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Networked Music & Soundart Timeline (NMSAT) Excerpts of Part One: Ancient and Modern History, Anticipatory Literature, and Technical Developments References

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This article presents a sample of references present in the existing Networked Music & SoundArt Timeline (NMSAT) database. The NMSAT is a research project led and initiated in 2008 by Jérôme Joy within the Locus Sonus lab. It is conceived as a monitor and a pool of informations on history of networked music and sound (Joy & Sinclair, 2009). It aims to provide an overview of practices and techniques in the realm of networked music and networked sonic performance from ancient history to the present (2008), related to sound transmission and distance listening. It consists of a collection of references from various online and bibliographical documents, articles, workshop notes and so on. The NMSAT offers a valuable resource made available to actors in the artistic and scientific spheres. Because it is not possible to summarise in one article the large spectrum of references from all periods, we decided to present a sample related to Part 1 of the database (Part 2 concerns references of networked music and soundart, technological developments and contemporary history; Part 3 contains a bibliography of reference papers). This sample lists a selection of references covering the period from the sixteenth century to the middle of the nineteenth century, just before the major developments of the telephone by Alexander Graham Bell and Elisha Gray from 1876. Situated before the realisation of apparatuses of telecommunication, the selected period can reveal, across the interactions between inventions, 'uchronias' (alternate history) and anticipation (Apollinaire, 1916; see also Valéry, 1960 [1928]), the paradigm of listening, and of manufacturing listenings, involved in the systems of sound transmission (and transport) and sound actions at a distance. This will highlight the contextualisation and foster analysis of the development of audio networked practices towards an 'organology' (the science of musical instruments and their classification, and more largely, the science of organs or of anything considered as an organic structure) of such of systems and the

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*exploration of the soniferous condition of electronic networks (interconnected spaces, audiences and 'streamers') (*Joy, 2009*). Of course, all the other periods, before and after these dates, are covered by the existing database currently developed by the NMSAT group. Currently this database comprises more than 1400 pages. This selection illustrates the historical and theoretical context of networked music and soundart, and more largely of network art.*

The database is maintained by the NMSAT Development Committee. Members (in alphabetical order and in September 2009) are: Brett Ian Balogh, Álvaro Barbosa, Clarisse Bardiot, Dinahbird, Samuel Bordreuil, Andrea Cera, Julien Clauss, Jean Cristofol, John Levack Drever, Alejo Duque, Björn Eriksson, Scott Fitzgerald, Golo Föllmer, Jean-Paul Fourmentraux, Peter Gena, Gh Hovagymian, Jérôme Joy, Rahma Khazam, Brandon Labelle, Anne Laforet, Marie Lechner, Eric Leonardson, Patrice Loubier, Gilles Malatray, Cédric Maridet, Sylvain Marquis, Luc Martinez, Andra McCartney, Udo Noll, Pauline Oliveros, Julien Ottavi, Jenny Pickett, Andrea Polli, Céline Prunneaux, Pedro Rebelo, Marc Relieu, Alain Renaud, Jean-Philippe Renoult, Annick Rivoire, Jocelyn Robert, Anne Roquigny, Peter Sinclair, Douglas E. Stanley, Atau Tanaka, Dante Tanzi, J. Milo Taylor, Jean-Paul Thibaud, Allen S. Weiss, Yang Yeung, Laura Zattra (http://locusonus.org/nmsat).

Keywords: Networks; Audio art; Networked music; Timeline; Database

1552__ 'Le Quart Livre—Les Paroles Gelées' (Frozen Words)

- In *Gargantua and Pantagruel, Complete. Five Books of The Lives, Heroic Deeds and Sayings of Gargantua and His Son Pantagruel*. The Fourth Book/Chapter LVI
- *François Rabelais (c. 1490–1553)*
- *Translated excerpt*: 'HOW AMONG THE FROZEN WORDS PANTAGRUEL FOUND SOME ODD ONES. The skipper made answer: Be not afraid, my lord; we are on the confines of the Frozen Sea, on which, about the beginning of last winter, happened a great and bloody fight between the Arimaspians and the Nephelibates. Then the words and cries of men and women, the hacking, slashing, and hewing of battle-axes, the shocking, knocking, and jolting of armours and harnesses, the neighing of horses, and all other martial din and noise, froze in the air; and now, the rigour of the winter being over, by the succeeding serenity and warmth of the weather they melt and are heard. By jingo, quoth Panurge, the man talks somewhat like. I believe him. But couldn't we see some of 'em? I think I have read that, on the edge of the mountain on which Moses received the Judaic law, the people saw the voices sensibly. Here, here, said Pantagruel, here are some that are not yet thawed.

He then threw us on the deck whole handfuls of frozen words, which seemed to us like your rough sugar-plums, of many colours, like those used in heraldry; some words gules (this means also jests and merry sayings), some vert, some azure, some black, some or (this means also fair words); and when we had somewhat warmed them between our hands, they melted like snow, and we really heard them, but could not understand them, for it was a barbarous gibberish. One of them only, that was pretty big, having been warmed between Friar John's hands, gave a sound much like that of chestnuts when they are thrown into the fire without being first cut, which made us all start. This was the report of a field-piece in its time, cried Friar John. [...] However, he threw three or four handfuls of them on the deck; among which I perceived some very sharp words, and some bloody words, which the pilot said used sometimes to go back and recoil to the place whence they came, but it was with a slit weasand. We also saw some terrible words, and some others not very pleasant to the eye. When they had been all melted together, we heard a strange noise, hin, hin, hin, hin, his, tick, tock, taack, bredelin-brededack, frr, frr, frr, bou, bou, bou, bou, bou, bou, bou, bou, track, track, trr, trr, trr, trrr, trrrrrr, on, on, on, on, on, on, ououououon, gog, magog, and I do not know what other barbarous words, which the pilot said were the noise made by the charging squadrons, the shock and neighing of horses. Then we heard some large ones go off like drums and fifes, and others like clarions and trumpets.' *(Translated into English by Sir Thomas Urquhart of Cromarty and Peter Antony Motteux)*

- *Source*: From the first edition of Sir T. Urquhart (1864 [1653]), *The Works of Mr. Francis Rabelais, Doctor in Physik. containing five books of the lives, heroick deeds and sayings of Gargantua and his sonne Pantagruel, London, 1653, and Motteux's rendering of Book IV (1708), Vol. 2, pp. 356–358, in the new edition revised, and with additional notes by Du Chat, Motteux, Ozell and others*. London, Henry G. Bohn.

1558__ 'Magiae Naturalis—Of Pneumatic Experiments' (Natural Magick—Concerning Wind-Instruments)

- In *The Nineteenth Book of Natural Magick*, Chapter 1.
- *Giambattista della Porta (c. 1535–1615)*
- *Translated excerpt*: 'Whether material statues may speak by any artificial way—I have read that in some cities there was a colossus of Brass, placed on a might high pillar, which in violent tempests of wind from the nether parts, received a great blast, that was carried from the mouth to a trumpet, that it blew strongly, or else sounded some other instrument, which I believe to have been easy, because I have seen the like. Also, I read in many men of great

authority, that Albertus Magnus made a head that speaks. We see that Brass guns, which by the force of Gunpowder, make a mighty noise, if they be a mile off, yet we see the flame much before we hear the sound. So handguns make a report, that comes at a great distance to us, but some minutes of time are required for it, for that is the nature of sounds. Wherefore sounds go with them, and are entire without interruption, unless they break upon some place. The Echo proves this, for it strikes whole against a wall, and so rebounds back, and is reflected as a beam of the sun. Moreover, as I said in this work, words and voices go united together, and are carried very far entire, as they are spoken at first. These therefore being laid down for true grounds; If any man shall make leaden pipes exceeding long, two or three hundred paces long (as I have tried) and shall speak in them some or many words, they will be carried true through those pipes and be heard at the other end, as they came from the speaker's mouth. Wherefore if that voice goes with time, and hold entire, if an man as the words are spoken shall stop the end of the pipe, and that is at the other end shall do the like, the voice may be intercepted in the middle, and be shut up as in a prison. And when the mouth is opened, the voice will come forth, as out of his mouth that spoke it. But because such long pipes cannot be made without trouble, they may be bent up and down like a trumpet, that a long pipe may be kept in a small place. And when the mouth is open, the words may be understood.' *(Transcribed from 1658 English edition)*

- *Source*: *Natural Magick (Magiae Naturalis):A Neapolitane in Twenty Books (1584 AD), Wherein are set forth All the Riches and Delights of the Natural Sciences, printed for Thomas Young and Samuel Speed, at the Three Pigeons, and at the Angel in St. Paul's Church-yard, English edition of Latin original, Magiae Naturalis, Naples, 1558* (published on the web by Scott Lincoln Davis).

1565__ Missa sopra Ecco sì beato giorno (Mass upon behold such a happy day)

- Music of the Ordinary of the Mass, for 40 and 60 voices divided into five choirs (or ten four-part choirs).
- *Alessandro Striggio (c. 1536–1592)*
- *Comment*: Although most of Striggio's piece is in 40 different voice parts, the last movement is for 60 separate voices (five 12-part choirs) and is the only known piece of 60-part counterpoint in the history of Western music (it has been rediscovered by a Berkeley music scholar in 2007). It has been first performed in February 1567 at the court of Albrecht V in Munich during a church service, and on the 11th of May 1567 in Paris at the Chateau de Saint-Maur in front of Charles IX, and finally in June 1567 at Arundel House in London at the English court of Elizabeth I. *(Compiled from various sources)*
- *Source*: D. Moroney. (2007). Alessandro Striggio's Mass in Forty and Sixty Parts. *Journal of the American Musicological Society*, *60*, 1–69.

c. 1570__ Spem in alium nunquam habui (Hope in any other than Thee)

- Music for eight choirs of five voices each (*a song of forties partes, made by Mr. Tallys*, according to the catalog of the library at Nonsuch Palace).
- *Thomas Tallis (c. 1505–1585)*
- *Quotation* : 'In Queene Elizabeths time there was a songe sent into England of 30 *[40]* parts (whence the Italians obteyned the name to be called the Apices of the world) which beeinge songe mad*[e]* a heavenly Harmony. The Duke of — *[maybe Thomas Howard, 4th Duke of Norfolk]* bearing a great love to Musicke asked whether none of our English men could sett as good a songe, & Tallice beinge very skillfull was felt to try whether he would undertake the Matter, which he did and mad*[e]* one of 40 p*[ar]*ts which was songe in the longe gallery at Arundell house which so farre surpassed the other th*[a]*t the Duke hearinge of the songe tooke his chayne of gold from of his necke & putt yt about Tallice his necke & gave yt him.' *(Letter by Thomas Wateridge, 27 November 1611)*
- *Source*: D. Stevens. (1982). A songe of fortie partes, made by Mr. Tallys. *Early Music*, *10*, 171–182.

c. 1590__ Cori Spezzati (Separated Choirs)

- *Comment*: This style arose from the architectural peculiarities of the imposing Basilica San Marco di Venezia. Aware of the sound delay caused by the distance between opposing choir lofts, composers began to take advantage of that as a useful special effect. Giovanni Gabrieli (c. 1554/1557–1612) designed the music for the specific space of San Marco, with its various separated choir lofts and its six-to-eight-second reverberation. A special characteristic of the work of Giovanni Gabrieli is the experimentation with echo effects inspired by the acoustic potential which the galleried architecture of the great basilica of San Marco in Venice provided. The acoustics were first put to resonant effect by the use of 'cori spezzati', the choir distributed in galleries. The instruments that Gabrieli requires are consistent with the resources of San Marco: combinations of violins, viola, cornetts, trombones, and sometimes organ (mainly a violin or viola or a cornett, playing florid parts, with four trombones for homophonic and 'white' notes). Gabrieli was the first composer to specify instruments specifically, including large choirs of brass, he also began to specify dynamics, and to develop the 'echo' effects. The music for double chorus, or 'cori spezzati', was brought to fame by Adrian Willaert, around 1540, when he was choirmaster at San Marco, the architecture of which lent itself singurarly well to such experiments (from the antiphonal to the polychoral style). He introduced into music the elements of space and contrast, and the fashion of echo effects wich wa become an important device in the hands of baroque composers. The spatial organization of composition into two opposing bodies of sound was accentuated by the use of

instruments together or in alternation with the voices. *(Compiled from various sources)*

- *Source*: A. F. Carver (1988). *Cori Spezzati: An anthology of sacred polychoral music*. Cambridge: Cambridge University Press; M. F. Bukofzer (1947). *Music in the Baroque Era: From Monteverdi to Bach*. New York: W.W. Norton.

