

HISTORY COURSE

# The History of Lighthouses

10 Chapters

Philip Osztromok

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THE HISTORY OF LIGHTHOUSES

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# The History of Lighthouses

Course 8 · Chapter 1 · Why Lighthouses? Scope & Sources

*A lighthouse is a simple idea: a fixed light on a dangerous coast that tells a sailor where he is and what to avoid. It took centuries, a great deal of engineering and a good deal of loss of life to turn that idea into the network of lights that now rings the world's coasts. This chapter explains the problem lighthouses solve, the main kinds of sea mark, the vocabulary needed to follow the story, why the subject is a good way into history, and where reliable evidence is to be found. Names, dates and measurements are from general knowledge and flagged "check".*

## The Problem

### Navigation without instruments

For most of history a captain found his way by landmarks, soundings with a lead line and experience. Near land at night or in fog he could see nothing, and the dangerous places (rocks, shoals, headlands) were exactly the places he could not see.

### Trade and cost

Ships carried cargo that was valuable, and wrecks meant lost goods and lost lives. Ports and merchants had a strong reason to pay for marks that made the approaches safer, and later governments agreed to pay for them as a public service (check).

### A hard job to build

The worst dangers are on isolated rocks in the open sea, where a tower must stand against waves and be built in short windows of calm weather. Much of the story is a story of engineering (Chapters 3 and 4).

**More than a tower**

A lighthouse is a system: a structure, a light, a means of making the light visible, a crew to keep it burning, a boat or helicopter to supply it, and an authority that pays for it. Each part changed over time. A history of lighthouses is therefore also a history of engineering, optics, administration and the people who lived in them.

## Kinds of Sea Mark

| Mark (check each) | What it is |
|---|---|
| Beacon | A fire or fixed light, often on a hill or tower, without the full apparatus of a lighthouse. The earliest aids were beacons. |
| Lighthouse | A tower with a permanent light designed to be seen from a distance at sea. |
| Daymark | A structure that is visible by day, such as a painted tower, used to identify a place. |
| Lightship | A ship anchored at a position where a tower cannot be built, carrying a light. |
| Buoy | A floating mark that shows a channel or danger, and may carry a light, a bell or a whistle. |
| Radio and satellite aids | Radio beacons, radar and, now, satellite navigation, which have replaced much of the work of the light (Chapter 9). |

## The Language of Lighthouses

| Term (check each) | Meaning |
|---|---|
| *Pharos* | The Greek word for the island of Alexandria and, from it, the origin of the word for lighthouse in several languages, such as the French *phare* and the Spanish *faro*. |
| Lantern | The glass room at the top of the tower that houses the light. |
| Lens and reflector | The optical parts that gather the light and throw it out in a beam. |
| Characteristic | The pattern of flashes by which a light identifies itself, such as one flash every ten seconds. |
| Range | The distance at which a light can be seen, which depends on its brightness and its height above the sea. |
| Rock station / shore station | A lighthouse built on a rock in the sea, or on land, which affected the keepers' lives very differently (Chapter 6). |
| Keeper | A person who tended the light, usually one of a crew of three or four. |
| Lighthouse board | The authority in charge of lights in an area, such as the Northern Lighthouse Board in Scotland and Trinity House in England (check). |

## Why a History Course?

- **It is a way into engineering history.** Building on a wave-swept rock was among the hardest civil engineering jobs of its day (Chapters 3 and 4).
- **It is a way into the history of science.** Optics, fuels and electricity all changed the light (Chapter 5).
- **It is a way into social history.** The keepers and their families lived in isolation, and their lives are documented in logs and letters (Chapter 6).
- **It has produced legends.** Wreckers luring ships with false lights and keepers driven mad by solitude are stories to test (Chapters 8 and 10).

## Scope of the Course

| Part (check) | Chapters | Topics |
|---|---|---|
| Beginnings | 2, 3 | Ancient beacons and the Eddystone towers |
| The age of engineers | 4, 5 | The Stevensons and the Bell Rock; light and lens |
| People and places | 6, 7 | The keepers; lighthouses worldwide |
| Safety and change | 8, 9 | Wrecks, wreckers and safety; automation and heritage |
| Method | 10 | Testing the legend |

The course is about lighthouses as history. It is not a travel guide or a guide to visiting. It deals with deaths and disappearances factually and respectfully, and flags dates and measurements as "check".

## Myths to Test

| Common claim | The question a careful reader asks (check each) |
|---|---|
| The Pharos of Alexandria was taller than any building of its day. | What do sources say about its height, and how reliable are they? (Chapter 2) |
| Wreckers lured ships onto the rocks with false lights. | What evidence is there for the practice, and what for the legend? (Chapter 8) |
| Keepers were driven mad by loneliness. | What do the logs and memoirs show? (Chapter 6) |
| The Flannan Isles keepers were taken by something mysterious. | What is documented, and what is added later? (Chapter 6) |

| Common claim | The question a careful reader asks (check each) |
|---|---|
| Fresnel invented the lighthouse lens. | What came before, and what did he change? (Chapter 5) |
| Lighthouses are obsolete. | What do they still do? (Chapter 9) |

## Sources to Use

- **The lighthouse authorities.** The Northern Lighthouse Board (in Edinburgh), Trinity House and the Commissioners of Irish Lights keep records and publish histories, from an institutional point of view (check).
- **Keepers' logs.** Daily log books survive for many stations, and are among the best sources for daily life (check which are public).
- **Engineers' accounts.** Books by the engineers themselves, such as Robert Stevenson's account of the Bell Rock (check), are first-hand but self-justifying.
- **Museums.** The Scottish Lighthouse Museum at Kinnaird Head near Fraserburgh and the Bell Rock exhibition at Arbroath (check), and maritime museums elsewhere.
- **The buildings.** Many towers still stand, and a visit shows the construction directly (check which are open).
- **Maps and charts.** Admiralty charts and sailing directions show how marks were used.

**A British comparison**

Scotland has a strong claim to be the home of the modern lighthouse. The Northern Lighthouse Board, founded in 1786 and based in Edinburgh, built towers across the Scottish coast, and its engineers, the Stevenson family, set standards followed around the world (check). The Edinburgh connection continues: the Board's headquarters is in George Street (check), and one of the family, Robert Louis Stevenson, became a writer after being trained as an engineer. The course on *The History of Timekeeping* has a similar Edinburgh theme in its chapter on the Castle's one o'clock gun, which helped ships to set their clocks.

**Check the details**

Dates of construction, heights and the ranges of lights vary between sources, and towers are rebuilt, raised and altered. Stories of rescues and disasters are often retold in a

polished form. Check dates, measurements and names of any anecdote against the lighthouse authorities and an engineering history before you rely on it.

## Exercises

**EXERCISE 1**

Explain to a friend the difference between a beacon, a lighthouse, a lightship and a buoy, and say where each is used.

→ Solution

**EXERCISE 2**

Write two paragraphs describing an imaginary approach to a rocky coast at night, using at least six terms from the vocabulary table.

→ Solution

**EXERCISE 3**

Pick two claims from the "Myths to Test" table and say what evidence you would look for and where you would find it.

→ Solution

### Quick Reference

- **Marks:** beacon, lighthouse, daymark, lightship, buoy
- **Words:** pharos, lantern, lens, characteristic, range, keeper
- **Authorities:** Northern Lighthouse Board, Trinity House, Irish Lights
- **Method:** describe the story, check the figures, test the legends

# The History of Lighthouses

Course 8 · Chapter 2 · Ancient Beacons

*The first lights at sea were fires on headlands, and the first great lighthouse was built by a Hellenistic king on an island at the mouth of an Egyptian harbour. This chapter follows the story from the Pharos of Alexandria to the Roman lights of the Channel, the long gap of the Middle Ages, when lights were kept by monks, ports and private owners, and the first coal-fired beacons of Scotland. It shows how little is certain about the earliest lights. Names, dates and measurements are from general knowledge and flagged "check".*

## The Pharos of Alexandria

### The building

The Pharos stood on a small island at the entrance to the harbour of Alexandria in Egypt. It was built in the early 3rd century BC under the first Ptolemies, and the architect is named in sources as Sostratus of Cnidus (check). It was counted among the Seven Wonders of the Ancient World.

