

A Cosmology of Invisible Fluids: Wireless, X-Rays, and Psychical Research around 1900

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ABSTRACT *On December 28, 1895, the German physicist Wilhelm Conrad Röntgen disclosed his discovery of X-rays to the public. Just a few months later, Guglielmo Marconi successfully demonstrated his wireless system at Salisbury Plain, England. This article traces the relations between the early histories of wireless and X-ray technology. It does so by highlighting the role played by psychic research to open the connections between different technologies and knowledges. The disclosure of occult connections between these two technologies helps to locate the cultural reception of wireless around 1900 in a wider cosmology of rays and invisible forces.*

KEYWORDS *Wireless; Radio; X-rays; Psychic research; History*

RÉSUMÉ *Le 28 Décembre 1895, le physicien allemand Wilhelm Conrad Röntgen révélait au monde sa découverte des rayons X. Quelques mois plus tard, Guglielmo Marconi faisait une démonstration de son système de télégraphie sans-fil en Angleterre, à Salisbury Plain. En examinant la parapsychologie comme un champ propice à la mise en relation entre les technologies et les connaissances les plus hétéroclites, cet article reconstruit les liens entre la télégraphie sans-fil et les rayons X. L'étude de ces liens occultes permet de situer la réception culturelle de la transmission sans-fils autour de 1900 dans une cosmologie des rayons et forces invisibles.*

MOTS CLÉS *Télégraphie sans-fil; Radio; Rayons X; Parapsychologie; Histoire*

“Wherever one body apparently acts on another at a distance, we are irresistibly compelled to look for a connecting medium.”

Oliver Lodge

Introduction

On July 2, 1881, the president of the United States, James Garfield, was shot. Garfield's life was in abeyance for the entire summer. Newspapers reported that the main challenge physicians had to overcome, to save his life, was to locate a bullet in his chest. During the height of Garfield's agony, Alexander Graham Bell worked with Simon Newcomb, who had developed a system for locating metal by running electric-

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ity through wire coils, to design a device capable of finding the position of the bullet in the president's chest. The instrument they created was composed of two coils of insulated wire, a battery, a circuit breaker, and Bell's telephone. On July 26, Bell, his assistant Tainter, and Newcomb visited the White House and tried to use their apparatus to locate the bullet. Although their experiments did not work, and Garfield ultimately died in September of that year, historians regard this event as a key moment in radiography and medical diagnostics, presaging the coming of what Bettyann Holzmann Kevles has termed "the X-ray era" (Kevles, 1997, p. 11).

This encounter between an *ante litteram* radiography and communications technologies has mostly been a matter for the history of medicine. Yet in recent years, researchers have reframed the early developments of X-rays and radiography as a part of the history of media (Cartwright, 1995; Jülich, 2008; Knight, 1986). Although Guglielmo Marconi's successful experiments with wireless telegraphy and its industrial applications took place at roughly the same time as radiological screenings and X-ray photography were being developed, what has not been examined in detail are the links between the reception of X-rays and wireless telecommunications. This article contributes to literature in media history on X-rays by drawing upon a rather unusual source: the supernatural fantasies that these two technologies stimulated. Popular mystifications and theories of psychical research that were related to X-rays and wireless will be used as a source for understanding wireless communication and its early cultural reception. Looking at such theories allows us to grasp the insertion of X-rays and wireless into a wider cosmology of invisible forces that reaches beyond a single technological artifact or scientific principle, incorporating a heterogeneous body of waves, rays, fluids, and telepathic connections.

Media scholars such as John Durham Peters and Jeffrey Sconce have linked the traditions of spiritualism and psychical research to the history of communication media. While Peters focuses on the relationship between supernatural belief and the desire for a communicative empathy with the other (Peters, 1999), Sconce argues that modern communication media have been constantly "haunted" by occult theories and practices, and that this recurring relation took different configurations in different times, as different media were gaining relevance at a practical and imaginary level (Sconce, 2000). This line of scholarship, however, has mostly focused on telegraphy, wireless, television, and the Internet. These are not the only technologies that have been related to occult beliefs. Beliefs in the supernatural, especially at the turn of the century, acted as a context wherein technologies as different as X-rays and wireless telegraphy came into connection with each other.