1620__ 'Novum Organum—sive indicia vera de interpretatione naturae'
(New Organon, or true directions concerning the interpretation of Nature)

- Aphorisms Book Two—XLV.
- *Sir Francis Bacon (1561–1626)*
- *Translated excerpt*: 'Among Prerogative Instances I will put in the twenty-first place Instances of the Rod or Rule, which I also call Instances of Range or of Limitation. For the powers and motions of things act and take effect at distances not indefinite or accidental, but finite and fixed; so that to ascertain and observe these distances in the investigation of the several natures is of the greatest advantage to practice, not only to prevent its failure but also to extend and increase its power. For we are sometimes enabled to extend the range of powers and, as it were, to diminish distances, as for instance by the use of telescopes. Most of these powers act and take effect only by manifest contact, as in the impact of two bodies, where the one does not move the other from its place unless they touch each other. Also medicines that are applied externally, as ointments or plasters, do not exert their virtues without touching the body. Finally, the objects of the taste and touch do not strike those senses unless they be contiguous to the organs. There are also powers which act at a distance, though a very small one; and of these only a few have been hitherto observed, albeit there are many more than men suspect; as (to take common examples) when amber or jet attracts straws; bubbles dissolve bubbles on being brought together; certain purgative medicines draw humors downward, and the like. So, too, the magnetic power by which iron and a magnet, or two magnets, are made to meet, operates within a fixed but narrow sphere of action; but if there be any magnetic virtue flowing from the earth (a little below the surface), and acting on a steel needle in respect of its polarity, the action operates at a great distance. Again, if there be any magnetic power which operates by consent between the globe of the earth and heavy bodies, or between the globe of the moon and the waters of the sea (as seems highly probable in the semimenstrual ebbs and floods), or between the starry sphere and the planets whereby the latter are attracted to their apogees, all these must operate at very great distances. There are found also certain materials which catch fire a long way off, as we are told the naphtha of Babylon does. Heat also insinuates itself at great distances, as also does cold; insomuch that by the inhabitants of Canada the masses of ice that break loose and float about the northern ocean and are borne through the Atlantic toward that coast are perceived at a great distance by the cold they give out. Perfumes also (though in

these there appears to be always a certain corporeal discharge) act at remarkable distances, as those find who sail along the coasts of Florida or some parts of Spain, where there are whole woods of lemon and orange and like odoriferous trees, or thickets of rosemary, marjoram, and the like. Lastly, the radiations of light and impressions of sound operate at vast distances. But whether the distances at which these powers act be great or small, it is certain that they are all finite and fixed in the nature of things, so that there is a certain limit never exceeded, and a limit which depends either on the mass or quantity of matter in the bodies acted on; or on the strength or weakness of the powers acting; or on the helps or hindrances presented by the media in which they act—all which things should be observed and brought to computation. Moreover, the measurements of violent motions (as they are called), as of projectiles, guns, wheels, and the like, since these also have manifestly their fixed limits, should be observed and computed. There are found also certain motions and virtues of a contrary nature to those which operate by contact and not at a distance, namely, those which operate at a distance and not by contact; and again those which operate more feebly at a lesser distance, and more powerfully at a greater. The act of sight for instance is not well performed in contact but requires a medium and a distance.' *(Based on translation from Latin into English by Peter Shaw (1733), and Francis Headlam, and finally completed by the editors)*

- *Source*: J. Spedding, R. L. Ellis & D. D. Heath. (Eds). (1863). *The works of Francis Bacon* (Vol. VIII, Translations of the philosophical works, Vol. 1, pp. 291–293). Boston: Taggard.

1627__ 'The New Atlantis—A work unfinished'

- *Sir Francis Bacon (1561–1626)*
- *Original excerpt*: 'We have also sound-houses, where we practise and demonstrate all sounds and their generation. We have harmony which you have not, of quarter-sounds and lesser slides of sounds. Divers instruments of music likewise to you unknown, some sweeter than any you have; with bells and rings that are dainty and sweet. We represent small sounds as great and deep, likewise great sounds extenuate and sharp; we make divers tremblings and warblings of sounds, which in their original are entire. We represent and imitate all articulate sounds and letters, and the voices and notes of beasts and birds. We have certain helps which, set to the ear, do further the hearing greatly; we have also divers strange and artificial echoes, reflecting the voice many times, and, as it were, tossing it; and some that give back the voice louder than it came, some shriller and some deeper; yea, some rendering the voice, differing in the letters or articulate sound from that they receive. We have all means to convey sounds in trunks and pipes, in strange lines and distances.'
- *Source*: J. Spedding, R. L. Ellis & D. D. Heath. (Eds). (1864). *The works of Francis Bacon* (Vol. V, p. 407). New York: Hurd & Houghton; Boston: Taggard and Thompson.

1632__ 'Le Courrier Véritable (ou les nouvelles admirables, ou le courrier extravagant, apportant toutes sortes de nouvelles extravagantes, de toutes sortes de lieux, tant de France que de pays estranger)'

- *Charles Sorel, sieur de Souvigny (1602–1674)/Anonymous or Charles de Sercy*
- *Comment*: A pamphlet called 'Le courrier veritable' told Parisians of a strange sponge discovered by a Captain Vosterloch on a voyage to the South Seas. Local people (strange bluish and greenish inhabitants of the austral lands) used these sponges to restitute sounds, music and voices, and to communicate across long distances: a message spoken into one of them would be exactly replayed when the recipient squeezed it appropriately. *(Compiled from various sources)*
- *Source*: *Le Courrier véritable, du Bureau des postes estably pour les nouvelles hétérogenées le dernier jour d'avril 1632*, s.1., 1632 [Bibliothèque Nationale de France, BN 4-LC2-11], republished and postdated April 23, 1643 in Charles Sorel's *Recueil du Sercy*, 1644.

1632__ 'Dialogo sopra i due massimi sistemi del mondo' (Dialogue Concerning the Two Chief World Systems)

- *Galileo Galilei (1564–1642)*
- *Translated excerpt*: 'Sagredus—You remind me of a man who offered to sell me a secret for permitting one to speak, through the attraction of a certain magnet needle, to someone distant two or three thousand miles, and I said to him that I would be willing to purchase it, but that I would like to witness a trial of it, and that it would please me to test it, I being in one room and he being in another. He told me that, at such a short distance, the action could not be witnessed to advantage; so I sent him away and said that I could not just then go to Egypt or Muscovy to see his experiment, but if he would go there himself I would stay and attend to the rest in Venice.' (*Unknown translator*)
- *Source*: P. Fleury Mottelay. (1922). *Bibliographical history of electricity and magnetism, chronologically arranged* (pp. 115–116). London: C. Griffin Company Ltd.

1641__ 'Mercury, or The Secret and Swift Messenger: shewing, how a man may with privacy and speed communicate his thoughts to a friend at any distance'

- Chapter XVII and XVIII.
- *Bishop John Wilkins (1614–1672)*
- *Original excerpt*: 'There is another experiment to this purpose mentioned by Walchius, who thinks it possible so to contrive a trunk of hollow pipe, that it shall preserve the voice entirely for certain hours or days, so that a man may send his ''words'' to a friend instead of his ''writing''. There being always a certain

space of intermission, for the passage of the voice, betwixt its going into these cavities, and its coming out; he conceives, that it both ends were seasonably stopped, whilst the sound was in the midst, it would continue there till it had some vent. Huic tubo verba nostra insusurremus, & cum probe munitur tabellario committamus, etc. When the Friend to whom it is sent, shall receive an open it, the words shall come out distinctly, and in the same order wherein they were spoken. From such a contrivance, (faith the same author), did Albertus Magnus make his Image, and Frier Bacon his Brazen Head, to utter certain words. Which conceit (if it have any truth) may serve somewhat to extenuate the gros absurdity of the Popish Relick concerning Joseph's [Hah] or the noise that he made (as other Carpenters use) in fetching of a blow; which is said to be preserved yet in a glass amongst other ancient Relicks. But against these Fancies it is considerable, that the species of sound are multiplied in the Air, by a kind of continuation and sfflux from their first original, as the species of light are from any luminous body; either of which being once separated from their causes, do presently vanish and die. Now as it would be a mad thing for a man to endeavour to catch the Sunbeams, or inclise the light; upon the same grounds likewise must it needs be absurd, for any one to attempt the shutting iin of articulate sounds : Since both of them have equally the same instrinsical and inseparable dependance upon their efficient causes. [...] Suppose a Friend were persidiously clapped up in some close Dungeon, and that we did not know exactly where, but could only guess at the place, within the latitude of half a mile or somewhat more; a man might very distinctly, by these other inventions, discourse unto him. Or suppose a City were straitly besieged, and there were either within it or without it, such a Confederate, with whom we should necessary confer about some design; we may by these means safely dicover to him our intentions. by which you may guess, that the Messenger which is here imployed, is of so strange a nature, as not to be barred out with walls, or deterred by enemies. To the performance of this, it is requisite that there be two Bells of different notes, or some such other audible and loud sounds, which we may command at pleasure, as Muskets, Cannons, Horns, Drums, etc. By the various founding of these (according to the former Table) a man may easily express any letter, and so consequentely any sense. These Tables I shall again repeat in this place : That of two letters may be contrived thus : A (aaaaa), B (aaaab), C (aaaba), D (aaabb), E (aabaa), F (aabab), G (aabba), H (aabbb), I (abaaa), K (abaab), L (ababa), M (ababb), N (abbaa), O (abbab), P (abbba), Q (abbbb), R (baaaa), S (baaab), T (baaba), V (=U) (baabb), W (babaa), X (babab), Y (babba), Z (babbb). [...] If the musical instrument that is used to this purpose, be able to express the ordinary notes, not only according to their different tones, but their times also, then may each letter of the alphabet be rendered by a single sound. Whence it will follow, that a man may frame a language, consisting only of tunes and such inarticulate sounds, as no letters can express. [...] By this you may easily discern how two musicians may discourse with one another, by playing upon their instruments of music, as well as by talking

with their instruments of speech. (And which is a singular curiosity) how the words of a song may be contrived in thetune of it. [. . .] The utterance of these Musical tunes may serve for the universal Language, and the writing of them for the universal Character. As all Nations do agree in the same conceit of things, so likewise in the same conceit of Harmonies.'

