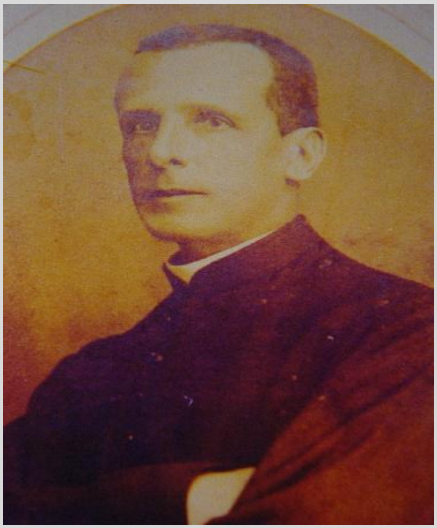
LANDELL



The priest who invented wireless and faced science deniers

HAMILTON ALMEIDA

"I know very well that, in matters of science, what is ahead of time should not expect justice from its contemporaries"

1861-1928

For Débora Vieira de Almeida

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Introduction

Wireless communication is one of the most important technologies of the 21st century. Mobile devices make it possible to interact with someone anywhere in the world easily, quickly and instantly. In addition to chatting, people can exchange photos, videos, messages, audio files and texts, watch TV, listen to the radio, read the news... A video conference can, for example, bring together Americans, Europeans, Asians, and Africans. There are no physical barriers to real-time communication.

The widespread use of the internet and social networks in modern societies reinforces the importance of online communication and digital media, increasing the conviction that

communicating is not only vital, but also commonplace.

These routine practices are the result of more than a hundred years of evolution. The wireless era of human communication was inaugurated by two young scientists quite geographically distant: in Italy, Guglielmo Marconi sent Morse code signals (the three points of the letter S) in 1895; in Brazil, Roberto Landell de Moura sent voice and musical sounds in 1899 or even before that.

The use of electricity radically changed the way of life and communications. Before Marconi and Landell, another major impact was caused by wired technologies: telegraph lines united cities and submarine cables connected continents, bringing citizens and nations together, and considerably expanding press coverage.

In the early days of the wired telephone, talking to someone in another city was a clear sign of progress. Newspapers and magazines were the only media tools available. The "global village" was in gestation in the second half of the 19th century.

Other names joined the list of telecommunications pioneers, such as Canadian Reginald A. Fessenden, Croatian Nikola Tesla, American Lee de Forest, and German Ernest Ruhmer. All of them marketed their ingenious inventions and entered the hall of fame. The only exception was the Brazilian inventor who, in spite of his hard efforts and sacrifices for the materialization and propagation of his works, remained on the sidelines.

Between 1894 and 1896, Father Landell, as he liked to be called, already admitted the possibility of intercommunication far from the

boundaries of the Earth – 75 years before man's arrival on the Moon:

"*Give me a vibratory movement as extensive as the distance that separates us from these other lands that roll over our heads or under our feet, and I will make my voice reach there*". (1)

When asked in 1902 about the range of wireless transmissions, he did not hesitate: "Practically infinite." (2) At the threshold of the 20th century, when he patented radio systems in Brazil and the United States, he began to design television. When radio broadcasting began to expand in the 1920s, he confessed:

"´*Indeed, God used my humble person to lift a little the veil that hides the secrets of nature, since the radiotelephony system currently in use is based on the principle of superposition of electrical wave movements and on the application of a similar lamp to the Crookes tube with*

three electrodes, but slightly modified, which transmits and receives telephone and telegraphic messages without a conductive wire`. These two main aspects were discovered for the first time by Father Landell de Moura". (3)

There was a huge technological leap in just a few decades. On July 20, 1969, when astronauts Neil Armstrong and Edwin Aldrin became the first men to walk on the Moon, images of the feat were broadcast live on television to about 1.2 billion people around the world. NASA has used radio frequency communication systems to successfully send data to and from spacecrafts since the early days of space exploration.

The advent of mass culture, with the dissemination of information not only printed, but also by electronic media and cinema, was consolidated with the internet; the last wave,

popularized since the 1990s, includes social media.

Father Landell's talent was at the service of the fantastic telecommunications saga in its initial stages. But as time passed by his inventions ended up being invented by other inventors.

Modern wireless communication systems “use frequencies as a means of transport for information. Radio waves are electromagnetic signals that transmit conversations, data, music and other information into the atmosphere. Several types of systems use them as a means of transport, such as AM and FM radio broadcasting, television, cell phones, and satellite communication”. (4)

These waves have different frequencies. The radio spectrum is subdivided into nine frequency bands, which range from very low (3 to 30 kHz)

to extremely high (300 to 3000 GHz). With the relentless expansion of wireless services around the world, all services that depend on radio waves are competing for a share of the radio frequency spectrum to support new applications, growing numbers of users and exploding traffic. The relevance of the work carried out by the radiocommunications sector of the International Telecommunication Union (ITU) is therefore increasing every day. (5)

In other words, by making the first transmission of voice and musical sounds by radio waves in human history, Father Landell opened the door that would lead to the creation of several wireless inventions, such as the cell phone in modern society.

I

The telephone right after Graham Bell

The year 1861 marked the beginning of the Civil War. Three years before the outbreak of the War of the Triple Alliance, or Paraguayan War, which was the largest armed conflict in South America, Brazil was a monarchy ruled by Emperor Dom Pedro II. A large part of the population lived in the fields, where enslaved labor was widely used.

Farmland was mainly in the hands of coffee and sugar cane farmers and cattle breeders. The families were large, patriarchal and Catholic. For the most religious ones, not guiding a child

towards an ecclesiastical career was “a social and moral omission”.

Children learned to fear God and to make morning and evening prayers. Girls matured early, got married when they were just over 13 years old and rarely chose their husbands. That decision was usually up to their fathers. At the age of 14 or 15, female adolescents dressed like ladies. The country was full of beggars. (1)

On Monday, January 21, 1861, Roberto Landell de Moura was born in the downtown area of Porto Alegre, capital of the province of São Pedro do Rio Grande do Sul (name of the State of Rio Grande do Sul during the Empire). The city had around 40 thousand inhabitants; the nation, 8.5 million.

He was the fourth child in a traditional middle-class family. His maternal grandfather, Robert Landell, was the patriarch of the Landell family

in Brazil. Born in the County of Berwickshire, Scotland (1788-1789), he graduated in medicine, surgery and obstetrics from University of Edinburgh. He emigrated to Brazil in 1826 with his wife Sarah Thompson Graham, with whom he had his first son, John. His second marriage was in 1831 to Rosa Joaquina de Carvalho, from Rio Grande do Sul, and the couple had Sarah Marianna and other children. (2)

Doctor Robert Landell faced an outbreak of smallpox in 1837 in Porto Alegre, which caused many deaths. When the disease broke out again in 1842, the sorrowful remembrance of the past event induced him to put into practice an idea which he had since that unlucky year: testing a solution with the cowpox virus. The oral vaccine was a success. Assisted by his son John Landell, he treated more than 30 patients, 14 of them with the most

dangerous and complicated symptoms, and lost none.

"The discovery of a new and successful treatment of smallpox" was informed to the US consul in the State of Rio Grande do Sul, and published in several medical journals. In 1857, an article signed by "R. Landell", revealing the drug formulation, was reproduced in *The American Journal of the Medical Sciences, Virginia Medical Journal, and American Medical Gazette and Journal of Health.*

The novelty was also on the pages of *The North American Medico-Chirurgical Review* (1858), *The Ohio Medical and Surgical Reporter* (1873) and T*he Medical World* (1894), as well as in magazines from England, Poland and Germany. In 2013, his feat was mentioned in the book *Smallpox: a history.* Robert died at the age of 90 on January 12, 1879. (3)

Roberto Landell de Moura's parents, Captain Ignácio José Ferreira de Moura (1829-1904) and Sarah Marianna Landell de Moura (1832-1926), had 14 children. He was educated according to the strict conceptions of the Catholic religion and initially studied with his father. Afterwards, he was enrolled in teacher Hilário Ribeiro's public school. He was then transferred to the famous school of teacher Fernando Ferreira Gomes. At the age of 11, he entered the Colégio de Nossa Senhora da Conceição, in São Leopoldo, where he completed his Humanities course (1877). (4)

He was impressed by the spots on the Moon, the moral dejection of the poor and scientific things since early childhood, as his own notes reveal:

"*In my adolescence, I liked to observe the insect carried by the ant; the strength of the snake overcome by the*

forces of a group of ants – elastic force or elasticity; the search for meat conservation; I liked to inspect bogs to see what was there; I liked to open dead animals or to see somebody else doing that just to check how they were made inside; I was so sorry when an animal was being killed and I was indignant when people prolonged its suffering.

"When I already knew how to read and was starting to learn the multiplication tables, I tried to find some way to avoid memorizing. I had an aversion to memorize what I didn't understand or didn't fully grasp. As I entered puberty, I developed an appreciation of poetry and poetic prose. I really enjoyed reading Telemachus and poetic compositions.

"And at the age of 14, I already tried to write verses. The transition from adolescence to puberty greatly accentuated my morale. In full puberty, I

developed a deep appreciation of philosophical concepts, celestial mechanics, physical and chemical sciences".

At just 16 years old, his strong inclination emerged with strokes of genius:

"I made some chemical compositions, like one to extract cavities from teeth. I built a telephone. I carried out an autopsy on a cat and studied the influence that atmospheric electricity could have on it".

Nothing is known about the effectiveness of that chemical formula for treating cavities nor about that phone. But when these things happened in 1877, a relevant fact was that the invention by Alexander Graham Bell launched in the previous year was arriving in Brazil! Back then, the most modern technology in communications was the wired telegraph.

The first intelligible telephone call dates back to March 6, 1876. The pioneering telephone network was installed in Hartford, USA, in 1877. The novelty was made available that same year by the Western and Brazilian Telegraph Company to Emperor Dom Pedro II, at the Palace of São Cristóvão, in Quinta da Boa Vista, today the National Museum, in Rio de Janeiro. (5)

As a young adult, Roberto possibly went to Rio de Janeiro to prepare at Escola Central. Previously, this school was the Royal Military Academy founded in 1792 by order of Dona Maria I, Queen of Portugal. Its official name was Royal Academy of Artillery, Fortification and Design, and now it is called the Military Engineering Institute (IME). Apparently, Roberto also started working in a grocery store to cover basic expenses. (6)

The fact is that he was educated under adverse conditions for his latent vocation. Until the end of the Empire, Brazilians were not interested in science. Education was almost exclusively literary, bookish and rhetorical, and there were no science colleges or associations of pure science and higher studies.

Thus, scientific culture could only develop haphazardly in Brazil, “mainly due to the strength of some exceptional spirits, children of their own works, and less to the pressure of a cultural environment that has always been hostile, if not to intelligence, at least to pure science research”. (7)

Roberto, “always oriented towards an ecclesiastical career, for which he had a true vocation, in addition to being his father's will,” soon went to Rome with his brother Guilherme. They were sent by the

bishop of the province of São Pedro do Rio Grande do Sul, Dom Sebastião Dias Laranjeira, to study Theology (bachelor's degree in Canon Law).

They enrolled on Friday, March 22, 1878, at the Collegio Pio Latino Americano on Quirinal Hill, one of the seven hills of the "Eternal City", which had around 300 thousand inhabitants. (6) Roberto was 17 years old; Guilherme, almost 15. The brothers lived on the college premises. In order to study, they ran up debts, which would only be paid off in 1901, when Roberto had almost 15 years of ecclesiastical activity, and Guilherme, 13. (8)

Roberto's attention was divided. One kilometer away from the college, he attended physics and chemistry courses at the Università Gregoriana, the most famous higher education Jesuit school, where 14 popes have

studied. It is very likely that he had studied *Elementary treatise on physics, experimental and applied: for the use of colleges and schools,* by A. Ganot, which addressed wired telegraph and telephone technologies in the communication field. And so he gained the basic knowledge to develop his talent that would revolutionize communications.

After almost nine years of studies, at the age of 25, Roberto was ordained as a priest on November 28, 1886, in the private chapel of Cardinal Lucido Maria Parocchi, and said his first mass in Latin. (9)

In the capital of Italy, he had ideas about the "unity of physical forces and the harmony of the Universe". On the way back to Brazil, when he was traveling from Rome to Paris, he observed a very common phenomenon in summer, which corroborated his

theory: the heated air seems to gallop in space, when the fields are burned. (10) At that moment, he glimpsed the possibility of communication through the air...

He arrived in Brazil on Monday, February 7, 1887 aboard the Steamship Senegal. (11) He lived again in Rio de Janeiro for a while, at the traditional São José Seminary. (12) On some occasions, he replaced the assistant of the chaplain of the Paço Imperial who was ill, and had long scientific conversations with Dom Pedro II. (13)

On February 20, he returned to the south of the country. In the chapel of the Carmo Convent, he said, for the first time, a mass in his homeland. On the 28th of that month, the bishop appointed him chaplain of the Bonfim temple and professor of Sacred and Ecclesiastical History at the Nossa

Senhora Madre de Deus Episcopal Seminary in Porto Alegre. (14)

The proclamation of the Republic, on November 15, 1889, profoundly changed church-state relations, which were separated. The bishops had an attitude of expectation right after the coup that put an end to monarchy. But, when religious freedom was introduced, they reacted: they condemned the mandatory civil marriage before Catholic marriage and the ban of religious instruction in public schools, among other issues.

The presbyters intended to maintain the distinction between worldly and spiritual powers, but did not approve the separation. Secularization hindered the insertion of the doctrine in an environment dominated by scientistic and positivist ideas. In addition to losing its status as an official belief, the Catholic faith felt

threatened by dominant Positivism, by the advance of Protestant and Spiritist evangelization and, above all, by the lay mentality. (15)

Anchored in faith and science, the singing chaplain ended up stuck in the middle of the debate and the undeclared war between positivists and the Church. And he would pay a heavy price for it...

On May 25, 1891, he was appointed vicar of Uruguaiana, on the border with Argentina, where he remained for a few months. His life would undergo a major change due to health reasons. (16)

II

The awakening of a new era

In the last decade of the 19th century, Father Landell sought help to implement his telecommunications projects. He traveled to Rio de Janeiro with the intention of asking the Church for funding telegraphy and "wireless telephony" (radio) experiments.[1]

[1] A note to readers: the concept of "wireless telephony", an expression of that time, refers to the human voice and music transmission over a distance by radio waves. Just like wireless telegraphy (or radiotelegraphy – transmission of Morse code signals), wireless telephony is part of the so-called radiocommunication. Wireless telephony and radiotelephony have the same meaning and represent what, nowadays, we simply call radio. Therefore, do not confuse the wireless telephone or radio with current cell phones or wireless telephone devices. Whenever this book refers to wireless telephony, respecting the historical name, it is addressing radio.

A witness to this event, professor Maria Ribeiro de Almeida, narrated:

“One day in 1893, I saw a humble and taciturn priest walking up the stairs of the Church of Glória, in order to talk to Monsignor Molina in the sacristy. The famous inventor was surrounded by people who already knew why he had come to the capital of the Republic. All of them wanted to have the honor of being able to say that they had met him, that they had shaken hands, that they had heard from his own lips the wonderful narrative of his discoveries!...

“But the eagle, injured in its lofty flight, lowered its head as a defeated warrior! Landell’s saddened gaze seemed to stare at a distant adored image, which was disappearing... And his lips, tightened by an endless pain, did not open to speak about his hopes!...

"The people gathered around the priest spoke low exchanging ideas... and I heard, indignantly, despite being a child, these painful words which I could never forget:

"- *He did not get the subsidy for experiments with the wireless telegraph and another device which would catch sound waves and make any voice heard from one continent to another!...*

"I could never forget Father Landell de Moura". (1)

But in spite of the setback, he did not give up. Engineer and businessman Jayme Leal Velloso has declared:

"I have lived in the State of São Paulo for 30 years, including 25 years in the capital, and I often have heard about the priest's experiments with wireless telegraphy and telephony transmissions from the top of Paulista Avenue to Santana heights, at an

approximate distance of 8 km in a straight line. Those events happened between 1890 and 1894". (2)

Paulista Avenue was inaugurated at the end of 1891. Today, it has become a postcard with many skyscrapers, various antennas for radio and television stations, and radio base stations for cell phones and other telecommunications services.

Doctor Hernani de Irajá asserted that Father Landell devised "in 1892, several devices that transmitted voice and writing remotely. In 1893, he achieved magnificent results with telephotography and a three-electrode lamp, which greatly helped the development of other inventions". (3)

In his book *O Incrível Padre Landell de Moura*, Ernani Fornari, another Landell's contemporary, stated that the first successful wireless transmissions

and receptions occurred between 1893 and 1894.

The book *O Brazil Actua*l, by Arthur Dias, which was published in Italian and English in 1904 with the intention of making the nation better known "in terms of its civilization and its current progress", informs:

"After the creation of his devices in Porto Alegre, Dr. Roberto Landell de Moura arrived in São Paulo[2] and soon began to make preliminary experiments, with the aim of achieving his goal – transmitting human voice over a distance of 8, 10 or 12 km, without metal wires. After a few months of painstaking work, he obtained excellent results with one of the devices he had built".

The chapter about inventors and scientists says that, "excited by the

[2] June 1894.

success of his experiments, he sought to perfect his invention, which is the result of studies and discoveries of some laws related to the propagation of sound, light and electricity into the space, earth and the aqueous element. Thus, he invented several devices: the telauxiophono, the kaleophono, the anematophono, the teletiton, and the ediphono". And Dias concluded: the wireless telephone is "the most important" of his inventions. (4)

Brazil in 1909, by J. C. Oakenfull, does not mention dates, but presents Landell as "the first inventor of the wireless telephone". He was listed among the most prestigious scientists, alongside Santos Dumont and Vital Brazil. (5)

The beginning of Landell's scientific career coincided with the infancy of the Brazilian Republic, a period which was partly influenced by

positivism. The proclamation of the Republic took place just over a year after the abolition of slavery (May 13, 1888). Gilberto Freyre reported that there was a notable use abroad of modern propaganda techniques, both by the regime and the country. Brazil had never had such a brilliant publicity, whether official or private, in Europe and even in the USA, by means of books such as those by Arthur Dias and J. C. Oakenfull, among others. (6)

Brazil was a member of the International Postal Union and a signatory country of all international agreements regulating telegraphy, submarine cables, and marine signaling. (7)

In the 19th century, the use of electricity revolutionized communications. This phenomenon was closely linked to the effervescence

caused by the Industrial Revolution (c. 1750-1850). (8) In 1837, Samuel Morse invented the electric telegraph. The patent for the device, which used the electromagnet and the dash and dot code, was requested in April 1838 and granted on June 20, 1840 (No. 1,647). Morse would make improvements in the following years. In 1844, the first commercial line between Washington and Baltimore was inaugurated. (9)

The wired telegraph changed the planet. “It transformed the way of communicating and informing, accelerated the time lived, hastened the circulation of news and, above all, changed the way of describing events. (...) After the telegraph, the news would be brief, concise, fast, telegraphic”. It shortened the distances by transporting messages across continents and oceans at a speed of 25 mil km per second. (10)

As a sort of ancestor of the internet, the telegraph was the primordial information technology used worldwide. Engineer Claude Chappe invented a semaphore visual telegraph, which in 1794 announced French victory against the Austrian armies. (11)

On February 14, 1876, something unimaginable happened. Scotsman Alexander Graham Bell requested a patent for his so-called Improvement in Telegraphy. Two hours after the application was filed, Professor Elisha Gray went to the U. S. Patent Office with the same intention. There was a long dispute and the invention of the corded telephone (patent No. 174,465 of March 7, 1876) was attributed to Professor Bell. (12)

The controversy is greater: by resolution No. 269 of June 11, 2002, the American Congress posthumously

recognized Italian Antonio Santi Giuseppe Meucci (1808-1889) as the true inventor. Living in the USA, Meucci built an electromagnetic telephone in 1856, called Teletrofono, which connected the laboratory to the bedroom on the 2nd floor of his house, in order to easily talk to his wife who suffered from disabling arthritis. He made a demonstration in 1860.

Without financial resources to register it, he only filed a "notification of objectives" (December 28, 1871), which assured the intention of patent and needed to be renewed annually. He could not renew it after 1874 because he did not have 10 dollars available. (13)

Emperor Dom Pedro II saw a telephone for the first time in June 1876, at the Philadelphia Centennial Exposition. Bell extended a wire and said: "To be or not to be".

“For Christ’s sake! It speaks!”, reacted the monarch.