### The size

Ancient and medieval writers give heights that vary widely, and modern estimates are often between about 100 and 140 metres (check). It had a square base, an octagonal middle stage and a round top, according to descriptions by Arab travellers (check).

### The light

A fire burned at the top by night, and writers mention a mirror or reflective surface, though the details of how the light worked are uncertain (check). By day it served as a landmark on a flat and featureless coast.

### What happened to it

The Pharos stood for many centuries, was damaged by earthquakes between the 4th and 14th centuries, and finally collapsed (check). In the 15th century its remains were used for a fort, and in the 1990s divers and archaeologists found large blocks in the harbour that may belong to it (check). The word *pharos* became the word for lighthouse in several

languages, a measure of its fame. Our knowledge of it comes largely from descriptions and coins, not from the building, so its details are open to question.

## Roman Lights

| Tower (check each) | Note |
|---|---|
| Tower of Hercules, A Coruña (Spain) | A Roman tower of the 1st or 2nd century AD on a headland in north-west Spain. Restored in the 18th century, it is often described as the oldest lighthouse still in use, and is a World Heritage Site (check). |
| Dover pharos | The remains of a Roman tower stand in the grounds of Dover Castle, beside a Saxon church. It was part of a pair of lights on the cliffs on either side of the harbour (check). |
| Boulogne | A Roman tower on the French side of the Channel, which collapsed in the 17th century (check). |
| Ostia and other ports | The Roman port of Ostia, at the mouth of the Tiber, had a tower with a light, shown on mosaics and coins (check). |

The Roman Empire built lights as part of a system of ports and sea trade. After its collapse in the west, many of these lights fell into disuse, and for centuries lights were fewer and more local.

## The Middle Ages

- **Monks and hermits.** Some lights were kept by religious houses and hermits, who lit fires or lamps as acts of charity, sometimes paid for by gifts from sailors (check).
- **Ports and towns.** Italian cities such as Genoa built towers for trade. The tower of Genoa, rebuilt in the 16th century, is still in use (check).
- **Local control.** In England the Guild of the Holy Trinity at Deptford, which received a royal charter from Henry VIII in 1514, became Trinity House and later the main lighthouse authority for England and Wales (check).
- **Private lights.** From the 17th century private individuals were granted the right to build lights and to charge ships a toll, which led to disputes about fairness and profit (check).

## Scotland: the Isle of May

| Item (check each) | Note |
|---|---|
| Location | The Isle of May lies in the Firth of Forth, off the Fife coast, an important point on the sea routes to Edinburgh's port of Leith. |
| The beacon | In 1636 a beacon burning coal was set up on the island under a patent granted to a group of private investors, among the first aids of its kind in Scotland (check). |
| The method | An open fire on top of a tower burned coal, which had to be carried to the island and kept burning all night. In bad weather the wind scattered sparks and ash, and the fire was fed by hand. |
| The cost | Ships passing paid a toll, and the keepers and owners had a continuing struggle to collect it (check). |
| The replacement | The old beacon was replaced by a lighthouse designed by Robert Stevenson, lit in 1816 (check). It is part of the Stevenson story (Chapter 4). |

Coal fires were bright but smoky, used much fuel and needed constant attention. Lights fed by oil lamps with reflectors would soon replace them (Chapter 5).

**A British comparison**

An Edinburgh reader can visit the Firth of Forth and see the Isle of May from the Fife shore, and boats run to the island in summer (check). The Roman tower at Dover is the oldest lighthouse structure in Britain, though not in use (check). England's Trinity House and Scotland's Northern Lighthouse Board followed different paths: the English system grew from a guild, and the Scottish one from an Act of Parliament in the 1780s (Chapter 4, check).

**Check the details**

The Pharos is known through writers who never measured it and through damaged remains, and its height, its mirror and its builder are all open to question. Roman towers have been rebuilt, so what we see may be mostly later work. Check every date and measurement against archaeological sources and museum guides.

## Exercises

**EXERCISE 1**

Test the claim "The Pharos of Alexandria was the tallest building of its age" with the six questions (Chapter 1).

→ Solution

**EXERCISE 2**

Compare a coal-fired beacon, such as the early Isle of May light, with a modern electric light: what problems did the keepers of the first face?

→ Solution

**EXERCISE 3**

Draw up a timeline from the Pharos to the Isle of May of 1816, with at least eight entries, and mark the ones you would want to check.

→ Solution

## Quick Reference

- **Ancient:** the Pharos of Alexandria; Roman towers at A Coruña and Dover (check)
- **Medieval:** monks, ports, Trinity House (1514, check)
- **Scotland:** the Isle of May coal beacon of 1636; the Stevenson tower of 1816 (check)
- **Method:** separate the building from the descriptions of it

# The History of Lighthouses

Course 8 · Chapter 3 · The Eddystone Story

*Some twelve nautical miles south-west of Plymouth, a reef of rocks lies half hidden at the entrance to the English Channel. It wrecked so many ships that in the 1690s a man decided to build a lighthouse on it, which no one had done before on a rock in the open sea. Four towers have stood there since, each teaching something to the next. This chapter tells the story of Winstanley, Rudyerd, Smeaton and Douglass, and shows how engineers learned to build in the sea. Names, dates and measurements are from general knowledge and flagged "check".*

## Four Towers

| Tower (check each) | Builder and dates | Fate |
|---|---|---|
| First | Henry Winstanley, built 1696 to 1698 as a polygonal timber tower on a stone base, later enlarged | Swept away in the Great Storm of November 1703, with Winstanley inside |
| Second | John Rudyerd, built 1706 to 1709, timber with a weighted stone base, a tall plain cone | Destroyed by fire in December 1755 |
| Third | John Smeaton, built 1756 to 1759, granite, shaped like an oak trunk | Dismantled in the 1880s because the rock beneath it was failing; the top was rebuilt on Plymouth Hoe |
| Fourth | James Douglass, built 1878 to 1882, large granite blocks, the present tower | Still standing, now automatic, with a helicopter platform added in the 20th century (check) |

## Winstanley

### The man

Henry Winstanley was from Essex, an engraver and showman who ran a popular

### The work

The workmen could land on the rock only in calm weather and worked for a few hours at

attraction of mechanical wonders in London (check). He was also a shipowner who had lost a ship on the rocks, which is said to have been part of his reason for acting.

a time. The first season they drilled holes for iron bars, and the tower was built over several summers, lit for the first time in November 1698 (check).

**The loss**

The tower was rebuilt larger and more decorated, with lantern, galleries and rooms. In the Great Storm of 26 and 27 November 1703 it vanished, taking Winstanley and the keepers with it (check). A story says that he had wished to be in it during the worst storm imaginable, a story that cannot be verified (Exercise 2).

**What was learned**

The first tower proved that a tower could stand on an open-sea rock and be lit, a major step. It also showed the dangers of building for looks: the tall, decorated structure offered a large surface to the wind and waves. The next builders used plainer and lower designs.

## Rudyerd and Smeaton

- **Rudyerd.** John Rudyerd, a silk mercer from London and not an engineer by training, designed a plain tower of timber over a stone base, weighted to resist waves (check). It stood for almost half a century. In 1755 the lantern caught fire. The old keeper, who tried to put out the flames, swallowed molten lead, and died after some days (check).
- **Smeaton.** John Smeaton (1724 to 1792), from Yorkshire, was asked to build a new lighthouse and became one of the first to call himself a civil engineer (check). He studied the shape of an oak tree, which widens at the base and narrows as it rises, and designed a stone tower on that model.
- **The method.** The granite blocks were cut to fit in a yard in Plymouth, assembled to test the fit, and then carried out to the rock. Each course was dovetailed to the next and pinned with marble dowels, so that the tower acted as a single mass (check). The first courses were fitted into steps cut into the rock.