- *Source*: J. Wilkins. (1802). *The mathematical and philosophical works of the Right Rev. John Wilkins*, Vol. II. London: Vernor & Hood, pp. 69–75.

1655__ 'Histoire comique des Etats et Empires de la Lune et du Soleil'
(Other Worlds: The Comical History of the States and Empires of the Sun)

- *Savinien Cyrano de Bergerac (1619–1655)*
- *Translated excerpt*: Talking Books—'Hardly had he left than I began to look closely at my books. The boxes—that is, their covers—seemed admirably rich. One was cut from a single diamond, incomparably more brilliant than ours. The other looked like a huge pearl cut in two. My familiar spirit had translated the books into the language of that country. Since I haven't yet talked about the written language, I'll tell how these two books were made. When I opened a box, I found inside something made of metal, somewhat like our clocks, full of an endless number of little springs and tiny machines. It was indeed a book, but it was a miraculous one that had no pages or printed letters. It was a book to be read not with eyes but with ears. When anyone wants to read, he winds up the machine with a large number of keys of all kinds. Then he turns the indicator to the chapter he wants to listen to. As though from the mouth of a person or a musical instrument come all the distinct and different sounds that the upper-class Moon-beings use in their language.' *(Translated into English by Donald Webb)*
- *Sources*: S. Cyrano de Bergerac. (1965). *Other worlds: The comical history of the states and empires of the moon and the sun*. Trans. G. Strachan. New York: Oxford University Press; S. Cyrano de Bergerac. (2003). *The other world: The societies and governments of the moon*. Trans. D. Webb. Moses Lake, WA: Bewildering Stories (electronic publication); S. Cyrano de Bergerac. (1855). *Oeuvres de Cyrano de Bergerac, précédées d'une notice par Le Blanc, Voyage Comique des les États et Empires de la Lune—Voyage Comique des les États et Empires du Soleil*. Toulouse: A. Chauvin/Paris: Victor Lecou Éd, pp. 193–194.

1659__ 'Épigone, histoire du siècle futur'

- Première Partie, Livre Premier.
- *Michel de Pure (1634–1680)*
- *Comment*: Michel de Pure's utopian novel was published anonymously and only once. Prince Epigone, the hero, a sort of anti-Don Giovanni, undergoes a series of sea adventures which produces very ambivalent portraits of the French Monarchy, the decline of the aristocracy, the status of marriage, the literature of

the times, and, most of all, the Precieuses and their salons. Humor, parody, and—one could add—disguised religious irreverence are the ingredients of this narrative in which social and ethical hierarchy are reconsidered. This novel announces the birth of the science fiction genre, and is well-known such as the first 'uchrony' because the author presented the first utopian representation based on time and not only on space. A chapter of this novel presents a sound invention: a device consisted of pipes and a mouthpiece used as a live translator into various languages spoken and understood by an audience. When one speaks into this apparatus, hidden by a curtain, your words are automatically translated into the listener's language. The author tells us that this device was designed by Minerve who put into the pipes, the languages' matrix of the Babel Tower, recovered after its destruction. The apparatus amplifies the voice so that a large audience can listen to the speaker. *(Compiled from various sources, with a large excerpt of a review by Ronald Creagh, Society for Utopian Studies, 2007)*

- *Sources*: L. Leibacher-Ouvrard & D. Maher (Eds). (2005). *Épigone, Histoire du Siècle Futur*. (Coll. Les collections de la République des Lettres, pp. 58–61). Québec: Les Presses de l'Université Laval; In the original edition published in Paris (1659), pp. 54–64. Paris: chez Pierre Lamy; L. Leibacher-Ouvrard (Eds). (2000). Querelles d'autorité: Les romans palimpsestueux de l'abbé de Pure. Paper presented at 'Classical Unities : Place, Time, Action', 32nd annual conference of the North American Society for Seventeenth-century French Literature, Tulane University, 13–15 April, published in proceedings, pp. 225–240. Tübingen: Gunter Narr Verlag.

1665__ 'Micrographia or Some physiological descriptions of minute bodies made by magnifying glasses with observations and inquiries thereupon'

- *Robert Hooke (1635–1703)*
- *Original excerpt*: 'The next care to be taken, in respect of the Senses, is a supplying of their infirmities with Instruments, and, as it were, the adding of. artificial Organs to the natural; this in one of them has been of late years accomplisht with prodigious benefit to all sorts of useful knowledge, by the invention of Optical Glasses. By the means of Telescopes, there is nothing so far distant but may be represented to our view; and by the help of Microscopes, there is nothing so small as to escape our inquiry; hence there is a new visible World discovered to the understanding. By this means the Heavens are open'd, and a vast number of new Stars, and new Motions, and new Productions appear in them, to which all the ancient Astronomers were utterly Strangers. By this the Earth it self, which lyes so near us, under our feet, shews quite a new thing to us, and in every little particle of its matter, we now behold almost as great a variety of Creatures, as we were able before to reckon up in the whole Universe it self. [. . .] And as Glasses have highly promoted our seeing, so 'tis not improbable, but that there may be found many Mechanical Inventions to improve our other

Senses, of hearing, smelling, tasting, touching. 'Tis not impossible to hear a whisper a furlongs distance, it having been already done; and perhaps the nature of the thing would not make it more impossible, though that furlong should be ten times multiply'd. And though some famous Authors have affirm'd it impossible to hear through the thinnest plate of Muscovy glass; yet I know a way, by which 'tis easie enough to hear one speak through a wall a yard thick. It has not been yet thoroughly examin'd, how far Otocousticons may be improv'd, nor what other wayes there may be of quickning our hearing, or conveying sound through other bodies then the Air: for that that is not the only medium, I can assure the Reader, that I have, by the help of a distended wire, propagated the sound to a very considerable distance in an instant, or with as seemingly quick a motion as that of light, at least, incomparably swifter then that, which at the same time was propagated through the Air; and this not only in a straight line, or direct, but in one bended in many angles.' *(Excerpt of the Preface)* [...] 'There may also be a possibility of discovering the internal motions and actions of bodies by the sound they make. Who knows but that, as in a watch, we may hear the beating of the balance, an the running of the wheels, and the striking of the hammers, and the grating of the teeth, and multitudes of other noises; who knows, I say, but that it may be possible to discover the motions of internal parts of bodies, whether animal, vegetable, or mineral, by the sound they make, that one may discover the works performed in the several offices and shops of a man's body, and thereby discover waht instrument or engine is out of order, what works are going on at several times, and lie still at others, and the like; that in plants and vegetables one might discover by the noise the pumps for raising the juice, the valves for stopping it, and the rushing of it out of one passage into another, and the like? I could proceed further, but methinks I can hardly forbear to blush, when I consider how the most part of men will look upon this; but, yer again, I have this encouragement, not to think all these things utterly impossible, though never so much derided by the generalit of men, and never so seemingly mad, foolish, and phantastic, that, as the thinking them impossible cannot much improve my knowledge, so the believing them possible may perhaps be an occasion of taking notice of such things as another would pass by without regard as useless. And somewhat more of encouragement I have also from experience, that I have been able to hear very plainly the beating of a man's heart, and 'tis common to hear the motion of wind to and fro in the guts, and other small vessels; the stopping of the lungs is easily discovered by the wheesing, the stopping of the head by the humming and whistling noises, the slipping to and for of the joints, in many cases, by crackling, and the like, as to the working or motion of the parts one amongst another; methinks I could receive encouragement from hearing the hissing noise made by a corrosive menstruum in its operation, the noise of fire in dissolving, of water in boyling, of the parts of a bell after its motion is grown quite invisible as to the eye, for to me these motions and the other seem only to differ "secundum magis minus", and so to their becoming sensible they require either that their motions be increased, or

that the organ be made more nice and powerful to sensate and distinguish them.' *(Excerpt of* Diary, *by Robert Hooke, quoted by John Tyndall)*

- *Sources*: R. Hooke. (1665). *Micrographia or some physiological descriptions of minute bodies made by magnifying glasses with observations and inquiries thereupon*, London: Royal Society; R. Hooke. (2007). *Micrographia*. London: BiblioBazaar, pp. 17–21; J. Tyndall. (1867). *On sound: A course of eight lectures delivered at the Royal Institution of Great Britain*. Lecture 1: Hooke's anticipation of the stethoscope. New York: D. Appleton, pp. 42–43.

1673__ Statua citofonica (talking statue)—'Phonurgia Nova sive conjugium mechanico-physicum artis & naturae paranympha phonosophia concinnatum' (New Way of Making Sound)

- *Athanasius Kircher (1608–1680)*
- *Translated excerpt*: 'Inside a room ABCD, where a spiral-shaped tube (cocleato) was put and moved in E or in the vertical conduit S, lies a statue having moving mouth and eyes and having breathing life through the entire mass of the body. This statue must be located in a given place, in order to allow the end section of the spiral-shaped tube to precisely correspond to the opening of the mouth. In this manner it will be perfect, and capable to emit clearly any kind of sound: in fact the statue will be able to speak continuously, uttering in either a human or animal voice; it will laugh or sneer; it will seem to really cry or moan; sometimes with great astonishment it will strongly blow. If the opening of the spiral-shaped tube is located in correspondence to an open public space, all human words pronounced, focused in the conduit, would be replayed through the mouth of the statue: if it is a dogs bark, the statue will bark, if someone sings, the statue will answer with singing and so on. If the wind blows, this will taken into the spiral-shaped tube; therefore the statue sill be forced to emit very strong breaths. Applying the breath to a pipe, it will play. Bringing the trumpet near to mouth of the statue, the musical instrument will play and it will make innumerable fun effects of this kind, provided that the spiral-shaped tube is disposed with the greatest of attention. [...] The ''delectationes'' were developed particularly to amplify voices inside places, to call at a distance, to send music to different rooms, to eavesdrop.' *(Translated from Latin by Galia Mastromatteo)*
- *Source*: L. Tronchin, I. Durvilli & V. Tarabusi. (2008). *The marvellous sound world in the 'Phonurgia Nova' of Athanasius Kircher*. Paper presented at the DIENCA-CIARM, University of Bologna, Acoustics'08 Conference, Paris, 29 June–4 July, pp. 4185–4190.

1684__ A method of discoursing at a distance—semaphor

- *Robert Hooke (1635–1703)*
- *Original excerpt*: 'I proposed some years since, a method of discoursing at a distance, not by sound, but by sight. I say that it is possible to convey intelligence

from any one high and eminent place, to any other that lies in sight ot it, though thirty or forty miles distant, in as short a time almost as man can write what he would have sent; and as suddenly to receive an answer, as he that receives it has a mind to return it, or can write it down on paper. Nay, by the help of three, four, or more eminent places visible to each other, lying in a stright line, 'tis possible to convey intelligence almost in a moment to twice, or thrice, or more times that distance, with as great a certainly as by writing.' *(Robert Hooke, Royal Society, May 1684)*

- *Source*: Quoted in: *The Percy anecdotes: Original and select by Sholto and Reuben Percy, Brothers of the Benedictine Monastery, Mont Benger*. Vol. VI: Science—Literature, Chapter: The Telegraph. London: T. Boys, 1823, p. 146.

