

PALAIS DES BEAUX ARTS

### **Erik Born: A Little History of the Wireless Icon**



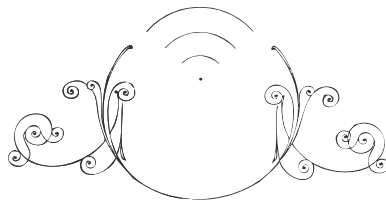
*Figure 1: A common sign for wireless, which has become well-known due to the rise of Wi-Fi. In digital interfaces, this animated version of the icon serves as an indicator for the quality of a network connection.*

Nothing says ‘wireless’ quite like this ubiquitous icon: three curved lines sitting atop a little point. An illusion of movement arises from the increasing size of the curves and the space between them. It looks almost like a wireless transmission were being sent out into space. As the waves are sent out, they become larger and larger, reaching not only one intended receiver but any number of unknown receivers who might together form an audience.

Like ships passing in the night, the members of a wireless network are not to be found at the end of a cable, but rather at unknown coordinates in the electromagnetic ocean. The location of each wireless station is not a given, present in the structure of the network itself. A wireless station must be made ‘discoverable,’ and the attraction of discovery is a constituent part of both radio astronomy and amateur radio. Whether researching an uncharted region of outer space or establishing a connection with an unknown conversation partner, wireless communications often deal with extremely long distances. Perhaps the waves in the wireless icon will continue to grow, crossing any imaginable boundary and overcoming any conceivable distance....

Omnipresence, overcoming borders, and universal accessibility—these common impressions of wireless connectivity are what the wireless icon makes visible.

Where does the wireless icon come from and what does it have to do with different generations of wireless technology?



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### *Wireless Icons*



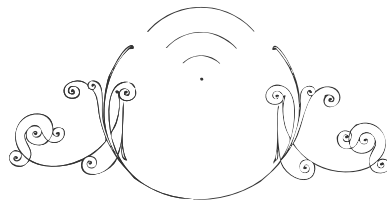
*Figure 2: The Wi-Fi logo (left) is used on devices with wireless interfaces that have been certified by the Wi-Fi Alliance. The Bluetooth logo (right) is used on devices that correspond to a protocol developed by the Bluetooth Special Interest Group.*

What is commonly taken to be the wireless icon is only one of many icons that are used in connection with different generations of wireless technology. There is no standardized icon for wireless technology, only standardized icons for various components on technical circuit diagrams. This particular icon only became popular due to its use for marking local wireless area networks. It differs significantly from seemingly related trademarks like Wi-Fi and Bluetooth. These icons involve different assumptions, and make their own claims on mythology: Wi-Fi references the symbol for yin and yang, Bluetooth the rune for Harald ‘Bluetooth’ Gorms, the medieval king who united Denmark and Norway. Just as these mythological symbols seem to unify competing elements, the computer protocols that use these symbols claim to unify competing standards.

The popular wireless icon makes a somewhat different claim. The propagation of waves in the form of concentric circles should call to mind a dominant model of wireless transmission known as ‘Broadcasting,’ which was frequently used for national radio and television in the twentieth century. Waves may be common among icons for various wireless services, but so are lightning bolts, an image that calls to mind both the speed of electricity and the removal of sparks (Funken) from the history of wireless radio (Funken). Wireless devices no longer create sparks, at least not since World War One, as was the case with spark-gap transmitters. Wireless, as we know it, means “Funken ohne Funken” to use Karl Ferdinand Braun’s famous phrase.

### *Electromagnetic Waves*

The popular wireless icon enables a different reading of wireless history, which would differ significantly from the history of the mass media. At first glance, the icon may primarily evoke images of broadcasting. But it also represents an elegant compromise in the depiction of a medium that would be completely incomprehensible without this kind of visual translation—namely, electromagnetic waves.



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*Figure 3: The vernacular iconography of electromagnetic waves: a loudspeaker (left), ray gun (middle), and wireless station (right).*

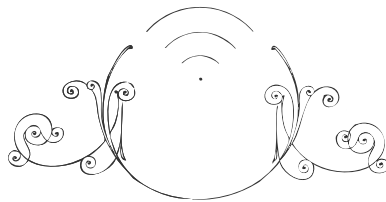
Electromagnetic waves are a physical phenomenon that results from the interaction of electric and magnetic fields. They exist everywhere, not only in the form of radio waves, which serve as the medium for wireless communications, but also as microwaves, infrared, light, ultraviolet radiation, X-rays, and Gamma rays. Since no human organ is capable of perceiving electromagnetic waves directly, they need to be converted or translated into some other form if we are to know anything about them at all. Using even a tiny area of the electromagnetic spectrum for transmitting information requires further technical operations, such as modulation and demodulation. These operations work on a portion of the electromagnetic spectrum with frequencies from ca. 3 Hz to 3,000 GHz, commonly known as ‘the radio spectrum.’

