

# Power and Speed

The key to moving faster in the water is reducing **water resistance**, the pushing force the water makes against the boat. This is why boats often have a streamlined shape with a **v-shaped hull** (bottom).

**Cargo ships** are designed for stability and to carry the maximum amount of cargo so has a square-shaped hull; speed is not the priority here.

**High speed racing yachts** that are specially built to win races and set speed records don't look like ordinary boats. They are trying to get as much power as possible from the wind and skim across the top of the water, reducing water resistance.

**Engine-powered racing boats** can travel as fast as racing cars on land. They often have propellers at the water's surface, called surface-piercing propellers. As only part of the propeller is underwater the boat can go up to 30% faster than boats with underwater propellers. As they speed up they rise higher until sitting on top of water, touching it only at 3 small points, again reducing water resistance.

Spirit of Australia



## Fun Facts:

- The Guinness World Record for the fastest boat in the world is held by the jet-powered hydroplane **Spirit of Australia**, captained by Ken Warby, which reached 511.09km/h (317.58mph) in 1978. However, it is estimated that the boat may have gone even faster a year earlier.
- Sailing boats cannot reach the same speeds as motor speedboats, but they can still travel very fast. The world speed sailing record was set by Paul Larsen in 2012. His **Vestas Sailrocket 2** boat reached 121.1 km/hr (75.2 miles/hr). That is faster than cars drive on the motorway!

Vestas Sailrocket 2



# When Were the First Boats Built?

The oldest discovered boat is the **Pesse Canoe** constructed around 8000 BCE. That is around 10,000 years ago!

We know that boats were actually used much much earlier. A rock carving from about 10000 BCE shows a large reed boat and **Aboriginals** may have used sea-going rafts to first reach Australia 55,000 years ago!

Did the predecessors to man also build boats? Probably as they had the tools to.

*Did you know? Ancient Egyptians didn't have nails, but we have evidence of large sailing boats in Egypt in 4000BC. How did they keep boats together? The ingenious Egyptians used short planks hooked together then tied tightly with ropes.*



**Left:** The Pesse Canoe can be seen preserved in the Drents Museum in the Netherlands

**Right:** Rock carvings depicting boats have been found in Egypt. These are estimated to be over 60,000 years old!



# Environmentally Friendly Boating

## Eco Energy

Many boats use diesel engines, which means they are creating a lot of air **pollution** and pumping out **carbon dioxide** into the atmosphere, which contributes to **climate change**. The less boats rely on **fossil fuels**, like diesel, for energy the better for the environment.

- **Solar power** uses energy from the sun. In May 2010, the Tûranor PlanetSolar was the first solar powered boat to travel the world! It was topped with solar panels which convert sunlight to electricity by solar cells, which are used to power an electric motor.
- **Wind power** is harnessed by sails, so a sailing boat does not require an engine.
- Wind power is also harnessed by wind turbines on some boats, that turn and help generate some of the boat's electricity.
- There different types of fuel a ship's engine can use and some are better for the environment than others.
- Some ships, like *The Purrpoise*, are now combining wind and/or solar power with fuel engines, to reduce the amount of fuel they need to use.

*Did you know? Ships produce huge amounts of air pollution. One large ship produces as much Sulphur as 50 million cars!*

## Shape Up

By having a streamlined shape, boats need to use less power to move, as there is less water and air resistance pushing them backwards. This means they need to use less energy from fossil fuels. *See Power and Speed.*

*Fun Fact: Animals can be streamlined too! Sharks and dolphins, for example, are the perfect shape for swimming fast through water.*



## Radical Recycling

Just like *The Purrpoise*, boats can be made using recycled materials. There have been boats made from recycled metal, wood and even, more recently, plastic.

*Fun Fact: The colourful Flipflopi is a sailing boat made from 30,000 recycled plastic flip flops that were thrown away! This amazing boat made its first journey down the East African coast in. It is promoting the Clean Seas campaign, which is trying to end ocean litter-*

*Fun Fact: The company with the world's leading wind propulsion technology is actually from Finland, Tiikat's home country!*

# Environmentally Friendly Boating

## Slow Down!

Ships and boats can slow down to help reduce harm to the environment, something Captain Turso forgot! More and more ships are reducing their speed to help.

Travelling just a bit slower means that a ship is much less likely to strike **whales**. By slowing down a vessel also decreases the noise it produces. This **noise pollution** can be harmful to animals, especially whales. The noise can damage their hearing and reduce survival rates. Most of the underwater noise from shipping comes from the propeller. Slowing down and making the propeller work less hard reduces the noise.