1753__ 'An Expeditious Method of conveying Intelligence'

- *C.M.*
- *Comment:* The first suggestion of an electric telegraph on record is that published by one 'C. M.' in *Scots Magazine*, 17 February 1753.
- *Original excerpt*: 'Renfrew, Feb. 1, 1753—Sir, —It is well know to all who are conversant in electrical experiments, that the electrical power may be propagated along a small wire from one place to another without being sensibly abated by the length of progress. Let, then, a set of wires equal in number to the letters of the alphabet be extended horizontally between two given places parallel to one another, and each of them about an inch distant from taht next to it. At every twenty yards' end let them be fixed on glass with jewellers' cement to some firm body, both to prevent them from touching the earth, or any other non electric, and from breaking by their own gravity. Let the electric gun barrel be placed at right angles with the extremities of the wire, and about an inch below them. Also, let the wires be fixed in a solid piece of glass six inches from the end, and let all that part of them which reaches from the glass to the machine have sufficient spring and stiffness to recover its situation after being brought in contact with the barrel. Close by the supporting glass let a ball be suspended from every wire, and about a sixth or an eighth of an inch below the balls, place the letters of the alphabet marked on bits of paper, or any other substance that may be light enough to rise to the electrified ball, and at the same time let it be so contrived that each of them may reassume its proper place when dropt. All things constructed as above, and the minute previously fixed, I begin the conversation with my distant friend in this manner. Having set the electrical machine agoing as in ordinary experiments, suppose I am to pronounce the word SIR, with a piece of glass or any other electric per se, I strike the wire S so as to bring it in contact wit the barrel, then I, then R, all in the same way, and my correspondent almost in the same instant observes those several characters rise in order to the electrified balls as his end of the wires. Thus I spell away as long as I think fit, and my

correspondent, for the sake of memory, writes the characters as they rise, and may join and read them afterwards as often as he inclines. Upon a signal given or from choice I stop the machine, and taking up the pen in my turn, I write down at the other end whatever my friend strikes out. If any boy should think this way tiresome, let him, instead of the balls, suspend a range of bells from the roof equal in numer to the letters of the alphabet, gradually decreasing in size from the Bell A to Z, and from the horizontal wires let there be another set reaching to the several bells, one, viz., from the horizontal wire A to the Bell A, another from the horizontal wire B to the Bell B, etc. Then let him who begins the the discourse bring the wire in contact with the barrel as before; and the electrical spark working on bells of different sizes, will inform the correspondent by the sound what wires have been touched. And thus by some practice they may come to understand the language of the chimes in whole words, without being put to the trouble of noting down every letter. [...] —I am, etc., C.M.'

- *Sources*: *Scots Magazine*, Vol. XV, 17 February 1753, p. 73; W. White (1854). The electric telegraph in 1753. In *Notes and queries: Medium of inter-communication*. Vol. 9: January–June 1854' (Vol. VIII, Nr. 230: 25 March 1854, p. 274). London: George Bell.

1760__ 'Giphantie' (Giphantia or, A View of What has Passed, What is Now Passing, &, during the Present Century, that Will Pass in the World)

- *Charles-François Tiphaigne de la Roche (1722–1774)*
- *Comment*: A man by the name of Tiphaigne de la Roche, published at the Hague, in the year 1760, a singular book, to which he gave for a title an anagram of his name, The Giphantie. In this book, which contains ahurly burly of strange things, the invention of the Daguerreotype is clearly indicated. Yes, the perfected daguerreotype such as we shall undoubtedly have it, but such as we have not yet got it, the daguerreotype reproducing colors as well as form. And all this in the year 1760. Wonderful Utopian cum science fiction novel, including the earliest imaginary description of photography as well as of prototype televisions and telephones. Escaping death in a hurricane, the hero finds himself on the enchanted fertile island of Giphantia (Giphantie: an anagram of the author's name), where he is greeted by a benevolent shade, the prefect of the island, in the form of a speaking cloud. The prefect demonstrates numerous spacial and temporal gadgets by which the traveller can observe the world. He shows the probation-column where the spirits are purified between their missions. Beyond this is a large globe from which come loud noises representing the excessive sorrows and joys of mortals. There are tiny pipes on the surface of the globe, through which one can hear what is being said in any part of the world. Chapter 17 contains a remarkable description prefiguring the techniques of photography. The prefect of the island shows the hero into a

room where he sees through the window a storm at sea. Not able to credit his sight, being in the middle of the desert, he runs to the window and bumps into the wall, finding the window to be an illusion. *(Compiled from various sources)*

- *Translated excerpt*: 'Chapter XVII—The Storm—Some paces from the noisy globe, the earth is hollowed, and there appears a descent of forty or fifty steps of turf; at the foot of which there is a beaten subterraneous path. We went in; and my guide, after leading me through several dark turnings, brought me at last to the light again. He conducted me into a hall of a middling size, and not much adorned, where I was struck with a sight that raised my astonishment. I saw, out of a window, a sea which seemed to me to be about a quarter of a mile distant. The air, full of clouds, transmitted only that pale light which forebodes a storm: the raging sea ran mountains high, and the shore was whitened with the foam of the billows which broke on the beach. By what miracle (said I to myself) has the air, serene a moment ago, been so suddenly obscured? By what miracle do I see the ocean in the center of Africa? Upon saying these words, I hastily ran to convince my eyes of so improbable a thing. But in trying to put my head out of the window, I knocked it against something that felt like a wall. Stunned with the blow, and still more with so many mysteries, I drew back a few paces. Thy hurry (said the Prefect) occasions thy mistake. That window, that vast horizon, those thick clouds, that raging sea, are all but a picture. Thou knowest that the rays of light, reflected from different bodies, form a picture and depict those bodies upon all polished surfaces, on the retina of the eye, for instance, on water, on glass. The elementary spirits have endeavored to fix those transient images; they have composed a very subtle matter, very viscous, quick in drying and hardening, by means of which a picture is made in the twinkle of an eye. They wash a piece of cloth with this matter, and present it to the objects which they desire to depict. The first effect of the varnished cloth is that of a mirror, in which one can see all the bodies, near and distant, of which the light can bring the image. The cloth with its viscous coating holds the images, which the glass can not do. The mirror represents the objects faithfully to you, but retains none; our cloths represent them no less faithfully, but keep them all. The impression of the images is made the instant the cloth receives them. It is taken away at once, and put in a dark place; an hour later, the coating has dried, and you have a picture, all the more precious because no art can imitate the truthfulness of it, and time can not damage it in any way. We take from the purest source, the body of light, the colors which painters extract from different materials, and which time never fails to alter. The justness of the design, the truth of the expression, the gradation of the shades, the stronger or weaker strokes, the rules of perspective, all these we leave to nature, who, with a sure and never-erring hand, draws upon our canvases images which deceive the eye and make reason to doubt, whether, what are called real objects, are not phantoms which impose upon the sight, the hearing, the feeling and all the senses at once. The Prefect then entered into some physical discussions, first, on the nature of the glutinous substance which

intercepted and retained the rays; secondly, upon the difficulties of preparing and using it; thirdly, upon the struggle between the rays of light and the dried substance; three problems, which I propose to the naturalists of our days, and leave to their sagacity. Meanwhile, I could not take off my eyes from the picture. A sensible spectator, who from the shore beholds a tempestuous sea, feels not more lively impressions: such images are equivalent to the things themselves. [. . .]'

- *Sources*: The English excerpt is from the English edition, London: Robert Horsfield, 1761, pp. 93–98; and from C. Hales. (Ed.). (1852). The old new. *Today: A Boston Literary Journal*, *16* (17 April), 252–253; É. Fournier. (1862). Discoveries—New or old. *The Eclectic Magazine of Foreign Literature, Science and Art*, March, 383–384; A. de Rochas. (1891). Scientific dreams of the past. *Popular Science Monthly*, *39*, 365–366.

1771__ 'L'An 2440, rêve s'il en fut jamais—Le temps présent est gros de l'avenir (Leibnitz)' (The Year 2440: A Dream If Ever There Was One) (translated: Memoirs of the Year Two Thousand Five Hundred)

- Vol. II, Chapter IV/le Cabinet du Roi (The King's Cabinet).
- *Louis-Sébastien Mercier (1740–1814)*
- *Comment*: Mercier's 'L'An 2440, rêve s'il en fut jamais' (translated into English as 'Memoirs of the Year Two Thousand Five Hundred') is a utopian novel set in the year 2440 and a work of French political speculation set in a 25th-century utopian society that worships science. The work describes the adventures of an unnamed man, who, after engaging in a heated discussion with a philosopher friend about the injustices of Paris, falls asleep and finds himself in a Paris of the future. L'An 2440 demanded to be read as a serious guidebook to the future. It offered an astonishing new perspective: the future as a fait accompli and the present as a distant past. Mercier describes a sound machine that imitates voices, animals, birds as well as war & awful sounds. This machine was used like a machine of torture, in order to contrainst people to have no bellicose and hostile ideas. *(Compiled from various sources)*
- *Translated excerpt*: 'What related to acoustics was not less miraculous. They had acquired the art of imitating all the articulations of the human voice, of the cries of animals, and the various notes of birds. By touching certain springs we feemed to be instantly transported to some wild forest, where we heard the roarings of the lyon, the tyger, and the bear, who feemed to be in conflict with each other. The noise rent the ear. you would have said that the echo, still more terrible, repeated at a distance those horrid and barbarous cries. But soon the songs of nightingales succedeed to those discordant sounds. By their harmonious organs each particle of the air became melodious; the ear discerned even the tremblings of their amorous wings, and those tender and enchanting sounds which the voice of man can never perfectly imitate. To the intoxication of pleasure was joined the

sweet surprise, and the voluptuous sensation that arose from this happy union, seized every heart. This people, who had constantly a moral aim even in the prodigies of art, had happily deduced an advantage from this surprising invention. When a young prince talked of combats, or discovered a warlike disposition, they conducted him to a room, which they properly named, the Hell. The artist immediately put the springs in motion, and saluted his ear with all the horrors of a battle, the cries of rage and of grief; the lamentations of the dying; the sounds of terror; the bellowing of that hideous thunder which is the signal of destruction and bears the execrable sound of death. If nature did not then prevail on his mind, if he did not send forth a cry of horror, if his countenance unmoved and placid, he was confined to that room the remainder of his days. Every morning, however, they repeated a piece of this music, that he might be satisfied without the destruction of the human race. The director of this cabinet, to my great surprise, exhibited all his infernal opera, without acquainting me of his intention. O heavens ! mercy ! mercy ! I cried with all my strength, stopping my ears. O spare me, spare me ! He stopped the exhibition.' *(Translated from the French by W. Hooper)*

- *Sources*: L.-S. Mercier. (1772). *Memoirs of the year two thousand five hundred*. Trans. W. Hooper. Dublin: W. Wilson, pp. 64–66; L.-S. Mercier. (1971). *L'An deux mille quatre cent quarante. Rêve s'il en fut jamais*. Ed. R. Trousson. Bordeaux: Coll. Ducros, pp. 255–257; R. Trousson. (1982). *Utopie, histoire, progrès. L'An 2440 de Sébastien Mercier. Académie Royale de Langue et de Littérature Françaises, Bruxelles, Communication of 13 November 1982*, p. 279; H. Hudde (1986). *L'influence de Mercier sur l'évolution du roman d'anticipation*. Paper presented at 'De L'Utopie à l'Uchronie': Colloque sur l'utopie littéraire, Erlangen, October; O. Balay. (2003). Trois Utopies sonores pour la ville contemporaine: Ambiances et espaces sonores/Three sound-based utopias for today's cities. *Espaces et Sociétés*, *115*, 61–78.