The following year, a telephone was installed at the Imperial Palace and a connection began to operate between the O Grande Mágico store on Ouvidor Street and the Fire Department headquarters. The Companhia Telefônica do Brasil was created on November 15, 1879, ten years before the proclamation of the Republic. (14)

“The discovery of electromagnetic induction by Michael Faraday (1831) sparked the idea of transmitting signals without the use of wires”. William Thomson (Lord Kelvin) demonstrated in 1853 the oscillating character of condenser discharge. And James Clerk Maxwell (1873) foresaw the existence of electromagnetic waves. (15) Previously, Danish Hans Christian Oersted discovered (1819) that electric currents generate magnetic fields. (16)

The revelations contained in one of the fundamental creations of physics, *A treatise on electricity and magnetism*, by Maxwell, "gave origin to the development of radiotelegraphy, radiotelephony, television and the set of modern radio electric techniques, such as radar and radio telescope. That treatise summarizes all the laws of electricity into a coherent system of equations, which remain fully valid today. (...) It considers the existence of electromagnetic waves that oscillate at frequencies different from those of light, but with the same properties as light: propagation in space, polarization, reflection, refraction, interferences". (17)

Based on Maxwell's foundations, Heinrich Hertz built in 1888 a device capable of detecting radio waves. Until then, "visible light and infrared and ultraviolet rays were the only known electromagnetic waves". (18)

The German physicist's work "was published in the book *Electric waves: being researches on the propagation of electric action with finite velocity through space.* He also discovered that radio waves – which he called inductive or air waves – could be transmitted through different materials and were reflected by others: the first step towards the conception of radar. The term Hertz would be part of the international metric system in 1933, giving his name to the measurement used for electrical and radio frequencies". (19)

An electromagnetic wave is formed by electric and magnetic fields that vary over time. "Today we know a broad spectrum of electromagnetic waves: Maxwell's rainbow". It is a radiation scale. They propagate at the speed of light and most of them are invisible.

We are immersed in these waves whose main source is the Sun. “Our bodies are also crossed by radio, television, and cell phone signals. Microwaves from radar devices can reach us. We also have electromagnetic waves coming from light bulbs, hot engines in cars, X-ray machines, thunderbolts and radioactive elements in the ground. Furthermore, we are bathed by radiation from stars and other bodies in our galaxy and other galaxies”. (20)

In 1894, Oliver Lodge proposed the use of glass tubes with loose metal filings between two electrodes, which he called “coherers, in the detection of electromagnetic waves. Alexander Popov (1895) and later Marconi improved the coherer and increased its power so that it could operate a Morse device. Marconi had the idea of putting a long vertical wire, the antenna, into the exciters that produced the

oscillations, in communication with one of the active spark poles, while the other was connected to earth. A similar device received the wave and carried it from the receiver to the coherer". (21)

Using Hertz's oscillator, Popov's antenna and Edouard Branly's coherer, Marconi made in 1895, in the town of Pontecchio, near Bologna, his pioneering wireless diffusion of signals over a distance, between two points separated by a hundred meters: radiotelegraphy. On February 2, 1896, he went to England where he registered the device under number 12,039, on June 2. (22) In the same year, he emitted signals at a distance of 1 ¾ miles. (23)

"Marconi was the great promoter and booster of the fruitful principles of Hertz and Branly, but the glory of inventor does not belong to him". On the other hand, Branly and Lodge just made laboratory experiments. "Aided

in his gigantic plans by engineer William Preece, the director of the Electric Telegraph Company in the UK, and by British capitals that contributed generously to boost his work, Marconi was persistent and had an astonishing energy, multiplying the experiments and modifications of his devices. At the end of 1896, he made radiotelegraph transmissions covering 5 km and then 14.8 km". (24) He founded the Marconi Wireless Telegraph Company Limited the following year. (25)

"From triumph to triumph, Marconi was conquering growing distances. In September 1899, 50 km. In 1900, 167. In 1901, 300. In 1902 and 1903, more than 1,500 km". He gave commercial momentum to radiotelegraphy, making the first installations in 1899. The example led to other ventures, such as those in charge of Slaby and Braun in Germany; Popov in Russia; Tissot, Blondel and

Ferrié in France; Guarini in Belgium; and Cervera in Spain. (26)

Guglielmo Marconi was born in Bologna, on April 25, 1874. He spent his youth in Italy, getting around his hometown, Florence, Livorno, and also going to England. His main focus was on electrotechnics. In 1893, he became interested in electrical oscillations. (27) "Marconi knew he would have to compete against companies that would explore wireless telegraphy. He also knew that his patents alone were not enough because a change in the position of wires could already give patent rights to another inventor. And that was what Marconi feared most". (28)

The testimonies of Maria Ribeiro de Almeida and Jayme Leal Velloso, as well as the books by Fornari and Irajá, indicate that Father Landell preceded Marconi in the field of radio

communications. According to these sources, the Brazilian inventor developed revolutionary theories and made experiments before 1895.

Also before Marconi, in 1893, at the Franklin Institute, in Philadelphia, and at the National Electric Light Association, in St. Louis, electrical engineer and physicist Nikola Tesla described in detail the principles of radio broadcasting. Margaret Cheney reports in *Tesla: man out of time* that he made the first public demonstration ever of radio communication in St. Louis, but the test did not have the expected repercussion. (29)

The book *History of wireless* is categorical: "What Tesla described in this lecture should be taken to be the foundation of radio engineering". The title of his presentations in February and March was "Light and other high frequency phenomena". T*he New York*

Tribune newspaper mentioned the event on April 16, 1899, and raised a question: “Wireless telegraphy. Did Tesla anticipate Marconi in this work?”

Cheney claims that the equipment patented by Marconi in 1896 was exactly what Tesla had described in his widely published lectures of 1893, which had been translated into many languages. Later, Marconi was to deny that he had ever read about Tesla's systems, and the U.S. Patent Examiner was to brand his denial patently absurd.

With patent No. 645,576 (System of transmission of electrical energy), granted on March 20, 1900, Tesla entered the field of radiocommunication. In 1898, a new achievement: patent No. 613,809 (Method of and apparatus for controlling mechanism of moving vessels or vehicles).

Patent No. 645,576 would have scientific repercussions until decades later. On June 21, 1943, a few months after Tesla's death, in the Marconi Wireless Telegraph Company of America's lawsuit against the United States, the Supreme Court ruled that Nikola Tesla and not Guglielmo Marconi should be considered the inventor of radio because his patent No. 645,576 preceded the one granted to the Italian inventor. The request made by Marconi arrived in the USA on November 10, 1900 and was rejected by Sir Oliver Lodge.

The Marconi Company sued the American Government alleging that its patent rights were violated during World War I. The legal dispute generated heated debates among experts to define what radio communication is. It was agreed that the model "requires two tuned circuits, each with a transmitter and a receiver.

All four must be on the same frequency". The definition does not exclusively cover radiotelephony.

Telecommunications were born with wires and evolved into wireless. Just as there were wired telegraphy (Morse) and wired telephony (Meucci), there were wireless telegraphy (Marconi) and wireless telephony (Landell). The wireless telegraph is different from the wireless telephone (radio), although both use electromagnetic waves or, more specifically, radio waves (Hertzian waves).

Even before Maxwell's Treaty, American dentist Mahlon Loomis (1826-1886) transmitted, in October 1866, wireless telegraphic messages between two mountains which were 22 km apart, in Virginia. The feat was witnessed by senators Samuel

Pomeroy, from Kansas, and John Bingham, from Ohio.

Using kites supported by 183 m conductor wires, Loomis managed to radiate and receive pulsations caused by the production of a change in the electrical balance of the atmosphere. On July 30, 1872, he was granted patent No. 129,971, issued by the U.S. Patent Office, for "Improvement in telegraphing". The novelty was presented in Congress, but he never received financial support to continue the project. (30)

Although nothing indicates that Loomis used radio waves, some American researchers affirm that he was the early pioneer of aerial telegraphy. He died two years before Hertz's tests, which formed the basis for Tesla, Father Landell, and Marconi.

In India, Jagadish Chandra Bose (1858-1937) did researches on

millimeter radio waves between 1894 and 1900. He made a public presentation in Calcutta between November 1894 and 1895, using microwaves: he rang a bell and lit gunpowder at distance.

The Institute of Electrical and Electronics Engineers (IEEE) considers Bose one of the fathers of radio because he preceded Marconi in the study of waves, although he was more interested in them as a scientific endeavor and not for communication. Versatile, he dedicated himself to physics, biology, botany, and archaeology. (31)

Nathan Stubblefield (1860-1928), a Kentucky farmer, created a wireless telephone using electromagnetic induction and reportedly made a demonstration in 1892 to his friend Rainey T. Wells. “Hello, Rainey... Hello, Rainey”. These were the words spoken

into the device, which did not generate radio waves.

Only ten years later, in 1902, Stubblefield showed it in public in Philadelphia. The Wireless Telephone was patented on May 12, 1908, under No. 887,357. But he did not get capital to sell or promote it and became dismayed. He died of starvation and alone on March 25, 1928. (32)

III

Campinas: the origin

Father Landell's official arrival in the State of São Paulo occurred in the middle of 1894. (1) He received authorization to celebrate in the Sé Cathedral, in the capital of São Paulo, on October 13, 1894. (2) But in October 28 he was assigned to Campinas, where he was a vicar in the old mother church of Santa Cruz, today Nossa Senhora do Carmo's Basilica, until December 19, 1896. (3)

Campinas is 84 km northwest of the capital of the state and back then had approximately 20 thousand inhabitants. (4) There, Landell deduced the following principles, based on some

phenomena that he considered a bit complicated:

"*Every vibratory movement transmitted through a conductor up to now, as in the future, could be transmitted through a light beam; and that's why it could also be transmitted without the assistance of this agent.*

"Every vibratory movement tends to be transmitted in direct proportion to the intensity, constancy and uniformity of its wave values and in inverse proportion to the obstacles that hinder its progress and production.

"Give me a vibratory movement as extensive as the distance that separates us from these other lands that roll over our heads or under our feet, and I will make my voice reach there". (5)

With these sentences written between 1894 and 1896, he predicted interplanetary communications!

Far beyond theory, “he built two devices, a transmitter and a receiver, which allowed him to say a mass in Campinas and transmit it simultaneously to the faithfuls of a church in Jundiaí”, reported Monsignor Geraldo Azevedo, who was clergyman at the Carmo Abbey from 1963 to 2000.

“Father Landell sent signals by sound waves that activated the lighting of the cross in the chapel in Jundiaí, warning Catholics that the virtual mass was about to begin. Landell’s story is recorded in documents in the Carmo Church”, added the monsignor. (6)

Based on this statement, preliminary evidences would have appeared between 1894 and 1896. It was not possible to have confirmation from other sources of this fantastic transmission of a mass by radio waves between two municipalities about 35 km apart in a straight line. Thus, this

piece of information remains as a possibility or an oddity.

However, other clues suggest that wireless propagation occurred during this phase. A note by lawyer and historian Aureliano Leite (1886-1976) in the *Edição monumental comemorativa do IV Centenário da cidade de São Paulo* endorses: “Father Landell's experiences began before 1899 in Campinas, where he was a vicar. Then, some fanatics accused him of being a sorcerer, invaded his small laboratory and destroyed his invention. Afterwards, he continued his studies in the capital”. (7)

Fornari wrote that, after the repercussion in Campinas that, two days earlier in São Paulo, Landell had managed to speak “once again with people who were kilometers away, half a dozen wild believers invaded his modest laboratory, which was so

precious to him, and destroyed all his devices, tools, and utensils".

From Irajá's point of view, Father Landell "faced antipathies from envious people", who instigated the opinion of Catholics who considered him a priest associated with supernatural entities: "They attacked his small laboratory, destroying everything there. They could not, however, destroy his moral fiber as a tenacious investigator and selfless scientist focused on elucidating highly transcendent problems". (8)

The scientist himself revealed this misfortune in an interview given in New York in 1902. Unfortunately, the newspaper did not mention where or when it happened.

The episode of destruction has another version: "According to subsequent statements from one of the invaders, it was surprising to see only a

few people participating in the invasion and most of them were strangers to the church's daily life. So he realized that the confidential invitation made in previous days on behalf of a group of discontent parishioners did not combine with the people present and with the destructive aggression practiced against the laboratory, the devices and study notes". (9)

Who were these intruders? Who was their leader?

Maximiano de Camargo, who was a captain, police chief, president of the tram company and partner in the firm Bueno e Camargo, died on November 19, 1896. "Tempers got heated, unleashing a violent reaction", when the clergy of Campinas refused to celebrate a mass for his soul because he had been a member of Freemasonry. (10)

A newspaper from São Paulo reported that “Reverend Roberto Landell had reasons to be a dedicated friend of Maximiano de Camargo, because this big heart had saved him from being arrested in the middle of the church for an arbitrary act he had committed. However, he was the first one who refused to say the mass”. (11) The conduct of the clergy in Campinas was supported by the bishop of the diocese. (12)

What “arbitrary act” did he commit? Could it have been something related to his inventions? The writer criticized, but did not explain!

Right after this incident, on December 5, Landell wrote a letter to the bishop. By alleging “health problems that are increasingly worse”, he asked to be replaced and four months off for medical treatment. The

request was accepted two days later. (13)

He was divided between religion and science. In 1897, he gave a series of sermons in Rio de Janeiro, attracting the attention of the press. He spoke about God, nature, divinity, and love. (14) It is not known why, but the fact is that, on May 5, 1897, he obtained a 60-day leave of absence (15) and, on July 22, he requested to leave the bishopric of São Paulo. (16)

Would his project to stay in Rio de Janeiro be linked to the fact that it was the headquarters of the Federal Government and, therefore, a prominent stage for the display of his inventions?

The only certainty is that his fate would not be disconnected from São Paulo. On March 2, 1898, he was appointed vicar of the then parish of Santana, in the northern zone of the

capital, and chaplain of the school run by nuns. (17)

In a manuscript, he admitted: “For reasons beyond my control and as I already was predicting, I had to settle here in this State, where, thanks to Almighty God, I am enjoying perfect health. São Paulo, April 30, 1898”.

IV

- Play the National Anthem

Father Landell was one of the first clergymen in Santana. The church (today, Santa Cruz Chapel) is located on top of a hill next to the Colégio Sagrado Coração de Maria, run by the Congregation of the Sisters of Saint Joseph of Chambéry in Brazil. The school's name would later be changed to Colégio Santana, in honor of the patron saint of the neighborhood.

One of the earliest records in the press about Father Landell's scientific practices is on the cover of *Jornal do Commercio* (RJ), on June 14, 1899, under the headline “O Teléforo”:

"*Father Landell has already managed to transmit the word at a distance longer than seven thousand meters*, using ether, telluric currents and electrified air; the transmitting apparatus and the receiver are entirely different from those of European inventions, and he does not use crystal tubes nor metallic filings of any kind in his marvelous work.

"The mechanisms capture the voice and launch it through space in a given direction, that is, an entirely straight line, whatever is the atmospheric state at the moment of transmission.

"*In the various experiments made recently*, the intelligent inventor noticed that, by placing several of these receivers in the same field of reception, a few meters apart from each other, they all receive the transmitted word a*t the same time with the same clarity. As far*

as we know, no wise man in the Old World nor in the New World obtained this result. All the glory of the invention belongs to Father Landell.

"But do not think that the indefatigable man of science made a leap; *he has been experimenting and studying methodical y for many years, focusing entirely on the triumph he has just achieved.*

"By putting the transmitting device in any compartment next to an open window and the receiver in the open air six or seven thousand meters away, two people could talk as if they were one meter away from each other".

In the middle of spring in the Northern Hemisphere, Marconi sent a message in Morse code beyond the horizon between Wimereux

and the South Foreland lighthouse, which crossed the English Channel. It was "the first wireless telegraphic communication between France and England", over an approximate distance of 60 km. (1)

The wireless experience

On July 16, 1899, a winter Sunday with cloudy and slightly cold weather, *O Estado de S. Paulo* newspaper reported an unprecedented event:

"Today, at 9 am, at the Colégio das Irmãs de São José in Santana, there will be a wireless telephony experiment with devices invented by the Very Reverend Landell de Moura. The experience will focus on aerial and underground telephony. Father Landell

de Moura, who invited several authorities, men of science and members of the press to this event, will give a lecture before making experiments with his invention".

On the same day, at least three other leading newspapers announced the news: *Correio Paulistano* (SP), *Jornal do Commercio* (RJ), and *A Imprensa* (RJ). The following day, *Jornal do Brasil* (RJ) highlighted: "The experiments with the wireless telephone invented by Father Landell were successful and reached 3,800 meters. But this device cannot yet have a practical application".

What was the meaning of the affirmation "cannot yet have a practical application"? Didn't people know what to do with it? Were there no interested parties in financing the development of the device? The only certainty is that nobody imagined how

the future of radio would be: the emergence of the first radio stations would still take two decades!

However, the monarchist *O Commercio de São Paulo* produced the most complete reporting, with details of the exact locations, the description of the artifact, the results, and the attendance list:

“By invitation of the Very Reverend Landell de Moura, we went yesterday to the Colégio do Coração de Maria, in Santana, to watch the experiments with wireless telephone made by that priest.

“By the window of a room at the top of the building, Father Landell has the device, which consists of a long tube with receivers at each end, through which the voice is transmitted and heard over a great distance inside the room or even outside it, as we had the opportunity to see.

“The experience was witnessed by Dr. Paula Souza, Dr. Gabriel Dias da Silva, Segismundo Bergen, Pedro Borges, d`Ottolini, J. Miranda, manager of the Telephone Company, dr. Tibagy, employees of the National Telegraph, Sá Rocha, from Correio Paulistano, Augusto Barjona, from O Estado de S. Paulo, and a member of this newspaper”.

“Dr. Paula Souza” was Antônio Francisco de Paula Souza (1843-1917), director of the São Paulo Polytechnic School. An engineer, politician and professor, he founded Poli (today integrated into the University of São Paulo) and was its director from 1894 until April 1917, when he died. (2)

Gabriel Dias da Silva was a lawyer and businessman (director of the Companhia Industrial de São Paulo, the Companhia Mac Hardy and the Companhia Rural de São Paulo); Pedro

Borges was partner at Pedro Borges & Comp. and director of the Companhia Viação Paulista; and Torres Tibagy was an engineer.

The aforementioned building still exists and is next to the chapel: it is the oldest building in the school and has children's classrooms. It also has 6 long vertical windows, with a small arch at the top. Father Landell's device was installed by one of those windows. From the balconies, people could see the Tietê River, Paulista Avenue and a large part of the metropolis.

Father Landell ordered the installation of the other transmitter/receiver on Ponte Grande (replaced by current Bandeiras Bridge) over the Tietê River, about 3 km from Colégio Santana. He may also have taken a gramophone there, which was operated manually using a crank, with a

flat disc. It is not known how many people were involved in the feat.

He had the support of a messenger, who went from one end to the other and gave him the password to start the procedure: "People are already aware". Then, the priest-scientist sent his voice into the air and a chilling sound invaded the student's classroom, in a symbolic act of patriotism and inventiveness.

"-`**Play the National Anthem**`, the Very Reverend then said through the tube. And the National Anthem was heard".

A chronicle by Fabricio Pierrot in *O Commercio de São Paulo* narrates the first vocal and musical sounds sent and received wirelessly. He commented that the device was "very simple". But he was wrong when he wrote that "the illustrious priest did not discover gunpowder, because if there is already a

wireless telegraph, there is necessarily a wireless telephone". In fact, the wireless telephone was a world novelty! Pierrot did not pay attention to the information that "the process of voice transmission over a long distance, independent of wires, invented by the priest is very different from the process invented by Marconi". (3)

"Father Landell was close to what came to be called broadcasting more than a decade later", says Luiz Artur Ferraretto, professor of Journalism in the College of Librarianship and Communication at the Federal University of Rio Grande do Sul (UFRGS). The definition of broadcasting is broad, involving the transmission of sounds and images by electromagnetic waves.

The ceremony was carefully planned and full of nationalism, what was a personality trait of the priest who

dreamed of the possibility of developing new technology in Brazil. Unfortunately, the reaction of those who were there is unknown, although there is a suspicion that some did not fully understand what happened.

Taking into account the qualification and number of guests and the wide media coverage (three newspapers from São Paulo and three from Rio), the experiment in July 1899, the year of the 10th anniversary of the Republic, was certainly the most important in Father Landell's scientific career in Brazil. Indications prior to that date, such as preliminary evidences, indications or assumptions, lack accuracy.

After the Brazilian inventor, Canadian physicist Reginald Aubrey Fessenden (1866-1932) emerged at the forefront of radiotelephony. “The first actual wireless word transmission was

achieved in December 1900. It was gradually perfected until 1904, when I was working up to 25 miles", he stated during an interview in 1915. (4)

On December 23, 1900, he sent the following message to his assistant: "Hello! One, two, three, four. Is it snowing where you are, Mr. Thiessen? If it is, telegraph back and let me know". (5) He started making point-to-point radio broadcasts.

On September 28, 1901, Fessenden applied for property rights in the United States: "The invention described herein relates to certain improvements in the wireless transmission of signals, said improvements relating more especially to the transmission and reproduction of words or other audible signals. In general terms, the invention consists in the generation and reception of electromagnetic waves or impulses of a

predetermined character and the modification of the character of the waves by sound-waves or other desired means". Under No. 753,863, the Wireless Signaling patent was granted on March 8, 1904.