From Röntgen to Marconi

On December 28, 1895, the German physicist Wilhelm Conrad Röntgen sent to the press of the University of Würzburg a brief publication describing the discovery he had made in the previous months, while experimenting on cathodic rays. His article, titled "On a New Kind of Rays," referred to the new phenomenon with the letter X, since several questions about its origins and properties were yet to be answered (Röntgen, 1954). The denomination of X-rays, initially meant to be provisional, spread in the press and was soon adopted in almost every Western language.¹ Sending a copy of

his article to the most influential scientists of Europe, Röntgen attached some photographs he had produced through the new rays. One of them, the X-ray photograph of his wife's hand, became one of the most reproduced photographic images of the turn of the century.

Just a few months later, the Italian inventor and entrepreneur Guglielmo Marconi filed the British patent 12.039, establishing the ground for the introduction of wireless telegraphy as a communication medium. In July 1896, he gave a demonstration of his system to the English Post Office at Salisbury Plain, where he succeeded in increasing the range from his previous 800 metres (a distance that had been obtained by other experimenters, too) to about three kilometres. Although his invention was soon challenged by litigations and claims of priority by other scientists (Hong, 2001), Marconi succeeded in making his name synonymous with the new technology. His experiments on wireless communications, including the first successful transatlantic transmission in 1901—when Marconi and his assistants reported to have heard a message that had travelled from Podhu in Cornwall, Great Britain, to St. John's, Newfoundland, Canada—were greeted as historical accomplishments the world over (Sarkar, 2006). Marconi was aware of the importance of the press, and he often twinned his experiments in ship-to-shore communications with other media events, fuelling public interest and expectations in his wireless system (Douglas, 2004).

The popular press and the public were also gripped by experiments with X-rays. In 1896, the news of Röntgen's discovery started a variety of crazes that exceeded by far the reaction to other contemporary inventions, such as cinema (Crangle, 1998; Henderson, 1988; Pamboukian, 2001). As the *British Quarterly Review* pointed out in April 1896, a scientific discovery had never “so completely and irresistibly taken the world by storm” (Anon., 1896, p. 496).

This proximity of dates and public response did not coincide, however, with a practical association of the two technologies. The application associated with X-rays and wireless had an impact on different fields. Röntgen's discovery led to a revolution in medical diagnostic imaging; wireless was to be framed as one of the milestones for the development of electric communications media. Both Röntgen and Marconi were awarded the Nobel Prize at the beginning of the twentieth century, and their accomplishments have had an enduring influence on modern physics. But Röntgen and Marconi, the two individuals who were symbolically bound to those technologies, did not have much in common. The German scientist, for example, renounced all financial profit associated with X-rays (Fölsing, 1995). Marconi, in stark contrast, immediately established an industrial empire in wireless communication that carried his name (Falciasecca & Valotti, 2003). Despite these differences, the world of occultism and psychical research² reacted to the two new media in strikingly similar ways. The two technologies came to be integrated into occultist circles following a common pattern in two respects.

First, both technologies were associated with the concept of ether. During the nineteenth century, influential scientists such as Heinrich Hertz, Wilhelm Wundt, and James Clerk Maxwell, who predicted the existence of magnetic waves in 1865, speculated about the existence of the ether, an invisible and all-embracing substance be-

lieved to be the medium through which forces as different as heat, light, electricity, and magnetism moved (Siegel, 1981). References to this substance continued to appear well after 1910, when its existence was definitively denied by the scientific establishment (Douglas, 2004). In occultism and psychical research, the existence of ether was constantly evoked by members of the British Society for Psychical Research as well as by supporters of mesmerism and spiritualism. Theories about ether, then, played a bridging role between the supernatural and science: in both psychical research and “ordinary” science, ether was the subject of numerous speculations between the end of the nineteenth and the beginning of the twentieth century (Milutis, 2006).

Secondly, both X-rays and wireless were associated with telepathy, thought transference, and mind-reading. Telepathy, as Roger Luckhurst (2002) has thoroughly documented, functioned as a leading paradigm for those who invested their efforts in psychical research at the turn of the century. Coined in 1882 by Frederic Myers, a member of the British Society for Psychical Research, the term was an oxymoronic combination between distant (tele-) and intimacy or touch (pathos).³ X-rays and wireless telecommunications were associated invisible forces that were able to effect reality at a distance, leading many occultists and psychical researchers to believe that these new technologies contained the secret to the phenomenon of mind-reading.