1776__ Notturno for four orchestras (K.286)

- *Wolfgang Amadeus Mozart (1756–1791)*
- *Comment*: An example [of open-air style and ideal garden-music] is a Notturno for four orchestras (K.286) by W. A. Mozart, or rather one orchestra consisting of strings and horns, answered by three other orchestras in a triple echo. This work belongs to the genre of outdoor works which require spatial effects. If we did not have reason to believe that it was composed for New Year's Day 1777, we should say that it was the proper nocturnal music for the baroque curiosities at Mirabell Garden, near Salzburg. But Mozart was fond of conjuring up summertime in the winter. The Notturno, K286, is scored for four of sextets, with a group of two horns and four strings (two violins, viola, and double bass).
- *Source*: A. Einstein. (1962). *Mozart: His character, his work*. Trans. A. Mendel & N. Broder. New York: Oxford University Press, p. 208.

1781__ Eidophusikon

- *Philippe Jacques de Loutherbourg (1740–1812)*
- *Comment*: Eidophusikon, an entertainment based on three-dimensional paintings with lighting effects, is opened in London by Philippe Jacques de Loutherbourg, a painter from Alsace. In the 1780s the painter and David Garricks scenery designer, Jacques-Philippe de Loutherbourg, created a large scale miniature theatre called the Eidophusikon which allowed him to experiment in his attempt to create the perfect illusion of natural reality—scenes of sunrise, sunset, moonlight, storm and volcanoes in different parts of the world plus accompanying sound effects and music. 'The stage on which the Eidophusikon was represented, was little more than six feet wide, and about eight feet in depth; yet such was the painter's knowledge of effect, and of scientific arrangement, and the scenes which he described were so completely illusive, that the space appeared to recede for many miles, and the horizon seemed as palpably distant from the eye as the extreme termination of the view would appear in nature. [...] The clouds in very scene had a natural motion, and they were painted in semi-transparent colours, so that they not only received light in front, but by a greater intensity of the Argand lamps, were susceptible of being illuminated from behind. The linen on which they were painted, was stretched on frames of twenty times the surface of the stage, which rose diagonally by a winding machine. [...] To illuminate the scenes for this interesting display of nature, the ingenious projector had constructed his lights to throw their power in front of the scenes; and the plan might be tried with advantage for spectacles, and particular effects on the great stages of our magnificent theatres. The lamps on De Loutherbourg's stage were above the proscenium, and hidden from the audience, instead of being unnaturally placed as we are accustomed to see them, by which the faces are illuminated, like Michael Angelo's Satan, from the regions below; thus throwing on their countenance, a preternatural character, in defiance of all their well-studied science of facial passion and expression. [...] Before the line of the brilliant lamps, on the stage of the Eidophusikon, were slips of stained glass; yellow, red, green, purple and blue; by the shifting of which, the painter could throw a tint upon the scenery, compatible with the time of day which he represented, and by a single slip, or their combinations, could produce a magical effect; thus giving a general hue of cheerfulness, sublimity, and awfulness, subservient to the phenomena of his scene. This, too, might be adopted on the regular stage, were the ingenious machinists of the scene-room to set their wits to work; and at no vast expence since the improvement of lighting with gas. [...] De Loutherbourg's genius was a prolific in imitations of nature to astonish the ear, as to charm the sight. He introduced a new art—the picturesque of sound. I can never forget the awful impression that was excited by his ingenious contrivance to produce the effect of firing off a signal of distress, in his sea storm. That appeling sound which he taht had been exposed to the terrors of a raging tempest

could not listen to, even if this mimic scene, without being reminded of the heart sickening answer which sympathetic danger had reluctantly poured forth from his own loud gun—a hoarse sound to the howling wind, that proclaimed, "I too ! holy heaven, need that succour, I fain would lend!" De Loutherbourg had tried many schemes to effect this, but none were satisfactory to his nice ear, until he caused a large skin to be dressed into parchment, which was fastened by screws to a circular frame, forming a vast tambourine; to this was attached a compact sponge that went upon a whalebone spring; which struck with violence, gave the effect of a near explosion, a more gentle blow, hat of a far-off gun; and the reverberation of the sponge produced a marvellous imitation of the echo from cloud to cloud, dying away into silence. The thunder was no less natural, and infinitely grand: a spacious sheet of thin copper was suspended by a chain, which, shaken by one of the lower corner, produced the distant rumbling, seemingly below the horizon; and as the clouds rolled on, approached nearer and nearer, increasing peal by peal, until following rapidly the lightnings zig-zag flash, which was admirably vivid and sudden, it burst in a tremendous crash immediately over head. To those who have not heard the sounds emitted by a large sheet of copper, thus suspended, it may appear extravagant to assert so wondrous an effect, indeed, it is not possible to describe the power of he resemblance—auricular evidence alone could convince. The waves for his stage were carved in soft wood, from models made in clay; these were coloured with great skill, and being highly vanished, reflected the lightning. Each turned on its own axis, towards the other in a contrary direction, throwing up the foam, now in one spot, now at another, and diminishing in altitude as they receded in distance, were subdued by corresponding tints. Thus the perturbed waters appeared to cover a vast space. One machine of simple construction turned the whole, and the motion was regulated according to the increasing of the storm. The vessels, which were beautiful models, went over the waves, with a natural undulation, those nearest making their courses with a proportionate rate to their bulk, and those farther off moving with a slower pace. They were all correctly rigged, and carried only such sails as their situation would demand. Those in the distance were coloured in every part to preserve the aerial perspective of the scene. The illusion was so perfect, that the audience were frequently heard to exclaim, "Hark ! that signal of distress came from that vessel labouring out these—and now from that." The rush of the waves was effected by a large octagonal box, made of pasteboard, with internal shelves, and charged with small shells, peas, and light balls, which, as the machine wheeled upon its axis, was hurled in heaps by every turn, and being accompanied by two machines of a circular form, covered with tightly strained silk, which pressed against each other by a swift motion, gave out a hollow whistling sound, in perfect imitation of loud gusts of wind. Large silken balls passed hastily over the surface of a great tambourine, increased the awful din. The rain and hail were no less truly imitated; for the rain, a long four-sided tube was charged with small seed, which, according to the degree of its motion,

from a horizontal ot a vertical position, forced the atoms in a pattering stream to the bottom, when it was turned to repeat the operation. The hail was expressed by a similar tube, on a larger scale, with pasteboard shelves, projecting on inclined planes, and charged with little beads; so, that sliding from shelf to shelf, fast or slow, as the tube was suddenly or gently raised, the imitation was perfect. One of the most interesting scenes described a calm, with a nItalian sea-port, in which the rising of the moon, with the serene coolness which it diffused to the clouds, the mountains and the water was finely contrasted by a lofty light-house, of picturesque architecture, jutting out far into the sea, upon a romantic promontory of broken rocks. The red glowing light of its spacious lantern, tinged the rippling of the water on one part of its surface, whilst the moon shed its silvery lustre on another in sweet repose. Shipping in motion added to the interest of the view; and a fleet in the offing, slowly proceeding in its course, melted into air. The clouds for this scene were admirably painted; and as they rolled on, the moon tinged their edges, or was obscured, at the will of the painter; for where he had loaded the colour to opaqueness, the transparent light of the orb could not penetrate. The clouds in front received sufficient illumination from the lamps, which were subdued by a bluish grey glass, one of the slips before described. The moon was formed by a circular aperture of an inch in diameter, cut in a tin box, that contained a powerful Argand lamp, which being placed at various distances from the back of the scene, gave a brilliant or a subdued splendour to the passing cloud, producing without any other aid, the prismatic circle with that enchanting purity which is peculiar to an Italian sky.'

- *Source*: J. Elmes (1825). *The arts and artists—or anecdoctes and relics of the schools of painting, sculpture and architecture*. London: John Knight & Henry Lacey, Vol. III, pp. 21–33.

1802__ Télégraphe Intime

- *Jean Alexandre*
- *Comment*: In 1802, Jean Alexandre, a reputed natural son of Jean Jacques Rousseau, brought out a TELEGRAPHE INTIME, or secret telegraph, which appears to have been a step-by-step apparatus. The inventor concealed its mode of working, but it was believed to be electrical, and there was a needle which stopped at various points on a dial. Alexandre stated that he had found out a strange matter or power which was, perhaps generally diffused, and formed in some sort the soul of the universe. He endeavoured to bring his invention under the eye of the First Consul, but Napoleon referred the matter to Delambre, and would not see it. (*John Munro, Heroes of the Telegraph, 1891*). Delambre, the illustrious astronomer, despite the persistence with which Alexandre refused to give up his secret to him, drew a report, the few following extracts from which will suffice to edify the reader: [...] All that is known is that the telegraph intime consists of two like boxes, each carrying a dial on whose circumference are

marked the letters of the alphabet. By means of a winch, the needle of one dial is carried to all the letters that one has need to use, and at the same instant the needle of the second box repeats, in the same order, all the motions and indications of the first. When the two boxes are placed in two separate appartments, two persons can write to and answer one another, without seeing or being seen by one another, and without any one suspecting their correspondence. Neither right nor fog can prevent the transmission of a dispatch. [...] The inventor has made two experiments – one at Poitiers and the other at Tours – in the presence of the prefects and mayors, and the records shows that they were fully successful. Today, the inventor and his associate ask that the First Consul [Bonaparte] be pleased to permit one of the boxes to be placed in his apartment and the other at the house of Consul Cambaceres in order to give the experiment all the éclat and authenticity possible; or that the First Consul accord a ten minutes' interview to citizen Beauvais [friend and associate of Alexandre], who will communicate to him the secret, which is so easy that the simple expose of it would be equivalent to a demonstration, and would take the place of an experiment. [...] If, as one might be tempted to believe from a comparison with a bell arrangement, the means adopted by the inventor consisted in wheels, movements, and transmitting pieces, the invention would be none the less astonishing. [...] If, on the contrary, as the Poitier's account seems to prove, the means of communication is a fluid, there would be the more merit in his having mastered it to such a point as to produce so regular and so infallible effects at such distances [...]. If, as one might be tempted to believe from a comparison with a bell arrangement, the means adopted by the inventor consisted in wheels, movements, and transmitting pieces, the invention would be none the less astonishing. [...] But Bonaparte remained deaf, and Alexandre persisted in his silence, and died at Angers, in 1832, in great poverty, without having revealed his secret.

- *Sources*: C. WM. Siemens (1883). The History of the Electric Telegraph. *Scientific American Supplement*, No. 384, May 12, 1883, pp. 19–20; see also J. Munro (1891 [2008]). *Heroes of the Telegraph*. London: BiblioBazaar, pp. 16–17; Anonymous (1863). La Télégraphie Électrique – Le Télégraphe Intime d'Alexandre (1802). L'Écho du cabinet de lecture paroissial de Montréal, 28 Dec 1863, Vol. V, Nr. 24, p. 372.