While the popular wireless icon depicts only one station, wireless networks usually consist of multiple stations that can be connected to each other in many different ways. While the structure of a wired network corresponds to the form of the cable used to create network connections, the connections in a wireless network always have to be created—not ‘out of the ether’ but out of the physical reality of electromagnetic waves that pervade the earth.

The stylized form of connection used in the popular wireless icon is only the tip of the iceberg when it comes to options for configuring wireless networks.

### *Signal Strength Indicators*

In addition to its symbolic meanings, the popular wireless icon also serves a real function. On digital interfaces, the icon provides information about the quality of a network connection in the form of a scale. The icon inherited this function from a related family of icons that serve as indicators of signal strength, commonly known as ‘signal bars.’



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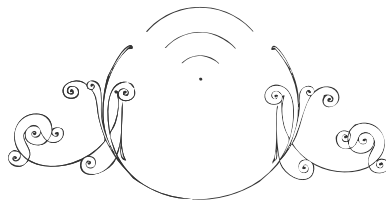


*Figure 4: Digital signal bars are a rough visualization of the quality of network connections. To view a more exact value of signal strength, you can switch your phone into a field test mode. (On the iPhone, dial \*3001#12345#\* and numbers will replace the signal bars. To end the test mode, press the Home Button.) The lower the number, the better the reception, since the value is a negative number.*

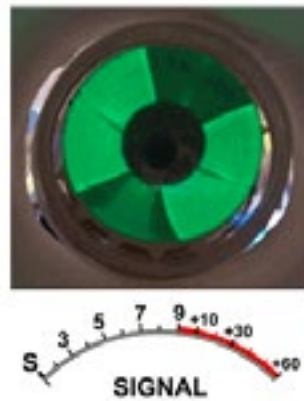
In this exact form, the popular wireless icon is still relatively new. Presumably, it appeared for the first time between 2001 and 2002 (shortly after the development of the first Wi-Fi protocols), featuring in operating system interfaces for Windows XP and Mac OS X. However, signal bars had already been introduced with the first generation of mass-produced mobile phones in the 1980s, and similar signal indicators can be found on radio receivers from the 1930s. In spite of the significant differences among these different generations of wireless technology, signal bars have remained a relatively stable sign.

Signal bars display the strength of a received signal—and in technical terminology, the icon is known as a ‘Received Signal Strength Indicator’ (RSSI). The unit of measurement for RSSI is the decibel, a logarithmic measure of signal power. This value varies greatly according to the presence of other signals, reflections, and other disturbances, but it gets rounded off through some mathematic operations and mapped onto a scale. Surprisingly, there is still no norm for signal bars: even if a greater number of bars tends to correspond to better reception, the exact meaning of 1 bar, 2 bars, etc. is always a matter of interpretation. In spite of this variability, the scale almost always uses 5 bars, a practice that can be traced back to an older generation of interfaces on wireless devices.

On electronic radios and televisions, signal strength is often displayed in the form of a glowing pattern. To create this display, the voltage of the receiver must be transformed directly into a visual indicator. The most well-known of these indicators is probably the ‘cat’s eye.’ Another common indicator is the ‘S Meter’ (signal strength meter), found especially in amateur radio devices. The numbers used in an S-Meter are derived from the RST-System for amateur radio, which—like the SINPO Code for short-wave radio or the Q code for wireless telegraphy—offer a norm for evaluating signal quality.



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*Figure 5: Forms of the ‘cat’s eye,’ a vacuum tube that serves as an indicator of relative signal strength (above); and the ‘S Meter’ or ‘signal strength meter,’ a form of microammeter (below).*

Before the development of wireless devices with integrated indicators, these systems of norms helped evaluate the quality of a signal on the basis of subjective reports. Wireless operators could ask each other about the loudness of a signal, on the one hand, and its clearness, on the other—hence, the expression “(I read you) loud and clear.” These reports of loudness and clearness were given according to a scale of 1 (very poor) to 5 (very good)—hence, the conventional representation of 5 signal bars on wireless interfaces.

### *The Wireless World*

The Palais des Beaux Art’s logo combines the popular wireless icon with art nouveau decorations to create a new kind of globe. In doing so, the logo updates Charles-Antoine Delanglard’s ‘georama’ for a wireless world. In the middle of the globe, three curved lines are sitting atop a little point, almost as though a wireless message was being sent out around the world.

Yet, whenever we see the popular wireless icon, our thoughts should not go immediately to questions of wireless coverage areas in the sense of broadcasting. We might think of the new possibilities for creating an audience and a public sphere inherent in the configuration of local wireless networks—think not only of endless distances, but also of closeness, of proximity, of the immediacy of electromagnetic waves that serve as the medium for our wireless transmissions.

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