- Genetically Modified Organisms is a controversial area in science.
- Genetic Engineering is used in many fields and many applications



Natural Genetic Modification

- Humans have been genetically modifying plants and animals for thousands of years.
- With each generation, those genes get more renowned. After thousands of years, almost every plant and animal are vastly different from its pre-domesticated state.



What's the difference?

- Selective breeding is basically hoping for lucky hits. Genetic Engineering eliminates this factor
- Possibilities of increased fruit size or even making it immune to pests.



Gene Flow

- GM crops and Non-GM crops could mix and increase unwanted characteristics
- Cases of GMO crops were found in natural crops area



Is there any danger in eating GM Crops?

- GMO plants are checked for possible dangers and the results are evaluated by multiple agencies.
- Eating GMO plants are no more risky than their Non-GM counter part.



Plants that are modified to be toxic

- Some engineered plants could produce a protein that destroys the digestive system of specific insect pests.
- The plant produces its own pesticides. Pesticide sprays can be washed off while the poison in BT crops is inside the plant.



Criticism and the potential of this Technology

Much of the criticism of modern technology is actually criticism of modern agriculture and a business practice of the huge corporations that control our food supply.



EDUCATIONAL

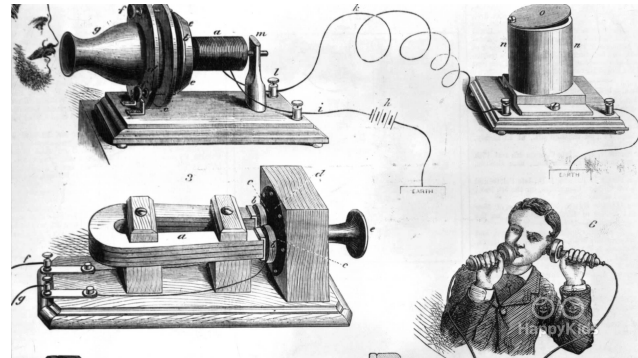
+ve: definitely brought about more knowledge to the world

#1 Discoveries of new ideas and concepts

- Industrial revolution was not only a period of technological boom but also ideas started becoming more creative.



Wright brothers invented the first airplane during the industrial revolution



The study of transmitting telegraph message and sound waves have brought Alexander Graham Bell to the invention of telephone.

#2 Scientific advancements

- Invention of the CRISPR-Cas9 gene drive
- Research jumped ahead as scientists could make precise genetic change to a wide variety of insects.

One specific insect that causes the widespread of diseases would be the Mosquito.

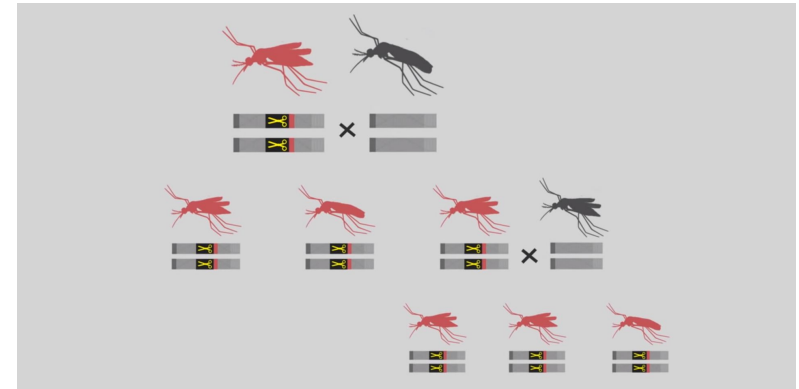
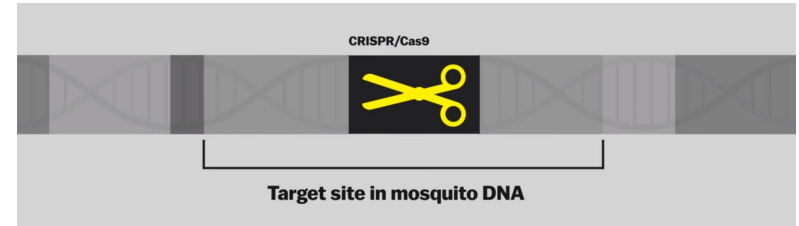


A **CRISPR-Cas9** gene drive system targeting for reproduction in the malaria mosquito vector *Anopheles gambiae*

