

Scientists and
Inventors - Copy 4

SCIENTIST
INVENTOR

Reginald Fessenden

 Ontario

Radio's Forgotten Voice

MICHAEL
WEBB

Reginald Fessenden

Radio's Forgotten Voice

MICHAEL WING


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CONTENTS

Introduction	1
Young Reg	2
School Days	4
Studying and Teaching	6
From Bermuda to New York	8
Working with Edison	10
Moving On	12
Marconi	14
The Weather Bureau	16
Starting a Company	18
Success	20
Troubles	22
The Later Years	24
Glossary	26
Index	28



Reginald Fessenden.

INTRODUCTION

When was the last time you heard a song you liked on the radio? It was probably not very long ago. So can you imagine the days before radio, when you could not have heard music in this way? Perhaps you think that you would have played a tape or a video instead. But they did not exist either. Record players were around, though they did not sound very good. Of course, you could always sing a song yourself or go to a concert.

For many years before television caught on, the radio was the main type of home entertainment for many people. But who was the inventor of the radio? He was a brilliant Canadian named Reginald Fessenden. And he was not just the person who made radio broadcasts possible — his voice was the first ever heard on the airwaves.



Radio broadcasts come from studios like this one.

YOUNG REG

Reginald Aubrey Fessenden was born on October 6, 1866, in East Bolton. This village was in Lower Canada, now called Québec. Reg's mother, Clementina, had three more sons after Reg. Reg's father, Elisha, was a **minister**.

The Fessendens valued education. Clementina taught Reg to read before he was five years old. Other relatives also had a great effect on the boy. His grandfather, Edward Trenholme, died before Reg was born. But Reg knew about his inventions. The best-known ones were the **grain elevator** and a kind of snowplow used on railroads. Then, there was Reg's uncle, Cortez Fessenden. Uncle Cortez was a teacher of math and **physics**. Reg loved to ask his uncle about science.



A modern grain elevator.



Fergus, Ontario.

Reg's parents were not happy about Reg's interest in science and inventing. Grandfather Trenholme had died penniless, so the Fessendens did not see inventing as a good career. They wanted Reg to be a minister or teacher.

After the family moved to Fergus, Ontario, Reg began school at age eight. In his free time, he enjoyed playing outdoors with his brothers. He learned to swim, skate, and fish. He had lots of pets — cats were always his favourites. Reg loved to read. Sometimes, he read so much his eyes hurt, and he had to rest them.



SCHOOL DAYS



Niagara Falls and the Niagara River.

Reg was nine when he heard of a great new invention — the telephone. Its inventor was Alexander Graham Bell, whose family home was in Brantford, Ontario. Reg's parents did not want Reg to get more excited about inventing. They even cut the news of the telephone out of the newspaper before Reg could read it. But Uncle Cortez visited the Bells to see how the telephone worked. He told young Reg all about the visit.



Trinity College School.

In Fergus, Reg began to invent for himself. He made an insulated box that stored winter snow and ice through the summer. He also built a small wooden model of a snowplow. He used the working parts of a clock to make an engine for it. Soon after, the Fessendens moved again, this time to Suspension Bridge, near Niagara Falls, Ontario.

