

Foreword

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Though invisible, radio frequencies have stage-managed for what is happening in much of the visible world. Our everyday lives are now “wireless”. Remote controls, mobile telephones, satellites, radar, etc. are weaving imperceptible webs that endow us with powers like those that heroes or the gods used to wield: actions at a distance, ubiquity, foreknowledge of the weather, sight in the dark, unlimited and instantaneous access to knowledge, etc.¹

Within a few decades, humanity has discovered and learned to control the radio-frequency spectrum, this strange natural resource. Just as the discovery of the New World upturned history after the 15th century, we shall probably come to realize that the exploration of this *terra incognita* measured in hertz instead of hectares has set the stage for our destinies since the start of the 20th century. Wireless transmission, radio stations, radar, live broadcasts worldwide, satellites, GPS and mobile telephones have, over the past century, set a fast pace for a humanity that is amazed or... bewildered. As engineers domesticate new bandwidths with esoteric names tainted with mystery (the K_u, K_a and X bands), this resource, though scarce, has new, endless prospects. The speed at which changes have followed upon each other inevitably arouses apprehension. Some persons suspect that the wizardry of radio frequencies is a black magic. However this technology has never been so well controlled as it now is at the start of the 21st century.

These successes have not been achieved effortlessly. Radio frequencies are still a resource that is hard to domesticate. Frequencies close to each other often interfere. Their ranges, though soon attenuated by distance, are quasi infinite for sensitive receivers. In cities, the density of buildings impedes radio signals. To tap this capricious resource, frequencies have to be managed. Where and how will they be used? In addition, verifications have to be regularly made to detect whether signals drift. For this management of the spectrum, advantage has to be taken of the exceptional flow of the technology that has been invented and benefits this sector. Furthermore, explanations have to be tirelessly made of the usefulness of deploying new services with their antennas, sometimes a nuisance for fellow citizens. Organizing radio frequencies on the scale of a country is an ongoing, ever-changing job.

All countries worldwide have these same preoccupations. Since radio frequencies know no borders, supranational coordination of uses of the spectrum arose early on. The International Telecommunication Union (ITU) held its first international conference in 1906. Since then, the major modifications of uses (services) of the spectrum have been set down in international treaties. The last world radiocommunication conference (WRC), held in November 2019 in Egypt, brought together more than 3500 experts from the 193 ITU member states in order to make decisions about the spectrum on Earth and in space.

This collection of articles holds up a mirror to this technical saga, which is, in fact, a grand human adventure. The authors — from all continents — share concern for a spectrum that leaps across borders. This *Digital Issues* is an introduction to the management of radio frequencies, a presentation of future uses, a glimpse of the changes in the pipeline. I would like to thank all the authors for their contribution to this issue. I hope that, among the readers, some will discover a calling that leads them to come join those of us who, day after day, see to the conditions such that this magic wand keeps its power to make a wireless universe appear.

¹ This article has been translated from French by Noal Mellott (Omaha Beach, France).