On December 11, 1906, he made a broadcast exhibition in Brant Rock, Massachusetts. On Christmas Eve 1906 and New Year's Eve 1907, he beamed music and biblical messages to ships out in the Atlantic Ocean and the Caribbean Sea. The Fessenden system was used by the National Electric Signaling Company. (6)

According to *Tesla: man out of time,* Fessenden was using a high-frequency alternator which he built, based on Tesla's design and principle. (7) The book *1001 inventions that changed the world* gives him the credit for the "first radio transmission" and informs that he "used a spark

transmitter, developed at the end of the 19th century by radio pioneers Hertz, Marconi and Braun, to generate electromagnetic waves on radio frequency – just slightly modified so that the waves produced were more continuous and did not extinguish so quickly – and also put a carbon microphone in series with the antenna cable". According to that book, the Canadian physicist was "the first to use the same principles that are still used for AM (medium wave) radio broadcasting". (8)

At the end of his trajectory, he said that he had become an object of ridicule among journalists, businessmen and even other scientists for believing that the voice could be transmitted wirelessly. (9)

In 1902, Danish Valdemar Poulsen (1869-1942) emitted a modulated voice wave between Copenhagen and Berlin.

(10) That same year, Spanish Julio Cervera Baviera (1854-1927) sent a human voice wave between Jávea and Ibiza. (11) In April 1903, Italian professor and physicist Quirino Majorana (1871-1957) sent a radiotelephone message 65 miles away, in Italy. (12)

Marconi only made similar experiments in 1914, in Spezia, when he sent the word 71 km away. (13)

Father Landell struggled with many difficulties "due to the lack of resources and good mechanics" who were trustworthy (14), and his inventions were not recognized, as emphasized by *Jornal do Brasil* newspaper and an article by Pierrot.

V

1900: experiences with various devices

São Paulo, June 3, 1900. It's Sunday, the day is clear, the wind blows towards the northeast and the temperature is close to 20ºC. A group of people, including British consul Percy Charles Parmenter Lupton and his family, gather and wait with curiosity for the outcome of an experiment presented by a priest with strange, recently invented devices.

In the year of the fourth centenary of the discovery of Brazil, Europe dominates the world, while imperialism, nationalism, Marxism and expressionism are the main movements. Scientific analysis is

widely used in all activities. Rationalism challenges religious dogmas. Friedrich W. Nietzsche's thoughts questioning society's values are part of an atmosphere of protest that revolutionizes the arts.

German Zeppelin airship makes an experimental flight. Pierre and Marie Curie research radioactivity. Santos Dumont is busy building airship No. 4 in Paris. Freud has just published *The Interpretation of Dreams*. Hearst and Northcliffe mark a new era of mass communication, with sensationalist and popular newspapers. In telecommunications, research was being done, but except for Father Landell, no one had managed to successfully transmit the human voice over a distance without conductive wires.

In 1900, the city of São Paulo changes rapidly, with a large number of

European immigrants. (1) It had 239 thousand inhabitants; the State, 2.2 million; and the nation, about 17.3 million. The majority of the population lived in the countryside. (2)

Jornal do Commercio (RJ) recorded a historical fact on June 10, 1900:

"Last Sunday, at the top of Santana in the city of São Paulo, Father Roberto Landell made an original experiment with various devices invented by him, with the aim of demonstrating some laws he discovered during the study of the propagation of sound, light and of electricity through space, the earth and the aqueous element, which was crowned with brilliant success.

"These eminently practical devices are like so many corollaries deduced from the aforementioned laws. Many people witnessed this test, including Mr. P. C. P. Lupton,

representative of the British Government, and his family".

Once again, Father Landell showed artifacts that represented an improvement in radiotelegraphy and unveiled, in a pioneering way, the possibility of sending voice and other sounds over a distance without conductive wires. This event must have occurred inside the current Colégio Santana, by the window of the building next to the chapel – repeating the position of the equipment in the wireless experiment in July 1899.

The other reception/transmission end may have been installed on Paulista Avenue, 8 km away in a straight line, where the Anglo-Brazilian High School was located.

On June 16, 1900, Jornal do Commercio published a letter from Father Landell to the British consul, in which he said he had imagined many

devices to demonstrate some laws “in part unknown to the scientific world”, which he had discovered during the study of the propagation of sound, light and electricity through space, the earth and the aqueous element.

However, due to the scarcity of resources and reliable labor, he regretted that he could only exhibit five inventions, all “eminently practical”, which “can already render good services”. And he was inclined to “willingly” cede them to whoever offered him more advantages:

“But if the proposals that may be made do not compensate for the immense sacrifices I have made, nor are they adequate for the profits that the proponents may have with these devices, I hereby officially declare to Your Excellency that I will donate them to the British Government or to any higher education institution, so that,

with the fruits of their exploitation, they can open two houses in England for the support and education of the sons and daughters of those brave men who have succumbed in the fields of this terrible conflict between the British Empire and the Boers in Transvaal and Orange Free State[3] , on the condition that they give me what I need to live and to continue with my studies and scientific experiments".

According to his own description, these were the five inventions:

"The Telauxiophone is the final word, in my opinion, in terms of wired telephony, not only because it transmits the word with vigor and intelligibility, but also because it produces all the effects of the 'alta

[3] Reference to the Second Boer War between the British Empire and the Boer Republics of Transvaal and Orange Free State (formed by settlers of Dutch, French and other origins), in the northeast of South Africa. It lasted from October 1899 to May 1902, and the British forces won the conflict.

parlatore' telephone and the Teatrophone, with the remarkable difference that, in the case of theatre acoustics, only one transmitter is enough no matter how large is the audience. Furthermore, with Telauxiophone, the issue of unlimited telephony will become a practical and economic reality.

“The Kaleophone also works with wires and is original because, instead of ringing the bell to call, it makes the articulated or instrumental sound be heard. It is very suitable for offices.

“The Anematophone: it is wireless and produces all the effects of regular telephony, but with much more clarity and security, as it works even with winds and bad weather. It is admirable because it reveals entirely new laws.

“The Teletiton is a sort of wireless phonetic telegraphy with which two people can communicate without being heard by others. I believe that with this system it will be possible to transmit over great distances and very economically, without the need to use a conductive wire or cable.

“And finally, the Ediphone serves to soften and purify the phonographed voice eliminating parasitic vibrations, so it sounds natural. This device will become the inseparable friend of musicians, composers, and speakers”.

Father Landell had developed revolutionary devices in the field of wired and wireless telephony and radiotelegraphy and he could probably create other ones, in addition to the five mentioned above. He promoted public exhibitions with the aim of attracting the interest of authorities and investors

for the commercial use of his inventions. His appeal to the British consul was another gesture of hope. As far as we know, the scream remained still in the air.

In October 1900, four months after this last experiment, Father Landell resigned his position in the parish of Santana. (3)

VI

Radio's birth certificate

At the end of the 19th century, the pioneering efforts related to radiotelephony aroused controversy. A daily newspaper from Rio de Janeiro gave the credit to Englishman Brighton, what was contested by Spanish engineer, inventor and businessman José Rodrigo Botet in a long article titled "O Gouraudphono", published in *La Voz de España* newspaper (SP) on December 16, 1900:

"The daily is misinformed. Neither the invention of the way of transmitting words from a distance is recent, nor was an Englishman the first to satisfactorily solve this arduous problem, which involves the most

intricate physical-chemical difficulties presented to human science. The person who first penetrated and discovered the great secrets, more or less a year ago, was a noble and wise colleague and friend of mine, the Very Reverend Roberto Landell.

"Because I followed step by step the study of his various inventions in the fields of telegraphy and telephony with or without wires; because I was a direct witness of several experiments, all with prodigious results, I feel compelled to defend the property right owned by the Very Reverend Roberto Landell regarding the transmission of the spoken word without the need for wires.

"Before this extremely virtuous apostle of the religion of Jesus Christ and science, no one, absolutely no one, did anything practical in wireless aerial

telephony, using only aqueous, terrestrial and aerial factors".

According to Botet, Landell's merit was even greater because he was on his own, while European and American inventors had "very intelligent mechanics" at their disposal, and factories and laboratories where they could choose the parts needed for their devices.

Father Landell designed and built the devices alone, being, at the same time, "the wise man who invents, the engineer who calculates and the artist who forges and adjusts all the pieces of very complicated mechanisms". Botet added that "the humble priest is very reserved, maintains his usual modesty and works incessantly to scientifically honor his homeland and glorify his family name.

"However, the Very Reverend Landell has to make many cruel

sacrifices of time, money and health on behalf of his enviable scientific achievements! He had many bitter disappointments when he saw that the Government and the press of his country, instead of acclaiming him with applause and encouraging him to continue with his triumphant career, paid little or no attention to his remarkable inventions!

“If the Very Reverend Landell had been born in England, Germany or the United States, as soon as his attempts at wireless telephony proved successful, the Government, the press, the bankers and the people would have rushed to provide him with all sorts of resources until their scientific discoveries reached a positive outcome.

“But the Very Reverend Landell is Brazilian, and the famous naturalist Agassiz once said to him that 'everything is great, except men' in

Brazil. That remark had a tone of complaint, due to the forgetfulness or little attention that Landell's compatriots paid to his prodigious inventions, but the priest, with his typical angelic kindness and a frank and cordial expression, replied immediately more or less in these terms:

"– No, my friend. I assure you that Brazil is great because of the beauty and riches that God gave it and also due to its children. What happens is that people, with rare exceptions, do not have all the scientific capacity necessary to accompany me in the different phases of the study and in the solutions of complex problems that I deal with. It is obvious that those who do not understand a scientific reason well cannot recognize its fair merit, nor can they applaud me and help me with resources to continue studying and working, because perhaps they assume that I live dreaming amidst scientific utopias of apparent usefulness.

"– But I have the consoling hope that my scientific works will soon shine like the midday sun, thanks to the luck of other inventors who, more fortunate than I, will discover my own inventions, conceived and executed by my own hands in the solitude of my small and poor workshop, where science rules and experience materializes before the wise men in Europe and America give tangible, useful form and public application to works equal or similar to those of mine.

"– I know very well that, in matters of science, what is ahead of time should not expect justice from its contemporaries. However, as long as the fruits of my study flow to the benefit and glory of my country, and in a holocaust to the Supreme God who inspires me in my investigations and illuminates me with his divine lights to penetrate and organize these most interesting factors of Creation, which connect us to the other planets, establishing communication between the

most remote spheres and the bowels of the earth we walk on, I will consider myself quite rewarded for the heavy vigils, for the continuous work demanded by the inventions that you and some close friends know in detail and most people barely know".

For Spanish journalist and researcher Antoni Zaragozà, Rodrigo Botet was "endowed with a quick intelligence and an enormous curiosity". He soon realized the importance of the Gaucho priest's inventions and became his "fervent follower". He had certainly realized that the political, economic and financial powers in Brazil underestimated the pioneering and successful public experiences with radio.

"Fortunately, thanks to the presence and intelligence of Valencian Rodrigo Botet, who left a written

testimony, Landell de Moura's inventions endure as one of humankind's extraordinary and stellar moments", concludes Zaragozà. (1)

On December 31, 1900, Father Landell was assigned to the parish of São João Baptista de Queluz, wich had "around 5 thousand souls", in the municipality of Queluz, 220 km from the capital of São Paulo. But he did not accept the proposal. (2)

He had other plans. He temporarily left his activities and, on January 30, 1901, he got a license "for one year" to travel to the USA. (3)

> Marconi had already made further improvements. In April 1900, he obtained registration No. 7,777 for "syntonic telegraphy, as well as for multiplex

> telegraphy with a simple antenna", which would later become famous. (4) "Marconi applied the tuning principles established by Lodge, Blondel and Braun and, in 1901, achieved communications over a distance of 300 km". (5)

Carrying a dream on his shoulders, on March 9, 1901, Father Landell was granted a Brazilian patent for "a device intended for distance phonetic transmission, wired and wireless, through space, the earth and the aqueous element". The privilege request was registered under No. 2,274 and the letter received No. 3,279, with a concession for 15 years. Jules Géraud, Lecrerc & Co. signed as proxies.

Landell guaranteed that this device could "project the voice into

space at very regular distances. It works under sun, rain, humid weather and heavy fog, as well as under headwinds if we use automatic boards. In these last two cases, it can reach a truly prodigious distance. At sea, when there is fog and also in calm regions, this device can render excellent services.

"By varying the shape of the metal bottom of box B, without the receiver, everyone within the sound radiation perimeter will be able to hear perfectly, especially if the voice is projected against a large perpendicular surface. People can also listen through the headset, as long as the device has a very sensitive microphone or adapts to the theory of radiophony or photophony. And the device also makes it possible to telegraph wirelessly, using the Branly tube and the producer of electric waves".

The descriptive memorial informs that, “although the artifacts are identical in terms of the laws and principles that govern them and of their common purpose, they differ greatly from each other not only in terms of the medium, but also in the various indispensable annexes and the more or less profound modifications that they present, notably the Tellogostomo and the Telauxiophone”.

That patent is a document equivalent to the radio’s birth certificate because it was issued before any initiative of its kind in the world.

On Sunday, May 19, 1901, at the São Bento Monastery, Dom Miguel Kruse offered a lunch to the Austrian scientific commission, which was sent by the Vienna Academy to study Brazilian flora and fauna. The meeting was attended by professors from the

Polytechnic School and doctor Adolpho Lutz, among others.

Austrian professor Victor Schiffner declared that “he was very pleased to be at a meeting of men of science” and highlighted that the “Benedictine Order, especially in Austria, is synonymous with science, as its great abbeys are at the forefront of scientific investigations”. Prior Miguel Kruse replied that the Order in São Paulo could not rival the European ones in terms of grandeur and resources, but would work to maintain the liturgy and contribute to the progress of science. Father Landell and Canon Araújo Marcondes also spoke. (6)

VII

The award in the United States

Just three months after obtaining the Brazilian patent, Father Landell went to the USA. Misunderstood and persecuted in his homeland, accused of having a pact with the devil, he took a step further, in spite of his limited financial resources.

Being aware that his devices were of great value and matchless, he traveled in June 1901, in order to patent them in the country that would certainly recognize their merit. He was authorized to stay abroad for up to a year, but his fate would be different...

The Steamship Piemonte left Rio de Janeiro and took him to Europe. He

went to Rome to pay off his and his brother's debts to the Collegio Pio Latino Americano. Then he left Italy and went to France and, in August (1), embarked to America. At the end of that long and tiring journey, he enjoyed an unforgettable scene: the skyline of the city in the background and the ship gradually approaching the imposing Statue of Liberty.

He set up his physics office in the Manhattan district, where he lived. New York City was the second largest metropolis in the world, only behind London. Father Landell witnessed a progressive era amid 3.4 million inhabitants, most of them immigrants, and more immigrants were arriving.

Somehow he would see the opening of some local icons: one of the first skyscrapers, the triangular Flatiron Building (1902) on Fifth Avenue, Macy's department store in

Herald Square (1902), the New York Stock Exchange building (1903) and the Williamsburg Bridge, which connects Manhattan to Brooklyn (1903). Animal-drawn vehicles were common on the streets and the huge social inequality was evident.

In September 1901, American President William McKinley was assassinated and Theodore Roosevelt succeeded him. (2) On October 4, Landell went to the U.S. Patent Office (now the U.S. Patent and Trademark Office) in Washington, D.C., with an application for property rights, which was registered under No. 77,576.

On November 6, a patent examiner made a series of technical observations and asked for greater detail in the descriptions, including about the circuits. And he stressed the fact that Landell's requests covered at least two separate and independent

inventions: the cordless telephone and the wireless telegraph.

When answering the questions, Landell carefully explained that The Exophone could transmit the human voice to everyone "within the perimeter of its sphere of action", without the need for receivers at the ends. He compared the effect to that of hearing someone talking in the next room.

In December 1901, Marconi sent signals from one continent to another – from Poldhu (England) to Newfoundland (Canada). For the first time, the wireless telegraph (the three points of the letter S in Morse code) crossed the Atlantic Ocean. That feat proved that, contrary to what many people said, the

curvature of the planet would not be an obstacle to wireless transmissions. (3) The New York Times reported, on December 15, “the most wonderful scientific development of recent times”.

After that prowess, Marconi was the guest of honor at the annual dinner of the American Institute of Electrical Engineers, at the luxurious Waldorf-Astoria Hotel in NYC, on January 13, 1902. Thomas Edison and Nikola Tesla could not be present, but sent letters praising him. Alexander Graham Bell was there. The Italian scientist spoke about the tests. He remembered that five years ago his telegraphy standard had

reached about 2 miles. Afterwards, the distances had increased rapidly. “I have no doubt that, in the near future, it will be possible to send many messages across the sea”, he declared. Scientists Charles Steinmetz, Elihu Thomson and Michael Pupin also spoke. (4)

Father Landell's request was divided into another invention and filed under No. 89,976 on January 16, 1902. On that day, he narrated the specifications and use of the wireless telegraph. He would have to make several modifications to the texts to meet the department's requirements, which were communicated to him by the lawyers who were following the process.

The remaining original documents that belonged to him include dozens of manuscripts with detailed descriptions of the functioning of the devices. It is clear that patent officials required proof of the originalities contained in the inventions.

Initially, he worked with Munn & Co. In a letter dated May 22, 1902, that office referred to a practical demonstration of the concepts and ways of using the devices and suggested the omission of some parts to facilitate patenting, thus eliminating the need for display. Landell did not accept the guidance.

On May 26, he told Munn & Co. how "the device for sending and receiving the natural voice through space" was, with explanations for its use. He named it Exophone and Endophone.

In August 1902, he decided to change his representatives and transferred the services to other lawyers, who were experts on the patent business: William D. Baldwin, Edward C. Davidson, and Lloyd B. Wight.

Back then, there were news in Europe about "various systems for sending telephone messages without the need for communication wires between the transmitting and receiving devices". The September 1902 issue of *La Lectura – Revista de Ciencias y de Artes,* from Madrid, publicized the advances made by German Ernest Ruhmer in the transmission of speech through light.

Acclaimed as a "remarkable physicist and a serious and industrious researcher", he achieved "marvelous results based on Alexander Graham Bell's famous experiments with light".

Ruhmer's method seemed to be the one that offered “the most practical and effective results”.

But there was “another prodigious discovery, an invention by Father Landell”. With the Brazilian scientist’s device, “the human voice can be transmitted without the need for wires over distances of 50 to 60 km, which is a far superior result to those achieved so far by Ruhmer in Germany”.

And the Spanish magazine went further: “Currently, with the aim of achieving the publicity that he was unable to get in Brazil, Father Landell is in New York and has applied for an invention patent at the appropriate Department in Washington. At this center, the Catholic priest's scientific theories were evaluated and considered so marvelous and revolutionary that he was then asked to present models of his

devices to prove the truth of his statements. Otherwise, the patent would not be granted.

"Because we do not have documents that assure the ownership of his discovery, we cannot give a detailed description, but, according to Father Landell, his wireless telephone transmission system is based on hitherto unknown properties of light, and anyone, without the need for special receiving devices, could receive the transmitted dispatches. The receptors will be the body senses and the dispatches can reach practically infinite distances".

The New York Herald, of Sunday October 12, 1902, published an extensive reporting titled "Talking over a gap of miles along a ray of light" on radiotelephony experiments:

"Professor Ernest Ruhmer has won national fame by sending

messages for several miles over a telephone without the aid of a wire. What Marconi has done in the field of telegraphy he has done in another field".

"Wireless telephony is a natural corollary to wireless telegraphy. The same great laws of nature are at the basis of both human inventions. But wireless telegraphy is now a fact, accepted by scientists and by the public. Wireless telephony, on the other hand, is still in the air. Scientists are interested in its possibilities as established in England and Germany. The many headed public has never a head to surrender to the subject".

"Even among scientists the name of Brazilian priest Robert Landell de Moura is little known. Few of them are aware of his claims to be the pioneer in this branch of electrical research. Messrs. Brighton, in England, and

Ruhmer, in Germany, have recently interested the learned by their experiments in wireless telephony. But before Brighton and Ruhmer were heard of, Father Landell, after years of experimenting, had succeeded in obtaining a Brazilian patent for his invention, which he called a gouradphone.

"With this apparatus, Father Landell, in the years 1900 and 1901, made many public demonstrations which attracted attention in Brazil (...) Since then, Father Landell has left his native country, and for several months has been a resident of New York City. He has made applications to patent his inventions in the United States to the Patent Office in Washington. He recently received word that his theories were so revolutionary that patents could not be granted without the submission of working models to make practical demonstration of their verity.

These models he will supply as soon as he is in a position to do so.

"It was only a few days ago that I met Father Landell for the first time. I found in him a gentleman some forty years of age, spare and ascetic in body, vivid and enthusiastic in mind. He was born in Brazil, of which country both his parents are natives, although his mother is of Scotch descent. (...) He was quite ready to speak about the inventions to which his entire worldly life is devoted. Only his worldly life, however, is involved. His first thought is for his religion, his second for science.