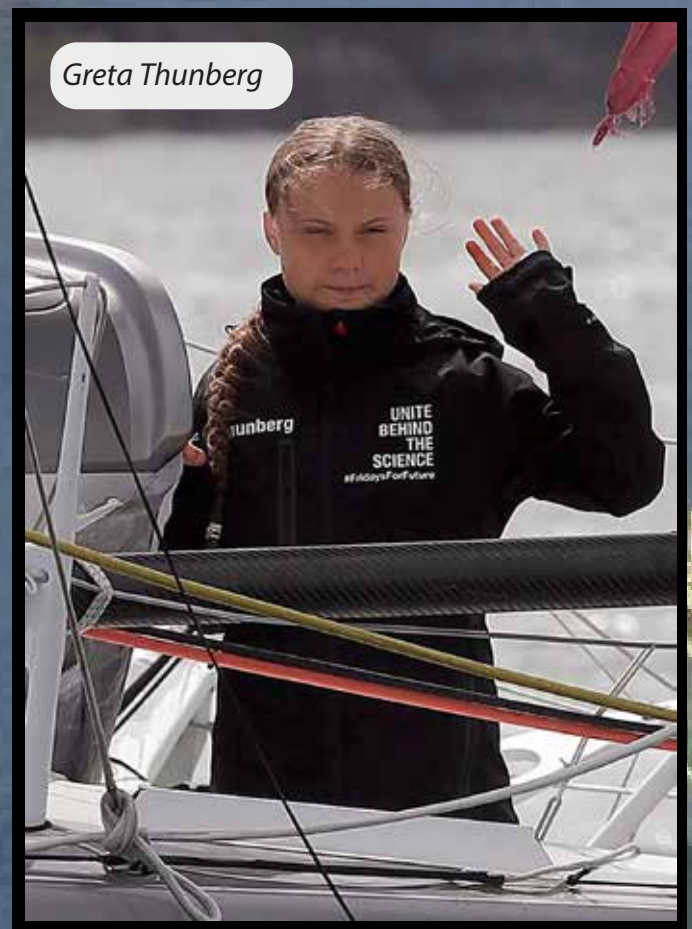
To travel faster a ship or boat uses more power, which means they may use more **fossil fuels** contributing to **air pollution** and **climate change**.

*Did you know? If speed is reduced by 10% it would reduce underwater sound from shipping by around 40% and cut the whale strike risk in half!*

## Go Greta!

You may have heard of **Greta Thunberg**, the teenage climate activist from Sweden. In 2019 she set sail across the Atlantic Ocean in a carbon-neutral boat. This means her trip did not release more carbon dioxide, reducing the harmful impact on the environment. She was travelling to the Americas as part of her dedication to educate the world about climate change and persuade people to take action.

*Fun Fact: Greta was only 16 when she embarked on this 2 week trip across the Atlantic Ocean! Her activism has inspired millions of people, led by children, to fight climate change. This shows how powerful one young person can be!*



Greta Thunberg

# What is Marine Conservation?

**Marine** means relating to or found in the sea.

**Marine Conservation** (also known as Ocean Conservation) is the study of marine plants, animals and **ecosystems** for the protection and preservation of them. This means that marine conservationists work towards preventing the **extinction** of **species**.

People are the biggest problem when it comes to protecting our marine world. This is partly due to litter and chemicals washing into the seas.

We can all do something to help by making sure we dispose of litter properly and reducing how much plastic we use. For example, we can make sure we drink from reusable water bottles and using reusable bags for shopping. The ocean is home to many wonderful creatures.

We wouldn't go to a friend's house and fill it with rubbish, and we need to treat the homes of these ocean creatures with the same respect.



*Two Marine Conservationists hard at work*



*A poor sea turtle tangled in a plastic net*

*Did you know? Every day 8 million pieces of plastic pollution find their way into our oceans! Plastics make up 80% of all ocean litter.*



*Plastic makes up 80% of all ocean litter*

# Fishing

Fish is a very **healthy** source of protein and contains fish oils which are good for all sorts of things, including the brain and heart. For some people it is essential for survival. If you are going to eat fish it is important to eat **sustainably sourced** fish to prevent overfishing of **endangered** species.