- **The mortar.** Smeaton tested limes and found a kind that set under water, a hydraulic lime, which was an important step towards modern cement (check).
- **The result.** The tower was first lit in October 1759 and gave service for more than a century. Smeaton wrote an account of its building, which later engineers read closely (check).

## Douglass and the Present Tower

| Point (check each) | Detail |
|---|---|
| The problem | By the 1870s the sea was undermining the rock under Smeaton's tower, and the tower trembled in storms. |
| The engineer | James Douglass, the engineer to Trinity House, designed a taller tower on a nearby part of the reef, using larger granite blocks and the dovetailing method (check). |
| The move | Smeaton's tower was dismantled and the upper part re-erected on Plymouth Hoe as a monument, where it can still be visited. The lower stump remains on the rock. |
| The light | The Douglass tower was lit in 1882 and uses a modern lens and electric lamp, and the keepers were withdrawn in 1982 when it was automated (check). |

The story of the four towers is the story of an engineering idea: the best shape for the sea is a low, heavy and interlocked mass, not a tall and elaborate one.

> **A British comparison**
>
> Smeaton's account of the Eddystone was the model for the Bell Rock in Scotland (Chapter 4). Robert Stevenson of Edinburgh studied Smeaton's methods before building his own tower, and borrowed the idea of a curved profile and of locking the blocks together (check). The Eddystone is also a link between England and Scotland on another level: Trinity House and the Northern Lighthouse Board, the two authorities, have exchanged ideas for more than two hundred years (check). Plymouth Hoe, where Smeaton's tower stands, is the place associated with Drake and the Armada, and a short walk from the harbour.

**Check the details**

The Eddystone story has been told in many popular versions. Winstanley's wish for a storm, the details of the 1755 fire and the exact numbers of blocks and heights are not all supported by contemporary documents. Check them against Smeaton's own narrative, Trinity House records and a modern engineering history.

## Exercises

**EXERCISE 1**

**Write a short table comparing the four towers by material, shape and fate, and say what each builder learned from the previous one.**

→ Solution

**EXERCISE 2**

**Test the story that Winstanley wished to be in his lighthouse during the greatest storm. What would support it, who told it and when, and what would you want to see?**

→ Solution

**EXERCISE 3**

**Explain in plain words why Smeaton chose a curved shape like an oak trunk and dovetailed stone blocks, and what problem each choice solved.**

→ Solution

### Quick Reference

- **Towers:** Winstanley (1698), Rudyerd (1709), Smeaton (1759), Douglass (1882) (check)
- **Lessons:** low and heavy beats tall and decorated; interlocking blocks; hydraulic lime

- **Legacy:** Smeaton's tower on Plymouth Hoe; his account guided later builders

# The History of Lighthouses

Course 8 · Chapter 4 · The Stevensons and the Bell Rock

*In 1786 an Act of Parliament set up a board to build lighthouses on the Scottish coast, and over the next century the engineers it employed, a single Edinburgh family, built most of them. This chapter tells the story of the Northern Lighthouse Board, of Thomas Smith, who started it, and of Robert Stevenson, whose tower on the Bell Rock was one of the great feats of engineering of its time. It then follows his sons and grandsons, among them the writer Robert Louis Stevenson. Names, dates and measurements are from general knowledge and flagged "check".*

## The Northern Lighthouse Board

### The Act

In 1786 Parliament created the Commissioners of Northern Lighthouses, usually called the Northern Lighthouse Board, to build and run lights on the Scottish coast and the Isle of Man (check). The Board was funded by dues charged to passing ships, and it met in Edinburgh, where it still has its headquarters.

### The first lights

The first four lighthouses were at Kinnaird Head, the Mull of Kintyre, North Ronaldsay and Scalpay, lit between 1787 and 1789 (check). They were modest towers built by local masons, each with a lamp and a reflector.

### Thomas Smith

The Board's first engineer, Thomas Smith (1752 to 1815), was an Edinburgh lamp-maker and tinsmith with no engineering training (check). He introduced oil lamps with polished reflectors, a big improvement on the coal fires, and trained his stepson, Robert Stevenson.

### A family business

Robert Stevenson married Smith's daughter and succeeded him, and his sons and grandsons followed him as engineers to the Board for most of the next century (check). It was an unusual arrangement: a public body relying on one family for its engineering. It gave continuity and a house style, and also raises the question of how far the Board's records were shaped by the family's own account of its work.

## The Bell Rock

| Point (check each) | Detail |
|---|---|
| The danger | The Bell Rock, or Inchcape Rock, is a reef about eleven miles off Arbroath on the east coast of Scotland. It is covered by the sea at high tide and was a deadly hazard to shipping. A storm in 1799 wrecked many vessels, which increased the pressure to act. |
| The legend | A story tells of a bell placed on the rock by an abbot of Arbroath, which was cut away by a pirate who was later wrecked on it. The poet Robert Southey told it in a ballad, and the story is unproven (check). |
| The engineers | Robert Stevenson drew up the plan and directed the work. The great engineer John Rennie was consulted, and the question of who deserved credit for the design was later disputed (check). |
| The work | From 1807 to 1810 workers landed on the rock at low tide for a few hours at a time. They lived on a ship moored nearby and then, in the second year, in a wooden barrack raised on legs above the rock. Blocks of granite were cut on shore and carried out by boat. |
| The tower | It is about 35 metres high, built of interlocking blocks in the manner of Smeaton's tower on the Eddystone (Chapter 3), and was first lit on 1 February 1811 (check). The light alternated red and white flashes so that it could be told apart from other lights. |
| The record | Stevenson wrote an account of the building, published in 1824, which is the main source for the story (check). |

The work was dangerous. The workers' lives were in the hands of the tide, and on one occasion in 1807 a boat failed to return and the men on the rock were nearly stranded (check). A man was lost in 1808 (check).

## Skerryvore and Beyond

- **Skerryvore.** Alan Stevenson, Robert's eldest son, built a tower on a reef off Tiree in the Inner Hebrides between 1838 and 1844. It is about 48 metres tall, with a concave curve like Smeaton's, and was a difficult job in a remote and wild place (check).
- **The other towers.** The family built or advised on many lights, including Muckle Flugga in Shetland, the most northerly lighthouse in the British Isles, finished in 1858, and Dubh Artach, a rock tower off Mull, finished in 1872 (check).
- **Other work.** Robert Stevenson also designed harbours, roads and bridges. His sons David and Thomas continued the work, and Thomas's name is also linked with a type of weather instrument shelter, the Stevenson screen, still used at weather stations (check).
- **Optics.** The family were among the first British engineers to adopt the Fresnel lens, and wrote technical works on lighthouse design (Chapter 5).

## Robert Louis Stevenson

Robert Louis Stevenson, born in Edinburgh in 1850, was the son of Thomas Stevenson and the grandson of Robert. He began studying engineering at Edinburgh University to join the family firm, switched to law and then became a writer, best known for *Treasure Island* and *Strange Case of Dr Jekyll and Mr Hyde* (check). As a young man he sailed with his father on inspections of lighthouses, including in the Orkney and Shetland islands, and he later wrote about the experience, which fed into his fiction (check). The connection is a good example of how the history of engineering and the history of literature overlap.

> **A British comparison**
>
> The Bell Rock and the Eddystone are the two great rock towers of the age of masonry. Stevenson learned from Smeaton, but worked in a harsher location, where the working time was shorter and the supply boats farther away. The Scottish towers were also built with Scottish materials: granite from Aberdeenshire and elsewhere (check). Edinburgh readers can see the Stevensons' world at the Board's headquarters in George Street, at the Robert Louis Stevenson sites in the New Town, and at the Signal Tower museum in Arbroath, the shore base of the Bell Rock builders (check).