Mental wireless

In an article published in *Harper's Magazine* in 1891, the American writer Mark Twain explained that he had written about “mental telegraphy” already some 16 or 17 years earlier, but had not published anything on it before, “for I feared that the public would treat the thing as a joke and throw it aside, whereas I was in earnest.” The work of the British Society for Psychical Research convinced Twain that it was now the right time to report his speculations: “within the last two or three years they have penetrated toward the heart of the matter. . . . And they have succeeded in doing, by their great credit and influence, what I could never have done—they have convinced the world that mental telegraphy is not a jest, but a fact, and that it is a thing not rare, but exceedingly common” (Twain, 2000, p. 71).

Telepathy was a popular topic of discussion at the turn of the century. The Society for Psychical Research (SPR), founded in 1882 by Cambridge's Trinity College professor of moral philosophy Henry Sidgwick and other British intellectuals to investigate phenomena commonly described as supernatural, had soon disavowed the spiritualist claims about the possibility of communication with the dead to focus primarily on a supposedly more rigorous and scientific subject of studies, the phenomenon of mental transfer. The influence of the society from the foundation to the beginning of the twentieth century is indicated by its roster of famous members. William James, Henri Bergson, and Arthur Balfour, who later became a British prime minister and authored the famous Balfour Declaration in 1917, were appointed presidents of the society during this period. The term “telepathy,” coined in 1882 by a member of the SPR, Frederic Myers, to cover “all cases of impressions received at a distance without the normal operation of the recognized sense organs” (quoted in Luckhurst, 2002, p. 61), soon become common in English as well as in several other languages.

Given the claims of scientific rigour made by the SPR during these years, reading the most known report on telepathy that was published on behalf of the society, the 1896 monumental *Phantasms of the Living*, is quite disappointing. Although a number of experiences had been conducted by the SPR in experimental conditions (Hacking, 1988), *Phantasms of the Living* is primarily a collection of anecdotes of alleged telepathic transfers, with the recurring narration of a dying person appearing to a loved one at the moment of her/his death. The book (Gurney, Myers, & Podmore, 1886) furnished no concrete evidence supporting any theory about the mechanism leading to mental communication.

Members of the SPR were well aware of this problem. Although they claimed to have collected a number of practical examples as evidence supporting telepathy, they lacked a non-speculative explanation of how this phenomenon actually worked. The understanding of telepathy's *modus operandi* was one of the greatest concerns for the SPR's first president, Henry Sidgwick (Thurschwell, 2001). This fallacy was pointed out by critics as one of the most clear demonstrations of the failure of psychical research. The German-born Harvard psychologist Hugo Münsterberg, for instance, argued in an article against mystical belief published in the *Atlantic Monthly* in 1899 that telepathy was to be refused precisely because there always has to be some physical intermediation between the transmitter and the receiver: without it, he wrote, "thought transference remains mystical" (Münsterberg, 1896, p. 71).

In this context, the research on electromagnetic waves and the success of Marconi's experiments promised to give to psychical researchers a plausible example and explanation for the "physical intermediation" occurring between the minds connected in a telepathic contact. If it were technologically possible to send a message at a distance, so the argument went, then the human brain should be able to perform a similar effect. As an 1892 article in the *Spectator* put it, "why, in fact, if one wire can talk to another without connections, save through ether ... should not mind talk to mind without any 'wire' at all?" (quoted in Boddy, 2004, p. 13).

The analogy between mind and wireless became extremely influential within psychical research. The eminent British scientist William Crookes, who had received international fame in the scientific world for his discovery of the element Thallium and had been a passionate spiritualist for decades, gave a well-defined description of how this mechanism might work:

It is supposed by some physiologists that the essential cells of nerves do not actually touch, but are separated by a narrow gap which widens in sleep while it narrows almost to extinction during mental activity. This condition is so singularly like that of a Branly or Lodge coherer (a device which led Marconi to the discovery of wireless telegraphy) as to suggest a further analogy.... The action of thought is accompanied by certain molecular movements in the brain, and here we have physical vibrations capable from their extreme minuteness of acting directly upon individual molecules. (Atkinson, 1910, p. 10)

This analogy included speculations on the transformation process from the physical impulse into a decipherable output, a question that is essential for communication media, too: thus, the Polish occultist Julian Leopold Ochorowicz noted that "an idea

is only a vibration, a vibration that is propagated ... But it cannot go beyond without being transformed” (Ochrowicz quoted in Atkinson, 1910, p. 12).