Fishing can be a big problem for oceans, particularly when big **trawlers** use nets to take up huge amounts of fish. If this continues won't be enough fish left in the oceans. Also, animals like dolphins, whales and turtles can get caught or tangled in the fishing nets and die (they are called the '**bycatch**' as they are not what the fishermen are trying to catch).

Small fishing boats are much better for marine life, as they limit the damage on the seas.

**Hand-line** caught fishing is the best, which uses a rod not a net. Small fishing communities also don't want all the fish caught by trawlers as there is not enough left for them.

The largest fishing vessels are whaling ships. These are used to catch whales and process the meat. Whales have been hunted almost to extinction, so whaling is now banned by most countries.

*Did you know? Sadly, over 300,000 small whales, dolphins, and porpoises die each year from entanglement in fishing gears*



Trawler boat



Fish hand-caught with line



Whaling ship

# Coral

## Do trees grow underwater?

No, but corals can look like trees and coral reefs are sometimes called 'rainforests of the sea'.



Coral reefs are living structures made up of tiny creatures called polyps and are home to millions of fish and sea creatures. The shape of a coral depends on the type of polyp it has



## What lives on a reef other than fish?

Octopus, squid, turtles, starfish, urchins, sea slugs, sponges and more! Other animals visit, such as dolphins, to feed on the fish.



Bleached coral

## Why is some coral white?

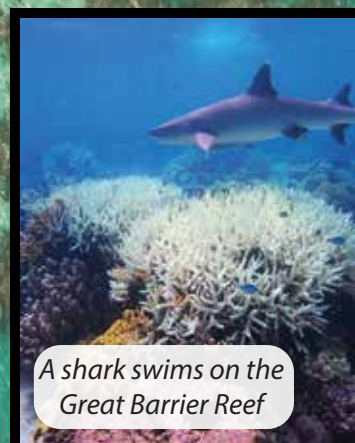
Most coral is colourful but when it dies it turns white or grey. This is called **bleaching** and is due mainly to dirty or too warm water. Coral reefs need lots of sunlight and clean water to grow and sea pollution is very damaging to it.

Ocean parks are set up to look after the coral reefs, to stop people damaging it or catching the fish there. It is very hard to restore damaged coral as it only grows very slowly. Naturally detached coral (e.g. from a storm) can sometimes be used as **coral donors**. This means they are taken from one place to another to help **regenerate** coral growth in an area.

*Fun Fact: Christmas tree worms also grow on reefs - their feeding tentacles look like christmas tree branches!*



Christmas tree worm



A shark swims on the Great Barrier Reef

*Did you know? The Great Barrier Reef is so big it can be seen from space! At over 2000 km long it is the largest structure built by living creatures.*

# Heroic Little Boats

History is full of stories of normal people taking part in heroic rescues.

## Little Ships of Dunkirk

About 850 private boats, including pleasure boats and fishing vessels, sailed to Dunkirk, in northern France on a rescue mission during the Second World War! They sailed from Ramsgate in England between 26 May and 4 June 1940 as part of Operation Dynamo.

These incredible boats helped rescue more than 336,000 British, French, and other **Allied soldiers** who were trapped on the beaches at Dunkirk during the war.

*Did you know? Tamzine was the smallest boat involved, at only 4.6m (15ft) in length! It is now on display now at the Imperial War Museum in London.*



Dunkirk evacuation



Tamzine



Kerala rescue boat



A rescuer in Kerala carries a child to safety

## Kerala, India

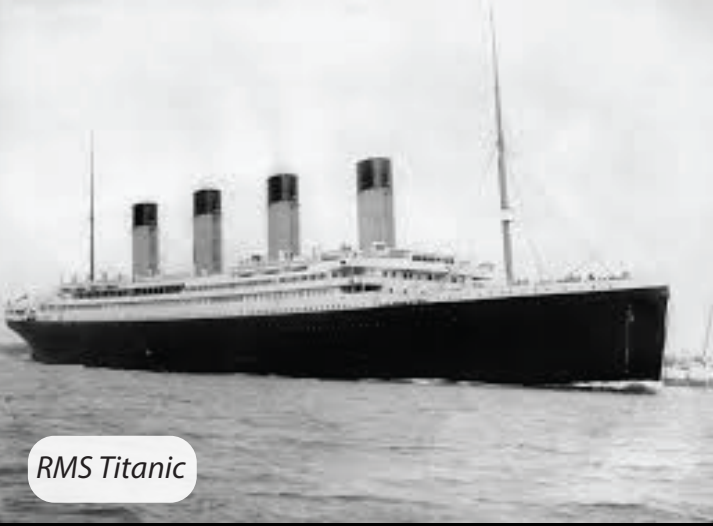
In 2018 Kerala was hit by the worst floods in a century (100 years). Luckily hundreds of fisherman joined the rescue effort, reaching people before the official rescue teams could. In the end tens of thousands of people were rescued by these fishermen!