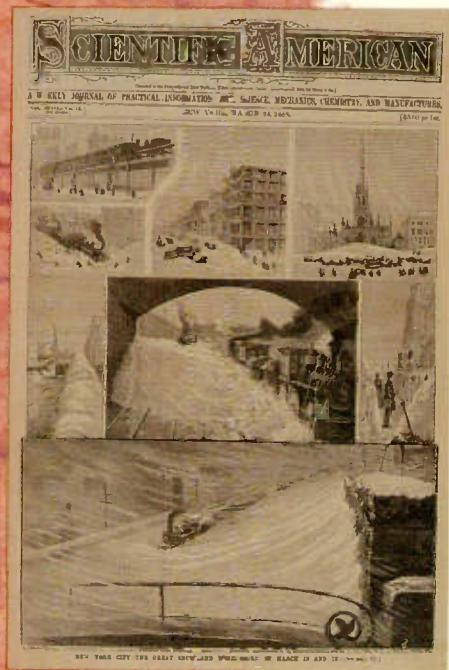
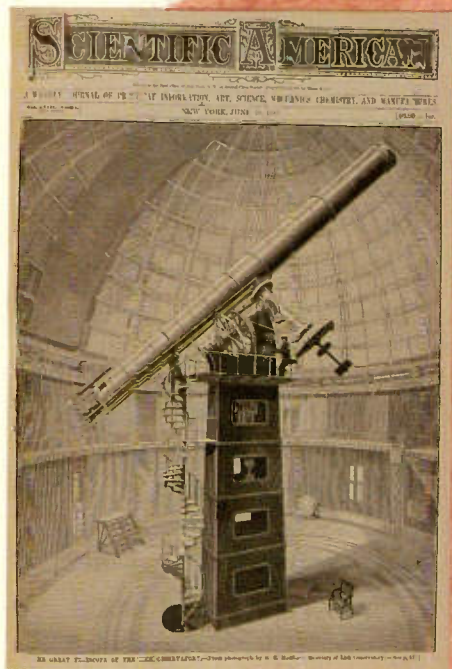
Reg won a **scholarship** at the De Veaux Military College on the American side of the Niagara River. He walked to school and back across a bridge. The work was hard there, but Reg did well. Because it was a military school, there was a lot of **military drill** on top of class work.

After a year at De Veaux, Reg went away to a famous Canadian boarding school, Trinity College School (TCS) in Port Hope, Ontario. He was very happy there and did well in all subjects, not just science and math. By the time he was 14, he could translate English sentences into French, Latin, and Greek. One year, he won all the prizes in his class.

STUDYING AND TEACHING

At TCS, Reg read more about science. Uncle Cortez helped by sending him a magazine that is still published today, called *Scientific American*.

In 1881, when Reg was 14, his eyes were hurting again. He had to have an operation, then rest at home. Even so, he graduated from TCS when he was only 15. Then, straight away, he became a school teacher himself!



Two Scientific American covers from 1888.



Bishop's College is now called Bishop's University.

Reg moved to Bishop's College and Bishop's College School in Lennoxville, Québec. He taught at the School and worked toward a degree at the College. He did not have to take College courses, just write the exams. Reg started out teaching math, but soon added French and Greek. In his spare time, he began to learn other languages, including Hebrew.

When he was not quite 18, Reg left Canada. He became principal of the Whitney Institute, a tiny school on the island of Bermuda. Reg loved Bermuda. He spent lots of time taking long walks there. On his first day in Bermuda, he met his future wife, Helen May Trott.

FROM BERMUDA TO NEW YORK



Bermuda is a beautiful island.

Reg still dreamt of inventing. He wanted to learn all about electricity because of an idea he had. Bell's electrical telephone let people speak along wires. Reg wanted to send speech without wires. In other words, he was thinking about the "wireless." We call it the radio.

Reg decided to work for the greatest inventor of his day, Thomas Alva Edison. So, after two years in Bermuda, Reg set off for New York. Helen's father made Helen stay behind.



New York City today.

Edison was already very famous. He was known as “the Wizard of Menlo Park,” after the town in New Jersey where he lived. His best-known inventions were the phonograph and the electric light bulb. The phonograph was a simple recording machine. It later led to the record player and made the recording industry possible.

Edison employed as many as 80 scientists at a time to work on his inventions. At first, though, he would not hire Fessenden. Edison needed people who already knew a lot about electricity, not someone trying to learn. So, at first, Reg wrote newspaper articles to get by.

WORKING WITH EDISON

After months of trying, Reg landed a job with one of Edison's companies. Reg helped test electrical wires in New York City. In those early days of electricity, fires were very common. The covering on electrical wires was made of rubber. This cracked easily and was not fireproof. Reg quickly found a way to reduce the number of fires. He covered the rubber with a metal pipe. Edison heard about this success and asked Reg to do research with him.