The British scientist Oliver Lodge, one of the pioneers of wireless technology and president of the Society for Psychical Research from 1901 to 1903, repeatedly supported the link between wireless and telepathy. Already in 1884, Lodge had proposed in the *Proceedings of the Society for Psychical Research* a link between electrical discharge and thought transference: “just as the energy of an electric charge, though apparently on the conductor, is not on the conductor, but in all the space around it ... so it may be that the sensory consciousness of a person, though apparently located in the brain, may also be conceived of as also existing like a faint echo in space, or in other brains” (quoted in Luckhurst, 2002, p. 79).

The call to wireless as a possible explanation for the transmission of thoughts at a distance was extremely popular beyond the boundaries of British psychical research. In Italy, the journal *Rivista di Studi Psicici* was founded in 1895, following the model of the SPR journal. In 1900 the journal reported the “scientific” hypothesis according to which every idea developed in the brain was propagated in the body and could reach the brain of another person through tactile contact. When such contact did not take place, editor Cesare Vesme and chemist Livio Silva explained, the same vibrations could reach another brain “through a canal that could be what physicists call the cosmic ether” (Silva & Vesme, 1900, p. 15). Thus, telepathy at a distance derived from the first hypothesis about telepathy through contact, “in the same way the theory of wireless telegraphy can be considered as an extension of telegraphy” (Silva & Vesme, 1900, p. 16).

Another point of contact between wireless technology and occultism concerned the concept of ether. Oliver Lodge, who claimed to have been the first to invent wireless telegraphy, ahead of Marconi,⁴ was particularly eager to link electromagnetic waves, which made wireless technology possible, with his theories about the ether, which he defined as “the universal connecting medium which binds the universe together” (Lodge, 1913, p. 134). The concept of ether, in fact, was soon established as an explanatory paradigm for the functioning of wireless. As Susan Douglas has put it, it functioned “as such a crucial bridging concept for everyday people (and many scientists and inventors as well) as they sought to grasp how messages could travel without wires from one place to another” (Douglas, 2004, p. 36). In other words, ether helped in understanding the counterintuitive reality of a communication system that apparently worked without a visible channel.

Occultism and psychical research also enthusiastically embraced another turn-of-the-century scientific discovery: X-rays. This discovery stimulated a discourse on the possibility of mind-reading and on the influence of ether that recalls the reaction to Marconi’s wireless. Like the electromagnetic waves associated with wireless telecommunications, Röntgen’s rays promised to demonstrate the activity of invisible forces in our world, and to open the way for wonderful discoveries in psychical research as much as in physics.

X-rays, black light, mesmeric fluids

Today, X-rays are usually regarded as a technology for medical diagnostics and security systems, rather than as a visual medium. At the end of the nineteenth century, how-

ever, the possibility of seeing into the interior of a human body excited the public imagination, and the X-ray image appeared beyond the medical field. As film scholar Yuri Tsivian pointed out, “cultural expectations aroused by the X-ray exceeded anything that could be observed in connection with other scientific discoveries of the time” (Tsivian, 1996, p. 82). Other scholars have noted that these expectations were haunted by images of ghosts and other occult fantasies (Grove, 1997; Henderson, 1988; Jülich, 2008). While the new rays were being presented in photographic journals, academic publications, and the popular press as a new wonder that would irremediably change modern science, several accounts mystically exaggerated their powers.

The possibility of seeing through women’s clothes was one of the most common fantasies circulating about the new rays (Cartwright, 1995). In February 1896, for instance, a London firm advertised the sale of X-ray-proof underclothing (Glasser, 1958). Others speculated on the faculty of the new rays to transform matter into gold: in Cedar Rapids, Iowa, a newspaper reported that a Columbia graduate, George Johnson, had made a wonderful discovery: “by means of what he called the X-rays he is enabled to change in three hours time a cheap piece of metal worth about 13 cents to 153 dollars worth of gold. The metal so transformed has been tested and pronounced pure gold” (quoted in Nitske, 1971, p. 121). The narration of X-rays’ discovery was influenced by occult fantasies, too, with the story of Röntgen’s involvement being recalled by several accounts in mystical terms: in 1945 a biography published in Germany reported how the “revelation” of the rays had reached the German scientist in the middle of the night in a quasi-Faustian atmosphere, whose description recalls more closely sixteenth-century alchemy than turn-of-the-century physics (Dessauer, 1945).