*Did you know? While the official Army, Navy and National Disaster Response Force teams had to stop their own rescue missions at sundown for safety reasons, local fishermen worked into the night with headlamps and basic tools. What heroes!*



# A Sinking Ship: *The Titanic*

The *RMS Titanic* is probably the most famous ship in history. As the most impressive and luxurious ship of her time, 100,000 people watched her launch. However, her fame skyrocketed further when she hit an iceberg and sank. There was even a huge Hollywood film made in 1997, about her sinking!



*RMS Titanic*



*One of the luxurious rooms inside the Titanic*

## **Fact Sheet:**

1. The Titanic was the world's largest passenger ship of its time. It was 269 metres (882 feet) in length and 53 metres (175 feet) in height.
2. The Titanic had a crew of around 900 people.
3. The Titanic's intended course was from Southampton, England to New York City, USA.
4. It was a luxury passenger liner that carried some of the world's richest people, as well as others looking for a new life in North America.
5. Life on board the Titanic depended on who you were and how much money you had.
6. First class was located at the top of the ship and they had access to lots of facilities, like cafes, a swimming pool, squash courts and a kennel for first class dogs.
7. Third class facilities were much more basic. Located at the bottom of the ship, cabins slept up to ten people. All 700 third class passengers had to share two bathtubs!
8. It left Southampton on April 10, 1912 and stopped at destinations in France and Ireland before heading west towards New York.
9. It collided with an iceberg and sank on April 15, 1912.
10. One of those lookouts did in fact spot the iceberg, but not with enough time to avoid a collision, since it was a moonless night and Titanic was travelling at close to her maximum speed.
11. While the Titanic carried over 2200 people, there were only enough lifeboats for around 1200 of them.
12. Over 1500 people died because of the sinking.
13. The remains of the Titanic wreck sit on the sea bed over 3780 metres (12400 feet) beneath the surface.

# A Sinking Ship: *The Titanic*

## Could more lives have been saved?

There have been many things that could have happened differently, perhaps preventing such a tragedy. Here are a some of them:

- The ship could have had more lifeboats.
- The Titanic could have been constructed with a double hull.
- The ship's watertight bulkheads could have been extended and fully sealed to reduce the risk of flooding.
- Captain Smith could have responded to all the ice warnings the ship received by slowing down or stopping completely and waiting for daylight. The Titanic continued to cruise ahead at full speed.
- The wireless (radio) operators could have passed on the ice warnings with more urgency. Unfortunately, the ice warning from close by ship SS Californian came right at the time that the Senior Wireless Operator was attempting to get through a backlog of passenger messages.
- SS Californian was the closest ship in the area and could have saved many or all of the lives that were lost, had it responded quickly to the Titanic's distress rockets.



Captain Smith



Titanic wreckage



A corridor inside the shipwreck

# Mutiny!

Rebellions have occurred on many ships. The most famous one story is probably known as the **Mutiny on the Bounty**.

The mutiny on the *HMS Bounty* occurred in the south Pacific on 28 April 1789. Here, the majority of crewmen seized control of the ship from their captain, **Lieutenant William Bligh**.

Bligh and his remaining 18 supporters ended up travelling a massive 3,500 nautical miles (6,500 km; 4,000 mi) in an open boat to safety! The boat was dangerously loaded and initially only carried five days' food and water, so it is remarkable that they managed it and survived!

**Fun Fact:** The famous Portuguese explorer **Ferdinand Magellan**, who led an expedition to circumnavigate (go around) the Earth in 1519 had to quell a rebellion by three of his five captains!