> **Check the details**

The Stevenson family wrote much of the history of their own work, so the credit given to individuals, especially in the argument with Rennie, is an interested account. Dates, heights and costs vary in sources, and the Inchcape bell legend has no solid proof. Check them against the Board's records and modern histories of engineering.

## Exercises

**EXERCISE 1**

**Treat Stevenson's own account of the Bell Rock as a source: what can it tell you, what are its limits, and what would you set beside it?**

→ Solution

**EXERCISE 2**

**Compare the building of the Bell Rock with that of the Eddystone (Chapter 3): what problems did the two share and how did the Bell Rock differ?**

→ Solution

**EXERCISE 3**

**Test the claim "The Stevensons built the lighthouses of the world" and give a more careful sentence.**

→ Solution

### Quick Reference

- **Board:** Northern Lighthouse Board, 1786, Edinburgh (check)
- **People:** Thomas Smith, Robert Stevenson, Alan Stevenson, Thomas Stevenson, Robert Louis Stevenson, John Rennie

- **Towers:** Bell Rock (lit 1811), Skerryvore (1844), Muckle Flugga (1858), Dubh Artach (1872) (check)
- **Source:** Stevenson's own account, an interested record

# The History of Lighthouses

Course 8 · Chapter 5 · Light and Lens

*A tower is only the support for a light, and the light itself went through a long series of improvements: from open fires to candles and oil lamps, from bare flames to polished reflectors, and from reflectors to the great glass lenses that made a single lamp visible for twenty miles. This chapter follows the history of the light, the lens of Augustin Fresnel and its adoption in Britain, the system of flash patterns that lets a sailor identify a light, and the fog signals that did the same job by sound. Names, dates and measurements are from general knowledge and flagged "check".*

## From Fire to Lamp

| Stage (check each) | Detail |
|---|---|
| Open fires | Wood and coal burned in an iron basket on a tower or hill. Bright but smoky, wasteful and hard to keep burning in wind and rain (Chapter 2). |
| Candles | Smeaton's Eddystone of 1759 was lit by a ring of tallow candles, which needed constant snuffing (check). |
| Oil lamps and reflectors | Lamps burning whale or vegetable oil with a polished reflector behind each flame were used by the late 18th century. The Argand lamp, with a hollow circular wick that drew in air to give a steadier and brighter flame, was introduced in the 1780s (check). Thomas Smith used these at Kinnaird Head (Chapter 4). |
| Fuels | Sperm-whale oil gave way to colza (rapeseed) oil in the 19th century, and then to paraffin from the 1870s (check). Later came the incandescent oil-vapour burner, which gave a much brighter light with the same fuel. |
| Gas | Acetylene gas, with a device that turned the light off in daylight, was developed by the Swedish engineer Gustaf Dalén and won him a Nobel Prize in 1912 (check). It made unstaffed lights possible in remote places. |
| Electricity | The South Foreland light in Kent was lit electrically in 1858, with the advice of Michael Faraday, and the system was tried at other stations in the following decades (check). |

## Fresnel and the Lens

### The problem

A reflector wastes much of the light and loses more as the metal tarnishes. Engineers wanted a way to gather all the light from a lamp and send it out in a narrow beam.

### The solution

Augustin-Jean Fresnel (1788 to 1827), a French engineer and physicist, designed a lens made of concentric rings of glass, each ring cut to bend the light the same way. It gave the effect of a huge lens without the thickness and weight (check). Prisms above and below caught more of the light.

### The first use

The first Fresnel lens in service was installed at the Cordouan lighthouse at the mouth of the Gironde river in France in 1823 (check). Lenses were made in sizes called orders, from the largest (first order) to the smallest (sixth order).

**"Fresnel invented the lens"?**

A stepped lens of this kind had been proposed before him, notably by the French naturalist Buffon in the 18th century (check). Fresnel's achievement was to work out the optics, design the rings and prisms as a whole system and get it built. It is a good example of a claim that is true in a strong sense (he made it work) and false in a weak sense (he had no predecessors). Exercise 1 asks you to put this into a careful sentence.

## The Lens in Britain

- **The Stevensons.** Alan Stevenson visited France to study the new lenses and used a first-order lens at Skerryvore (Chapter 4, check). Scottish and English lights adopted the system through the 1830s and 1840s.

- **The makers.** British lenses were made by the glass firm Chance Brothers in the English Midlands, which became a leading supplier around the world (check).
- **Improvements.** Thomas Stevenson developed "holophotal" optics, which gathered light from all directions, and worked on improving the efficiency of the lens (check).
- **The lens floating on mercury.** A rotating lens could weigh several tonnes. Many were floated on a bath of mercury so that a keeper could turn them with a finger, a practice later abandoned because of the health risk of mercury (check).

## How a Light Tells Who It Is

| Characteristic (check each) | Meaning |
|---|---|
| Fixed | A steady light with no change. |
| Flashing | Flashes of light separated by longer periods of darkness. |
| Occulting | A steady light that is regularly cut off for a short time. |
| Group flashing | Groups of flashes at regular intervals, such as two flashes every 15 seconds. |
| Colour | White, red or green, used by themselves or in sectors to show safe and dangerous areas. |
| Period | The time from the start of one pattern to the start of the next. |

Charts and "lists of lights" give the characteristic of every light, so that a navigator can recognise a light by counting the flashes with a watch. The range at which a light can be seen depends on the height of the light above the sea. As a rough rule, the distance to the horizon in nautical miles is about 1.17 times the square root of the height in feet (check). A light at 100 feet can be seen from about 11 or 12 nautical miles for an observer at sea level.

## Sound in the Fog

- **Bells.** Fog bells, rung by hand or by clockwork, were used from the early 19th century. The Bell Rock had a bell on its tower (check).
- **Guns and rockets.** Some stations fired a gun at set intervals, which was loud but costly.
- **Sirens and horns.** Steam, compressed air and, later, electric horns replaced bells from the mid-19th century (check). The characteristic sound of a diaphone is remembered by many.

- **Limits.** Sound travels unevenly in fog, and the range is short, so the sound signal gave a warning but not a precise bearing.

**A British comparison**

The Scottish Lighthouse Museum at Kinnaird Head, in Fraserburgh, has a large collection of lenses and lamps, including a first-order Fresnel lens, set in the first lighthouse built by the Northern Lighthouse Board (check). The early use of colour sectors and characteristic patterns on the Scottish coast made its lights famous among sailors, and the Board's own "List of Lights" is still published (check). The Bell Rock's alternating red and white light of 1811 and the flashing light of the Isle of May in 1816 were among the earliest of their kinds in Britain (check).

**Check the details**

Dates for the first use of a lamp or lens vary between sources and countries, and the claim to be "the first" is often disputed. Rough rules such as the horizon distance depend on the observer's height as well as the light's. Check them against official lists of lights and a technical history.

## Exercises

**EXERCISE 1**

**Test the claim "Fresnel invented the lighthouse lens" with the six questions and give a more careful sentence.**

→ Solution

**EXERCISE 2**

**Using the rough rule in this chapter, estimate how far away the horizon is for a light 80 feet above the sea, and say why the real range of the light may differ.**

→ Solution

**EXERCISE 3**

Describe in words the light shown by a station whose chart entry reads "Fl(2) W 15s", and explain why a navigator needs a watch to use it.