"´I wish to show to the world,' he told me, `that the Catholic Church is not the enemy of science or of human progress. Individuals in the Church may in this or that case have opposed the light, but they did it in blindness to Catholic truth. I have myself met with

opposition from my fellow believers. In Brazil a superstitious mob, holding that I was in partnership with the devil, broke into my study and destroyed my apparatus. Nearly all my friends of education and intelligence, whether in or out of holy orders, looked upon my theories as contrary to science. I know what it is to feel like Galileo, and to cry. E pur si muove. When everybody was against me I simply stood my ground and said, ´It is so. It can be no otherwise`.

"Father Landell explained that it is was impossible for him to go into details concerning his theories and inventions so long as the patents were pending. But in a general way he was willing to explain that his system of wireless telephony depended upon a new principle of light which he had discovered.

“´By virtue of this principle´, he went on, ´it is possible to transmit speech through a luminous axis without the intervention of selenium or of a microphone. Nay, even a receiver will not be necessary. All persons within the radius of reception will be able to hear the message with the aid, merely of their natural organs`.

“And what is the distance, to which you can reach?

“Practically infinite”.

The New York Herald published a photograph with the following caption: “Rev. Father Landell de Moura – Inventor of the wireless telephone apparatus”. The contents of this reporting spread and were published in other American newspapers, such as *The Kansas City Star*, *The St. Louis Republic* and *The St. Paul Globe*, and in several periodicals in Brazil. (5)

Two days later, on Tuesday 14, Baldwin, Davidson & Wight sent a letter to the NYC law firm Hoppin & Berard, referring to the wireless telephone application. They analyzed the property rights previously registered by Graham Bell, Charles Sumner Tainter and Joseph Poliakoff, in addition to Ruhmer's essays; made it clear that Father Landell's invention had differences; and asked for advice.

On November 6, 1902, with the headline "O Gouraudphono" on the cover, *Jornal do Commercio* (RJ) highlighted:

"We received a telegram the day before yesterday from New York informing that there is an eager sympathy for the next definitive experiments with wireless telephony, discovered by Brazilian priest Landell de Moura". Several publications from North to South of the country

propagated these pieces of information distributed by news agencies. (6)

But there was a setback. Landell caught pneumonia. So, on medical recommendation, he went to Cuba in November 1902. (7) He thus escaped the harsh winter in New York, what probably saved his life.

On November 14, the lawyers prepared another letter addressed to Hoppin & Berard, reviewing the schemes and descriptions. Several questions were raised. For example: "Why are all three forms – electrical oscillations, cathode light rays, and clear light rays – contained in one device? If they are used together, how and why is it done this way? If they are not used together, why are they included in an organization?" [4]

[4] Only two letters from Baldwin, Davidson & Wight to Hoppin & Berard were found and they are in the collection of the Historical and Geographic Institute of Rio Grande

While Landell was recovering from pneumonia in the Caribbean, expectations about the experiments continued to resonate in the press. The *Gazeta de Petrópolis* (RJ), of January 13, 1903, reinforced: "Now he is preparing to make definitive experiments in New York, which will naturally be followed by the full confirmation of his scientific theories and the immediate application of the cordless phone. The Very Reverend Landell de Moura believes that the human voice can be transmitted over an infinite distance".

The physicist from Rio Grande do Sul believed in the "practically infinite" range of messages carried by

do Sul. The lack of further information prevents us from knowing the real role of lawyers Hoppin & Berard in the process of patenting Father Landell's inventions. It is true that the firm Baldwin, Davidson y Wight replaced Munn & Co., but it is unknown how and why Hoppin & Berard entered this story. Eugene M. Berard was one of the witnesses for the Wave Transmitter patent.

radiotelephony, but Marconi thought exactly the opposite.

On a business trip to New York in January 1903, the Italian scientist was interviewed by *The Evening World*:

“Is the wireless telephone possible?

“Marconi shrugged his shoulders.

“It may be for short distances. I do not believe they will ever get power enough to telephone wireless at any great distance. They have telephoned without wires a distance of two miles.

“But there was a time when you were only able to telegraph that distance. Now you telegraph across the ocean. Why shouldn´t the telephone be subject to the same improvement?

“It´s a matter of power. They do not use Hertzian waves. They are not applicable. I have left that field to

others. It may be perfected, but I do not believe so".

In the January 23 issue, the newspaper called Marconi "inventor of the wireless system which has revolutionized telegraphy". As he was more interested in improving and selling what was profitable for him, the famous scientist questioned the range of radio...

Still in January 1903, the Baldwin, Davidson & Wight law firm sent a letter to the commissioner reporting that, on medical advice, Father Landell should remain for another four or five months to restore his health, which was damaged by a bronchial condition (bronchitis). The letter also highlighted that he had sought financial help to present his inventions, but was unsuccessful.

"Under the circumstances", they requested a one-year period from

March 14, so that the client could organize his life and comply with the determination. The examiner, however, gave a deadline of just three months until June 14. On February 9, the lawyers presented the application for a new patent, which was filed under No. 142,440.

He returned from Cuba on June 3, 1903, aboard the ship Mexico that left the Havana Harbor. At the immigration station on Ellis Island, he was identified as "Rev. Robert Landell" and declared that he had 100 dollars in his pocket (8): around 3,386 dollars in 2023 values[5] . He would still stay in NYC for another year and a half...

Feeling pressured by the U. S. Patent Office, he sincerely communicated that he was still "totally incapable of taking all measures to

[5] Calculation according to the website https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800-

demonstrate the operability of his invention." And he proposed to do it "as soon as possible".

In another letter on June 10, his lawyers respectfully requested an extension of the deadline until September 14, "by which time the applicant will make every effort to comply with the official requirements".

At the end of September, the priest-inventor wrote reports to lawyer Edward Davidson, modifying and correcting the specifications of the phonetic switch, and answering the questions about "the telephone and the wireless telegraph".

Supposedly representing the department, Willard M. Miner[6], who

[6] Willard M. Miner sent this letter from 80 Broadway Ave. to 464 West 14th St., approximately 2.5 miles away. Currently, this former address of Father Landell is close to the Ground Zero Museum Workshop. Miner's address is close to the Anglican Trinity Church. Baldwin, Davidson & Wight's address in NYC was at 141 Broadway.

had patents in the field of telephony, sent a letter to Father Landell on October 15, 1903, agreeing with the idea of making a "small demonstration of the wireless telephone and telegraph" between the rectory and another point (the original letter is cut) or at a similar distance. In a respectful language, he left him free to do whatever was most convenient.

And the requirement was met. Father José Joaquim Valença made the following statement:

"To test the wireless telephone, he installed the device in the lounge of the hotel where he was staying, putting the receiver in one of the theaters where a grand opera was to be recited or performed. On the scheduled night, those invited to the experience at the hotel lounge heard the music perfectly as if they were in the theater. The

following day, *The World*[7] , a daily with a large circulation, published a laudatory article with a portrait of our fellow countryman". (9)

Because the sojourn in America was much longer than expected, he fell into financial hardship to pay for maintenance and patenting expenses. Out of the five letters of accountability from lawyers that were found, Father Landell could only pay two with his own resources.

The other three were paid off by Daniel Tamagno (1860-1937), a merchant from NYC who became his friend, was a witness to one of the patents and was his pen pal for several years. Father Landell owed him at least 4 thousand dollars, a small fortune: in

[7] A research commissioned the New York Public Library to investigate editions of *The World* (NY) newspaper, but they did not find any news involving Father Landell in the period from August 1903 to September 1904.

2023 values[8] , it would correspond to 135 thousand dollars. That debt would only be paid after a few years, when the priest was already in Brazil.

In a manuscript dated November 4, 1903, he made new clarifications on some aspects of the phonetic switch. On November 29, he explained in detail how the "wireless telegraph" worked, making changes in a previous document. On December 2, he amended the text about the "cordless telephone" that would be attached to the process: description and operation. And, on the 8th, he made modifications to the Landelphon, with specifications.

> In 1902, Marconi registered the magnetic detector, a new improvement that

[8] Calculation according to the website https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800-

would be used for more than 10 years in ships equipped with wireless telegraphy. (10) In December 1902, he transmitted messages from Canada to England, directly between the kings of the two countries. In January 1903, he established the early radiotelegraph communications between the USA and England. (11)

In 1903, he discovered that signals could be transported over a much greater distance at night than during the day. (12) That same year, five wireless methods were being tested in the States: Marconi's; the Slaby-Arco, by the Navy; Braun's, by the Army; Fessenden's, by the

Weather Bureau; and De Forest's, by the Navy. (13)

In 1903, American A. Frederick Collins gained visibility in the media for making short-distance experiments with "a new wireless telephone system". He imagined that he would soon be able to communicate with Europe, according to The Evening World newspaper of July 21. Collins' project did not succeed because the device produced damped waves. Other scientists followed the same path in the early days of radiocommunication.
Father Landell, however, had already developed continuous wave

transmitters - that are still used today!

“On February 3, 1904, the Marconi International Marine Communication Company held their 4th Ordinary General Meeting at 18, Finch Lane, where Major Flood Page presided. Here it was announced that 54 ocean-going ships were provided with wireless, in contrast to only 10 the previous year. There was some disappointment expressed by a few shareholders that extensions on a larger scale had not been made, but they were assured of the true fact, that a great deal of time during the past year had been given up to completing foreign contracts”. (14)

> Professor John Ambrose Fleming, as well other experts, joined Marconi's company, where he was a scientific advisor and helped to solve several issues regarding the improvement of the model. (15)

While traveling in the United States, Monsignor Vicente Lustosa reported the conversation he had on April 21, 1904: "We visited our fellow countryman Father Roberto Landell de Moura who has been living here for three years studying electricity. He set up a modest office and managed to discover new and interesting applications of electricity. It has already obtained two privileges from the American Government, and is on the verge of getting others.

"Newspapers in New York have already honored his name, publishing his portrait and declaring him wise. And prominent engineers offered him a dinner, as a sign of appreciation and consideration." Lustosa ended the chronicle by saying: "Father Landell de Moura is completely abandoned by his fellow countrymen. He lives here with scarce resources and without being able to expand the scope of his activities in terms of inventions and applications. An exploitation company has already wanted to buy his privileges, for an insignificant price, to label everything as if they were American things". (16)

On May 27, 1904, *Jornal do Commercio* (RJ) reported:

"The experiments made by the Very Reverend Roberto Landell de Moura have been achieving the best results, according to New Yorker newspapers. Some published his

portrait, presenting him as a remarkable scientist.

"His wireless telegraphy and telephony devices have recently been favored by the American Government, after experts have declared that the two wireless transmission systems exceed the previous ones. Father Roberto is, therefore, the discoverer and creator of the principles of wireless telephony. He is currently working on new applications related to the others he has tried, which are necessary for the full guarantee of all his inventions and privileges obtained".

On August 10, *Jornal do Commercio* (RJ) mentioned the facts:

"The Government of the United States of America granted our compatriot Father Roberto Landell, currently in New York, with another patent for an invention that aims to transmit musical notes and songs over

a long distance without the use of conductive wires or light axis.

"The effect is obtained by means of electrical impulses or vibrations, which are converted at the final station into sound waves, identical to those at the initial station. Our compatriot has three patents granted by that government, namely: for a Wireless Telephone, for a Wireless Telegraph and for a Wireless Wave Transmitter. These are the official titles of his patents, which involve four new wireless transmission systems, two telephonic and two telegraphic".

While the press was announcing the granting of three patents as a certainty, Father Landell was focusing his mind on new projects. On August 20, 1904, he designed and polished concepts for a creation as grand as unprecedented: "The Telephotorama or Vision at a Distance".

On September 5, he defined a wireless phonic and graphic equipment – the Landelgraph –, operated through electrical impulses, with a transmitting station and a receiving station: “In this system, messages at the initial station can be transmitted by a new security telegraph key and also by sounds or musical notes, as stated in the Wave Transmitter specification. At the final station, the same messages can be received by means of a telephone or a Morse recorder”.

In the analysis made by technician and engineer Fabio Serra Flosi, a telecommunication expert, it was a variant “of a device to transmit, remotely and wirelessly, Morse code signals or human voice”.

In a letter to Edward Davidson on September 15, he described “a new application called Landelphon: a telephone without conductive wires,

that is, operated through electrical impulses, which are produced by sound vibrations at the sending station and are turned again into sound vibrations at the receiving station".

According to Flosi, it was an improvement in the Wave Transmitter, that is, an artifact for sending voice and music over long distances, without wires: "The big difference is that in the Landelphon he used the microphone from a telephone device, perhaps coal powered. In the Wave, a mechanical key opened and closed when people spoke".

The struggle and hard efforts to overcome considerable obstacles were finally rewarded on Tuesday, October 11, 1904, when the priest-scientist received Patent No. 771,917 for the Wave Transmitter, which is the precursor of radio. At the end of the same month, another sign of modernity

was inaugurated in NYC: the first subway line. (17)

On November 22, 1904, another Tuesday, it was the turn of patents No. 775,337 for the Wireless Telephone, and No. 775,846 for the Wireless Telegraph.

In October 1904, the *Western Electrician* periodical, from Chicago, reported that "an ingenious apparatus for the transmission of intelligence through space has been patented by Roberto Landell de Moura, a Brazilian residing in New York City". Images of the phonetic switch illustrated the reporting that almost filled one page and summarized how the Wave Transmitter worked.

"The phonetic switch is nothing more than a microphone. The components associated with this switch constitute what we currently call an amplitude modulator. The result is

amplitude modulation (or AM) – the process of transmitting speech or other sounds over long distances, without the use of wires", explains Flosi.

Other American periodicals also spread the news: in December 1904, The *Electrical World and Engineer* reported the registration of the Wireless Telephone; in January 1905, *Telephony* commented on the Wireless Telephone and the Wireless Telegraph.

Over the years, Landell's three patents would be cited in the References of other inventions registered with the U. S. Patent and Trademark Office:

- **Antenna**. Patent No. 2,423,648, of July 8, 1947, by Clarence W. Hansell (RCA). Cites the Wireless Telegraph;

- **Means for supplying pulses of modulated current**. Patent No. 2,437,315, of March 9, 1948, by Paul N.

Bossart (Union Switch & Signal Co). Cites the Wave Transmitter;

- **Radio and visual warning device**. Patent No. 2,475,578, of July 5, 1949, by William S. Halstead (Farnsworth Research Corp.). Cites the Wave Transmitter and the Wireless Telephone;

- **Device for detecting variations in fluid pressure**. Patent No. 2,583,941, of January 29, 1952, by Thurlow M. Gordon Jr. Cites the Wave Transmitter;

- **Method and apparatus for transmitting information using arc.** Patent No. 5,220,246, of June 15, 1993 (Mitsubishi Jukogyo Kabushiki Kaisha). Cites the Wave Transmitter;

- **Adaptive modulation and data embedding in light for advanced lighting control.** Patent No. US 2013/0069540 A1, of March 21, 2013, by Tim Corneel Wilhelmus Schenk,

Lorenzo Feri, and Hongming Yang (Philips). Cites the Wave Transmitter.

This set of references means that, even decades later, Landell's creations were useful, being an inspiration to other inventors in the development of more sophisticated devices and models.

"It's like writing a scientific article. People use existing articles on the subject as a basis to create something more updated, advanced, and sophisticated", explains Flosi. The invention by Clarence Hansell (RCA), for example, is a parabolic antenna for radar systems, which was developed in the 1940s. Hansell "studied the priest's patent and, perhaps, was inspired by some aspect of the Wireless Telegraph to develop something more sophisticated and efficient", observes the engineer.

In the text of the **Multi-functional electronic device holder and**

method of use, No. US 2012/0285907 A1, of November 15, 2012, David Edward Emmons wrote in Background art as follows:

"The relatively recent commercialization and proliferation of the cell phone tends to invoke the notion that wireless communication is a recent technology. However, it was a Brazilian Roman Catholic priest and inventor, Father Roberto Landell de Moura, who publicly first demonstrated a radio broadcast of the human voice on Jun. 3, 1900[9] . De Moura was a student of the physical sciences, and shortly after his radio broadcast over 8 kilometers in Sao Paulo, Brazil he was granted a Brazilian patent on Mar. 9, 1901 for his technology. De Moura secured three U. S. patents for a ´Wave Transmitter` (Oct. 11, 1904), a

[9] In fact, Father Landell made the first human voice radio transmission on July 16, 1899, as already mentioned in this book.

´Wireless Telephone` and a ´Wireless Telegraph´, both dated Nov. 22, 1904".

VIII

The Telephotorama

Author Ernani Fornari mentions in *O Incrível Padre Landell de Moura* that he intended to patent six other inventions in the United States. (1) In the private papers of the priest-scientist, which was found and filed after his death, there were several handwritten notebooks and the three American patents.

However, a lot with more texts, technical descriptions, drafts, drawings, letters, promissory notes and expense reports was found in a house of his relatives almost half a century after the inventor's death. And many more years went by until a group

of experts was created to analyze this material.

At the request of A. Eduardo Diniz Schlaepfer, then director of *Telebras* magazine, the committee of CPqD scholars was composed of engineers Edson Benedicto Ramos Féris (coordinator), Antônio Carlos Bordeaux, Juan José Chica, Arnaldo Adam Wahl, Zara Barragan Martinez, Leonhard Korawajczuk, and Nelson Guilherme Bardini (who invented the inductive telephone card adopted in 1992, but was not duly remunerated).

The investigations and interpretations took a long time. It was an arduous task, because many of the drawings are sketches and have no written instructions. Some are incomplete, others could not even be identified. Therefore, everything was analyzed within the bounds of possibility.

A certain set of drawings was interpreted as “an attempt to build a telegraph recorder, given a series of moving mechanical parts and gears.” If this is true – highlighted engineer Féris –, “Father Landell is a precursor of teletype or even radio remote control”.

Radio remote control for vehicles was patented in 1898 by Nikola Tesla. (2) He “used large batteries and switches controlled by radio signals, which energized the propeller and the rudder of the boat”. (3) But it was only during World War I that this invention really became famous. The German Navy developed and applied this technique to motor boats that fought enemy ships. In World War II, it was the turn of bombs and other weapons. After the great conflict, experiments of this type began to be made for non-military purposes in North America. (4)

Telegraphic recorders with printing on paper existed since the mid-19th century. The Morkrum Company produced the first start-stop writing teletype in 1912 for the Western Union. After merging with competitor Kleinschmidt Electric in 1924, the business prospered even more.

The “remote typewriter”, the classic teletype model widely used by the press until the end of the 1980s, was designed in 1930 by Sterling Morton, Howard Krum (both had previously worked for Morkrum), and Edward Kleinschmidt, from Teletype Corporation. (5) But with the advent of new technologies, such as computers and fax machines, it lost its relevance.

In the worst scenario, considering that Father Landell only idealized it and did not implement it, he would still have anticipated the future.

Other drawings immediately caught attention. In one of them, "The Telephotorama or Vision at a Distance" is engraved. It is from August 20, 1904, when Landell was in the USA. Telebras engineers commented:

"Based on a set of four sketches with some notes, we can conclude that Father Landell was moving towards a process of image transmission and reception, that is, television.

"The sketches indicated that he used image transduction for electricity by means of a photosensitive semiconductor, in this case, selenium.

"To exploit images, he was trying to use a device known as Nipkow disk that, through the mechanical exploitation of images, would actually make the system work. However, we should have in mind that the Nipkow disc has a certain number of holes arranged in a spiral shape, what is a

very important detail for its operation. In Father Landell's drawings, the holes are arranged in a circular shape, but there is no reference to the arrangement of the holes, nor is it clear if the device in question is the Nipkow disk, which, at the time, was already described in some physics textbooks.

“Unfortunately, some of Father Landell's drawings and notes have been lost over the years. It is noticeable that details added in the sequence of drawings make the functioning of the system more plausible. It is possible that the omission or incorrectness of the geometric arrangement of the holes on the disc was due to lost documents. As we cannot confirm this hypothesis, we are unable to categorically state that Father Landell was the inventor of a television model that actually worked.

“But we can prove, without a doubt, that at least his work is a

precursor to the aforementioned invention, because he had already solved some problems of video communication, as evidenced by the few documents preserved to this day".

The development of TV involved arduous efforts of many scientists in search of better equipment and solutions. The very name of this "brand new communication resource," which Father Landell called The Telephotorama, varied a lot, such as photoradio, radiovision, pictorial radio, illustrated radio, tele-eyes, ethereal projections, visual wireless and others, until reaching the accepted definition of television. "In the USA, the term television was used for the first time in Scientific American magazine, in June 1907". (6)

Interestingly, the word television was created before its very creation. Russian physicist Constantin Perskyi

cited it for the very first time at the International Electricity Congress (August 18 to 25, 1900), held during the Universal Exhibition in Paris. “He combined the terms tele (far) and videre (see), from Greek and Latin, respectively, to describe an equipment based on the photoconductive properties of selenium”. The article Télévision au moyen de l`électricité (Television by means of electricity) mentioned works by Nipkow, P. I. Bachmetiev, Jan Szczepanik, Benedict Schöffler, and A. A. Polumordinov. (7)

On August 31, 1913, when the word television was already established, the talented researcher from Rio Grande do Sul wrote “some ideas” on a pad about the transmission of images. The third option seemed to be “the most feasible”, then he made a list of materials with 11 items, in order to make the experiment. But other items

were also crucial: “Peace, time, money, and opportunity”.

