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WEB & WIRELESS TECH

# Hedy Lamarr

*Movie Star, Inventor, and the Mother of WiFi*

## From Hollywood to Frequency Hopping

Hedy Lamarr (1914-2000) lived a double life that few people knew about. To the public, she was a glamorous Austrian-American movie star, one of the most famous faces in Hollywood. Away from the cameras, she was a self-taught inventor who spent her spare time solving technical problems.

During World War II, Lamarr wanted to help the war effort. Radio-controlled torpedoes had a serious weakness: the enemy could 'jam' the single radio frequency guiding them, scrambling the signal and sending the torpedo off course. Working with composer George Antheil, Lamarr designed a solution in which the transmitter and receiver would rapidly switch, or 'hop,' among many frequencies in a shared secret pattern.

This technique is called frequency hopping spread spectrum. Because the signal never stays on one frequency for long, an enemy cannot easily find it, jam it, or intercept it. Lamarr and Antheil patented the idea in 1942 as U.S. Patent 2,292,387.

For decades, few took Lamarr seriously as an inventor because she was known mainly as a beautiful actress. Yet her frequency-hopping concept became a foundation for modern wireless technology, including WiFi, Bluetooth, and GPS. In 2014 she was inducted into the National Inventors Hall of Fame, and today she is sometimes called 'the mother of WiFi.'

## Part 1 · Reading Comprehension

**1. What weakness of radio-controlled torpedoes was Lamarr trying to fix?**

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**2. In simple terms, how does frequency hopping protect a signal?**

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**3. Why was Lamarr not taken seriously as an inventor for many years?**

**4. What is the connection between Lamarr's WWII invention and today's technology?**

## Part 2 · Critical Thinking

**Lamarr's idea was patented in 1942 but did not become widely used until decades later. What are some reasons a good invention might take a long time to be adopted?**

## Part 3 · STEM Challenge

### Crack the Hop Pattern

A frequency-hopping radio cycles through 5 channels in this repeating secret pattern: 2, 5, 1, 4, 3, then it starts over. The radio hops 5 times every second. Work out each step and double-check your arithmetic.

1. The signal just landed on the last channel in the pattern (3). List the next three channels it will hop to.

2. If the radio hops 5 times per second, how many hops happen in 4 seconds?

3. One full pattern is 5 hops long. How many complete patterns occur in those 20 hops?

4. An eavesdropper randomly guesses one of the 5 channels for a single hop. What is the probability they guess the correct channel for that hop?