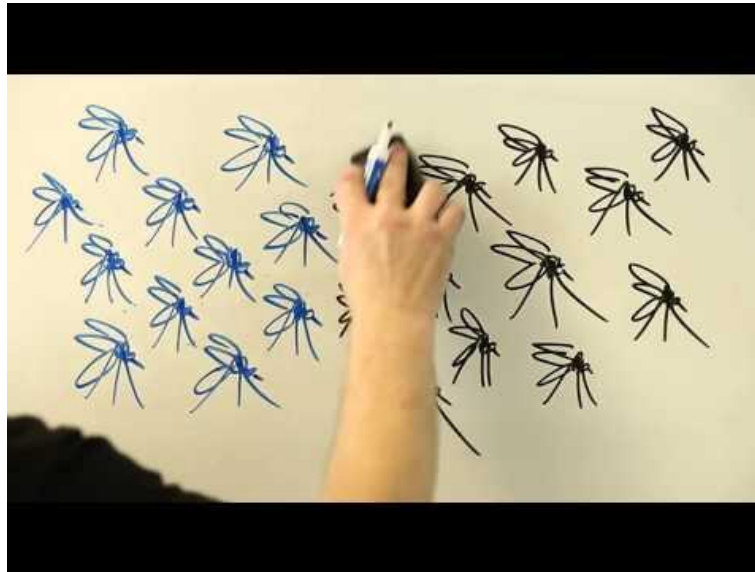
Andrew Hammond¹, Roberto Galizi¹, Kyros Kyrrou¹, Alekos Simoni¹, Carla Siniscalchi², Dimitri Matthew Gribble¹, Dean Baker³, Eric Marois⁴, Steven Russell³, Austin Burt¹, Nikolai Windbichl¹, Andrea Crisanti¹ & Tony Nolan¹

How does it work?

- Inserting the gene editing tool itself into a chosen segment of the mosquito's DNA.
- When the gene editing tool is on both chromosomes, it will get passed down to their offspring and so on



How does it work



1.00- 2.51

Risks & Unwanted Consequences

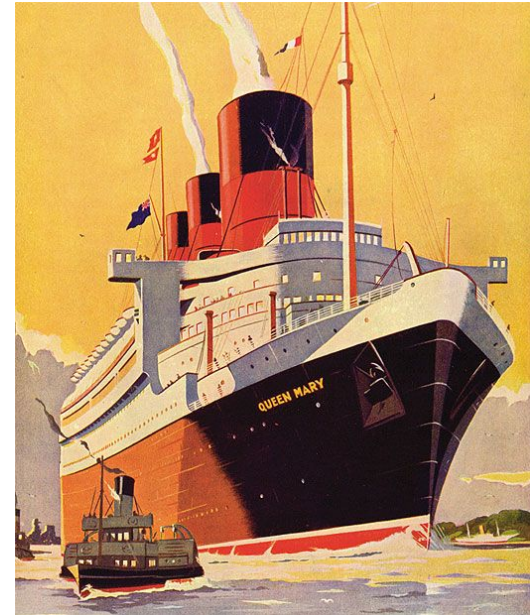
- It might not work or the parasite adapts in a negative way.
- Technology such as Gene Drive needs to be handled with a lot of care.



**HOW DID IT AFFECT
SINGAPORE?**

Invention of Steamships

- Trading opportunities were increased
- More ships could easily reach Singapore's port
- Singapore became a rest spot for ships that are traveling a large distance.
- Ships will stop here to refuel, restock food supplies and sells items
- Increase the importance of Singapore to the world, and improved trade for Singapore



Better Communication

- With the invention of the internet, information of the world could be passed easily
- Letters that could've taken months to receive could now takes minutes



Manufacturing

- Factories were used to produce fishing net, matches and mosquito coils
- Intense labour industries reduced human labour
- Singapore became the leader producer in hard disks drives



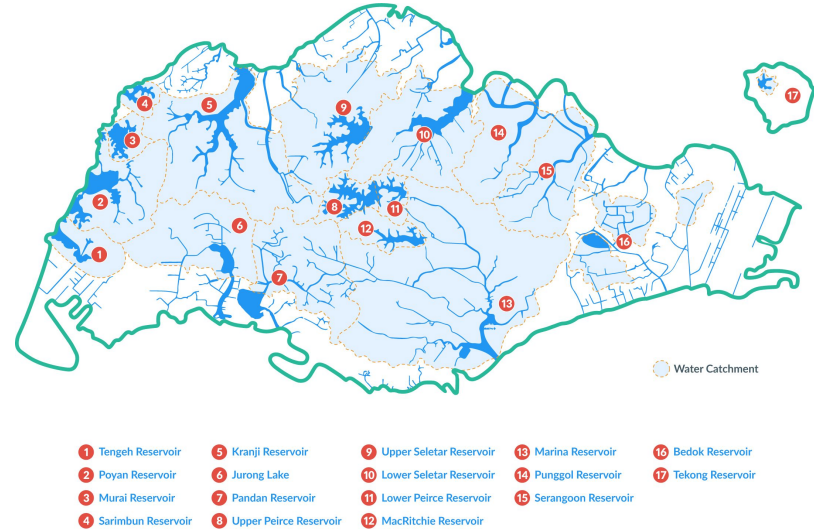
Industrial Estates 60s

- Attraction of labour intensive industries
- Increase in economic growth and increase in number of jobs
- 2 types of industrial estates were planned



Industrial Estates 70s

- To build on the factors in the 60s
- Get rid of unemployment
- Petroleum Industries were built in offshore Jurong to boost economy
- Industries like furnitures and shipyards developed



Industrial Estates 80s

- Upgrade the industrial economies modernize
- Focus more on technological industries, well trained workforce
- Introduction to science and business parks





Q&A

How did Industrial Revolution change the way the world works?

How did Industrial Revolution affect the environment? What were the consequences caused and are we able to salvage these damages?

Was the discovery of science through industrial Revolution beneficial for us?

How did Singapore's industries change after being affected by Industrial Revolution?

END