One of the reasons X-rays were often associated with mystical forces can be found in the effects they produced on physical reality. The rays, in fact, were not only able to pass through opaque surfaces: they produced dramatic effects on the human body, too. Already at the end of 1896, they had been deemed responsible for at least 23 cases of burning and lesions (Caufield, 1989). It soon became apparent that X-rays could take lives as much as they could save them. Clarence Dally, for instance, who in 1896 had assisted Thomas Alva Edison in the development of the fluoroscope, a device that allowed real-time X-ray screening, developed in the following years a terrible cancer that originating from his hands, which he had used for the experiments. After having both his arms amputated, Dally died in 1904 of the consequences of his exposure to the rays. Many other early pioneers of the X-ray technology suffered a similar personal tragedy. As historian of X-rays Bettyann Holtzmann Kevles put it, “a gloved or amputated hand became the emblem of X-ray workers” (Kevles, 1997, p. 47). Since they were also used to heal cancers and other illnesses as soon as 1896, when the Austrian physician Leopold Freund initiated radiotherapy, X-rays became a contradictory phenomenon—able to kill as well as to cure.

Quite often, as in the case of wireless, mystifications about the potentials of this technology focused on the relationship between X-rays and mind-reading (Knight, 1986). At the beginning of 1896, for instance, a journalist reported that X-rays had been used to reflect anatomic diagrams directly into the brain of advanced medical students, making a much more enduring impression than ordinary teaching methods

(Nitske, 1971). A similar association appeared in one of Edison's "idea letters," messages sent to the celebrated American inventor by his fans with ideas for future invention. Lisa Gitelman reports that in 1896 one of the senders of these correspondents asked for Edison's opinion after having heard "a short time ago, of an English scientist who was experimenting in the new X-rays. The account stated that this scientist took a picture of his own brain while thinking of a little child who was dead. When he developed the plate he found that there was a faint impression of the child of whom he was thinking when he took the picture" (quoted in Gitelman, 1999, p. 88). X-rays and radioactivity were evoked as a possible physical explanation of mind-reading, too, mimicking Lodge and others' use of wireless as an explanatory paradigm of telepathic phenomena (Feldmann, 1938).

The Russian intellectual Maxim Gorky fantasized, in a short essay published shortly after Röntgen's discovery, about the power of X-ray photography to disclose the inside of one's mind:

Imagine that someone wants to know you better.

He takes a picture of your skull, and if the skull contained some thoughts, the negative will reveal them as black spots, or smokelike spirals, or some other unattractive form.

If he wishes, he can try to photograph your conscience, and the negative will also show all the excrescences and blots.

In a word, every person will be seen through now, and however thick and impenetrable your skin might be, the new light makes it transparent like glass. (quoted in Tsivian, 1996, p. 91).

Like wireless, X-rays were also framed in the beliefs about the existence of the invisible substance, the ether, through which it was imagined that they, together with electricity, magnetism, and light, moved. The link between Röntgen's discovery and ethereal substances can be found, for instance, in the renewal of beliefs in mesmerism at the end of the nineteenth century.

Mesmerism, a theory conceived by the physician Franz Anton Mesmer, became widely known in Europe and beyond; Mesmer succeeded in gathering a large number of acolytes, including several from the aristocracy and the rich bourgeoisie, at the end of the eighteenth century in France (Darnton, 1968). Mesmer claimed to be able to influence the balance of powers that regulates the health of every individual, stimulating a vital fluid which, according to his theories, pervaded the entire universe. This "magnetic" fluid, on whose balance depended human health as well as the general equilibrium of the natural world, recalled in several ways the concept of ether. Although Mesmer's name was later associated with the practice of hypnosis, a technique that one of his followers, the Marquis de Puységur, had introduced in his healing treatment in 1784 (Crabtree, 1993), mesmerism also gave rise to a tradition in nineteenth-century occultism that focused on the idea of ethereal fluids: the German baron Karl Ludwig Freiherr von Reichenbach, for one, claimed in the 1860s to have discovered this universal fluid, to which he gave the name of "od."