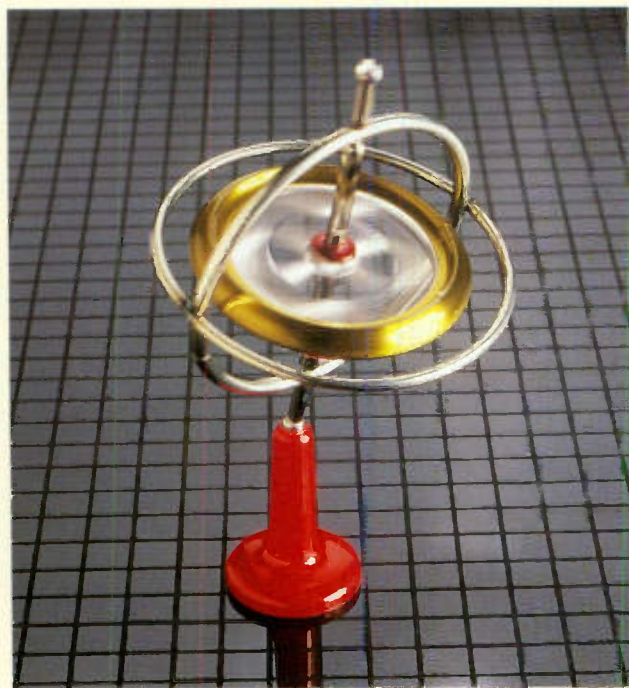


A chemist in her laboratory.

Edison told Reg to learn some chemistry and to make a new type of covering for electrical wires. Reg soon made a material that was less flammable than rubber. After only two years, Edison put Reg in charge of chemistry research.

Reg liked working for Edison and put in very long hours. Sometimes, instead of going home to bed, Reg slept on the floor of his laboratory, with his head resting on a book! He had little spare time, and he spent much of that reading in the Edison library.

Reg worked on all kinds of projects for Edison. For example, he made a new kind of varnish for a paint company. But he was still interested in electricity. While he was with Edison, he invented an electrical “gyroscope.” This machine has since helped many ships, planes, and rockets stay on course.



A type of gyroscope.

MOVING ON

Sadly, by 1890, the Edison companies were in trouble. Though Reg was laid off in August, he and Helen did not delay their wedding plans. Helen, who had been teaching in Bermuda, arrived in New York in September.

Reg found a new job right away. He worked in Newark, New Jersey, for George Westinghouse, who had invented a type of brake for trains. Westinghouse wanted to compete with Edison by selling a better light bulb. Reg found a way to make it. Then, this company also ran into problems. In 1892, Reg was out of work again.



Purdue is still a well-known university.



Modern Pittsburg by night.

The Fessendens were not well off. So Reg went back to teaching to get a steadier income. He taught first at Purdue University, in Lafayette, Indiana. After one year there, he became professor of electrical engineering at the University of Pittsburg. The Fessendens moved there with their young son, Ken. When you think about all the things Professor Fessenden had already done, it is hard to believe that he was only 26 years old.

He started inventing again right away. Photography was a hobby of his, and he used it to solve a problem. He had huge files of papers and was running out of storage space. So he took tiny photographs of them. When he needed to read a paper, he projected it onto a screen. These days, storing information in tiny photographs is very common, but Reginald Fessenden was one of the first to think of it.

MARCONI



Marconi (second from left) on Signal Hill.

Reg worked on all kinds of other ideas. For example, he made his own X-ray machine. And he kept thinking about the radio. But it was an Italian inventor who was in all the headlines. His name was Guglielmo Marconi.

Since 1837, when Samuel Morse had invented the telegraph, people had been sending coded messages along wires from place to place. The telegraph used a system of long and short clicks, called Morse code. Marconi surprised everyone by sending Morse code messages from a transmitter to a receiver through the air without wires. He called his system “wireless telegraphy.”



The coast of Cornwall, England.

In 1896, working in England, Marconi sent his signals about three kilometres. Three years later, he sent a message over ten times further, across the English Channel to France. On December 12, 1901, he was on Signal Hill in St. John's, Newfoundland. There, he heard the most famous wireless message of all. Though it was only the letter "s" in Morse code, it came right across the Atlantic Ocean from Poldhu in Cornwall, England.

This success made Marconi a household name. In 1909, he won the **Nobel Prize** in physics for his work. Today, Marconi often gets all the credit for inventing the radio. But he sent Morse code messages, not the human voice, from one place to another. Fessenden was trying to build a better system.

THE WEATHER BUREAU

With a lot of teaching to do, Fessenden did not have enough time for research. So, the year before Marconi's trip to St. John's, Reg became a full-time inventor. He had already built his own wireless telegraph. He showed it to the United States Weather Bureau, which needed a faster way to send out weather forecasts in Morse code.