Nine years after the Telephotorama, he was still researching... It is not known how this project ended or how far he went.

In 1884, German Paul Gottlieb Nipkow invented a scanning device that sent images over short distances. In 1922, American Philo T. Farnsworth perfected a scanning method. He sold his patent for 1 million dollars to RCA in 1939.

Russian Vladimir K. Zworykin, who became a naturalized American citizen, created the iconoscope and the kinescope in 1923. The iconoscope was the primitive TV camera tube suitable for television broadcasting and the kinescope is the cathode ray tube intended for reproducing images in receivers. (8)

In 1926, Scotsman John Logie Baird made an original public demonstration of what could be called television. (9) Zworykin presented a practical all-electronic mode in 1929. (10)

“The first image, which was of Felix the Cat, had just 60 lines. Ten years later, in 1939, researchers managed to transmit images with the significant number of 441 lines”. (11)

IX

Technological advances

As soon as he got his third and final patent, Father Landell boarded a ship on November 25, 1904, bound for Rio de Janeiro. But he intended to return to NYC "to definitively resolve issues linked to his three privileged wireless telegraphy and telephone systems". (1)

"Back then, when I returned from the United States, I thought I would only spend three months in my homeland and would return to New York to continue my studies. But man proposes and God disposes. For reasons entirely beyond my control, I could not return. I had to remain in Brazil and I was also forced to abandon my experimental studies and the

necessary means for them," he would comment 20 years later.

"In the United States, where I lived for three years, I managed to patent several devices demonstrating my theories on the sound and voice transmission over a distance without the need for a conductive wire; these devices needed to have a practical and commercial purpose and, therefore, my return to North America was necessary. But it was not possible. Patience". (2)

It is unknown what circumstances forced him not only to stay in the country, but also to put one of his identities aside. He could be as religious as he wanted, but he would have to put an end to his career as a scientist. That certainly didn't please him. Disappointment was a loyal companion...

Father Landell was still hopeful when he wrote to the then President of

the Republic, Rodrigues Alves, requesting two ships from the war fleet to demonstrate his inventions. A government official got in touch personally. Enthusiastic, Father Landell said that he wanted the longest possible distance between the ships out of the Guanabara Bay and on the open sea right now, because in the future "his inventions will even be used for interplanetary communications!"

He would not be contradicted by history, but his idealistic naivety took a toll. He was not taken seriously and was probably considered crazy. He received a telegram from the Presidency stating that it was not possible to meet his request promptly, so he had to wait for an opportunity. (3) The "opportunity" would never arise.

Father José Joaquim Valença, former parish priest in Petrópolis, said that Father Landell proposed to install

his system's devices in the fortresses. The offer was not accepted, because the Government already had commitments to install the Telefunken system. (4)

Ironically, on March 1, 1905, there was news about the success of the radiotelegraphy experiments made the day before, when a radiogram was sent from the sea by the battleship. This is considered the first “official” wireless transmission in Brazil. (5)

The Navy began studying the new technology in 1903, when Father Landell was in the United States. Two Telefunken-type stations, which operated by sparking, were set up at the Naval Battalion on the Isle of Snakes; experimental procedures began in 1904. That same year, Telefunken stations were also set up on the ships Aquidaban, Barroso, Riachuelo, Tamoyo, and Benjamin Constant. (6)

On March 11, 1905, *Jornal do Commercio* (RJ) related the advances made by the priest-inventor, highlighting that he planned other developments, despite the existing difficulties:

"The three patents granted to him by the Government of the United States of America involve two telephone systems and two telegraphy systems, with all four systems operating without conductive wires. According to the text of the patents, the author can telegraph or telephone over long distances using light waves or electric waves.

"A transmission by light waves can easily reach 30 to 50 km and even longer distances, as these are in direct proportion to the extension of the light axis. This system differs greatly from

Bell's Photophone[10] , because in Father Landell's system the luminous axis is modified not only by the mechanical action of the voice, as in the case of Bell's system and its congeners, but also by electrical vibrations produced by the voice.

"Thus, due to these and several other very important and new circumstances, his conductive wireless telephone system operated by light is resilient to the Sun, rain, wind, fog and other meteorological phenomena, as confirmed by the various experiments made by him and several researchers.

"We must recognize that Father Landell was the creator and inventor of

[10] Graham Bell's *Photophone* was patented in the United States on December 7, 1880. The device transmitted sounds by light. A precursor to modern fiber optics, it was the first device in the world to transmit voice through space without the use of wires. Bell patented the *Photophone* four years after the corded telephone and even imagined that it would be his most important invention, but it did not succeed. It was the telephone that made him famous.

another telephone system using special electric waves through space, but without a conductive wire and without the slightest aid from the luminous axis. In addition, he devised a transmission system through the ground, as we can deduce from the reports of his American patents and the one granted to him three years earlier than experiments made in Europe and the United States.

“Although not commercial, this system of transmission through the ground invented and privileged by him will be a starting point for later understanding the laws that ruled the first one, that is, by electrical signals of undulating sound waves through space.

“In this wave telephone system, sound is turned into electric waves, which propagate through space over long distances and, when they arrive at the final station, they are turned again

into sounds by the devices at the receiving station. By means of this system of his, musical notes, songs and articulated words can be transmitted over truly prodigious distances.

"If the calculations are correct, the inventor hopes to soon bring his wave telephony system to the perfection of ordinary wire-based telephony. In turn, his telegraphy system, without a metallic conductor and using electric waves, presents the following novelties that completely differentiate it from the current systems in use, being, due to certain circumstances, more effective, more practical, more economical and easier to handle:

"1st, because the transmission is made by a special key or by tones corresponding to the long and short ones of the Morse alphabet;

“2nd, because reception can be made using a Morse receiver or by a device that emits notes or tones identical to those produced at the transmitting station;

“3rd, because the disturbances or wave electrical movements that propagate through space can result from reflected or non-reflected wave electrical radiations, as in the case with other wireless telegraphy systems”.

Edson Benedicto Ramos Féris, an engineer at the Telebras Research and Development Center (CPqD) and professor at the Polytechnic School of the University of São Paulo (USP), examined the patents and concluded:

“In those inventions, Father Landell transmitted signals of variations in light intensity. This type of communication was reborn with the transmission of light variations via optical fibers. In the inventor's time, it

was a voltage arc that had varied luminous intensity; today, it is a semiconductor laser whose emission of infrared rays is modulated by information. The principle, however, is the same".

Engineer Féris attested that Landell "created a three-electrode lamp based on the Crookes tube. He would have placed the third electrode in the form of metallic filaments, which makes it very clear that this would be the triode grid. This valve already produced continuous oscillations in contrast to previous devices that produced pulsating and damped oscillations. The latter were known as Hertzian waves. The continuous waves generated by Father Landell's device were called 'Landellian waves' by his contemporaries".

In 1924, a newspaper from Rio Grande do Sul referred to this phenomenon:

“Landellian waves differ greatly from those that are more or less damping and produced by electrical vibratory movements without constancy or uniformity, which gradually decrease. Landellian waves are not subject to such transformations and are produced by electrical vibratory movements, whose wave values are continuous and always remain the same. And Canon Landell de Moura uses these waves in his various telegraphy and wireless telephone systems, based on laws and principles that he discovered.

“In his theories on the superposition of vibratory, acoustic, luminous, radiant and electromagnetic movements to transmit and receive the luminous, harmonic and acoustic

phonic signal, and the articulated or phonographed human voice through space, the ground and the aqueous element, these waves have a fundamental role, because they fling continuously between the receiving and transmitting stations, forming a permanent and uniform wave field. And it is through this field that he sends his telegraphic and telephone messages.

"The idea of creating this wave field through space is ingenious and has a great practical and scientific scope, as it has already been used for various purposes. Furthermore, on the basis of this wave field, Canon Landell realized the possibility of transmitting images wirelessly over long distances, what is the principle of television that is now being tested.

"It was also based on this principle that he saw the possibility of transmitting the vibrations

corresponding to the logus, or mental verb, just as the vibrations corresponding to the articulated word are transmitted". (7)

In short, engineer Féris stated that Father Landell was the one who "transmitted for the first time in continuous waves, using a type of valve whose characteristics were similar to those of the three-electrode valve, which came to dominate completely the means of transmission". The triode, a fundamental piece in the development of radio broadcasting, was invented by American Lee de Forest in 1907. (8)

The initial model of radio communications included sending via damped waves, what "was replaced by the emission with intertwined waves, that is, by continuous waves of constant frequency; the possibilities offered by them, both in emission and reception,

are much superior to those of damped waves". (9)

Féris also commented that "the invention of thermionic valves revolutionized wireless telegraphy, allowing for the modulation, reception, amplification and production of intertwined waves of any length". In 1907, Lee de Forest devised the audions, whose use developed in 1914. "It was in 1904 that J. A. Fleming used the diode to rectify alternative currents. Lee de Forest sought to control the plate current by means of another device. He introduced a grid, which was a supplementary electrode, into the lamp bulb". (10)

When he patented it in the United States, the Brazilian scientist recommended the use of short waves to increase the transmission distance. Marconi insisted on declaring them useless - only in 1916 he recognized

that they offered advantages. During the First World War (1914-1918), his researches slowed down, but were resumed in 1922. In 1924, he made a radiotelephone beam transmission of short waves between England and Australia. (11)

In 1925, Marconi said: "Two years ago, we believed that it was necessary to use large amounts of force and long waves to cover considerable distances. We thought that short waves could only be used for long distances during the night, but these nighttime ranges were irregular and too unsafe for commercial exploitation. Now, everything has changed. We found that these waves can carry messages at any time of the day or night over considerable distances". (12)

X

Landell and Marconi

From the radio signal produced in a laboratory by Heinrich Rudolph Hertz (1888), confirming what had been predicted by brilliant Scotsman physicist and mathematician James Clerk Maxwell, the "father" of electromagnetic waves (1873), to patents No. 12,039 of Marconi, in 1896, in England, and those of Father Landell, in the United States (1904), there was a technological revolution.

As expert in electricity Luiz da Silva Netto observes, radiocommunication entered the scene radically transforming the parameters in force. When telecommunications were exclusive services of the wired

telegraph and the corded telephone – from 1838 to 1896 –, the emerging possibility of sending and receiving messages wirelessly implemented a new concept, eliminating problems with the infrastructure of wires and poles and their maintenance.

Historical data and documents related to Marconi's original patent indicate that the Italian inventor decided to focus solely on radiotelegraphy and had the merit of knowing how to use together materials available at the time, such as Ruhmkorff's coil, Branly's coherer, Hertz's oscillator and Popov's antenna.

In the same field, Father Landell made good use of the Ruhmkorff's coil to generate signals and transmit them through sparking spheres and/or antenna. When receiving the radiated signals, the Branly's coherer was used together with the decohesive relay,

allowing for the reception of the next signal. But he invented an acoustic signal reinforcer and used the Crookes tube, which produced flashes of light of varying duration, following the Morse code. In this context, the reception was done by the audio detector mode via light.

"I think Father Landell wanted to add the device for emitting flashes of light through the Crookes tube to his inventions just to suggest possibilities, since the transmission and reception of telegraphy were covered by means of electromagnetic waves with lower frequencies, through its telegraphy transmitter and receiver", highlights Silva Netto.

"He thought of radiotelephony in different ways. By inserting a phonetic microphone invented by him into the Ruhmkorff's primary coil, which opened and closed the circuit through

the cadence of the voice, he already had created, in the Wave Transmitter, an incipient way of transmitting speech".

When he imagined human language being transported over distances through light, he inherited a premise used by Bell in the Photophone. "Bell used a ray of sunlight to modulate the light with the voice, but as the range achieved was a few hundred meters, he abandoned the idea.

"Based on the same principle, the Brazilian scientist gave power to the light ray with the use of a powerful light source, obtained through rheophores initially put in a short circuit and fed by a powerful energy source. The light rays generated were put in parallel at the focus of a parabolic surface. The modulation of light by the voice was done through a quartz plate, which vibrated according to variations in the frequency of the speaker's voice.

“At the other end, the modulated light was also collected by a parabolic mirror, whose focus had a photosensitive element, selenium. Its electrical resistance varied according to the variation in the intensity of light received. A headphone jack was interspersed in this circuit. The signal quality was excellent, and it was possible to hear the ticking of a clock 8 km away!”

The use of light to convey information has become a highly efficient medium. Today, television channels and data are transmitted by optical-fiber cables, for example. Another use of light to record and reproduce sound was introduced in the recording and reproduction of movie soundtracks.

Why is Marconi considered in many countries to be the inventor of

radio, if he invented the wireless telegraph or the radiotelegraph?

The confusion probably exists because radiocommunication has a broad definition: it refers to the communication of signals and also of sounds or images using electromagnetic waves. Marconi, Landell, Fessenden, and Tesla made similar experiments with different characteristics on different occasions.

At the end of the 19th century, US newspapers used the term wireless telegraphy to describe Marconi's creation. In the meantime, the term wireless telephone was also used to distinguish voice communications. In the prelude to the 20th century, the nomenclature increased with the synonyms of the previous ones: radiotelegraphy and radiotelephony.

The word radio is derived from Latin radius and has several meanings.

On December 3, 1880, it was used for the first time with the current meaning in communication: physicist Ernest Mercadier (1836-1911) presented a note titled Sur la radiophonie in a session of the Société Française de Physique.

Bell participated in the meeting on October 22, in Paris, when the photophony experiments with the Photophone were repeated. Mercadier called it radiophone because it used radiant energy, light, to transmit voice. The Frenchman would invent the headphone. (1)

XI

From New York to Botucatu

1904 was a good year for Father Landell, whose talent was crowned in the Mecca of Inventors. But he had to cope with the loss of loved ones: his father, Captain Ignácio José Ferreira de Moura, died on February 10; and his sister Rosa, on July 12.

At the invitation of the Bishop of São Paulo, Dom José de Camargo Barros, he ran the parish of Botucatu (1) from March to November 1905. (2) After shining abroad, living in New York, the metropolis of America, he was assigned by his superiors to work in a place far from the benefits of urbanity.

Botucatu is located 242 km from the capital, so life was different and more primitive compared to large centers, such as Campinas and São Paulo. When he settled in that dusty village, with no paved streets, no running water and no electricity, Brazil "officially" entered the wireless stage: February 28, 1905.

Even though he suffered all these blows of fate at the same time, living practically as a stranger in a strange land, he did not give up on the ideals of science or the Catholic faith.

In a final attempt to get recognition, he asked the Government of the State of São Paulo for financial resources to make the radio device, which was still unknown on the planet, and a new radiotelegraphy system available for the domestic market.

On December 16, 1905, during the session of the State Chamber of

Deputies (current Legislative Assembly), the first secretary, José Vicente de Azevedo, read the order of the day citing that the "petition presented by Father Roberto Landell de Moura requesting financial aid in order to continue studying to put into practice his telegraphic and telephonic systems" would be forwarded to the Finance and Public Accounts Committee.

"As I have three invention patents granted by the American Government, I thought, before taking any decision, to turn to you, with the intention of asking for financial assistance, in order to pursue my studies to achieve the purpose of those invention patents", wrote Father Landell.

He used a patriotic argument to sensitize the deputies: "Although they (the patents) belong to me, they are also yours. So if you don't help me, they

will no longer be ours and also Brazil's, because, in matters of inventions, although privileged, the name of the person who discovers or invents them is not linked with them, but rather the person who puts into practice what the author of these discoveries or inventions cannot achieve due to the lack of financial resources".

"The mentioned patents involve two telegraphy systems and two other telephone systems, with all four systems operating without conductive wires. With these four systems, I can telegraph and telephone over great distances, using light waves or electric waves.

"Telegraphic and telephone transmission systems, using light waves, are very suitable to put the ends of a large city into mutual communication, especially in times of unrest," and to establish reciprocal

communications between lighthouses, ships and the coast, “especially when there is fog, as the light I use has the property of passing through opaque bodies.

“The two other telegraphic and telephonic transmission systems by means of electric waves reach truly prodigious distances, especially on the high seas.” He clarified that his artifacts “differ greatly from their counterparts” in several aspects, because “they are more constant in their effects, more economical, more practical and easier to manipulate than the existing systems in the market, according to a commission of American experts assigned to check and give their opinion about the usefulness, practicality and commercial feasibility of these lately privileged inventions of mine”.

The petition was handwritten, sealed, signed and accompanied by a dossier with clippings from *The New York Herald* and national newspapers that published reportings on his pioneering spirit, as well as by the certified translation from English into Portuguese of the three American letters patent. He did not specify how much money he needed for their industrial manufacture. As he was very modest, he probably left the matter at the discretion of the state authorities.

"The petitioner says that it is possible to telegraph and telephone over long distances, using light waves or air waves", highlighted *Correio de Botucatu* (SP), on December 21. The newspaper opined: "His request deserves to be met, because the Very Reverend Landell de Moura is an indefatigable worker".

The document indicates that he devised the new point-to-point communication mode with different purposes, according to the technology used (radio or light waves). He would not have imagined up to then the possibility of radio broadcasting, which would end up being, decades later, the great destiny of radio.

Seven months after the legislative session, on July 20, 1906, when he was already working in another location, the Finance and Public Accounts Committee expressed its opinion about ten petitions simultaneously. Father Landell's petition was the fourth to be mentioned. All were archived under the general allegation that some requests “were fulfilled and others lost their opportunity”. (3)

He dedicated himself body and soul to his ideals and struggled beyond his limits to introduce radio to the

country where he was born. But he was not heard.

XII

The exorcism

On April 19, 1906, Father Landell was transferred to the parish of Santana, in Mogi das Cruzes, where he would stay for one year. (1) Located 46 km from the capital, the municipality had around 20 thousand inhabitants and just over two hundred voters. (2)

“People who lived in Mogi at that time remember him well: a tall, thin man, whose cassock made him even taller and thinner. But, above all, a strange man, whom the city viewed with respect and suspicion”, described historian Isaac Grínberg.

“His reputation preceded him: it was said that he was a mystifier, a

madman, a wizard and even had a pact with the devil! The old men in Mogi with whom we spoke about him didn't mention such suspicions, but they confirmed that Father Landell was indeed very weird and that his contemporaries believed that he was a Spiritist..." (3)

Former altar boy Benedicto Olegário Berti got very emotional recalling that priest who “walked hunching his shoulders, had big feet, sometimes looked up from one side to the other, as if he was suspicious, and talked to himself on the streets”. At 81-years-old and very attentive, he remembered many past events and, despite constantly repeating them, expressed conviction.

“Father Landell had quite a temper. I don’t know why, but one day he took off his cassock and fought with two boys in Largo do Carmo”. When he

arrived in the village, altar boy Berti was 11 years old and continued his service. The priest lived in a bedroom in the church, where no one could enter, because the door was always locked. He did the cleaning himself. But one day Berti and another altar boy managed to enter his bedroom. They were playing when they saw a small black box with some wires and touched a button. Suddenly, something was heard. Then, Father Landell arrived:

"- What are you doing here?"

"The small box should be about 20 centimeters wide and 10 centimeters tall, and he almost always kept it in his pocket. Walking down the street, he sometimes stopped and communicated with the object. That's why people said he was crazy. At masses, he took it to the altar and put it next to the chalice. At a signal coming from the box, he would interrupt the service and talk in

Italian to that strange piece, which responded very quietly".

The altar boy beside him witnessed everything. "After finishing the dialogue, he would ask:

"- Where have we stopped?"

And he resumed the mass. When the altar boy didn't know the right answer, he started all over again. "That's why almost no one liked to attend his masses". Who was the interlocutor that Berti used to hear saying words through a mysterious box? It is another mystery in this narrative.

In 1906, the radiotelegraphy was a commercial success. The Marconi Company, the Telefunken Company, the Braun-Siemens and Slaby-

> Arco inventions, the National Electric Signaling Company of Washington (Fessenden system), the De Forest Wireless Telegraph Company of New York, the Lodge-Muirhead Wireless and General Telegraphic Syndicate were in the same business. To defend their interests, these companies fought any form of monopoly at all costs. (4)

Father Landell still hoped that he could return to the United States. On August 16, 1906, he wrote a letter to his friend Daniel Tamagno, saying: "My bishop died in the Sirio shipwreck and now I am waiting for the designation of a new bishop to resolve my trip".

He was referring to Dom José de Camargo Barros, who died at the age of

48, in August 1906, when the ship Sirio sank off Cape Palos, on the coast of Spain. (5) On the other hand, in a correspondence dated October 2 of that year, Tamagno expressed his desire that Landell's inventions could get support in Brazil. Neither one thing nor the other happened.

But fate had an unusual event in store for him. At the Rocha household, he observed supernatural occurrences and performed an exorcism, what caught the attention of Spiritists and, due to its repercussions, displeased the Catholic Church.

In a letter to the vicar capitular, Father Landell explained: "Two infernal packs inhabited the house. A lot of secrecy has been kept about all these facts, which have been very scrupulously verified, studied and proven experimentally and scientifically by me, using instruments

and devices devised ad hoc, in order to eliminate the slightest suspicion of fraud, deceit, mystification, suggestion or hallucination".