1803__ The Invisible Girl

- *Comment*: In June 1803 the artist Joseph Farington went to see 'the extraordinary contrivance called ''The Invisible Girl'' in a room in Leicester Square [in London] and jotted in his diary: 'June 28—Lady Thomond spoke so warmly of the extraordinary contrivance called ''The Invisible Girl'', at an apartment in Leicester Square, I went to see it. Four mouths of Trumpet shapes [suspended from a framework] to any persons place their ears & hear as from

within a voice like that of a girl, which answers any question, —described your person & dress, sings plays on a pianoforte tells you what a Clock it is, etc. The effect of the voice a the music was surprising, and no conjecture that was made by persons present of the nature of the contrivance seemed satisfactory. —One thought that the sound passed from below through Tubes into the mouths of the Trumpets & seemed to the hearer to proceed from the inside of the Ball— The voice spoke English, French & German—. The admittance to hear is 2s. 6d.' *(Joseph Farington, Diary)*. 'The Invisible Girl—Leicester Square. A globe of glass is suspended by a ribbon, under which four tubes are adapted, but they do not communicate therewith, and are likewise insulated, by these conversation is carried on with an invisible lady, who answers every question, breathes on you, and tells every visitor whatever they hold in their hands, in an instant. This exhibition is open from ten o'clock to six. Price of admittance two shillings and six pence.' *(Arthur Schopenhauer, The philosopher will here experience an uncommon result of the union of catoptric and acoustic principles)* 'The Invisible Lady—being an Explanation of the Manner in which the Experiment in London, by Mr. Charles, and others, is performed. The visible part of the apparatus connected with the invisible girl is this: —First, a mahogany frame not very unlike a bedstead, having at the corners four upright posts, about five feet high, which are united by a cross rail near the top, and two or more cross rails near the bottom, to strengthen the frame: these cross rails are about four feet in length. —The frame thus constructed stands upon the floor, and from the top of each of the four pillars springs one of four strong bent brass wires, converging towards the top, where they are secured by a crown and other ornaments. From these four wires at a hollow copper ball, of a foot in diameter is suspended by slight ribbons, so as to cut off all possible communication with the frame. This globe is supposed to contain the invisible being, as the voice apparently proceeds from the interior of it: and for this purpose it is equipped with four trumpets, placed round it in a horizontal direction, and at right angles to each other, the trumpet mouths coming to within about half an inch of the respective cross rails of the frame surrounding them. When a question is proposed, it is asked from any side of the frame, and spoken into one of the trumpets, and an answer immedialtely proceeds from all the trumpets, so loud as to be distinctly heard by an ear addressed to any of them, and yet so distant and feebel that it appears from a very diminutive being. In this the whole of the experiment consists, and the variations are, that the answer may be returned in several languages, a kiss will be returned, the breath producing the voice may be felt, and songs are sung, accompanied by the pianoforte, etc. In this illusion the sound is really conveyed by a tube, in a manner similar to the old and well-known contrivance of the speaking bust; the invisible girl only differing in this circumstance, that an artificial echo is produced by means of the trumpets and hollow globe, in consequence of which the sound no longer appears to proceed in its original direction, but is

completely reversed. In the present case, the beginning of the tube is one of the hand rails, just opposite the centre of the mouth of one of the trumpets, the orifice being concealed by reeds or other mouldings; the tube itself, which may be about half an inch in diameter, runs through half the hand rail, then down one of the corner posts, and from thence under the floor, till it reaches a large deal case almost similar to an inverted funnel, along the side of which it rises till it come nearly into contact with the ear of the confederate, who, with a piano-forte, etc. is concealed in this case. Any question asked by a voice directed into one of the trumpets, will be immediately reflected back by a concave interior surface of the globe to the orifice of the tube, along which it will be conveyed so as to be distinctly heard by the person in the deal case; and the answer returned, or a song or a tune from the instrument, will, in consequence of a similar reflection, be distinctly heard at the mouths of the trumpets, but no where else; and there is will appear to come precisely from the interior of the globe. A small hole closed with glass is left through the deal case and side-wall of the room, by means of which the concealed person has an opportunity of observing and commenting upon any circumstances which may take place in the room.' *(Mr. Charles, June 1807)*

- *Sources*: Mr. Charles. (1808). The Invisible Lady; being an explanation of the manner in which the experiment in London, by Mr. Charles and others, is performed (in a letter from a correspondent. Phil. Jour. n°. 65 and n°. 66). *Retrospect of philosophical, mechanical, chemical and agricultural discoveries*, *3*, 60–61, and first published in *Scots Magazine and Edinburgh Literacy Miscellany: Being a General Repository of Literature, History, and Politics*, *69*, 1807; J. Farington. (1923). *Farington diary – 1793–1821*, Vol. II, p. 116. London: Hutchinson & Co.; P. Bridgewater. (1988). *Arthur Schopenhauer's English schooling*. London: Routledge, pp. 135–136.

1810__ 'New Method of Conveying Letters and Goods (with great certainty and rapidity) by Air'

- *George Medhurst (1759–1827)*
- *Original excerpt*: 'The extraordinary strenght, levity, and elasticity of Air renders it capable of very high degrees by mechanical means, far greater than can be given to any other body passing through the atmosphere. [...] These properties of air afford the means of conveying letters, and other light articles, to great distances with a celerity than the most rapid conveyance that has ever been put in practice. If a light and hollow vessel is so formed as to fill the area of a tube, and to move freely through it, carrying papers not exceeding three ounces in weight, it will be driven through the tube with the velocity of 150 feet in a second by the pressure of 9 ounces per square inch. [...] This principle is capable of being far extended as to convey portable goods of great weight and magnitude through the country than can be effected by canal or waggon, and at less expence than either.' *(George*

Medhurst, New method of conveying letters and goods (with great certainty and rapidity) by air, 1810) 'The principal advantages attending the mode of conveyance will be, First. Passengers may be conveyed to the greatests distance through the country with ease and gat safety at the rate of a mile in a minute, or fifty miles per hour upon an average, and at the expense of one farthing per mile. Second. All kind of portable goods, merchandize, manufacture, and produce, will be conveyed with the same velocity, at the expense of one penny per mile conveyance. Third. The conveyance cannot be obstructed or impeded by frosts, snow, floods, or drought, nor endangered by robbery, by darkness, or the weather. Fourth. No locks or other obstructions will be required in the passage, for the force of the impelling Air will be sufficient to gain an ascent of 100 feet in a mile continually.' *(George Medhurst, Calculations and remarks tending to prove the practicability effects and advantages of a plan for the rapid conveyance of goods and passengers [...] by the power and velocity of air, 1812)*. 'The principle of this invention is to employ the wind as a first mover, to condense the common air of the atmosphere into a vessel of sufficient strenght and capacity; which condensed air is then applied to produce the regular power and motion upon proper machienry adapted to the required purpose.' *(George Medhurst, On the properties, power & application of the aeolian engine,* 1810?) 'There is no art that has ever engaged the assiduity and energy of mankind, that is of such general utility, of such innate and unbounded importance, as that of the conveyance of goods and persons from place to place, over the surface of the globe. [...] The extensive step that is here advanced towards the perfection of an art so useful, so necessary, so honourable, and so munificent, will form a new epoch in the history of mankind, will stamp a new value upon all the productions of art and nature, and add immensely to the riches, the splendour, the freedom, the happiness, the science, and the civilisation of the whole world. This new system is founded upon the well-known and wonderful properties of common air—the most powerful and universal mechanical agent within the reach of mankind; created and perpetually maintained by the hand of nature through-out all the regions upon the earth; no withheld from any creature, or from any spot; but is at hand in every climate, from pole to pole, ever ready to exert its utmost force, or to dispense with its own essence, for the service of mankind. *(George Medhurst, A new system of inland conveyance for goods and passengers, 1827)*

- *Sources*: G. Medhurst. (1810). *New method of conveying letters and goods (with great certainty and rapidity) by air*. London: D. N. Shury, pp. 5–11; G. Medhurst. (1912). *Calculations and remarks tending to prove the practicability effects and advantages of a plan for the rapid conveyance of goods and passengers [...] by the power and velocity of air*. London: D. N. Shury, pp. 6–19; G. Medhurst (1810?). *On the properties, power & application of the aeolian engine*, London: William Barton, pp. 3–15; G. Medhurst. (1827). *A new system of inland conveyance for goods and passengers*. London: T. Brettell, pp. 1–3. All compiled into one

book: G. Medhurst (1810). *Medhurst on Atmospheric Railways*. London: D.N. Shury, Berwick Street, Soh.

1821__ Aconcryptophone—Diaphonicon (Hearing a hidden sound)

- *Charles Wheatstone (1802–1875)*
- *Comment*: 'The Diaphonicon apparatus is so placed that the interior flexible substances they are covered with may receive the vibrations from the strings when sounded, aided by the sound-boards; and, by reverberating them between the two felxible surfaces, and through the agency of the columns of air therin interposed, greatly inprove the quantity of the tones produced from the instruments, and communicate them, thus improved, through the esterior flexible vibrating surfaces, to the auditor. From this we observe that the novelty in the Diaphonicon consists, chiefly, of a diaphonic screen (with double surfaces, and enclosing volumes of air,) which acts around the strings when they are struck, on a similar principle to that of sounding-boards on other cases. But however constructed, we can say that the effect produced is extraordinary. The tones are wonderfully augmented in force and richness; and there is a grandeur in them which we had thought could only belong to the noblest organs. In other respects it seemed to be performed upon with as much facility as the piano-forte, which it resembles in size; and to be capable of same slight turns and niceties of expression. Upon the whole we were greatly delighted with the invention, which certainly deserves the most earnest attention of the musical world. We should mention that his instrument is entirely distinct from the beautiful Euphonon, of which we formerly gave a description, and for which the amateurs of sweet music are also included to the ingenuity and enterprise of Mr. Pinnock.' *(The London Literary Gazette and Journal of Belles Lettres, Arts, Sciences, etc., 1824; Ogston & Bell, Useful Arts, 1827)* After Wheatstone's studies of vibrations through solid bodies he creates his most famous instrument the 'enchanted lyre' or the Aconcryptophone (Greek for 'hearing a hidden sound', sometimes called 'acoucryphone'). The vibrations from a remote piano, which transmitted through a long wire, activated it. At just 19 years old Sir Charles Wheatstone gave the worlds first network music performance in his fathers music shop in Pall Mall, England (*Cf. Thomson, Annals of philosophy, 1823*). It consisted of a mimic lyre hung from the ceiling by a cord, and emitting the strains of several instruments—the piano, harp, and dulcimer. In reality it was a mere sounding box, and the cord was a steel rod that conveyed the vibrations of the music from the several instruments which were played out of sight and ear-shot. When Wheatstone played this instrument it was not a simple walk-on performance but more a musical installation. The enchanted lyre was suspended from the ceiling and circled by a velvet hoop supported on the floor by three rods. The horns of the lyre were like bugles bent down towards the floor and discs on both sides of the body of the instrument were of metallic appearance. The lyre was suspended by a brass wire, which passed through the

ceiling and connected with the soundboards of instruments in a room above, where Wheatstone played pieces on the harp, piano, and the dulcimer. He used the string instruments for his 'telemusic' pieces because it was easy for him to transmit sound over those devices as apposed to the flutes in which the only vibration was in a column of air. Tuned metal rods were sounded by vibrations coming from a distance through an obtrusive solid conductor. This appeared in an article entitled 'The Repository of Music' which went on to predict the telecasting of operas and even 'words of speech—[these may be] susceptible of the same means of propagation'. The concerts were conducted quite frequently and were very well received by the music critics who urged the public to go and hear the wonderful music of the 'unseen performer'. The high point of Wheatstone's music career came in 1822 when he conducted the sound of a whole orchestra in one of the shops along the Royal Arcade. The cost for the one-hour performance was 5 shillings. Wheatstone demonstrated both music and voice conduction with his 'diaphonicon', a horizontal sound conductor running between rooms. Wheatstone continued his performances until the autumn of 1823. A writer in the REPOSITORY OF ARTS for September 1, 1821, in referring to the 'Enchanted Lyre', beholds the prospect of an opera being performed at the King's Theatre, and enjoyed at the Hanover Square Rooms, or even at the Horns Tavern, Kennington. The vibrations are to travel through underground conductors, like to gas in pipes. 'And if music be capable of being thus conducted,' he observes, 'perhaps the words of speech may be susceptible of the same means of propagation. The eloquence of counsel, the debates of Parliament, instead of being read the next day only, —But we shall lose ourselves in the pursuit of this curious subject.' *(Munro, Heroes of the telegraph, 1891)*

- *Sources*: *The London Literary Gazette and Journal of Belles Lettres, Arts, Sciences, etc.*, 1824, p. 748; J. Ogston & J. T. Bell. (1827). Useful arts. *New Monthly Magazine and Literary Journal*, *21*, 121; Munro, *Heroes of the telegraph*, p. 22; D. P. McVeigh. (2000). *An early history of the telephone 1664–1865*. Electronic publication, with the help of Jean Gagnon, Daniel Langlois Foundation and Don Foresta, MARCEL.