Fessenden took a job with the Weather Bureau. He did research on Cobb Island in the Potomac River, about 100 kilometres from Washington, D.C. The Fessendens lived on the island with Reg's new helper, Alfred Thiessen of the Weather Bureau.



St. John's, Newfoundland.

On Cobb Island, there were two 15-metre tall telegraph masts over a kilometre apart. Fessenden and Thiessen were soon sending Morse code wireless messages back and forth between them, and to a tower about 80 kilometres away. The Weather Bureau was not interested in voice messages, so Reg worked at them in his free time.

The great breakthrough came on December 23, 1900. Instead of sending a Morse code message across Cobb Island to Thiessen, Fessenden said these words to him: “One, two, three, four. Is it snowing where you are Mr. Thiessen? If it is, telegraph back and let me know.” The clicks of the return message began almost at once. Fessenden had sent the world’s first spoken radio message. Many other firsts soon followed.



The Potomac River flows through Washington, D.C.



STARTING A COMPANY

The Weather Bureau built more weather stations. The Fessendens and Mr. Thiessen moved everything from Cobb Island to a new site on Roanoke Island, off the coast of North Carolina. For two years, Reg carried on testing his wireless telegraph. He sent Morse code messages further and further. Of course, he kept working on his radio as well. He could soon send his voice and musical notes over 100 kilometres.

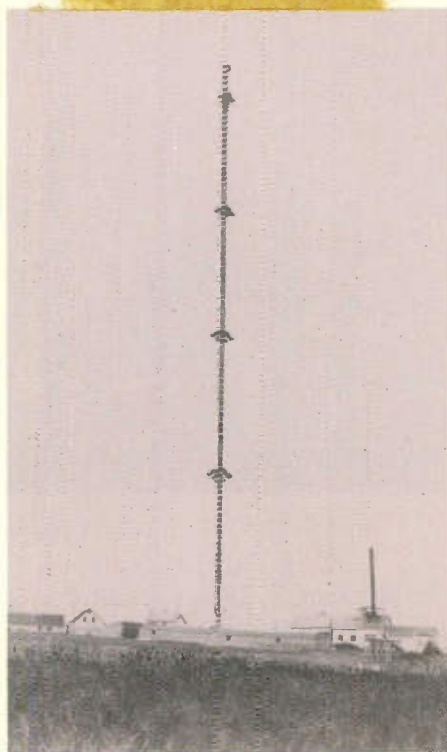
His work was going well, but he faced a major problem. The head of the Weather Bureau demanded half ownership of Reg's wireless inventions. Reg refused. So, in August, 1902, he was once more out of a job. He had very little money and needed a way to carry on with his work.



This weather station is in the Canadian Arctic.

Fessenden asked the Canadian Government for funds, but it was already buying Marconi's system. So he instead found two millionaire investors in Pittsburg. Together, they set up the National Electric Signalling Company. Reg's job was to build and operate wireless telegraph stations. The Company would charge customers for sending messages.

The investors also wanted to sell Fessenden's entire system later on. They needed a dramatic event to get publicity. They chose to try sending telegraph messages across the Atlantic Ocean. So the Company built two extra stations, one at Brant Rock on the coast of Massachusetts, the other at Machrihanish in Scotland. Each station had a mast over 120 metres tall, about as tall as a 30-storey building.



The giant mast at Brant Rock.

SUCCESS



A fishing boat at sea.

On January 3, 1906, Fessenden succeeded in sending a Morse code message across the Atlantic to Scotland. A week later, messages were flying in both directions. He had overtaken Marconi. But there were still problems to deal with. The weather could weaken the signals, and could sometimes stop them altogether.

Fessenden also pressed on with his radio. In one experiment, he radioed the day's fish prices to a fishing boat. And voice messages regularly travelled back and forth between Brant Rock and Plymouth, about 17 kilometres away.

Then, one day in November, 1906, Reg got a letter from Scotland. It told him that a voice message from Brant Rock to Plymouth had been picked up by the Scottish tower. Reg couldn't believe it. His team had sent the first voice message across the Atlantic without even trying! But, before they could do more testing, disaster struck. On December 6, a storm destroyed the Scottish tower.