→ Solution

## Quick Reference

- **Light:** fire, candle, oil lamp with reflector, Argand lamp, paraffin, acetylene, electricity
- **Lens:** Fresnel, first used at Cordouan in 1823; orders from first to sixth (check)
- **Pattern:** fixed, flashing, occulting, group flashing, colour and sectors
- **Sound:** bells, guns, sirens and horns

# The History of Lighthouses

Course 8 · Chapter 6 · The Keepers

*A lighthouse works only if someone keeps the light burning, the lens clean and the log written, night after night, in all weathers. The keepers were usually ordinary men and their families, working to strict rules in places most people never saw. This chapter describes their working life, the shore and rock stations, the case that led to the rule of three keepers, the rescue by Grace Darling, the disappearance of three keepers from the Flannan Isles in 1900, and the popular idea that the work drove men mad. It treats deaths and disappearances factually. Names, dates and details are from general knowledge and flagged "check".*

## The Work

### Light and lens

The principal keeper and his assistants trimmed the wicks, filled the lamp with oil, wound the clockwork that turned the lens and polished the brass and glass every day. A dirty lens could cut the range sharply, so cleaning was close to a religious duty (check).

### The watch

Keepers took turns on watch through the night, keeping the lamp burning and the machinery turning. They recorded the weather, the passing ships and any event in the log book, which was inspected on visits by the superintendent (check).

### The rules

Boards issued detailed regulations on uniform, cleanliness, behaviour and the care of the station. A visit by an inspector could be unannounced, and a poor report could cost a man his post (check).

**Two kinds of life**

A shore station, on a headland with a road, was a village in miniature: keepers' cottages, a school or a teacher, a garden and neighbours. A rock station, on a reef or islet, was a tower in which three or four men lived for weeks at a time with no family and no way of

leaving. The two are often confused in popular accounts, and the myths about keepers mostly describe the rock stations (check).

## Rock Stations

- **The rota.** On Scottish rock stations the usual crew was three or four keepers, of whom one or two were ashore on leave at any time. Spells on the rock were a number of weeks, followed by weeks ashore (check the pattern for each period).
- **Relief.** The Board's supply ships, called tenders, carried men and stores, and landing on the rock depended on the weather. In bad conditions relief could be delayed by days or weeks. Helicopters took over from boats from the 1970s (check).
- **Daily life.** Off watch, men slept, cooked, read, wrote letters and practised hobbies such as model-making and fishing. Memoirs by former keepers describe boredom, cold and small quarrels, and also companionship and pride in the work (check).
- **Families.** At shore stations families lived beside the tower. The keepers' wives and children appear in the records as sharing the work, for example in keeping the light when a husband was ill (check).

## The Smalls, 1801

| Point (check each) | Detail |
|---|---|
| The tower | The Smalls lighthouse stands on a reef off the coast of Pembrokeshire in Wales. It was built in the 1770s by John Phillips, a Liverpool maker of musical instruments, as a wooden hut on stilts. |
| The story | In 1801 a storm damaged the tower and cut it off. One of the two keepers, Thomas Griffith, died. His colleague, Thomas Howell, feared he would be accused of murder if he threw the body into the sea, and made a coffin from wood from the tower and lashed it to the outside. The body remained there for weeks until relief arrived. |
| The result | The incident is said to be the reason for the later rule of three keepers, so that one could always bear witness to the death of another (check). It is retold in many histories, and some details may have been improved by tellings. |

## Grace Darling

On the night of 6 September 1838 the paddle steamer *Forfarshire* was wrecked on rocks near the Longstone lighthouse in the Farne Islands off Northumberland. At dawn Grace Darling, the 22-year-old daughter of the keeper, William Darling, saw survivors on a rock about a mile away, and she and her father rowed out in a small boat and brought nine people back to the lighthouse (check). The rescue was reported across Britain and Grace became a celebrity, visited by admirers and painted by artists. She died of tuberculosis in 1842 at the age of 26 (check). She was not a keeper herself, and her fame shows how the lighthouse family could be at the centre of events.

## Flannan Isles, 1900

| Point (check each) | Detail |
|---|---|
| The station | The lighthouse on Eilean Mor in the Flannan Isles, about 20 miles west of Lewis in the Outer Hebrides, was built by David Alan Stevenson and lit in 1899. |
| The discovery | On 26 December 1900 the relief ship *Hesperus* reached the island. The three keepers, James Ducat, Thomas Marshall and Donald MacArthur, were missing, and the station was in order apart from signs of a storm damage at the west landing. A ship had reported that the light was not lit some days earlier. |
| The inquiry | An inspector for the Board, Robert Muirhead, examined the station. He found that the men had probably been swept away by a large wave while securing equipment at the landing (check). No bodies were found. |
| The legend | Later retellings added unexplained clocks, a meal left uneaten and log entries about men weeping or praying. Several of these details appear to have been invented in later accounts, and the original log shows nothing of the kind (check). A poem of 1912 by W. W. Gibson helped to fix the legend. |

The disappearance is documented as a tragedy: three men lost, the cause most probably the sea. The mystery in the popular version is largely the work of later storytelling. The families of the men are part of the record, and the case should be treated with respect (Exercise 1).

## Madness and Isolation

The idea that keepers were driven mad by solitude is common in fiction and films. The evidence is thin. The Boards chose keepers with care, kept them in teams and rotated them, and the logs and memoirs show a working life of routine, and sometimes of conflict between men confined together. Some individuals did suffer, and there are cases of illness and of men leaving the service (check). A careful historian separates the few documented cases from the general claim (Chapter 10).

**A British comparison**

Most of the stories in this chapter are British: Grace Darling in Northumberland, the Smalls in Wales and the Flannan Isles in the Hebrides. The Board's tender ships and its keepers' families belong to the Scottish story, and the shore station at Kinnaird Head, now a museum, shows the cottages in which the keepers lived (check). Edinburgh readers may know the poem and the later opera and film versions of the Flannan Isles story, which show how a documented loss became a legend.

**Check the details**

Keepers' stories are told with great feeling, and the details of the Smalls, the Flannan Isles and Grace Darling's rescue are often changed in the telling. Dates, names and sequences should be checked against the official reports, the logs, newspapers of the time and modern scholarship. The loss of life in these cases should be described only to the extent that it is documented.

## Exercises

**EXERCISE 1**

**Separate what is documented from what was added later in the story of the Flannan Isles, and say what each kind of source adds.**

→ Solution

**EXERCISE 2**

Using the evidence in this chapter, describe a day on a rock station in about 150 words, and mark which parts are documented and which are imagined.

→ Solution

**EXERCISE 3**

Explain why a rule of three keepers made sense after the Smalls, and what it did not solve.

→ Solution

## Quick Reference

- **Work:** light, lens, watch, log book, inspection
- **Stories:** the Smalls (1801), Grace Darling (1838), Flannan Isles (1900) (check)
- **Method:** separate the documented loss from the later legend
- **Myth:** "driven mad by loneliness", thinly supported

# The History of Lighthouses

Course 8 · Chapter 7 · Lighthouses Around the World

*Lighthouses spread across the world with trade, empire and the steamship. Each country built them in its own way, under its own authority, but the ideas and the engineers moved from place to place. This chapter looks at the French tower of Cordouan, the American system, the work of a Scottish engineer in Japan, the lights of the British Empire and of the Chinese customs service, and the international agreements that standardised sea marks in the 20th century. Names, dates and measurements are from general knowledge and flagged "check".*

## France: Cordouan

### The tower

The Cordouan lighthouse stands on a rock in the mouth of the Gironde estuary, which leads to Bordeaux. It was built from 1584 to 1611 under the architect Louis de Foix, and is richly decorated, with a chapel and a royal apartment (check). It is often called the oldest lighthouse in France still in use.

### The lens

It was raised in height in the 18th century and was the first to carry Fresnel's lens, installed in 1823 (Chapter 5, check). It has been listed as a UNESCO World Heritage Site (check).

### The French system

France had a central lighthouse commission from 1811, and Fresnel was one of its members. This state-led system contrasts with the older British pattern of separate boards (check).