The vicar capitular did not answer the letter, "despite its very important subject", but he made a surprising move on March 4, 1907: he ordered Landell to resign for "not having complied with certain clauses relating to the congregation of the Christian doctrine".

After that, Father Landell would stay in São Paulo for a while, without knowing where to go. Only on July 2, 1908 he was assigned the position of parish priest in Caconde. He would have stayed in a chapel in the rural village of Tapiratiba, 231 km from the state see in the northeastern region. That village belonged to Caconde. (6) Going from town to town, each time smaller, he would only stay there for a short time...

Another milestone in the history of radio communication was reached on July 18, 1907. During the annual regatta of the Interlakes Yachting Association, Lee de Forest, aboard the Thelma, one of the main sport sailboats, transmitted the results of the competition over an approximate distance of 30 km, which were heard by his assistant Frank E. Butler on land. To the Americans, this experience was the first ship-to-shore radio broadcast. The US Navy bought products manufactured by the De Forest Radio Telephone Company for 26 boats. (7)

In August 1908, in Paris, Lee de Forest installed equipment on the Eiffel tower to make another broadcasting test. The sounds were captured in Marseille, 700 km away. (8)

XIII

The Landell effect

Presumably in 1907, Father Landell made another important discovery, which only decades later would become known as the Kirlian effect.

He named it “the perianth” and wrote about it on a pad as follows:

“The whole human body is kind of surrounded by a vaporous element, more or less dense, depending on the nature or state of the individual or on the environment where he is. When this element acquires a voltage capable of overcoming the obstacles that hinder its expansion, it drains from the human body in the form of disruptive or silent

discharges, just as it happens with electricity. And the phenomena that occur on these occasions have a lot in common with static and dynamic electrical phenomena, in relation to other similar bodies.

“I came to the conclusion that this phenomenon comprehends a variety of phenomena produced by electricity or due to electricity, heat, light, etc. The perianth itself is invisible; but, by means of certain lights, it can become visible and even be photographed, if we put an appropriate board or paper between the body, whose perianth is being studied, and the special light.

“A small animal, preferably with short hair, put under these circumstances and inside an appropriate tube, can be used for a test. If a vaccum is gradually created by a mercury pneumatic machine, when the

animal remains still in a state of agony, its figure is drawn in a vaporous form on the board. And when the animal dies, this vaporous form will visibly rise on the board".

It wasn't just theory. He managed to photograph the effect:

"Human radioactivity exists, as you can see in these X-rays of my thumbs. I called the cause of human radioactivity stenicity to distinguish it from electricity, even though they are similar. Among the irradiations emitted by my thumbs, some have an inductive and penetrating power. This X-ray, long before entering the chemical bath, already showed the contours and hues produced by the body's radioactivity. A singular case: this same X-ray, after being fixed, dried and examined with a microscope, showed countless luminous points, which constantly

emitted scintillations similar to those of radium".

And he added: "It is precisely in human radioactivity, in suggestion and in nerve currents that we will find the explanation for prodigious cures and so many other apparently wonderful facts, such as the (illegible), the transmission of thought or mental suggestion, the (illegible), etc." The scientist stated that "radioactivity of the human body, like electricity, can be transmitted through a metal wire and be printed on a plate at the receiving station".

Ignácio Landell de Moura told that, right after his uncle's death, he found "a box full of things and a lot of photographic plates" among his belongings. When the photos were enlarged, he saw "mysterious things". Innocently, he took all the material to a priest who immediately collected it and never gave it back, claiming that it

could “compromise the Church”. Decades later, Ignácio made new searches, but could not find the whereabouts of these photos.

In 1939, a Russian couple, electrician Semyon Davidovich Kirlian and teacher and journalist Valentina Khrisanovna Kirlian, found that all animate or inanimate bodies are surrounded by coronas of colored luminous energy, invisible to the naked eye – the “photography of radiance fields”. (1)

“To put it simply, the Kirlian technique consists in directing a high-frequency electric field, between 75 thousand and 200 thousand cycles per second, through an object to be photographed and the corresponding photographic plate. Apparently, the electric field leads the object to radiate a kind of luminescence onto the plate. The Kirlians soon realized that the

photographs showed some form of energy closely related to life". The discovery was named the Kirlian effect. For many, it is the photograph of the human aura. (2)

In 1894, American physicist and college professor Fernando Sanford photographed a coin with a similar process. This is the oldest record of this sort of experiment. (3)

XIV

“A patriotic question”

At the beginning of the 20th century, Brazilian Alberto Santos Dumont was a celebrity in Paris. In 1901, he circumvented the Eiffel Tower with a “flying cigar”. In 1906, the 14-Bis took flight for the first time in the French capital, consecrating him. Father Landell wrote a dramatic text titled “A patriotic question”, but unfortunately he forgot to write the date. The words denote the pain and anguish of a man faced with a hostile reality that defeated his dream:

“*Who invented wireless telephony?*

“Wireless telephony, both acoustic and wave luminous electric or magnetic,

was invented by the author of these lines. He achieved acoustic telephony, which consists in the voice transmission through the air, using a device to transmit and receive the human voice. He achieved the luminous one by means of rays or the abundant light in actinic and ultraviolet rays, as well as by means of a property of selenium discovered by him.

"Electric or magnetic modes by means of special electric waves, a phone mic transmitter and a lamp that reveals electric waves are some of his inventions related to wireless telephony. The author of these lines was also the inventor of the reflexive wave system and the discoverer of receivers based on magnetism and magnetic synderesis. The above facts can be confirmed with the three patents granted by the Government of the United States of America, which cover several inventions. He is also the author of many other electric devices, such as the 'ediphono', the 'calleophone', the

'teletiton' and the 'geophon', among others...

"Thus, what Santos Dumont represents for air navigation in terms of the lightest and the heaviest modes, the author of these lines represent for the wireless transmission of intelligent signals and articulated words. Santos Dumont is well, but his contemporary colleague leads a dog's life because he committed a crime: he wanted to leave the sacristy to show the world that religion has never opposed the progress of humanity. Everything the author of these lines has done is in accordance with his theories about the unity of forces and harmony of the universe, which were once very rejected. Others who are luckier will be able to confirm them with the facts".

In 1908, the pilgrimage across the State of São Paulo came to an end. Father Landell was appointed as parish priest in the Menino Deus

neighborhood, in Porto Alegre, where he would remain until December 31, 1914. At the age of 47, he returned to his birthplace when “the cinema (1896), the automobile (1906) and the electric tram (1908) were instigating the curiosity and fascination of the locals in Porto Alegre, which had a population of 73,474 inhabitants in 1900”. (1)

Coincidentally or ironically, in 1909, when Marconi won the Nobel Prize in Physics (November 16) together with German Professor Karl Ferdinand Braun, for the development of radiotelegraphy (2), the book Brazil in 1909, by J. C. Oakenfull, was launched in April with a first run of 5 thousand copies, under the auspices of the Brazilian governmental commission for propaganda and economic expansion.

In giving an overview of the country, with data on 20 years of the

Republic, geography, climate, Constitution, laws, education, communication, economy, geology, tourism, etc., the author referred to Father Landell in the chapter dedicated to science as “the first inventor of the wireless telephone”.

J. C. Oakenfull's work would be updated in English in 1910 (with a run of 5 thousand copies), 1911 (10 thousand), 1912 (12 thousand) and 1913, maintaining the reference to the priest-inventor's pioneering spirit in almost all editions.

In 1910, Marconi received messages in Argentina from the Clifden Station in Ireland. (3) That year, Lee de Forest broadcast a program from the Metropolitan Opera House in NYC, starring singer Enrico

Caruso. (4) The Marconi Company acquired all the registers of The Lodge-Muirhead System on October 21, 1911, and Professor Oliver Lodge was the company's scientific advisor. (5) The biggest rival of the Italian's company was Telefunken. (6)

In the dramatic sinking of the Titanic in April 1912, the telegraph played a very important role, contributing to the distress call that saved the lives of hundreds of people. Marconi's commercial project gained more prestige. (7) The radio operator at the American Marconi in New York, housed in the Wanamaker store, was Russian

immigrant David Sarnoff, future president of RCA. (8)

In Europe, new broadcasting tests were made between 1913 and 1914: Frenchman Raymond Braillard and Belgian Robert Goldschmidt broadcast spoken and musical programs from the Royal Castle in Laeken, near Brussels. (9)

In 1914, Marconi made his first radiotelephony experiments on the ship Regina Elena, in the town of Spezia, emitting the human voice over 71 km. (10) “The inventions of Fleming's valve in 1904 and Lee de Forest's three-electrode valve in 1907 eliminated the difficulties that hindered

> the commercial development of radiotelephony and allowed for its current progress" – said Marconi during a lecture in 1931. In July 1914, the wireless telegraph dispatched 300 words per minute. (11)

On his 53rd anniversary, on January 21, 1914, Father Landell inaugurated the Colégio Santa Ignez, which he had founded and started to run. (12) The creation of the College of Homeopathy of Rio Grande do Sul in Porto Alegre, opened a new front for him. Among the "full professors" were the priest and his brother João Landell de Moura (director). He taught two facultative subjects - anthropology and experimental psychology. (13)

On January 6, 1915, he was transferred to the temple of Nossa Senhora do Rosário in the central zone. People said that he was deeply hurt and disheartened when he left the parish of Menino Deus. (14)

On February 8, the vicar general asked for clarifications on a piece of news published in *Correio do Povo* (RS) that said he had opened an "experimental anthropology office" to study hypnotism and Spiritism. (15) He continued to study and expand his cultural sphere. But his thirst for knowledge caused frictions with the Church, although he vigorously defended religious ideas.

That same year, David Sarnoff presented the idea of turning radio into a mass media vehicle to the Marconi Wireless Telegraph

Company, where he worked. (16) “I have in mind a development plan that would turn radio into a leisure item for households, like the piano and the phonograph. The idea is bringing music home by means of the radio”, he stated in the “Radio Music Box Memo”. (17)

“In October 1919, the Marconi Wireless Telegraph Company sold all the shares of stock of the American Marconi Company, on advantageous terms, to the General Electric Company, from New York. This is how Radio Corporation America, known worldwide as RCA, was born”. (18) Once again, David Sarnoff presented the idea of turning radio into a

mass media vehicle, but he was unsuccessful. (19) But he would be recognized “as one of the main promoters of the development of researches on television sets in the 1920s”. (20)

XV

Radio stations spread

Commercial radio stations emerged on November 2, 1920, with the opening of the KDKA, set up by Westinghouse in Pittsburgh. It was born with enough power to reach large areas with regular programs. Eight months later, the RCA started operations reporting the boxing fight between Dempsey and Carpentier. (1)

In the Netherlands, radio broadcasting began an experimental phase in November 1918, thanks to engineer Hanso Idzerda. He inaugurated the continuous service on November 6, 1919, what gives him the "universal pioneering credit" for planned radio broadcastings.

The British BBC implemented a frequent script on November 14, 1922, through the station with 2-LO prefix, housed in the Marconi House in London. The BBC started operations in 1919 and went through a preliminary testing phase. (2)

> In June 1922, Marconi was already called the "Father of Wireless" by the American press. (3)

In Brazil, the first official public demonstration of wide-ranging broadcasting took place in Rio de Janeiro, on September 7, 1922, at the opening of the Centenary of Independence Exhibition in the Esplanada do Castelo, with a transmitter positioned at the top of Corcovado Mountain by Westinghouse

Electric. (4) Eighty receivers were imported especially for the occasion. (5)

In the meantime, *Brazil – a centenary of independence 1822-1922,* by J. C. Oakenfull, was published. Once again, Father Landell's feat was remembered on the science page: “the first inventor of the wireless telephone”. In 1919, the author had released another book – *Brazil – past, present and future* –, also mentioning Landell. Oakenfull's seven books about the country circulated abroad and sold more than 50 thousand copies.

The year 1923 is also in the history of radio in Brazil. On April 20, the Rádio Sociedade do Rio de Janeiro was founded by Roquette-Pinto, Edgard Sussekind de Mendonça, Álvaro Alberto, Henrique Morize and others, with the purpose of being an educational, cultural and artistic

vehicle. The transmissions began on May 1. The act, accompanied by just a few receiving devices, took place in a manner completely dissociated from the inventions of the genius from Rio Grande do Sul. Donated to the Federal Government in 1936, it currently operates under the name Rádio MEC. (6)

The Rádio Clube de Pernambuco began broadcasting constantly on October 17, 1923. (7) It was founded as a radio club at 1 pm on April 6, 1919, by "wireless telegraphy amateurs", under the leadership of radio operator Augusto Pereira, at the headquarters of the Escola Superior de Eletricidade (Ponte d`Uchoa), in Recife. (8) Initially, the broadcastings were "individual, without a specific time; listeners were guided by the programming published in the newspapers". (9) It is still operating today.

When radio stations were spreading across the country and the world, *Última Hora* newspaper (RS) sought Father Landell for an interview "about the priority of discovering radiotelephony and radiotelegraphy".

"The modest study hall" of the religious man was located at the back of the Rosário church, reported the edition of November 13, 1924. "It is a plain and simple room, with just a few pieces of furniture – which are essential to the cult of intelligence. A hanger, a planisphere and some anatomy maps are hung on the walls.

"- We would like to hear from you, professor, about radiotelephony. Twenty years ago, when Your Excellency returned from the United States, Jornal do Commercio, from Rio de Janeiro, published a long interview in which the theory of radiotelegraphy and

radiotelephony discovered by Your Excellency became clear".

Landell had stated:

"*After the 17-year term set by the Patent Law, the Americans had put my theories into practice. I'm no less happy for it. I have always seen my discoveries as a gift from God. And as I have always worked for the good of humankind, trying at the same time to prove that religion is not incompatible with science, I am happy to see that my dream nurtured for years came true in a practical way.*

"*- Indeed, God used my humble person to lift a little the veil that hides the secrets of nature, since the radiotelephony system currently in use is based on the principle of superposition of electrical wave movements and on the application of a similar lamp to the Crookes tube with three electrodes, but slightly modified, which transmits and receives telephone*

and telegraphic messages without a conductive wire".

In 1925, *Fon-Fon* magazine, from Rio de Janeiro, promoted a contest to determine who were the greatest living Brazilians. Santos Dumont won by far, with 36,273 of the total 37,228 votes cast in the Inventor category. Father Landell was in the last position, with just 1 vote - less remembered than 27 other names. The Brazilian population no longer remembered the pioneer of telecommunications, with three international patents...

In 1927, when he was already very ill, he preached about Our Lady of Aparecida sitting in a chair and "shed abundant tears". Father Landell's devotion to Our Lady of Aparecida began in Rio Grande do Sul. He intended to build a chapel and a vocational institute under the saint's invocation, but nothing happened the way he

wanted. (10) And he would not get to see Our Lady of Aparecida designated by Pope Pius XI as the patron saint of Brazil.

> In 1927, the Washington Conference established three wavelength bands for radio transmission: long waves, medium waves, and short waves. (11)

Father Landell's suffering got worse. A friend, Antônio Monteiro Martinez, took him to spend some time at his country place in the Tristeza neighborhood, in the southern zone. He became a recluse. So some friends managed to convince him to go to another place, and he chose a room at the Orfanotrófio de Santo Antônio do

Pão dos Pobres, in the Praia de Belas neighborhood.

As a last resort, his brother João Landell de Moura transferred him, at his own expense, to a private room at the Beneficência Portuguesa Hospital.

He was a vicar at Rosário for 13 years and "lived among his pigeons and the crates that contained the documentation of his inventions in the attic of the sacristy, a neglected corner without the slightest comfort, where he slept on a rough board". Much was said about his oddities, bad temper and quirks. However, people recognized his "unassailable moral conduct, his kind heart and his sincere spirit of charity towards those in need". (12)

He read many scientific magazines, such as the British Nature, and studied in the library. He used to meet a group of intellectuals in the old Bragança Drugstore on Praia Street

(now Andradas Street). He would also go often to the Cinema Central to listen to the orchestra that performed during the projection of silent films. (13)

When asked about his inventions, he would just say with evident sadness:

- *It's all water under the bridge.* (14)

Roberto Landell de Moura spent his last days in one room at the Beneficência Portuguesa Hospital in Porto Alegre. Surrounded by a group of friends and admirers, someone alluded to the progress of radio and asked him why he hadn't disclosed his invention and patents in the USA to everyone.

He replied that, as a religious man, he could not and should not appear as an inventor. He recalled that he had been advised to abandon the cassock to dedicate himself to science, but he didn't want to. Not only to

respect the vow, but also because the priesthood had been his parents' greatest aspiration. Under these circumstances, he had decided to renounce the glories that inventions could bring. And, with a hand gesture to stress his point, he added:

- *I have been keeping everything that is out there in the air and I will take it to the grave...* (15)

At 5:45 pm on Saturday, June 30, 1928, he died of tuberculosis, at the age of 67. "Compared to all the parish priests, Monsignor Landell was the one who left the church in the best financial condition". (16)

On July 2, *A Federação* newspaper (RS) published: "Monsignor Roberto Landell de Moura, archdeacon of the Metropolitan Chapter of Porto Alegre, passed away on Saturday in this capital, at Beneficência Portuguesa, where he was undergoing treatment. A man of

noble qualities, endowed with an affable and communicative personality, a modest and charitable priest, Monsignor Landell de Moura was very respected and esteemed in this capital. He recently had celebrated the 40th anniversary of his first mass (November 28, 1926), and Porto Alegre society was there to express their appreciation of his trajectory".

No mention of his scientific life was made.

Father Landell took his most intimate emotions to his grave. Disappointed? Frustrated? Happy with his achievements? A text written by him opens a slit that can help to clarify these questions:

"What is the ideal?

"The ideal is that thought, that intense, constant and persistent feeling, towards which all our faculties and

activities converge, and which, over time, will end up contributing to our happiness or misfortune".

1928. Radio broadcasting is a success and spreads worldwide. The fear that the novelty would subvert civilization was already over. The teletype progressed and television went through an experimental phase.

The world is on the brink of the Great Depression. In the Jazz and Blues Age, Father Landell's star, which was like a comet, was erased by misfortune.

Father Landell moved from religion to science and philosophy. In his view, the three paths converged into unity or emanated from unity. A profound theological sense marked his journey.

He used to write down ideas and observations. His views on different aspects of life are expressed in

approximately 40 handwritten notebooks that are at the Historical and Geographic Institute of Rio Grande do Sul. He had an evident interest in physics, chemistry, biology, philosophy, psychology, parapsychology, and medicine.

In 1931, the Brazilian Government showed a special deference to Marconi: he was invited to activate from Rome the lighting of the Christ the Redeemer statue in Rio de Janeiro, by means of radio waves. The lights were turned on at 7:15 pm on October 12. The ceremony was attended by the President of the Republic, Getúlio Vargas, and

Cardinal Dom Sebastião Leme da Silveira Cintra. (17)

Years later, according to journalist Ethevaldo Siqueira, some experts responsible for the electrical system confessed that the signals sent by Marconi could not be captured due to meteorological problems. To avoid a total failure, one of the engineers resorted to the alternative plan: he turned on the switch in parallel that he had planned to save the party. (18)

Marconi visited Brazil in September 1935. He landed in São Paulo to inaugurate the Rádio Tupi. “Several receptions were planned”, but it rained a lot and he had

flu, which left him bedridden for two days. In a ceremony, he was granted the title of Honorary Citizen of São Paulo. That same night, he suffered an attack of angina pectoris. In March 1937, he had another crisis. (19) On July 20, 1937, he died in Rome. (20) He is widely considered to be the "Father of radio".

A 2009 newsletter from the Fondazione Guglielmo Marconi - *Guglielmo Marconi: il pioniere delle radiocomunicazioni*, P*remio Nobel per la Fisica 1909* -, says:

"The peaceful revolution in radio communications, or wireless communications, has radically transformed society in the contemporary world. Guglielmo Marconi was the precursor of this

revolution: his wireless telegraphy model, which was developed in 1895, marked the beginning of radio communications".

The publication honestly distinguished telegraphy from radiotelephony. However, when it gave the credit for the development of radio to another researcher, it ignored Father Landell:

"It was Reginald Aubrey Fessenden who made in 1906 the first experiments in radiotelephony, by sending not just Morse signals, but complete sound signals by means of electromagnetic waves". (...) "Throughout the 1920s, radio broadcasting, or radio as we know it, developed exceptionally, becoming the first leading means of mass communication".

XVI

The replicas work!

The whereabouts of the original devices is unknown. But a letter written by Father Landell in Porto Alegre to Daniel Tamagno, on March 25, 1909, giving him instructions on goods that would arrive in Brazil, provides a clue:

"All these voluminous boxes contain old clothes and books, debris and equipment of the physics office, most of them useless". In that letter, he confesses that he has no words to express his gratitude to "the honorable and good friend: I will never forget all your courtesies".

After his death, manuscripts, notebooks, letters, newspaper clippings, photos, and the three patent letters were found... but there was no trace of the devices.

In 1984, the Science and Technology Foundation (Cientec) of Porto Alegre was assigned to build a replica of what could be considered the first radio set in the world: the Wave Transmitter.