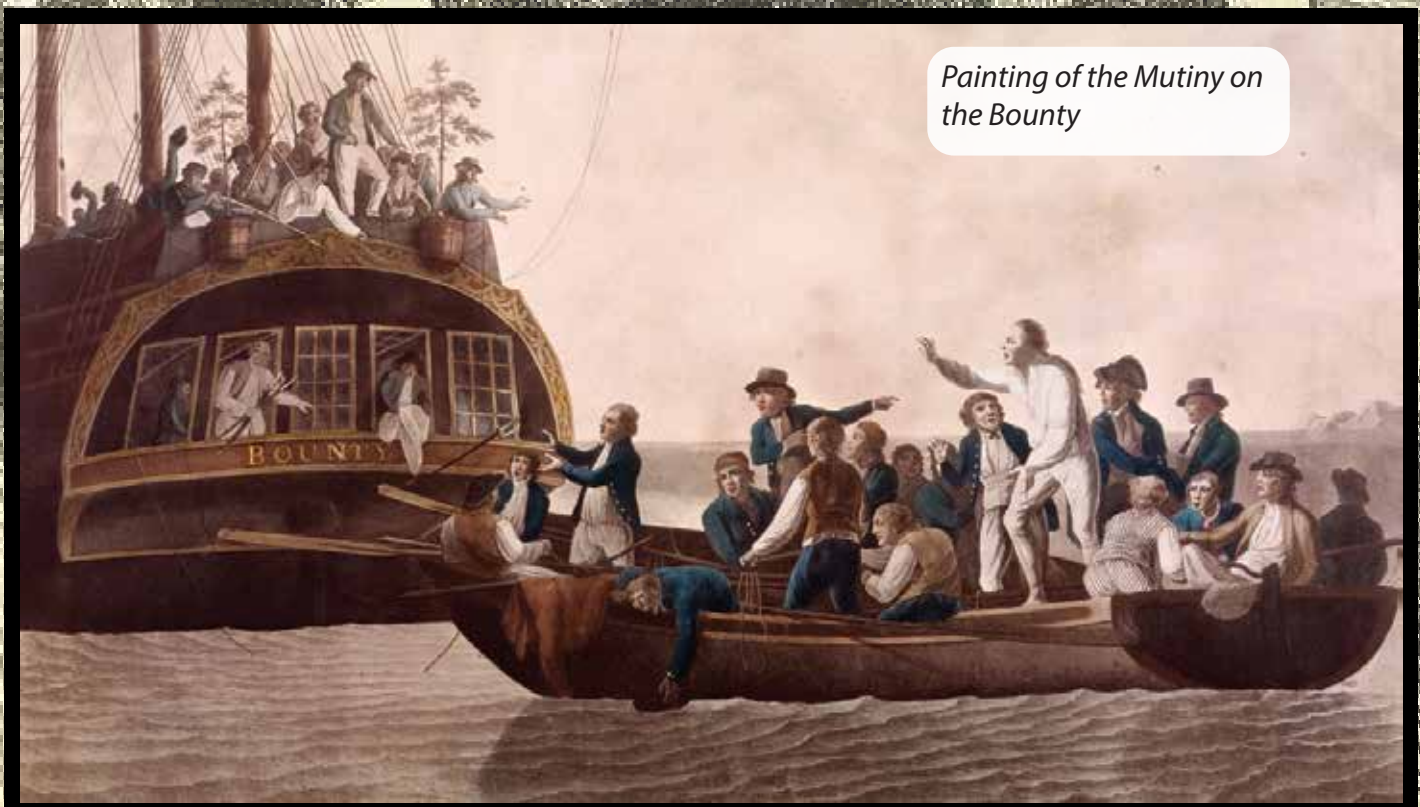
Lt. William Bligh



Ferdinand Magellan



Painting of the Mutiny on the Bounty

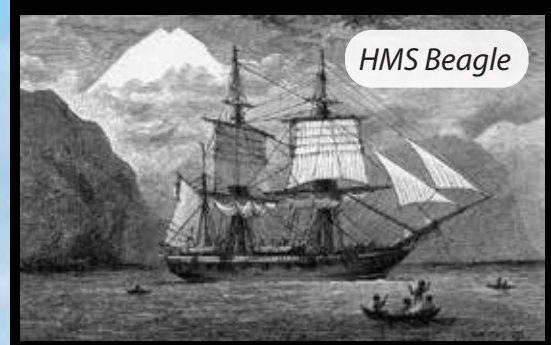


# HMS Beagle

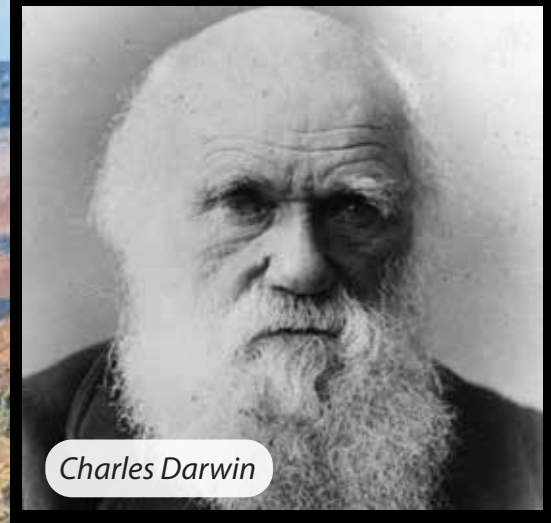
*HMS Beagle* is best known for carrying naturalist **Charles Darwin** on his voyages around the world studying species, leading to his Theory of Evolution. Initially built for war, it was converted to a surveying vessel. Starting in 1831 Darwin sailed round the world in her for 5 years, studying animal and plant species.

While the *Beagle* is most famous for Darwin's discoveries, the ship's main focus was in fact a survey of the waters around **Patagonia** and **Tierra del Fuego**, the extreme southern tip of South America. Exploring those Southern waters was incredibly dangerous, so this was an amazing feat for a sailing boat at the time.

*Fun Fact:* A strait in the *Tierra del Fuego* archipelago (group of islands) was named the *Beagle Channel* after the ship!



HMS Beagle



Charles Darwin

## Darwin's Theory of Evolution

Where did we, and all living things come from?

In Darwin's book *On the Origin of Species*, published in 1859, he provided a great deal of evidence that **evolution** has taken place. In it he also proposed a theory to explain how evolution works. That theory about how things changed over time is known as evolution by natural selection.

Darwin noticed that individuals most **adapted** to survival were more likely to have children and pass on these characteristics. Over time, the characteristics that help survival become more common and a **species** gradually changes. Given enough time, these small changes can add up to the extent that a new species altogether can evolve.

This groundbreaking research allowed people to understand how evolution works and so how we, and all living things, came to exist. *Darwin's travels on HMS Beagle changed how we see the world!*