1823__ Telephone & Microphone

- *Charles Wheatstone (1802–1875)*
- *Comment*: Wheatstone made numerous experiments on sound and its transmission. Some of his results are preserved in Thomas Thomson's *Annals of Philosophy* for 1823. He recognised that sound is propagated by waves or oscillations of the atmosphere, as light by undulations of the luminiferous ether. Water, and solid bodies, such as glass, or metal, or sonorous wood, convey the modulations with high velocity, and he conceived the plan of transmitting sound-signals, music, or speech to long distances by this means. He estimated that sound would travel 200 miles a second through solid rods, and proposed to

telegraph from London to Edinburgh in this way. He even called his arrangement a 'telephone'. [Robert Hooke, in his *Micrographia*, published in 1667, writes: 'I can assure the reader that I have, by the help of a distended wire, propagated the sound to a very considerable distance in an instant, or with as seemingly quick a motion as that of light.'] Nor was it essential the wire should be straight; it might be bent into angles. Besides transmitting sounds to a distance, Wheatstone devised a simple instrument for augmenting feeble sounds, to which he gave the name of 'Microphone'. It consisted of two slender rods, which conveyed the mechanical vibrations to both ears, and is quite different from the electrical microphone of Professor Hughes.

- *Source*: J. Munro (1891 [2008]). *Heroes of the telegraph*, p. 14. London: Bibliobazaar.

1827__ 'On the transmission of Musical sounds through solid liner conductors and on their subsequent reciprocation'

- *Charles Wheatstone (1802–1875)*
- *Original excerpt*: 'The fact of the transmission of sound through solid bodies, as when a stick or a metal rod is placed at one extremity to the ear, and is struck or scratched at the other end, did not escape the observation of the ancient philosophers: but it was for a long time erroneously supposed, that an aëriform medium was alone capable of receiveing sonorous impressions; and in conformity with this opinion, Lord Bacon, when noticing this experiment, assumes that the sound is propagated by spirits within the pores of the body (*Cf. Sylvarum, Phonics, para. 3, 1627*). [...] Chadlni had, in an ingenious manner, inferred the velocity of sound in different solid substances; and his results are fully confirmed by calculations from other grounds. His method was founded on Newton's demonstration, that sound travels through a space of a given length, contained in a tube open at both ends, makes a single vibration. His own discovery of the longitudinal vibrations of solid bodies, which are exactly analogous to the ordinary vibrations of columns of air, enabled hom to apply this proposition to solid bodies, and to establish the general law, that sound is propagated through any elastic substance in the same time in which this substance makes one longitudinal vibration. [...] In all the experiments (above alluded to), the sounds transmitted were either more noises, such as the blow of a hammer, or [...] a single musical sound, produced by striking a silver spoon attached to one end of the conducting wire; and in no case were any means employed for the subsequent augmentation of the transmitted sound. I believe that, previous to the experiments which I commenced in 1820, none had been made on the transmission of the modulated sounds of musical instruments; nor had it been shown that sonorous undulations, propagated through solid linear conductors of considerable lenght, were capable of exciting, in surfaces with which they were in connexion, a quantity of vibratory motion, sufficient to be

powerfully audible when communicated through the air. [...] It will be necessary to make few observations on the augmentation of sound which results from the connexion of a vibrating body with other bodies capable of entering into simultaneous vibration on it. This participation of the vibrations of an original sounding body is called ''resonance'', or reciprocation of sound. Sonorous bodies are audible (the extent of their excursions being supposing equal) in proportion to the quantity of their vibrating surfaces. [...] It will be obvious in what manner two square piano-fortes of two harps may be so connected as mutually to reciprocate each other's sounds; by such an arrangement, two performers in different rooms may play a duet together to two distinct audiences, or one may eacho the performance of the other. If the transmission is required to be horizontal, ie. between two rooms on the same floor, cabinet piano-fortes must be employed. [For instance in the case of a vertical apparatus, the wire between the instruments, consisted of four portions: the first part touched the sounding-board of the piano-forte, and reached half-way to the floor; the second passed through the insulating-tube in the floor, and terminated when it reached the ceiling of the room below in a hook; a third part was suspended from this hook by a loop; and the fourth, after identifying itself with one of the apparent wires of another instrument.] The sounds of an instrument may be at the same time transmitted to more than one place; for instance, communications may be made from a square piano-forte to a resounding instrument above, and to another below: and the communications may be even continued through a series of reciprocating instruments. If the instruments be not in adjacent rooms, but be further removed from each other, a person in the intermediate room, through the conductor passes, will hear no sound but what is communicated by the ordinary means. Hence it would be possible to extend a horizontal conductor through a series of rooms belonging to different houses, and (provided the instrument connected with one of its extremities be constantly played upon) to hear at pleasure the performance in any of these rooms, by merely attaching a reciprocating instrument to the conductor; on removing this instrument, the sonorous undulations would pass inaudibly to the next apartment. These observations will equally apply to the transmission of other musical sounds, which will be hereafter noticed. [...] In a similar manner, the sounds of an entire orchestra may be transmitted, viz. by connecting the end of the conductor with a properly sounding-board, so placed as to resound all the instruments. [...] Compared with an ordinary band, heard at a distance through the air, the effect is as a landscape seen in a miniature beauty through a concave lens, as compared with the same scene viewed by the ordinary vision through a murky atmosphere. [...] Could any conductiong substance be rendered perfectly equal in density and elasticity, so as to allow the undulations to proceed with a uniform velocity without any reflections or interferences, it would be easy to transmit sounds through suc conductors from Aberdeen to London, as it is now to establish a communication from one chamber to another. Whether any substance can be

rendered thus homogeneous and uniform remains for future philosophers to determine. The transmission to distant places, and the multiplication of musical performances, are objects of far less importance than the conveyance of the articulations of speech.'

- *Source*: C. Wheatstone. (1827). On the transmission of musical sounds through solid liner conductors and on their subsequent reciprocation. *Journal of the Royal Institution*, IV, pp. 223–238. London: John Murray.

1838__ Acoustic Telegraph

- *Comment*: 'Nothing is more remarkable among the rage of inventions for communication than the neglect of signs by sound. A few years ago some experiments were made by Biot and Arago, in France, by which they ascertained that the sound by means of tubed could be propagated with almost infinite rapidity ti any distance to which the tube extended. The experiments were made on tubes joined together to upwards of the length of a mile; and, so far as they could discover, if the tubes had been a thousand miles long, the sounds would have been articulated through them with the same immeasurable rapidity. This contrivance may yet be perfected, and we shall have communications passing through the bowels of continents as eaisly as they now pass from a taylor's counter to his shop-board in the attic. The speaking-trumpet is the only portable contrivance of the kind, but it is a remarkably rude and limited instrument. An attempt at improvement has been lately made in Austria. It is called an Acoustic Telegraph, and is a tube externally resembling a speaking-trumpet, but which is six feet five inches long, and carries the sound to about twelve thousand feet.'
- *Source*: From: The mechanics magazine, museum, register, journal and gazette. *Blackwood's Magazine*, 7 October 1837–31 March 1838, 198.

1844__ Recording Telegraph

- *Samuel F. B. Morse (1791–1872)*
- *Comment*: 1 May: Samuel F.B. Morse (d. 1872) publicly proves the viability of electric telegraph (with dots & dashes automatically written on a paper tape) by receiving in Washington a message from a distance of 25 miles, and 64 minutes ahead of the parallel message sent by train. 24 May: Samuel F.B. Morse uses his electric telegraph to send the message ''What hath God wrought''on a completed 40 miles long line from Baltimore to Washington. The second message sent immediately after the first one was ''Have you any news?'' Samuel F. B. Morse invented his recording telegraph in October 1832. 'Mr. Morse went to work and got the machine built, and got it all ready to talk on the 24th day of last May. And then the folks in Washington all flocked round one end of the wires, and the folks in Baltimore flocked round t'other end of the wires to see the machine go. And then Mr. Morse called Anna [Miss Annie Ellsworth] and told her to get ready to speak to the floks at Baltimore; for she should have the first ''say'', and

say just what she'd a mind to. When they put the magnetism on to the wires, the first words the folks at Baltimore see coming out of their end of the wire was, "What Hath God Wrought!" And in less than two minutes the folks at Baltimore spoke it back again to Washington, and the folks there see the same words coming out of "their" end of the wires.' *(Major Downing, 22 August 1844)*

- *Sources*: Major Downing (1844). From Major Downing's Bunker Hill. To Uncle Joshua, of Downingville, away from east. New York Aug. 22, 1844. *The Rover: A Weekly Magazine of Tales, Poetry and Engravings*, *3*, 393; D. Miller (1998–2004). *Din Timelines* (electronic publication).

1844__ The first chess-game conducted via telegraph & remote bank operation.

- *Comment*: The players are from Washington and Baltimore, respectively. Also, the line is used by a Baltimore businessman to verify with the Bank of Washington the credit worthiness of his customer.
- *Sources*: D. Miller (1998–2004). *Din Timelines* (electronic publication); T. M. Ciolek (2000). *Global networking: A timeline* (electronic publication). Canberra: Research School of Pacific and Asian Studies, Australian National University (culled from: T. Standage (1998). *The Victorian Internet*. New York: Berkley, p. 50).

1846__ The security expert's argument

- *Comment*: In 1846, one Dr Barbay, a semaphore enthusiast, memorably uttered an early version of what might be called 'the security expert's argument' against the open media. Dr Barbay and his high-security stone machines were eventually unsuccessful, but his argument—that communication exists for the safety and convenience of the state, and must be carefully protected from the wild boys and the gutter rabble who might want to crash the system—would be heard again and again. 'No the electric telegraph is not a sound invention. It will always be at the mercy of the slightest disruption, wild youths, drunkards, bums, etc. ... The electric telegraph meets those destructive elements with only a few meters of wire over which supervision is impossible. A single man could, without being seen, cut the telegraph wires leading to Paris, and in twenty-four hours cut in ten different places the wires of the same line, without being arrested. The visual telegraph, on the contrary, has its towers, its high walls, its gates well-guarded from inside by strong armed men. Yes, I declare, substitution of the electric telegraph for the visual one is a dreadful measure, a truly idiotic act.'
- *Source*: B. Sterling. (1992). *The hacker crackdown*. New York: Bantam Books, p. 12.