The wireless voice messages that Reg had sent so far were really wireless telephone calls. One person talked to another. By the end of 1906, Reg was ready for the first broadcast to many listeners at the same time. He gave a Christmas concert for sailors on the ships of the United Fruit Company. These ships carried bananas to markets in the U.S.

The world's first broadcast took place on Christmas Eve, 1906. Reg gave a short speech and played some music on a phonograph. Then he played a song on his fiddle, sang, read from the Bible, and wished everyone Merry Christmas. He sent out a similar broadcast on New Year's Eve.



Fessenden sent the first voice message across the Atlantic.

TROUBLES



New Orleans is in Louisiana.

Fessenden had patented hundreds of inventions and should have been wealthy. But many companies used his inventions without paying him. He fought long battles in court.

His scientific work was still going well. By 1910, he could send wireless Morse code messages from Brant Rock to New Orleans, about 2600 kilometres away. This was the furthest a wireless message had travelled over land at that time. But, in January, 1911, his business partners removed him from the Company and claimed all of his wireless inventions. Again, Fessenden had to go to court. The cases dragged on for years.

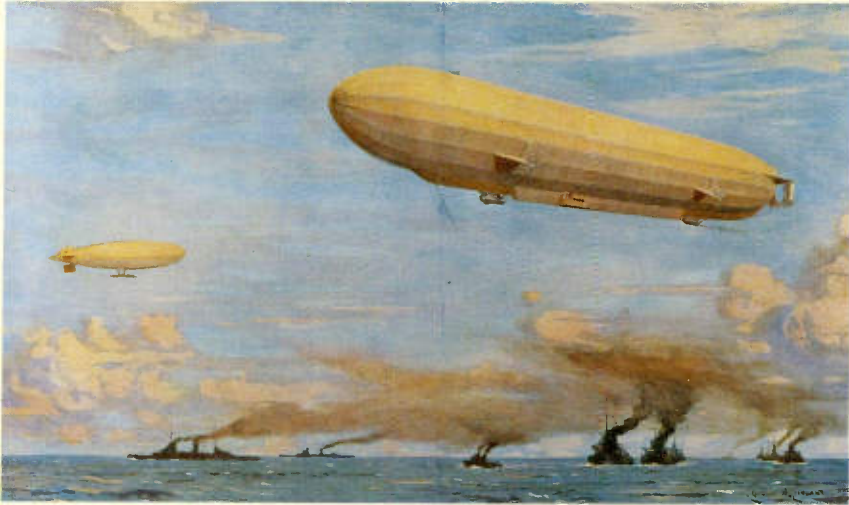


The Titanic sank in 1912.

In the meantime, Reg found other work. In 1912, the Submarine Signal Company hired him, and the Fessendens moved to Boston. Within three months, Reg built a machine that could send wireless telegraph messages 80 kilometres under water from one submarine to another.

Earlier that year, the giant passenger ship *Titanic* had hit an iceberg and sunk, taking many lives. So Reg invented a machine to bounce radio signals off of solid objects. A ship could tell how close it was to an iceberg, even in thick fog. Or, by sending signals straight down, a ship could tell how deep the water was.

THE LATER YEARS



German airships were known as “Zeppelins.”

In World War I, Fessenden kept on inventing. He developed better **gun sights**. He built a machine that used radio signals to find German **airships**, called “Zeppelins,” that were bombing London, England. Then they could be shot down more easily. And he invented a way for warships to find submarines under water. Though he took some time off to play golf and take singing lessons, he still worked too much. His health began to suffer.

Fessenden left the Submarine Signal Company in 1921. He spent a lot of time on his new interest — studying ancient history. In 1928, he finally got some of the money that people owed him for his earlier inventions. He received two and a half million dollars, a huge sum of money at the time. But, by then, he was 62 years old, and his heart was failing. The Fessendens bought a house by the sea in Bermuda. There, on July 22, 1932, Reginald Fessenden died.



This Canadian stamp was issued in 1987.

Fessenden's work lives on. Beginning in the 1920s, radio became a very popular form of entertainment. As early as 1928, there were over 60 radio stations in Canada. By 1936, a million Canadian homes had radios. These days, there is roughly one radio for every person in Canada. And there are over 25 000 radio stations around the world. Of course, radios have all kinds of other uses, from **cellular telephones** to radio-dispatched taxicabs.