## The United States

| Point (check each) | Detail |
|---|---|
| Boston Light | The first lighthouse in what is now the United States, on Little Brewster Island in Boston harbour, lit in 1716. It was blown up by British forces in 1776 and rebuilt in 1783. |
| Federal control | One of the first laws passed by the new Congress in 1789 made the federal government responsible for lighthouses, an early sign of how important they were for trade (check). |
| The delay | For decades the system was run by a Treasury official, Stephen Pleasonton, who kept to the cheaper reflector lamps and resisted the Fresnel lens. After criticism, a Lighthouse Board was created in 1852 and the lens was adopted (check). |
| Notable towers | Minot's Ledge off Massachusetts, a granite rock tower completed in 1860 after an earlier iron tower was swept away, and the Cape Hatteras tower in North Carolina, the tallest brick lighthouse in the country (check). |
| Moving a tower | In 1999 the Cape Hatteras lighthouse, threatened by erosion, was moved about 870 metres inland on rollers, a famous feat of engineering (check). |

## Japan and Richard Henry Brunton

- **The background.** After 1868, Japan's new Meiji government wished to modernise and was bound by treaties with Western powers to provide lights on its coasts. It hired foreign experts, known as *oyatoi*, to build them (check).
- **The engineer.** Richard Henry Brunton, born in Aberdeenshire in 1841, was a Scottish railway and civil engineer who came to Japan in 1868 on the advice of the Stevenson firm of Edinburgh (check). He is often called the "father of Japanese lighthouses".
- **The work.** In about eight years he designed and supervised the building of some twenty-six lighthouses, as well as lightships, buoys and beacons, and trained Japanese engineers (check). The first lit was at Kannonzaki, near Yokosuka, in 1869 (check).
- **The end.** Disputes about cost and about authority led to his dismissal in 1876. He returned to Britain and later wrote a memoir of Japan (check). His towers still stand in several places, and some are museums.

## The Empire and China

| Region (check each) | Note |
|---|---|
| Australia | The first lighthouse was on South Head in Sydney, built under the convict colony and rebuilt in 1818 by the architect and convict Francis Greenway as the Macquarie Lighthouse (check). |
| South Africa | The Cape Agulhas lighthouse, lit in 1849 at the southernmost tip of Africa, was built under British rule, and is a national monument (check). |
| India and Asia | Lights were built at ports under the East India Company and later the colonial governments, mainly to serve British trade (check). |
| China | After the treaties of the 1860s the Chinese Maritime Customs Service, led by the Irish-born Robert Hart, built lighthouses and buoys along the coast and the Yangtze river, financed by dues on foreign shipping (check). |

Lighthouses therefore served trade, and trade served empire. The lights were also useful to local shipping, and many are still in use. A careful historian keeps both facts in view (Chapter 10).

## International Standards

- **Colours and buoys.** Before the 20th century each country used its own system of lights and buoys, which confused sailors. In 1957 the lighthouse and navigation authorities formed an international association to set common standards (check).
- **Two buoyage regions.** The system today has two regions, in which the colours of port and starboard marks are reversed, a legacy of compromise between countries (check).
- **The lists.** National lists of lights and international charts now use similar symbols and abbreviations (Chapter 5).

> **A British comparison**
>
> The Scottish contribution abroad was large. Brunton's journey to Japan was part of a pattern in which Scottish engineers, many trained on the Stevenson works, built harbours, railways and lights in other countries (check). The British system itself was a mixture: Trinity House in England, the Northern Lighthouse Board in Scotland and the Commissioners of Irish Lights in Ireland, each with its own history. A reader in Edinburgh can compare this with the French and American examples, where one national authority took over lights early.

**Check the details**

Lists of "firsts" by country are often disputed, and counts of lighthouses built by a named engineer vary by source. Brunton's own memoir is an interested account. Check dates, numbers and attributions against each country's lighthouse authority and a modern history.

## Exercises

**EXERCISE 1**

Write a short profile of Richard Henry Brunton that separates the documented facts from the stories told about him, and say where you would look for each.

→ Solution

**EXERCISE 2**

Compare the American, French and British systems of running lighthouses in a table (who ran them, when, and with what results).

→ Solution

**EXERCISE 3**

Test the claim "Lighthouses abroad were built for empire, not for local people" with the six questions.

→ Solution

### Quick Reference

- **France:** Cordouan (1611), the first Fresnel lens (1823) (check)

- **United States:** Boston Light (1716), federal control from 1789, the Lighthouse Board of 1852 (check)
- **Japan:** Richard Henry Brunton and the Meiji lights, 1868 to 1876 (check)
- **Empire and China:** lights built for trade by colonial authorities and the Customs Service

# The History of Lighthouses

Course 8 · Chapter 8 · Wrecks, Wreckers and Safety

*Lighthouses were built because ships were lost, and in the 18th and 19th centuries they were lost in very large numbers. This chapter looks at the scale of shipwreck, the legend of the wreckers who lured ships ashore with false lights and what the evidence actually shows, the other aids that grew alongside lighthouses (lightships, buoys, lifeboats), and the safety reforms of the Victorian period. It ends with the storm of 1859 that changed forecasting as well as shipping. Names, dates and figures are from general knowledge and flagged "check".*

## The Scale of Loss

### Numbers

In the mid-19th century well over a thousand ships were wrecked around the British coast every year, with a loss of life measured in the hundreds or more (check the series). Britain had the largest merchant fleet in the world, so it also had the most to lose.

### Causes

Storms, poor charts, overloaded or badly built ships, ignorance of position and the lack of marks on dangerous coasts all contributed. Lighthouses addressed only one cause, and the records show that many wrecks happened near lights, in bad weather (check).

### Cost

The owners of ships and cargoes, the insurers and the seamen's families bore the cost. This pressure led merchants, shipowners and insurers to press for lights and for regulation.

**Lights are only part of the answer**

It is tempting to tell the history of safety at sea as a history of lighthouses. In fact the reductions in loss came from many changes together: better charts, chronometers (*The*

*History of Timekeeping* 6), stronger and better regulated ships, lifeboats, weather warnings and, later, radio. A lighthouse is the most visible of these, and so gets much of the credit.

## The Wreckers

| Question (check each) | What the evidence suggests |
|---|---|
| What is the legend? | That gangs on the coast, notably in Cornwall, lit false lights or lanterns on cliffs to draw ships onto rocks, and then killed survivors and plundered the cargo. |
| What is documented? | The plundering of wrecked ships is well documented. Coastal communities took what came ashore, sometimes violently, and customs officers and magistrates complained of it. In law, goods from a wreck belonged to the Crown or the local lord, and taking them was a crime (check). |
| What about false lights? | Clear proof of ships deliberately lured by false lights is hard to find. There are rumours and a few accusations, but few convictions on that charge (check). Historians disagree about how much deliberate wrecking took place. |
| Where did the story spread? | Sermons, ballads, novels and, in the 20th century, books such as Daphne du Maurier's *Jamaica Inn* (1936) made the figure of the wrecker familiar (check). |
| What do modern historians say? | Some accept that deliberate wrecking happened occasionally, while others see the legend as a later invention that blamed poor communities for losses that were mostly caused by storms and bad navigation (check). |

The case is a good example of a story that contains a documented core (plunder) and an undocumented addition (luring). It is tested again in Chapter 10.

## Other Aids

- **Lightships.** The first English lightship was moored at the Nore, in the Thames estuary, in 1732 (check). By the 19th century dozens marked sandbanks and channels, crewed by men whose lives were hard and wet. Most were replaced by automatic buoys by the late 20th century (check).
- **Buoys and beacons.** Cheap and portable, buoys marked channels and wrecks, and became the commonest mark of all. A system of colours and shapes told the navigator

which side to pass.

- **Lifeboats.** The Royal National Lifeboat Institution was founded in 1824 by Sir William Hillary, who lived on the Isle of Man, to save life at sea by volunteer crews (check). It is funded by gifts and is independent of the state. Lighthouses and lifeboats worked together, with the keepers raising the alarm.
- **Charts and pilots.** The Admiralty published charts and sailing directions, and local pilots guided ships through difficult waters.