# Fabulous Facts

## Here are some rather random but amazing facts about boats you can wow people with!

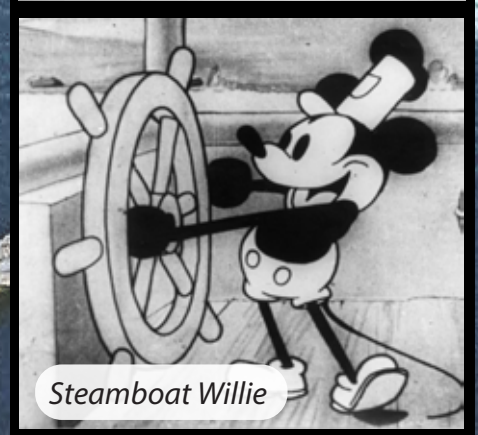
1. There is an old abandoned Russian cruise ship that has been roaming international waters empty since 2013!
2. Chunosuke Matsuyama, a Japanese Seaman, sent a message in a bottle in 1784 that his ship had wrecked. It washed up in 1935 in the village where he was born.
3. During World War II, a Dutch warship was disguised as a tropical island to escape detection by the Japanese. It was the only ship of its type to survive!
4. An intact steamboat from 1856 was excavated in 1988 under 45 feet of dirt in a farmer's field. Thousands of artifacts were excavated and preserved so well that some of the food was still edible.
5. One of the mightiest pirates that ever lived was a Chinese female named Ching Shih. She controlled 1,800 ships and 80,000 sailors!
6. Over a period of 200 years, 3 ships sunk at the same location off the coast of Wales, on the same day (December 5th) and all three had only one survivor. The 3 survivors all had the same name: Hugh Williams!
7. Did you know that there was a man that survived under the sea for three days? How? In 2013, the chef of a sunken ship survived for 3 days after taking refuge in an air pocket of the ship.
8. Steamboat Willie was the first Disney cartoon with sound and the first to feature Mickey and Minnie Mouse. Set on a boat it was released on November 18, 1928, which is now celebrated as Mickey Mouse's birthday!
9. Did you know that cooks on board ships in the old days were the only ones allowed to whistle? It proved they were not using their mouths to eat the food as long as they whistled. Other crew would not whistle since superstitiously they thought it would summon strong winds.



Ching Shih



Message in a Bottle



Steamboat Willie