So the next time you hear a song you like on the radio, perhaps you will think of radio's very first voice — the brilliant Canadian inventor, Reginald Aubrey Fessenden.

GLOSSARY

- airships** — Very large balloons, used as aircraft. (*p. 24*)
- broadcasts** — Programs heard by many listeners at the same time. (*p. 1*)
- cellular telephones** — Telephones that work by sending and picking up radio signals. Cellular telephones do not need wires to connect them to the rest of the telephone system. (*p. 25*)
- chemistry** — The study of changes in which materials are changed into other materials. (An example is the study of a wood fire, which changes wood into ash and smoke.) (*p. 11*)
- flammable** — Easily set on fire. (*p. 11*)
- grain elevator** — A type of building used for storing grain. (*p. 2*)
- gun sights** — Objects attached to guns to help people aim. (*p. 24*)
- Hebrew** — A very old language. Hebrew is now one of the official languages of Israel. (*p. 7*)
- insulated** — Built so that heat cannot enter or leave easily. An insulated container keeps cold things cold and hot things hot. (*p. 5*)
- investors** — People who provide money in order to make a profit later. (*p. 19*)
- laboratory** — A room where scientists do experiments. (*p. 11*)
- military drill** — Training in the kinds of tasks that soldiers do, like marching and handling a gun properly. (*p. 5*)

minister — A person who runs a religious service in a church. (p. 2)

Nobel Prize — One of the world's top awards. There are Nobel Prizes for medicine, sciences, helping world peace, and other types of work. (p. 15)

patented — Registered with a government office. If you patent an invention, anyone who wants to make or use it within a certain number of years has to pay you. (p. 22)

physics — The study of certain features of the world around us, such as light, sound, electricity, and how things move. (p. 2)

receiver — A machine that picks up a signal sent out by a **transmitter**. (p. 14)

research — Work done to find out and explain new facts. (p. 10)

scholarship — Money given to help pay for a student's education. (p. 5)

telegraph masts — Long poles that send telegraph signals a long way and help pick them up. (p. 17)

transmitter — A machine that sends out a signal. (p. 14)

varnish — A liquid that makes wood, metals, and other materials look shiny when it dries. (p. 11)

World War I — The War from 1914 to 1918. Germany and other countries were on one side. The United Kingdom and other countries, including Canada, were on the other side. (p. 24)

X-ray machine — A machine that can see right through flesh and other soft materials, but not through such materials as bone and metals. (p. 14)

INDEX

- Bell, Alexander Graham, 4, 8
Bermuda, 7, 8, 12, 24
Bishop's College, 7
Boston, Massachusetts, 23
Brant Rock, Massachusetts, 19, 20,
21, 22
Cobb Island, 16, 17, 18
Cornwall, England, 15
De Veaux Military College, 5
East Bolton, Québec, 2
Edison, Thomas Alva, 8-9, 10, 11, 12
electricity, 8, 9, 10, 11
Fergus, Ontario, 3, 5
Fessenden, Clementina, 2
Fessenden, Cortez, 2, 4, 6
Fessenden, Elisha, 2
Fessenden, Ken, 13
gyroscope, 11
Lennoxville, Québec, 7
Marconi, Guglielmo, 14-15, 16, 19, 20
Morse, Samuel, 14
Morse code, 14, 15, 16, 17, 18, 20, 22
National Electric Signalling
Company, 19, 22
New Orleans, Louisiana, 22
New York City, 8, 10, 12
Newark, New Jersey, 12
Pittsburg, Pennsylvania, 19
Plymouth, Massachusetts, 20, 21
Port Hope, Ontario, 5
Purdue University, 13
radio, 1, 8, 14, 15, 18, 20, 25
Roanoke Island, 18
Scientific American, 6
Signal Hill, St. John's,
Newfoundland, 15
Submarine Signal Company, 23, 24
Suspension Bridge, Ontario, 5
telegraph, 14, 16, 18, 19, 23
Thiessen, Alfred, 16, 17, 18
Titanic, 23
Trenholme, Edward, 2, 3
Trinity College School (TCS), 5, 6
Trott, Helen May, 7, 8, 12
U.S. Weather Bureau, 16-17, 18
University of Pittsburg, 13
Washington, D.C., 16
Westinghouse, George, 12
Whitney Institute, 7
World War I, 24
Zeppelins, 24



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