## Regulation

| Reform (check each) | Note |
|---|---|
| Lloyd's Register | A register of ships and their condition, begun in the 18th century by merchants and underwriters, helped insurers to judge the risk of a ship (check). |
| The Plimsoll line | Samuel Plimsoll, a Member of Parliament, campaigned against overloaded and unsafe "coffin ships". The Merchant Shipping Act of 1876 required a mark showing the safe loading level, and it is still used (check). |
| The Board of Trade | The government department that oversaw shipping collected wreck returns, held inquiries into wrecks and regulated the lights and the seamen (check). |
| International law | Conferences in the 20th century led to the international convention on safety of life at sea, adopted after the loss of the *Titanic* in 1912 (check). |

## The Royal Charter Storm, 1859

In October 1859 a great gale struck the British coast, and the steam clipper *Royal Charter*, returning from Australia with gold and passengers, was wrecked on the coast of Anglesey with the loss of about 450 lives (check). The storm sank many other ships. In response Robert FitzRoy, the head of the new meteorological office of the Board of Trade, began issuing storm warnings in 1861, the start of public weather forecasts (check). The same gale thus connects shipwreck, safety and the history of weather forecasting.

> **A British comparison**
>
> Scotland had its own wrecking stories, often about the Western Isles and the Northern Isles, where wrecks brought valuable timber and goods to poor island communities

(check). Sir Walter Scott recorded a visit with the Stevensons to the Northern Lighthouse Board's works in 1814, and used the experience in his novel *The Pirate* (check). The RNLI has stations on the Firth of Forth, and Edinburgh readers can visit lifeboat stations and the Scottish Fisheries Museum in Anstruther, which show the fishing communities that benefited from lights and lifeboats (check).

**Check the details**

Wreck statistics were gathered by different bodies at different times, and the numbers for losses and for lives vary. The wrecker legend should be discussed with the evidence for each part kept separate. Check the figures against the Board of Trade returns, the RNLI and modern scholarship.

## Exercises

**EXERCISE 1**

**Apply the six questions to the claim "Wreckers lured ships onto the rocks with false lights", and give a more careful sentence.**

→ Solution

**EXERCISE 2**

**List five causes of 19th-century shipwreck and say which a lighthouse could address and which it could not.**

→ Solution

**EXERCISE 3**

**Choose one reform (Lloyd's, the Plimsoll line, the lifeboat service or the storm warnings) and write a short note on what it changed, who opposed it and what evidence you would use to judge its effect.**

→ Solution

### Quick Reference

- **Wreckers:** plunder documented; luring by false lights unproven (check)
- **Aids:** lightships (1732), buoys, lifeboats (RNLI, 1824) (check)
- **Reforms:** Lloyd's Register, the Plimsoll line (1876), the Board of Trade
- **1859:** the Royal Charter storm and the first storm warnings

# The History of Lighthouses

Course 8 · Chapter 9 · Automation and Heritage

*In the last decades of the 20th century the keepers left the lighthouses, and radar and satellite navigation took over much of the work of the light. Yet the towers did not disappear. Many are still lit, many have become museums, hotels or holiday cottages, and the lighthouse has become one of the most familiar images in art and writing. This chapter follows the story from automation to heritage and asks what a lighthouse is for today. Names, dates and figures are from general knowledge and flagged "check".*

## The End of the Keepers

### Automation

Electric lamps, automatic lamp changers, remote monitoring and, for remote towers, solar power and batteries made it possible to run lights without a crew. Automation spread through the 20th century, station by station (check).

### The last keepers

The last keepers left the Eddystone in 1982 and the Bell Rock in 1988 (check). The last manned Scottish lighthouse, on Fair Isle South, was automated on 31 March 1998, and Trinity House's last, at North Foreland in Kent, later that year (check).

### The reasons

The chief reason was cost: wages, housing and supply by boat or helicopter. Reliable electric equipment made the keepers' work unnecessary, and the boards argued that automation was also safer, since fewer people were put at risk by landing on rocks (check).

### A loss and a gain

Automation ended a way of life that had lasted two centuries and ended the jobs of many families in remote communities. It also removed a risk to the keepers themselves and cut

the cost of the service. Memoirs by former keepers and oral history projects now record the experience before it is lost, and they are a source for the history in Chapter 6.

## Radar, Radio and Satellites

| Technology (check each) | What it did |
|---|---|
| Radio beacons | From the early 20th century, stations transmitted signals that a ship could use to find its bearing in fog, when the light could not be seen. |
| Radar | Developed in the Second World War, radar showed coastlines and other ships on a screen, and by the 1960s was common on merchant ships. |
| Radio navigation systems | Systems such as Decca and Loran gave position from signals from shore stations, and were widely used until satellites replaced them. |
| Satellite navigation | The Global Positioning System, available to civilians from the 1990s, gives a position anywhere with great accuracy, and is now on almost every ship and in every phone. |
| AIS and charts | Automatic identification systems broadcast each ship's identity and position, and electronic charts show the ship's position in real time. |

## What Do Lighthouses Do Now?

- **Backup.** Satellite signals can be jammed, spoofed or lost, and equipment can fail. The lighthouse authorities of Britain and Ireland keep their lights partly as a back-up and are interested in other back-up systems (check).
- **Small craft.** Fishing boats, yachts and many small vessels use lights as an easy check on position and to identify the coast.
- **Mark of a danger.** Even a ship with GPS needs to know where a rock is. A light is a physical, permanent mark of it.
- **Modernised.** Many lights now use LED lamps, solar panels and remote monitoring, and the tower is only the support (check).

The answer to "are lighthouses obsolete?" is therefore "less needed than in 1900, but still used". Exercise 1 asks you to put this into a careful sentence.

## Heritage and Reuse

| Use (check each) | Example or note |
|---|---|
| Museums | The Scottish Lighthouse Museum at Kinnaird Head in Fraserburgh, opened in 1990, the Bell Rock Signal Tower in Arbroath, and the Hynish shore base for Skerryvore on Tiree, now a museum (check). |
| Visitor attractions | Smeaton's Tower on Plymouth Hoe can be climbed, and other lighthouses allow tours (check). |
| Holiday lets and hotels | Keepers' cottages and some towers are rented to visitors. Income from them helps to pay for the buildings (check). |
| Private sale and community ownership | Some stations, no longer needed by the authorities, have been sold or leased to individuals and trusts, with debates about access and upkeep (check). |
| Legal protection | In Britain and elsewhere many are listed buildings. In the United States a law of 2000 set up a scheme for transferring surplus lighthouses to local groups (check). |

Erosion and rising seas also threaten towers: the move of the Cape Hatteras lighthouse in 1999 (Chapter 7) was an early case of preserving a tower by shifting it, and others may follow (check).

## In Art and Literature

- **Novels.** Virginia Woolf's *To the Lighthouse* (1927) uses a family's holiday and the trip to a lighthouse as its frame (check). Robert Louis Stevenson, trained as a lighthouse engineer, wrote of the sea and islands in many works (Chapter 4).
- **Poems.** W. W. Gibson's poem about the Flannan Isles of 1912 is among the best known (Chapter 6, check).
- **Painting.** Lighthouses appear in the work of Edward Hopper and many other painters, as solitary buildings on the edge of the land (check).
- **Film.** Several films use the lighthouse as a setting for isolation and strangeness, a theme that feeds the myth of the mad keeper (Chapter 10).
- **The symbol.** The lighthouse stands for guidance, safety, loneliness and endurance, and is used in logos, charities and everyday speech ("a beacon of hope"). Which of these meanings is meant depends on the work.

**A British comparison**

The Northern Lighthouse Board still operates more than two hundred lights, buoys and beacons around Scotland and the Isle of Man from its headquarters in Edinburgh, and its tender ships still visit the remote stations (check). A visitor from Edinburgh can reach several of the places in this course in a day, including the Isle of May by boat, the museum at Fraserburgh and the Signal Tower at Arbroath, with a view toward the Bell Rock on a clear day (check). The cultural link to Robert Louis Stevenson is also close at hand in the city where he was born.