In France, a number of researchers between 1893 and the beginning of the twentieth century argued that they were able to detect mesmeric fluids or other kinds of *éflaves* on a photographic plate. After the discovery of X-rays, such theories gained a stunning popularity, stimulating a sort of revival of mesmerism at the turn of the century. The debate that originated from these experiments has been documented, among others, by the German art historian Peter Geimer (2002) and the French historian of photography Clément Chéroux (2005). Some of the most important French photographic journals of the time, including the *Bulletin de la Société Française de Photographie*, published a fair number of articles discussing whether such “photographs of fluids” were reliable scientific facts or not.

What occultists such as Jules Bernard Luys, Hyppolite Baraduc, Jacob van Narkiewicz-Jodko, and Louis Darget were claiming was that vital fluids similar to those that Mesmer had theorized could be recorded by means of a photographic plate. The plate, as in the case of X-ray photography, had to be exposed directly, without the aid of a photographic camera. Among the experiments Luys conducted, attempts to photograph the vital fluids through the contact of his bare hands had a great resonance (Colson, 1897). Luys also tried to perform a “medication at distance,” using magnets to transfer diseases through the stimulation of invisible forces (Monroe, 2008). Baraduc and Darget, recalling the functional analogy between wireless and telepathy, claimed that thoughts and feelings produce radiations and that, as with X-rays, these radiations could be recorded on a photographic plate (Chéroux, 2003).

According to Darget, Luys, Baraduc, and others, if the exposure of the plate to the X-rays had revealed the interior of the human body, the same device might have been capable of detecting other invisible forces. As the French photographer René Colson put it in 1897, after the revelation of “these astonishing rays discovered by Prof. Röntgen ... many researchers have started to penetrate into the domain of the invisible, where the sensitive plate is destined to perform other wonderful discoveries” (Colson, 1897, p. 10). Referring to these experiences, the *Photo-Gazette* announced in 1898 that a new illness had reached the world of science, the “actinic fever.” Similar to the symptoms of “gold fever,” people affected by this illness “wish to have discovered some obscure rays, and several effects that can be explained much easier in another way are ascribed to the unknown rays” (Gaedicke, 1898, p. 83).

Although the notion of ether was not mentioned in all cases, the new forces that seemed to open new perspectives for both science and psychological research emerged from the ether paradigm, as Joe Milutis (2006) has suggested in his book on the ether. The concept of ether was, in this sense, the umbrella under which a panoply of theories concerning magnetic fluids and new kinds of rays coalesced.

The celebrated French writer Gustave Le Bon, whose work on the psychology of the crowd is still considered as foundational within communication theory, took part in this rather bizarre tradition of research. In 1896, after experiencing Röntgen’s discovery, Le Bon started to research a force he called *lumière noire* (“black light”), a kind of energy that was different to the X-rays but could pass through opaque bodies as well. This kind of ray, Le Bon claimed, could be captured on a photographic plate. One of the first books published in France on X-rays, Aubert’s (1898) *La photographie de*

l'invisible, reported Le Bon's theory alongside the discovery of radioactivity by Henri Becquerel, who in 1896 had accidentally realized that the radiations of uranium could be recorded by a photographic plate. However, while Becquerel was awarded the Nobel Prize in 1903 for his discovery, Le Bon's theory on "black light" was soon withdrawn and repeatedly ridiculed (Wallon, 1897). Like the photographs of fluids, this theory proved to be a mere fantasy, inspired by X-rays.

Conclusion

Why were both wireless and X-rays associated, during their early history, with beliefs in the supernatural, and particularly to ether and telepathy? Two factors help to answer this question: their status as "new media" and their capacity to effect physical reality at a distance.