After three months of exhaustive work that required an immersion in an unusual universe of physics, engineer Antonio Carlos Solano and technicians José Clóvis Totel and Antônio Felipe Pepe finished modeling the replica which, contrary to initial pessimism, worked well, within limits.

The replica was publicly presented at the closing ceremonies of the Homeland Week. On September 7, 1984, before the Expeditionary

Monument in the capital of the State, the governor of Rio Grande do Sul, Jair Soares, spoke by phone two words that were clearly heard by hundreds of people: “Porto Alegre”. That festive act unquestionably proved the functionality of Father Landell's invention, which has been patented 80 years earlier.

The Cientec team had to overcome several obstacles in the construction process. At first they had to understand the technical specification. The description was not very detailed and did not mention the scale. Physics books from the times of the priest were consulted to give an idea of the characteristics of certain components (coils, capacitors, terminals, switches, etc.). The team then opted for the approximate dimensions of a telephone of those days.

Many components had to be built several times before they fit properly. For the diaphragm, for example, they tried tinplate, acetate and laminated copper. With hammered copper, the piece was too frail. It worked better with phosphor bronze. Several attempts were also made with the Ruhmkorff coil, in order to obtain a spark with a reasonable length.

According to engineer Solano, the Wave Transmitter is basically composed of a phonetic switch, a modified Ruhmkorff coil, a spark gap, and an antenna circuit. “The voice vibrations through the mouthpiece make the diaphragm vibrate. The diaphragm has an electrical contact in its core, which interrupts the primary current of the coil at the same frequency, causing high-voltage damped oscillations in the secondary connected to the spark gap. This procedure gives rise to the appearance

of electromagnetic waves emitted by the antenna".

In the opinion of the Cientec team, the phonetic switch is the most important element of the invention and also the true innovation, as the other parts were known and had been arranged to send radio waves.

It was found that the Wave Transmitter reaches a wide range of the radio frequency spectrum, being even captured in the FM frequency band. In tests coordinated by engineer Solano, a transmission range of approximately 50 meters was achieved, a lower limit in relation to the device's capacity. After all, for longer distances, noise interference is currently very intense, while car ignition, high voltage lines, fluorescent lamps, industrial noise, etc. did not exist at the time of its creation.

Voice reproduction is not perfect with this pioneering equipment. "The

characteristic nuances of the letters m, n, l, c, s, f, v and g are not reproduced, except for the guttural sounds that accompany them; the consonants t, d, p, b and q and the vowels a and e are reproduced in the same way among themselves", observed Solano. It is therefore not sensitive to intonation, but exclusively to the frequency and sequence of words. That's why Father Landell suggested the use of a code of words to improve communication.

The electronics engineer recognized that its daily use during the checking phase leads to an efficiency standard in operation. Thus, it is possible to avoid words that are unidentifiable, speak other words clearly and maintain a constant level of speech, discarding useless intonations. "The device requires trained operators who are accustomed to its peculiarities", he added.

In the year of the centenary of the American patents – 2004 –, Marco Aurélio Cardoso Moura, an employee at Caixa Econômica Federal, completed the construction of a new replica of the Wave Transmitter in Porto Alegre. After two years of research, dedication, many tests and "huge difficulties" due to the lack of data regarding the size of the parts and types of materials used, Moura confirmed: the replica works! The tests were watched on May 23 by radio amateurs Flavio Walker da Silva and Ivan Dorneles Rodrigues. (1)

Moura began to admire Father Landell as soon as he heard about his story. The Industrial Eletro-Mecânica Apex Ltda. gave him technical support to prepare the replica. "At times, I almost gave up. The construction of the coil and capacitors required considerable labor". Although signal reception was verified in both AM and

FM, the best signal was in medium waves below 540 kHz", he states.

XVII

The great synthesis

The use of electricity revolutionized communications, which evolved into the transmission of wired and wireless distance messages. The first wave unfolded from the wired telegraph credited to Samuel Morse (1837). Then Graham Bell introduced the corded telephone (1876)[11].

In 1893, Nikola Tesla described in detail the basic requirements of radio transmission and reception and made tests. Soon, he was considered the forerunner of radio remote control.

[11] Since 2002, the United States consider Antonio Meucci the true inventor of telephone.

In 1895, Marconi invented the wireless telegraph, inaugurating a new era. In many countries he would be credited with inventing the radio but this is not the historical truth and it is necessary to be specific in the definitions to avoid misunderstandings.[12]

If Father Landell began making wireless tests around 1893 and 1894, as some sources point out, he anteceded Marconi and may have been ahead or behind Tesla. In a rigorous analysis, however, these indications are not so clear.

The testimony of Spanish businessman José Rodrigo Botet and the news in the press corroborated Landell's success in public trials of emission and reception of voice and music by electromagnetic waves (radio

[12] In the United States, Tesla is considered the inventor of radio, while in Canada, that credit goes to Reginald A. Fessenden.

waves), on July 16, 1899 and on June 3, 1900, in São Paulo.

Considering the interest shown by the media (6 newspapers) and the high level of authorities, businesspeople and scientists who were there, the event in 1899, between Colégio Santana and Bandeiras Bridge, stands out as the great moment of the launch of radio in Brazil and in the world. It was an extraordinary fact!

By propagating the sound of the National Anthem to a select audience, Father Landell produced the first point-to-point operation and came closer to the concept of radio broadcasting. When presenting "just five inventions" to the British consul in 1900, he would have connected Santana heights to Paulista Avenue. This time, just one newspaper reported his feat.

When radiotelegraphy was already a reality in Europe and the

United States, spread by The Marconi Company and other companies, the priest, in an unlikely location, far from major science centers, demonstrated a technological advance.

With a device consisting of the ingenious invention of a phonetic switch (microphone), a modified Ruhmkorff coil, a spark gap and an antenna circuit, he reached the level of radiotelephony, wireless telephony or simply radio as we know it. July 16, 1899 is a day that should be included in the calendar of the world history of radio and telecommunications.

Executive Hermano Junior, the organizer of Futurecom, highlights that Father Landell's experiment in 1899 would only be repeated by Fessenden a year and a half later, while Marconi's transmitter was for Morse code signals, a much narrower band. In 1906, Fessenden sent a radio broadcast that is

considered by Canadians to be the first of its kind.

If the patents granted are the evaluation parameter, the global merit of radiotelegraphy goes to Marconi (1896), since Tesla only had his patent approved in the USA on March 20, 1900. The Brazilian patent, granted on March 9, 1901, proves the pioneering spirit in radiotelephony. It's the birth certificate of radio! Fessenden's patent is dated March 8, 1904.

If the news, facts and testimonies can give rise to doubts or questions, what seems natural over the years, the reconstruction of one of the devices in 1984, in Porto Alegre, is a conclusive proof of functionality. And there is a second piece of evidence: the new replica, completed in 2004 in the capital of the State of Rio Grande do Sul, also works! Tests made on Wave Transmitter replicas showed that the

priest-scientist transmitted his voice on AM and FM frequencies.

From whatever angle one analyzes Father Landell's scientific work, a precious value emerges. It was him who transmitted, for the first time, continuous radio waves, superior to the damped radio waves used by other scientists in the early days of radio communications. Continuous waves were adopted later and are still used today. Tesla and Fessenden also abhorred damped waves and even predicted that the future of radio lay in continuous waves.

Landell created a type of valve similar to the three-electrode lamp, a fundamental piece in the development of radio broadcasting, patented by Lee de Forest in 1907. To send messages, he used radio waves and also light waves, which is the same principle that improved modern communications,

using laser and optical fibers. In this case, he made a different application based on Graham Bell's idea for the Photophone.

When he registered his inventions in the United States (1904), he recommended short waves to increase transmission distances. In those days, those waves were not even considered by his peers and they would only be devised two decades later.

He used to say that the range of wireless transmissions would be "practically infinite", while Marconi, who was famous worldwide, affirmed that this technology would only be useful for "short distances" and did not believe in its improvement.

Landell was also the precursor of teletype and television and one of the pioneers of radio remote control. When radio was far from being consecrated as a mass vehicle, he was already

projecting TV! When he patented abroad, he also worked on improvements – Landelgraph, Landelphon - and on other creations. He developed several artifacts. In Brazil, he was a trailblazer in these researches and also discovered the so-called Kirlian effect about three decades before the Russians.

The great synthesis: in telecommunications, Father Landell foresaw and proved the possibility of long-distance wireless transmission of the human voice and other sounds, texts and images.

The priest who wanted to hear the stars was a genius. A rare intelligence. Alone, far from the most developed nations on the planet and the electricity hubs, he developed revolutionary equipment and projects. At the same time, he was the master who "invents,

the engineer who calculates and the artist who forges and adjusts all the pieces of very complicated mechanisms".

Specializing, in 1900-1901 he dealt, at the same time, with wireless devices (Anematophone, Teletiton; Gouraudphono or Tellogostomo) and some that required wires (Telauxiophone, Kaleophone). With radiotelephony, radiotelegraphy and telephony. By radio waves or light waves.

He had no support from the government, authorities and other sectors of society. Only a small group of friends understood, respected and valued him. He faced all kinds of obstacles. At every step. He suffered from the disbelief of others, the financial restrictions, the embarrassments, the pressures and the rebuffs that filled his trajectory.

Nothing was easy in the life of this priest-inventor. Even so, he implemented innovative ideas.

Some faithfuls did not understand or did not accept that a cleric could dedicate himself to science topics. A small group in fury destroyed his devices, which had been built with an enormous sacrifice of time and money. Accused of having a pact with the devil, he felt the blow, but did not give up his ideals based on the truth, his propulsion engine. With increased energy, he rebuilt them and kept fighting. His belief in the union of religion and science was evident: his modest laboratory was inside the church.

He promoted public demonstrations with the hope of attracting sponsorship for the commercial development of new

products. He had been assured patent privileges in Brazil. All in vain.

He traveled to New York with a renewed spirit, aiming to register his inventions and commercialize them. He abandoned wired devices, concentrating his efforts to develop two telegraphy and two telephony systems using radio waves and light waves. He stayed there much longer than he imagined and could afford. He had received permission from the Church to leave for a year, but the trip lasted three and a half years!

The difficulties increased when he caught pneumonia and bronchitis. The recovery was slow and distant: he stayed in Cuba from November 1902 to June 1903.

Because he presented revolutionary inventions, the U. S. Patent and Trademark Office was very demanding, forcing him to make

increasingly detailed descriptions and a practical exhibition, what extended his stay and consumed more financial resources. Against all odds, he made it!

Hope was in the air. The book *O Brazil Actual*, by Arthur Dias, released in August 1904, predicted, citing Spaniard Botet, that Landell would be recognized "as the author of wonderful discoveries" before long.

He returned to Brazil at the end of 1904 with his résumé reinforced by three American letters patent. He appealed to the Presidency of the Republic to give him a chance to present what he had in Rio de Janeiro.

However, a new obstacle would leave the most talented Brazilian citizen in this field on the sidelines of history. Since 1903, the Navy had been studying the implementation of radiotelegraphy, comparing

commercially available systems in the Northern Hemisphere.

With technology imported from German Telefunken, the first official message was sent by the battleship Aquidaban on the last day of February 1905. Father Landell was resuming his function in the town of Botucatu. He requested financial resources from the Government of the State of São Paulo, by means of the Legislative Assembly, to industrialize his inventions. And, again, he was ignored in his own homeland.

He had plans to return to the USA to develop new ventures and commercialize those that had been registered. However, in his own words, he would be “forced” to give up his studies and his promising career.

It is not known who or what forced him. But any analysis made must consider that he went through practically half of his ecclesiastical duties (around 20 years) in debt – to the Collegio Pio Latino Americano, in Rome, and to his friend Daniel Tamagno.

The books about Brazil, written by Irishman J. C. Oakenfull and published abroad from 1909 to 1922, also covered the evolution of radio communications. When radio broadcasting was already a reality - it started to gain momentum from 1910 onwards -, the author mentioned Landell among the most prominent scientists: “first inventor of the wireless telephone”.

These editions had positive repercussions in the domestic and international press - Great Britain, USA, Belgium, Canada, France,

Switzerland, Portugal, Australia, New Zealand, India, and China. The *Financial Times* commented: "Interesting, excellent and valuable".

The paradox gained momentum in 1922, when the centenary of Independence was celebrated with the first official radio broadcast, using imported equipment. The pioneering spirit of the priest-scientist was once again emphasized, contributing to "selling" the country's image abroad.

His scientific production was well received in contemporary publications, but his personal reality was inconsistent. Living in Porto Alegre since 1908, he seemed abandoned. Why was there this dissociation between the genius and the society's response? Why haven't his inventions been translated into something concrete?

He tried hard to commercialize them several times, but never

succeeded. In his opinion, the dual role of priest and inventor was what weighed most against him. When challenging insipidity, he didn't always win. He had many disappointments and died dismayed at the failure of his efforts.

This is another sad example of the centuries-old conflict between obscurantism and science. Back then, the deniers defeated him. Nowadays, what is known about his work cannot be denied!

His trajectory exposes the hardships of working on cutting-edge science in Brazil by the late 19th and early 20th century, a period of huge transformations in the world, notably in the field of telecommunications.

As a spiritually evolved being, Father Landell did not attribute merit to himself: he considered himself an instrument of God at the service of faith

and science. His objective was to contribute to the well-being and progress of humankind. And he went further because he could understand those who did not understand him.

Endowed with a strong devout and patriotic feeling, as well as with a privileged, curious mind, he spent his life studying. He was interested in multiple aspects of science, philosophy, and religion. He enjoyed analyzing in depth the wonders of nature, life, divinity, and the characteristics of human beings.

He always investigated, dismissing preconceived or prejudiced ideas. He examined the so-called supernatural phenomena with a meticulous gaze, what brought him a new wave of problems. He was up to date with political, social, monastic, and technological developments. And he made discoveries in other areas. He

was naturally very intelligent and cultured.

He sought to open doors to education and help the less favored segments of the population. He often clashed with his superiors. However, he always accepted (even intransigently) the concepts of the Catholic faith. His sermons and lectures used to delight the audiences.

With sensitivity, he exalted the female strength and defended minorities, such as black people in the State of Rio Grande do Sul. And always, with an impressive fidelity, he perceived the presence of God in all occurrences of humankind and nature on Earth and in space. He was a good speaker and a singing priest.

On the personal side, the virtues of this extremely kind man prevailed. Instead of criticizing the prostitutes who circulated near the temple, he tried

to catechize them. He was seen as someone with quirks and oddities. Rough and strict with himself and others. A polyglot, he was fluent in Portuguese, Latin, Italian, French, and English at the very least.

But his health was relatively fragile. At the age of 30, his lungs were already weakened. Even so, he was careless smoking, a rare behavior among his colleagues of priesthood. He also stood out for liking movies and attending groups of intellectuals.

Many people who knew him never forgot him, and, even decades after his death, they remembered their acquaintanceship with pure emotion. With his virtues as a religious and a scientist, he knew how to captivate deep sympathies. But, some of his issues upset deep-rooted beliefs and established powers. And certain attitudes aroused strong antipathies.

He was ahead of his time. A century in advance, when man could barely communicate between cities, he predicted the possibility of sending messages to other planets!

Undoubtedly, he is one of the most important inventors in Brazil and, surprisingly, one of the least renowned. In spite of his dramatic and fascinating role, he died in scientific anonymity, when, in popular memory, his vibrant inventions were already credited to others. In particular, he went from wireless to nowhere, although he had actively participated in the magical achievement of wireless communication.

It is probable that, if he had gotten the necessary support at the right time, he could have had a different fate and man's evolutionary chronicle would be a little different.

Jesuit Teilhard de Chardin (1881–1955) also wanted to merge faith with science. As a result of this longing, he was persecuted, accused of heresy, exiled and had his books banned. A bitter treatment, similar to that applied to Landell.

Meanwhile, Einstein, the admired creator of the theory of relativity, thought: "Science without religion is lame, religion without science is blind". (1)

Since the pioneering transmission of the human voice by radio waves made by Father Landell, there was a fast evolution and, more than a century later, thousands of radio and TV channels are spread across all countries.

According to reports from the International Telecommunication Union, there is at least one radio set in most homes. Radios are also present in

cars and cell phones and the access to radio stations on web is immeasurable. Radio has become a multiplatform medium that has already entered the digital era.

The General Conference of UNESCO (United Nations Educational, Scientific and Cultural Organization), in November 2011, established February 13 as the World Radio Day "to highlight its power as an educational platform that promotes freedom of speech and public debate, as well as its vital task in responding to crises and disasters." With a coverage reaching 95% of the world's population, it is "the most universal information medium in the world." Radio knew how to adapt and reinvent itself over time, even with the advent of new technologies.

After more than a century rendering good services, radiotelegraphy in Morse code, the

greatest legacy left by Marconi, seems to be in its final stages. Since 1992, by decision of the International Maritime Organization, world navigation has migrated to a new procedure based on satellites, the Global Maritime Distress and Safety System (GMDSS).

With the simple touch of a button, the ship's location is automatically informed along with the warning signal, integrating terrestrial dialogues with the Inmarsat satellite. The last maritime communication in Morse code was made on January 31, 1999, in Australia. Some say that the dots and dashes methodology will remain and could be used by amateur radio operators, spies and members of the armed forces, but the fact is that its peak tends to be limited to the past. (2)

Wireless communications have gone beyond the concept initially restricted to radio and remote control.

AM and FM radio broadcasts, television, cellular and cordless telephones, automatic garage doors, wireless networks, GPS, ham radios, satellite communications, police radios, radars, microwave ovens, radio-controlled toys, and baby monitors are some icons of modernity that depend on radio waves.

"Each wireless technology has its own small bandwidth. There are hundreds of them," wrote Professor Marshall Brain in the article How Radio Waves Work. "Nowadays the term radio is used in various wireless communication technologies. The exception is the infrared remote control of most televisions," says electrical engineer Fabíola Mira Martins, a specialist in access networks.

For her, Father Landell and other pioneers of the wireless era, such as Marconi and Tesla, expanded the scope

of radio communications. But she points out a singularity: “Father Landell is the true Father of Radio and the Grandfather of the Cell Phone because he was the first to broadcast voice by radio waves!” The cell phone is a low power radio.

According to Crodowaldo Pavan, a renowned emeritus professor at the University of São Paulo and a leading biologist and geneticist in Brazil, Father Landell was a kind of “Brazilian Leonardo da Vinci”.

This book aims to rescue a world-class science star, shedding light on an almost unknown period in telecommunications history. The final content is a fragment of the existence of a man who deserves all the credit for a series of inventions.

The *Encyclopedia of Radio*, a portentous publication jointly developed with the Museum of Broadcast Communications from Chicago and published simultaneously in the USA and Great Britain in 2004, could not forget Landell. In three volumes, with 1,696 pages and over 600 entries, it covers all the stages of radio history. Father Landell appears in three entries: "Brazil", "Early wireless" and "Roberto Landell de Moura".

"The 'Marconi of Brazil' was a priest," informs Edward Anthony Riedinger. "In the 1890s and early 1900s, Father Roberto Landell de Moura produced a series of wireless communication devices that were as original in their day as they were unrecognized".

Robert Henry Lochte comments: "Two other inventors (Landell and

Tesla) had the opportunity to develop wireless communication by electromagnetic waves prior to Marconi, but failed to do so". Lochte attributes Landell's difficulties to the opposition of ecclesiastical leaders who saw, in the transmitter developed by the Brazilian inventor, "the work of the devil". That religious obscurantism, which led to the depredation of equipment and the destruction of the priest's laboratories by a gang of fanatics, caused the delay in Landell's researches.

Lochte emphasizes that the priest, even with difficulties due to poor legal advice, his poor health in the early 1900s, and ignorance of the particularities of the US patent system, never gave up on having his work recognized. Thanks to this effort, in 1904, he obtained the registration of three patents with the U. S. Patent and Trademark Office: "Back then, Marconi

and others already controlled the radio market".

In Italy, *Tu piccola scatola... La radio: fatti, cose, persone*, released in 1993 by journalist Laura De Luca and priest Walter Lobina, attributes "the earliest known radio broadcast" to Father Landell. The city of São Paulo witnessed the emission and reception of electromagnetic and light waves. "Radio was born but no one noticed".

According to the authors, Brazil's socioeconomic status, which would be later defined as a Third World country, was crucial. Radio did not find a favorable environment to develop. Meanwhile, "similar experiments by Guglielmo Marconi got a lot of publicity, more guarantee and commercial exploitation in Italy and Europe". However, Marconi's patent did not have "a fundamental element,

which was present in Landell's inventions: voice transmission".

When he obtained radio broadcasting privileges in the USA, he did not get "the right support to commercialize them". Official broadcasting was only attested with emissions made with the thermionic valve with a 'grid' added by American Lee de Forest. Father Landell's pioneering spirit was not taken into account. In his homeland, his experiences were reduced to "an isolated fact".

At the International Microwave Symposium held in Montreal, Canada, in June 2012, the paper A Cursory Historical Overview on the Evolution of Wireless Communications, on the evolution of wireless communications, was presented. Its authors, Magdalena Salazar-Palma, from Carlos III University, from Madrid, and Tapan K.