**Check the details**

Dates of automation vary with the exact meaning (last keeper leaving, last night manned, formal handover). Counts of lights and the details of sales and uses change often. Check them against the authorities' current publications, and treat tourism material as promotion.

## Exercises

**EXERCISE 1**

**Test the claim "Lighthouses are obsolete" with the six questions and give a more careful sentence.**

→ Solution

**EXERCISE 2**

**Imagine a decommissioned lighthouse with keepers' cottages on a headland. List three possible uses, with the advantages and risks of each, and say what you would want to know first.**

→ Solution

**EXERCISE 3**

Choose one novel, poem, painting or film that uses a lighthouse and say what it shows about how lighthouses are imagined, and what it cannot show about how they worked.

→ Solution

## Quick Reference

- **Automation:** Eddystone 1982, Bell Rock 1988, Fair Isle South 1998 (check)
- **Replacements:** radio, radar, Decca and Loran, GPS, AIS
- **Heritage:** museums, holiday lets, listed buildings, community ownership
- **Image:** guidance, loneliness, endurance

# The History of Lighthouses

Course 8 · Chapter 10 · Capstone: Testing the Legend

*Lighthouses attract legends: the wonder of the ancient world, the wicked wreckers, the keeper driven mad, the three men who vanished. This last chapter pulls the course together: a timeline, a table that tests the claims from Chapter 1 against what the course found, a six-question method for testing any claim about lighthouses, and some advice on reading lighthouse history as a source. Dates are from the earlier chapters and flagged "check" where they were.*

## A Timeline of Lighthouses

| Period | Strand (see chapter) |
|---|---|
| 3rd century BC to the Middle Ages | The Pharos of Alexandria, Roman towers, monastic and coal lights (Chapter 2, check) |
| 1690s to 1880s | The four Eddystone towers: Winstanley, Rudyerd, Smeaton, Douglass (Chapter 3) |
| 1786 to 1850s | The Northern Lighthouse Board, the Bell Rock, Skerryvore and the Stevensons (Chapter 4) |
| 1780s to 1900s | Argand lamps, Fresnel's lens, flash characteristics, fog signals, electric light (Chapter 5) |
| 1801 to 1900 | The Smalls, Grace Darling, the Flannan Isles: the keepers (Chapter 6) |
| 1611 to 1957 | Cordouan, the United States, Brunton in Japan, the empire and international standards (Chapter 7) |
| 1732 to 1912 | Lightships, lifeboats, the Plimsoll line and the Royal Charter storm (Chapter 8) |
| 1980s onward | Automation, satellite navigation, heritage and the image of the lighthouse (Chapter 9) |

## Myths and Evidence

| Claim from Chapter 1 | What the course found |
|---|---|
| The Pharos of Alexandria was taller than any building of its | Unproven as stated: it was one of the tallest structures of the ancient world, but the pyramids rivalled it and its height is |

| Claim from Chapter 1 | What the course found |
|---|---|
| day. | uncertain (Chapter 2). |
| Wreckers lured ships onto the rocks with false lights. | Not supported: plundering of wrecks is well documented, but luring with false lights lacks clear proof (Chapter 8). |
| Keepers were driven mad by loneliness. | Thinly supported: the logs and memoirs show routine and some hardship, with the boards choosing and rotating keepers (Chapter 6). |
| The Flannan Isles keepers were taken by something mysterious. | False as stated: three men were lost, most probably to the sea, and the mystery details were added later (Chapter 6). |
| Fresnel invented the lighthouse lens. | True only in a careful sense: he designed and introduced the compound system, building on earlier ideas (Chapter 5). |
| Lighthouses are obsolete. | False as stated: less essential for large ships, still used as a back-up, by small craft and as marks of danger (Chapter 9). |

## Testing a Claim: Six Questions

### 1. Who says it?

An engineer, a lighthouse board, a keeper, a novelist, a museum or a tourist office? Each has an interest.

### 2. What exactly is claimed?

Pin down the words: "first", "tallest", "mysterious", "saved". Define them before looking for evidence.

### 3. What would count as evidence?

Logs, board minutes, engineers' drawings, inquiry reports, newspapers of the time. Decide before you look.

### 4. Compared with what?

Other towers, other countries, other kinds of safety aid. A claim of importance needs a comparison.

### 5. Which period?

A light of 1650, 1850 and 1990 differ so much that a claim about "lighthouses" needs a date.

### 6. What would change my mind?

State in advance what finding would count against the claim.

**Worked example: "Lighthouses made the sea safe"**

**1.** It is said by the boards, by museums and by popular writers, who have reason to praise the lights. **2.** "Made the sea safe" is vague: fewer wrecks, fewer deaths, or lower insurance costs? "Safe" is also relative. **3.** Evidence: wreck and loss-of-life returns over time, insurance rates, and studies of causes of loss. **4.** The comparison is with other changes, such as charts, chronometers, stronger ships, lifeboats and the Plimsoll line (Chapter 8). **5.** The claim covers the 18th to the 20th century, over which the numbers changed greatly. **6.** Evidence that losses fell as much where there were no new lights would count against it. **Verdict:** lighthouses contributed to safety, but did not do it alone, and "made the sea safe" gives them credit that belongs to many reforms (check).

## Lighthouse History as a Source

- **It records structures and dates,** the hard facts, though towers are rebuilt and altered and the date of a light may differ from that of its tower.
- **It records stories,** such as Winstanley's wish or the Flannan Isles details. They add colour but are unreliable as facts (Chapters 3 and 6).
- **It records engineers' own accounts,** which are first-hand and self-justifying (Chapter 4).
- **It records what is left out.** The ordinary workers, the keepers' wives and the local people who used the lights appear in the sources only occasionally, and the sources must be read for their silences (Chapters 6 and 7).
- **Method.** Use the boards' records and logs for facts, inquiries and newspapers for events, and literature and art for the image. Say which is which.

**A British comparison**

The same method works on British maritime legends: the wreckers of Cornwall, the smugglers of the coast, the Spanish Armada wrecks on the Scottish and Irish shores, or the story of a famous ghost ship. Each can be broken down in the same way (who says it, what exactly, what evidence, compared with what, which period, what would change my mind). An Edinburgh reader might try the method on a local legend, such as claims about the Isle of May or the Bell Rock bell (check).

**Check the details**

The timeline and tables summarise the earlier chapters, and their "check" items still apply. The verdicts are conclusions from the sources used in this course, not proof, and a different set of sources might shift the emphasis. Dates, dimensions and counts of lights change with each new history.

## Exercises

**EXERCISE 1**

Choose one entry from the myths-and-evidence table (other than the worked example) and apply the six questions to it in a short paragraph for each.

→ Solution

**EXERCISE 2**

Take one famous lighthouse anecdote (Winstanley's wish, the Smalls, Grace Darling or another) and test it as a source: what supports it, who told it and when, and what would you want to see?

→ Solution

**EXERCISE 3**

Apply the six questions to a legend about a British or Scottish sea story and say what you conclude.

→ Solution

### Quick Reference

- **Six questions:** who, what exactly, what evidence, compared with what, which period, what would change my mind

- **Verdict on the legends:** a real history of engineering and people, with myths that need careful wording
- **Sources:** board records and logs for facts, inquiries and newspapers for events, literature and art for the image

**Course complete**

You have finished *The History of Lighthouses*: why the coast needed lights, the ancient beacons, the Eddystone towers, the Stevensons and the Bell Rock, the lens and the lamp, the keepers, the world's lights, shipwreck and safety, automation and heritage, and a method for testing the legends. Related courses include *The History of Timekeeping*, *The Age of Exploration* and *History of Space Exploration*.