Since the pioneering work by Carolyn Marvin (1988), literature in media history on "old" and "new" media has demonstrated how novelty plays a relevant role in charting desires and public concerns toward media technologies. As Marita Sturken and Douglas Thomas (2004) aptly put it, a new technology is "almost inevitably a field onto which a broad array of hopes and fears is projected and [which is] envisioned as a potential solution to, or possible problem for, the world at large" (p. 1). The expectations that the discoveries of Röntgen and Marconi aroused in the public sphere were important in stimulating the interest of occultists and psychic researchers. Throughout the nineteenth and early twentieth century, in fact, psychical research was extraordinarily receptive to the wonders of modern technology. New discoveries and inventions were often regarded by the members of societies for psychical research in Britain, the United States, France, and Germany as further evidence of the most common argument of end-of-the-century psychical research: that, to use the words of Van Helsing in Bram Stoker's *Dracula*, "there are things done today in electrical science which would have been deemed unholy by the very men who discovered electricity—who would themselves not so long before have been burned as wizards" (Stoker, 2003, p. 196). If transatlantic telegraphy, electrical lightning, or airplanes were believed impossible just a few years before their invention, then, reasoned the supporters of psychical research, why could not phenomena such as clairvoyance, telepathy, and spirit communication be the scientific discoveries of tomorrow?

In this context, it is easy to imagine how wireless and X-rays could be seen as a potential answer to the challenges posited by psychical research and, at the same time, as a promising way to find a solid scientific framework. To give but one instance, a supporter of spirit photography, a spiritualist technique by which it was apparently possible to capture a picture of the spirits of the dead, could convincingly point out that "to say that the invisible cannot be photographed, even on the material plane, would be to confess ignorance of facts which are commonplace—as, for instance, to mention the application of X-ray photography to the explorations of the muscles, of fractures and bones, and the internal organs" (Coates, 1911, p. 2).

Another relevant factor was the idea of action at a distance. According to psychoanalysis, as Pamela Thurschwell has noted in her book on literature and psychical research, magical thinking is the belief that thoughts and desires can directly transfer themselves to, and transform, the material world, other people, or the future: "like telepathy and contact with the dead, magical thinking collapses distances"

(Thurschwell, 2001, p. 6). John Durham Peters (1999) has argued that the idea of action at a distance has been perhaps the most important link between communication and the occult since the early nineteenth century. The discovery and technological application of both X-rays and wireless disclosed a world of invisible forces that were able to act on physical reality without any apparent physical contact. This idea emerges, for instance, in Rudyard Kipling's famous 1902 short story "The Wireless," where the existence of a field of electromagnetic waves elicits literary fantasies of spiritualist contacts and mental transference (Kipling, 1911); or, in reference to X-rays, in the flourishing of theories about mystical forces such as mesmeric fluids and Le Bon's black light.

To scholars in media history, the role played by these rays and invisible forces acting upon physical reality may suggest something about the cultural reception of wireless technology at the turn of the century: that the new medium of wireless communication was understood, in its early history, as taking part in a sort of cosmology of radiations. This wide cosmology included fascinations with X-rays, a rejuvenation of theories on the ether, the end-of-the-century revival of mesmeric fluids, and a belief in a network of telepathic transfers. Electromagnetic waves and X-rays seemed to be only two elements of a broader spectrum of natural forces. This world of invisible rays that was all around us could not be perceived by the human senses alone but was thought to have powerful effects on reality. The imaginary life of wireless went well beyond its use as a communication medium, incorporating speculations about its relations to the human body that are still at play today, as the unending debate about the possible health risks in the use of mobile phones testifies.

The history of psychical research, a realm of science and pseudo-science that was open to extraordinary connections and influences, has helped to rediscover this early association of wireless with X-rays. But this link was not, at least not only, a matter of occult or supernatural belief. Contemporary physics demonstrates that the electromagnetic spectrum includes radio waves, microwaves, infrared, ultraviolet, X-rays, and gamma rays, plus the visible wavelength region that we perceive as light. Between them, it is just a matter of wavelength.

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Notes

1. The exception was Germany, where the denomination *Röntgenstrahlen* (Röntgen rays) was adopted, honouring the discoverer.
2. I use the term "occultism" in its more general sense, as "the study of the supernatural." Also, although "psychic research" is more common in contemporary English, I mostly use the term "psychical research," because this was customarily employed around 1900.
3. While the etymology of pathos recalled the idea of empathy and erotic contact, the prefix tele-associated linguistically the phenomenon of mental communication with new media technologies such as the telegraph or the telephone.
4. His claims, as Sungook Hong convincingly demonstrated, were most probably unjustified (Hong, 2001).

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