Sarkar, from Syracuse University, USA, are members of the Institute of Electrical and Electronics Engineers (IEEE).

They disclosed that the first human voice transmission by electromagnetic waves and modulated by an audio signal was made by Father Landell. “IEEE is the world's largest technical professional organization dedicated to advancing technology. IEEE and its members inspire a global community through its highly cited publications, conferences, technology standards, and professional and educational activities”.

With a vast scientific production, Sarkar and Salazar-Palma are among the writers of the reference book *History of wireless*, which was published simultaneously in the United States and Canada in 2006.

At last, Father Landell received a worthy reward in the USA. His three letters patent were cited in the references of six other inventions: in 1947 (RCA), 1948, 1949, 1952, 1993 (Mitsubishi), and 2013 (Philips). Furthermore, American David Edward Emmons made an honorable mention of Landell's pioneering work on radio transmission in the descriptive text of the Multi-functional electronic device holder and method of use, patented on November 15, 2012.

A pioneer on the outskirts

Gildo Magalhães

Full Professor, Department of History, University of São Paulo. Director of the Science History Centre of the University of São Paulo (CHC - USP)

The story of scientist-priest Roberto Landell de Moura (1861-1928), whose inventions would possibly accelerate the development of wireless electrical communications in a few years, is also a portrayal of the vicissitudes that mark the trajectory of Brazilian science.

When one studies the general situation of science in Brazil during the Empire and in the first decades of the Republic, the resulting scenario is not auspicious. Despite some positive points, in a country deprived of natural

science colleges and universities, subjects such as physics, chemistry and mathematics could practically only be addressed in the few existing engineering schools. Historians of science have found information that in some places at that time, such as museums, demonstrations of scientific experiments were made for a public eager for knowledge.

The only alternative to the lack of education and research institutions was when individuals made private experiments by their own, but the repercussions were necessarily small. Father Landell de Moura belonged to that restricted group of individuals interested in science who tried to break the vicious circle of lack of resources and dissemination by means of solitary studies, but trying to interest the authorities in the inventions they were producing.

It may sound obvious, but, despite managing to attract public attention, Landell de Moura's initiatives never got a decisive government support. Unfortunately, the situation hasn't changed much in nearly a century after his death. Today, as yesterday, budgets for science, education and culture are always the first to be cut and, although islands of excellence have emerged here and there, they seem insufficient in a sea of adversity in which stubborn efforts struggle not to collapse amidst neglect. If the non-existence of scientific and technological policies constitutes a negative policy, then we can say that the lack of continuity in public policies for those fields is the main characteristic of our history.

Researches into science history and techniques in Brazil point to a series of contributions that could have meant a real advance in knowledge and the establishment of a more solid

foundation based on some remarkable endeavors. Examples include shipbuilding in the second half of the 19th century and even later, a pioneering photographic technique devised by Hercule Florence in 1834, and Santos Dumont's models of balloons and airplanes. There are many other cases that would not reach the stage of industrial manufacture and diffusion, unless they attracted the interest of foreign companies. That's what happened to Santos Dumont himself and his Demoiselle model, which was licensed and had a successful mass production in France, as well as to the automatic gearbox invented by José Araripe and Fernando Lemos and sold to General Motors in the 1930s.

On the other hand, many inventions from other countries fell into the hands of Brazilians, who used a method that dates back to the beginnings of humanity: copying and

innovating. The history of techniques demonstrates that inventions are in fact a collective process, what should not leave aside the individual contributions that make innovation fundamental, that is, the improvement and adaptation to local conditions based on an already existing development. That was the Americans' strategy for developing their railway industry in the first half of the 19th century. After the Second World War, Japanese people also used this resource for the creation or resurgence in their country of scientific, industrial and financial conglomerates in the fields of mechanics and electronics.

From the 1970s to the 1990s, Brazil experienced an outbreak of creativity in the IT field, which began with the traditional copying phase, but gave rise to innovative solutions even on a global level. The process ended up being frustrated partly due to pressure

from foreign companies, but also due to errors in the government policy initially instituted with the purpose of protecting the domestic industry and which was distorted throughout the process.

The difference between Brazil, as well as other developing countries, and the nations at the techno-scientific forefront is exactly the lack of a continuous and global support policy. The contrast is clear when we compare some aspects of the Brazilian case with the American one. A series of important universities already existed in the USA in the first half of the 19th century, when the new science of electromagnetism was developing in Europe. The result was that by 1850 the USA already had a world-famous scientist in this field -- Joseph Henry, who came to run the Smithsonian Institute, which had been recently created to foster "the gain and dissemination of knowledge".

Inventors who were requesting the analysis of their patents deposited their models there.

There was nothing comparable in Brazil to these developments. During the Empire, the Sociedade Auxiliadora da Indústria Nacional made efforts to support inventions, but the dominant mindset was that the country should not deviate from its so-called "agricultural vocation". The production of agriculture, cattle breeding and mining would be sufficient to purchase industrial products manufactured abroad. This vision of an international division of competences based on the ideas and precepts of British economic liberalism still has a major influence on the policies defined by Brazilian governments. The result is a huge technological dependence that, together with the lack of investment in infrastructure and qualified jobs, is so

costly and increases the economic gap and poor income distribution in the country.

It is therefore no wonder that Father Landell de Moura could not convince the authorities to support his experiments with the electrical transmission of wireless information. In 1888, Heinrich Herz had spectacularly demonstrated on the international scene the transmission of electromagnetic waves, in accordance with theoretical predictions.

The subsequent improvement of what would be known as radio waves was spearheaded by several researchers, including Guglielmo Marconi, who had also successfully settled in England as an entrepreneur in the electric power sector. Landell de Moura managed to make a public demonstration in São Paulo of the feasibility of electromagnetic

transmission of wireless information in the 1890s, with strong indications that this had occurred even before Marconi's renowned exhibition of the phenomenon. But the two experiences did not have the same impact for the reasons mentioned above.

Even without an institutional connection that could help him in his endeavor, the priest-inventor did not give up on the public diffusion of his proposal and managed to register patents in the USA for the application of his ideas. Some consider Landell's ideas as an anticipation of Lee de Forest's diode and triode valves, which were responsible for the practical success of commercial radio in the early 1900s. It has also been stressed that the Brazilian inventor may have contributed to the development of principles that would lead to the invention of television. Back in Brazil, Landell de Moura did not find the necessary support to pursue his

researches, which gradually sank into oblivion.

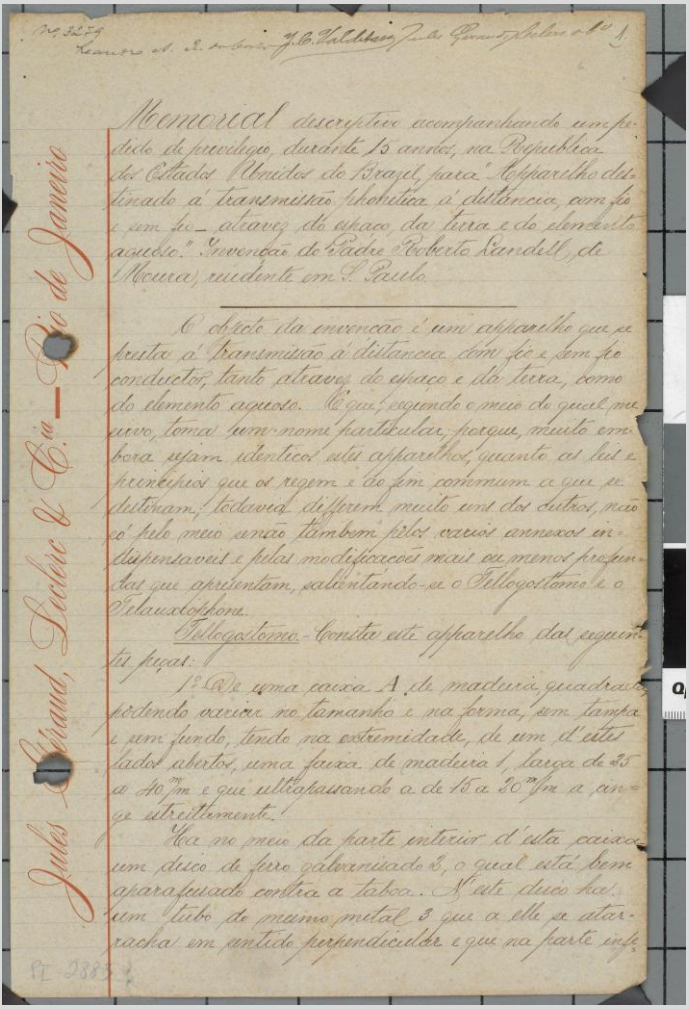
However, a few authors could not bear this loss of historical memory. Hamilton Almeida stands out among them because he is on a true and continuous crusade for more than 40 years championing the recognition of Landell de Moura's pioneering efforts. Based on his journalistic experience, he became an assiduous and dedicated researcher of historical sources, including national and foreign archives, in search of a more documented assessment of the saga of this emblematic figure of the difficulties of doing science in the wrong place at the worst time. Along this trajectory, Hamilton Almeida published several journalistic articles and a biographical text, which was continually expanded with new information collected and was divided

into three books published in Brazil (one of them with a German version).

His hard efforts now appear in a new book, Landell: the priest who invented wireless and faced science deniers, which puts emphasis on the 1899 public demonstration made by Landell de Moura for the elite in São Paulo. New supporting documents provide a broader view of the practical results achieved by the inventor and expand the recognition of their current domestic and international repercussion. As often happens in history, revisions do not put an end to the search for facts, as information and circumstances unknown today may be found in the future.

Some time ago, in Campinas, the Research and Development Center of the old Telebras System opened its library named after Landell de Moura. In the 1980s, this center achieved a

major technical feat for Brazil, with the domestic development of the first CPA-T Switch Exchange from the Trópico Family, which was a great commercial success. Possibly, the priest-inventor would have been satisfied with this application of telecommunications.



The Brazilian radio patent, dated March 1901

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Roberto Landell de Moura,
of New York, N. Y.

HA presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in

Wave-Transmitters

a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and HA complied with the various requirements of law in such cases made and provided, and

Whereas upon due examination made the said Claimant is adjudged to be justly entitled to a patent under the law.

Now therefore these Letters Patent are to grant unto the said

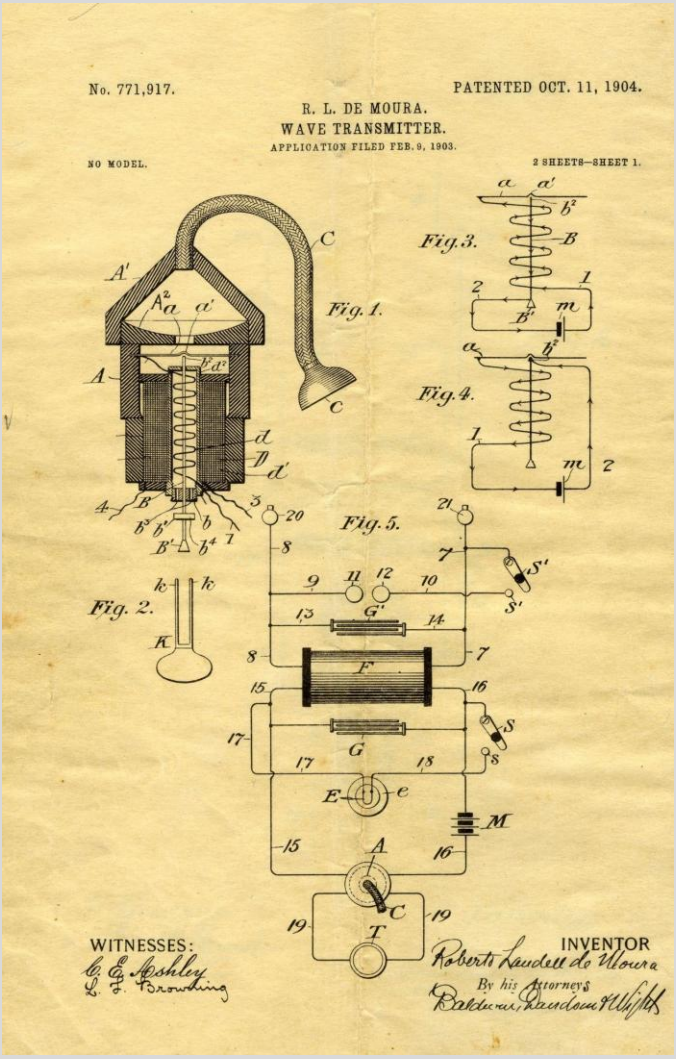
Roberto Landell de Moura, his heirs or assigns for the term of Seventeen years from the eleventh day of October one thousand nine hundred and four

the exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this eleventh day of October in the year of our Lord one thousand nine hundred and four and of the Independence of the United States of America the one hundred and twenty-ninth.

Commissioner of Patents.

Wave Transmitter, the precursor of radio



Wave Transmitter patent drawing

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Roberto Landell de Moura,

New York, N. Y.

HAS PRESENTED TO THE Commissioner of Patents A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL IMPROVEMENT IN

Wireless Telephone

A DESCRIPTION OF WHICH INVENTION IS CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND HA S COMPLIED WITH THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED, AND

Whereas UPON DUE EXAMINATION MADE THE SAID CLAIMANT IS ADJUDGED TO BE JUSTLY ENTITLED TO A PATENT UNDER THE LAW.

NOW THEREFORE THESE Letters Patent ARE TO GRANT UNTO THE SAID

Roberto Landell de Moura, his HEIRS OR ASSIGNS FOR THE TERM OF SEVENTEEN YEARS FROM THE twenty-second DAY OF November ONE THOUSAND NINE HUNDRED AND four

THE EXCLUSIVE RIGHT TO MAKE, USE AND VEND THE SAID INVENTION THROUGHOUT THE UNITED STATES AND THE TERRITORIES THEREOF.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this twenty-second day of November in the year of our Lord one thousand nine hundred and four and of the Independence of the United States of America the one hundred and twenty-ninth.

P. J. Allen
Commissioner of Patents.

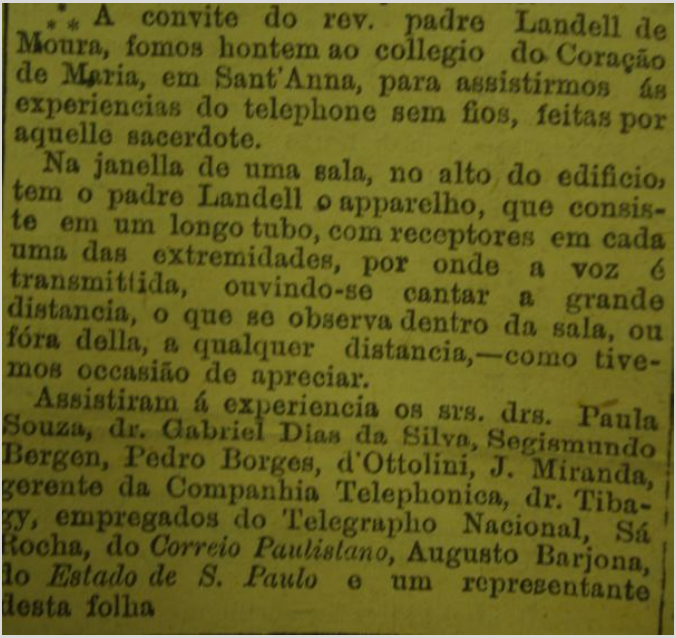
Wireless telephone

Wireless telegraph

Spanish businessman José Rodrigo Botet was a witness to Father Landell's first radio experiments, at the end of the 19th century. In this photo, he is accompanied by Alberto, one of his 11 children

In one of these windows at Colégio Santana, in São Paulo, a radio transmission and reception point. Site of the first experience of its kind on the planet. Photo by the author

One of the current early childhood education classrooms at Colégio Santana. In one of them, Father Landell brought together authorities, in 1899, to carry out a wireless experiment. Photo by the author

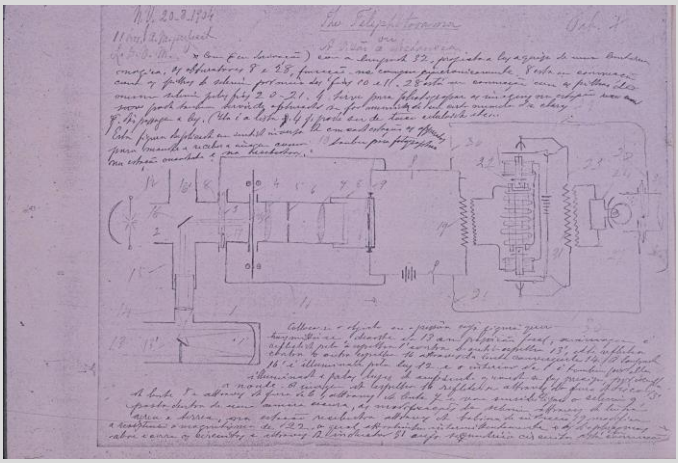


*** A convite do rev. padre Landell de Moura, fomos hontem ao collegio do Coração de Maria, em Sant'Anna, para assistirmos ás experiencias do telephone sem fios, feitas por aquelle sacerdote.

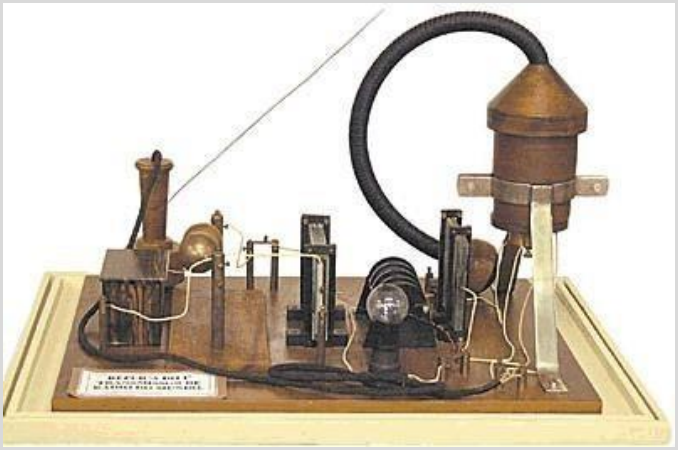
Na janella de uma sala, no alto do edificio, tem o padre Landell o apparelho, que consiste em um longo tubo, com receptores em cada uma das extremidades, por onde a voz é transmittida, ouvindo-se cantar a grande distancia, o que se observa dentro da sala, ou fóra della, a qualquer distancia,—como tivemos occasião de apreciar.

Assistiram á experiencia os srs. drs. Paula Souza, dr. Gabriel Dias da Silva, Segismundo Bergen, Pedro Borges, d'Ottolini, J. Miranda, gerente da Companhia Telephonica, dr. Tibagy, empregados do Telegrapho Nacional, Sá Rocha, do *Correio Paulistano*, Augusto Barjona, do *Estado de S. Paulo* e um representante desta folha

In O Comércio de São Paulo, on July 17, 1899, the most complete news about Father Landell's first public wireless experience. BMA Hemeroteca Collection



Telephotorama. An essay on the invention of TV in 1904. IHGRGS Collection



Replica of the world's first radio

Acknowledgments

I´m deeply grateful to those who contributed information for the writing of this book, the research for which has extended through most of my life.

A special thanks to Sylvio Landell, whose initiative and dedication were decisive in bringing this e-book to fruition in English, with the meticulous translation of the original Portuguese version by Thaïs Costa.

Sylvio is also the creator of this English website dedicated to the incredible Father Landell. He embraced the Landell cause with the sole purpose of sharing content that challenges some historical myths by revealing another side of the early wireless era. This was no coincidence: his paternal great-grandfather, Edmundo, was one of Father Landell's brothers!

All this joint effort has a clear purpose: to restore Father Landell to the place he rightfully deserves in the world´s scientific memory.

The author

Hamilton Almeida is a Brazilian journalist and writer. He began his professional career in São Paulo at Grupo Visão in 1977. He worked for many years at the newspaper Zero Hora in Porto Alegre. From 1994 to 2001, he was an international correspondent for Zero Hora and Gazeta Mercantil Latino-Americana in Buenos Aires, where he also contributed as a columnist for Imprensa magazine, and as a correspondent on economic topics for BBC Radio. Back in São Paulo, he worked at Gazeta Mercantil and CDN. In recent years (up to the present) he has collaborated with the Jornalistas & Cia newsletter and Química & Derivados magazine. The author has been studying and researching the life and work of Roberto Landell de Moura for over 45 years, publishing five different

books on the subject, including one in Germany. This ebook is his sixth publication on the topic. He is a member of the Instituto Histórico e Geográfico do Rio Grande do Sul and author of eight books.

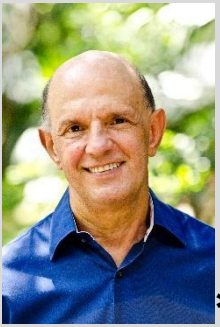
 *

***Photo by Carlos Goldgrub**

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