1846__ Euphonia

- *Professor Joseph Faber*
- *Comment*: 'I paid my shilling and was shown into a large room, half filled with boxes and lumber, and badly lighted with lamps. In the centre was a box on a

table, looking like a rough piano without legs and having two key-boards. This was surmounted by a half-length weird figure, rather bigger than a full-grown man, with an automaton head and face looking more mysteriously vacant than such faces look. Its mouth was large, and opened like the eyes of Gorgibuster in the pantomime, disclosing artificial gums, teeth, and all the organs of speech. There was no lecturer, no lecture, no music—none of the usual adjuncts of a show. The exhibitor, Professor Faber, was a sad-faced man, dressed in respectable well-worn clothes that were soiled by contact with tools, wood, and machinery. The room looked like a laboratory and workshop, which it was. The Professor was not too clean, and his hair and beard sadly wanted the attention of a barber. I have no doubt that he slept in the same room as his figure—his scientific Frankenstein monster—and I felt the secret influence of an idea that the two were destined to live and die together. The Professor, with a slight German accent, put his wonderful toy in motion. He explained its action: it was not necessary to prove the absence of deception. One keyboard, touched by the Professor, produced words which. slowly and deliberately in a hoarse sepulchral voice came from the mouth of the figure, as if from the depths of a tomb. It wanted little imagination to make the very few visitors believe that the figure contained an imprisoned human—or half human—being, bound to speak slowly when tormented by the unseen power outside. No one thought for a moment that they were being fooled by a second edition of the 'Invisible Girl' fraud. There were truth, laborious invention, and good faith, in every part of the melancholy room. As a crowning display, the head sang a sepulchral version of 'God save the Queen', which suggested inevitably, God save the inventor. This extraordinary effect was achieved by the Professor working two keyboards—one for the words, and one for the music. Never probably, before or since, has the National Anthem been so sung. Sadder and wiser, I, and the few visitors, crept slowly from the place, leaving the professor with his one and only treasure—his child of infinite labour and unmeasurable sorrow.' *(Hollingshead, My Lifetime, 1895)* ' The machine has been constructed from an attentive observation of the human organs of articulation; and the professor, by closely following nature in the formation of lungs, larynx, and mouth, has been able to make his machine extremely simple and manageable. [. . .] The mouth of this figure alone moves. At the back of the head is an apparatus like the bellows to a blacksmith's forge, which acts as lungs for a supply of air necessary to articulation. Then, on one side are a number of keys, not unlike those of a pianoforte, communicating with the internal arrangements of the figure. By touching these singly, the sounds of the alphabet are produced, and, by touching them in combiantion, words and sentences are rapidly uttered. Nothing can be more simple and ingenious than the whole arrangement, nothing more surprising than the effects produced. The appearance would, however, be more scientific if the figure, which answers no purpose, were altogether dispensed with. The German alphabet is uttered more distincly than the english alphabet - in fact the machine speaks English with a

German accent, but some sounds common to both languages are given with astonishing accuracy, as f, m, n, s, and x.' *(Littell & Littell, The speaking automaton)*

- *Sources*: J. Hollingshead (1895). *My lifetime*, 2 Vols. London: Sampson, Low, Marston & Co., Vol. 1, pp. 67–69.; The speaking automaton, in E. Littell & R. S. Littell. *The living age*, Vol. X, July–August–September 1846. Boston: E. Littel and Co.; *Chamber's Edinburgh Journal*, *141*, 12 September 1846, 168–171 (quoted in: S. Connor. (2000). *Dumbstruck: A cultural history of ventriloquism*. Oxford: Oxford University Press).

1848__ The first marriage is performed via telegraph

- *Comment*: The first marriage is performed via telegraph, for a bride in Boston and groom in New York. The transaction, like other business contracts conducted through the wire, is legally binding.
- *Source*: D. Miller (1998–2004). *Din Timelines* (electronic publication).

1849__ Teletraphone, Telegrafo parlante (Talking Telegraph)

- *Antonio Meucci (1808–1889)*
- *Comment*: First discovery of electrical transmission of speech. Telephone device is invented by Italian Antonio Meucci at Havana, Cuba, using electrical impulses—but not very effectively. Meucci was asked by a friend's doctors to work on Franz Anton Mesmer's therapy system on patients suffering from rheumatism. In 1849 Meucci developed a popular method of using electric shocks to treat illness and subsequently made an experiment developing a device through which one could hear inarticulated human voice. While providing a treatment to a patient with a 114V electrical discharge, in his laboratory Meucci heard his patient's scream through the piece of copper wire that was between them, from the conductors he was keeping near his ear. His intuition was that the 'tongue' of copper wire was vibrating just like a leave of an electroscope; which means that there was an electrostatic effect. In order to continue the experiment without hurting his patient, Meucci covered the copper wire with a piece of paper. Through this device he heard inarticulated human voice. 'I thought I heard this sound more distinctly than natural. I then put this copper of my instrument to my ear, and heard the sound of his voice through the wire. This was my first impression, and the origin of my idea of the transmission of the human voice by electricity.' He called this device 'telegrafo parlante' (lit. 'talking telegraph'). In 1856 Meucci reportedly constructed the first electromagnetic telephone. He constructed this as a way to connect his second-floor bedroom to his basement laboratory, and thus communicate with his wife (so to share information from one room to another in his house). Between 1856 and 1870, Meucci developed more than 30 different

kinds of telephones on the basis of this prototype. In a note dated 1857 Meucci describes his telephone: '[I]t consists in a vibrating diaphragm and in a magnet electrified by a wire wounded around it. When the diaphragm vibrates the magnet modifies the wire curren. These modifications, once they reach the other end of the wire, impresses similar vibrations to the receiving diaphragm, which reproduces the words.'

- *Source*: Compiled from various sources.

1852__ The first direct message from London to Paris

- *Comment*: In June 1852, the submarine telegraph between Dover and Ostend was completed, and on 1 November the first electric communication was established direct between Great Britain and the continent of Europe. 'By a line of wires between London and Dover, via Rochester and Canterbury, in connection with the submarine cable across the straits of Dover, instantaneous communication is obtain between London, Paris, Sweden, Trieste, Cracow, Odessa, and Leghorn. The wires are also being carried onward to St Petersburg; also to India, and into the interior of Africa. A project had been formed for constructing a submarine telegraph between Great Britain and the United States. It is proposed to commence at the most northwardly point of Scotland, run thence to the Orkney islands, and thence by short water lines to the Shetland and the Feroe Islands. From the latter, a water line of 200 miles conducts the telegraph to Iceland, thence to Greenland, and acorss Davis's Straits to Bryon's Bay, on the coast of Labrador. The entire length of the line is estimated at 2,500 miles—the submarine portion of it at 1,500 miles; and the expense of this great international work is estimated at £500,000.'
- *Sources*: A report of J. C. G. Kennedy, Superintendent of the Census, on telegraphs. *Friends' Review*, *6* (1853); Statement—Agricultural productions, value of improved and unimproved lands, agricultural improvements, etc.—The United States, p. 114 (quoted in: Miller, *Din Timelines*).

1852__ 'Les Soirées de l'Orchestre—Euphonia ou La Ville Musicale' (Evenings with the Orchestra)

- *Hector Berlioz (1803–1869)*
- *Translated excerpt*: 'An amphitheatre, comparable to those found in Greek and Roman antiquity, but built on vastly superior acoustic principles, is devoted to these monumental performances. It can accommodate on one side an audience of twenty thousand, and on the other ten thousand performers. [...] The signal for working hours and for meals, for assembly by quarters, by streets, rehearsals in large or small groups etc. is given by a gigantic organ placed at the top of a tower which rises above all the buildings in the city. This organ is powered by steam, and its sound is such that it can easily be heard at a distance of ten miles. Five centuries ago the talented maker A. Sax, to whom we owe the

invaluable family of brass reed instruments which bears his name, suggested the idea of an organ of this kind to perform the function of bells, but in a more musical way. He was dismissed as a lunatic, as also happened earlier to the unfortunate man who talked of the application of steam to sailing and railways, and as was still happening two centuries ago for those who persistently looked for methods of steering navigation by air, which has changed the face of the world. The language of the tower organ, a telegraph for the ear, is only intelligible to the Euphonians. They alone are familiar with telephony. The full potential of this valuable invention was sensed in the 19th century by a certain Sudre, and one of the harmony prefects of Euphonia has developed and perfected it to the point it has now reached. They also have telegraphy, and the directors of rehearsals need only make a simple gesture with one or both hands and their baton to indicate to the performers that they must play this particular chord, whether loud or soft, followed by this particular cadence or modulation, that they must play a given classical work with the full orchestra, or in a small section, or in a crescendo, with the various groups making their successive entries. [...] The full ensemble is then subjected to the composer's critical judgment; he listens from the top of the amphitheatre which the public will occupy. And when he feels fully master of this vast and intelligent instrument, when he is sure that all that is left is to indicate the vital nuances of the tempo, which he feels and can convey better than anyone else, then the time has come for him to become a performer as well, and he ascends the podium to direct the performance. A tuning fork fixed to each desk enables all the players to tune unobtrusively before and during the performance; practice runs and the slightest sounds from the orchestra are strictly forbidden. An ingenious mechanism which could have been invented five or six centuries earlier, if anyone had made the effort to devise it, and which responds to the conductor's movements without being visible to the public, displays before the eyes of each player, close to him, the beats in the bar, and also indicates precisely the different nuances of forte or piano. In this way the performers sense immediately and instantly the intentions of their conductor, and can respond as quickly as do the hammers of a piano to the hand that presses the keys. The maestro can then say in all truth that he is playing the orchestra. [...] The whole building and its musical ensemble would comprise a "huge intelligent instrument".' *(Translated from French by Michel Austin)*

- *Source*: H. Berlioz (1852). Euphonia ou la ville musicale. In *Les Soirées de l'Orchestre*. Paris: Michel Lévy Frères, libraires-éditeurs, 1852; and in the second edition, 1854, p. 292 and pp. 320–354.

1854__ Transmission électrique de la parole (Transmission of speech by electricity)

- *Charles Bourseul (1829–1912)*
- *Comment*: On August 18, 1854, Charles Bourseul, a French soldier and telegraphist, writes a paper articulating the concept of the telephone. The article

is published on 26 August in the *L'illustration Journal Universel*.

- *Translated excerpt*: 'I ask myself, for example, if speech itself, couldn't also be transmitted by electricity; in a word, if we couldn't speak in Vienna and be heard in Paris. This is how it can actually be achieved: we know that sounds are made by vibrations and are brought to the ear by the same vibrations reproduced by the intervening medium. Suppose that a man speaks near a movable disk, sufficiently flexible to lose none of the vibrations of the voice; that this disk alternately makes and breaks the currents from a battery; you may have at a distance another disk which will simultaneously executes the same vibrations.'
- *Sources*: C. Bourseul. (1854). Transmission électrique de la parole. *L'illustration Journal Universel*, 26 August, 139; quoted in: McVeigh, *An early history of the telephone*.

1854__ Acoustic Telegraphy & Telephony

- *Comment*: Acoustic telegraphy was also known as harmonic telegraphy. During the 1800s inventors tried to find ways of sending multiple telegraph messages simultaneously over a single telegraph wire by using different audio frequencies for each message. These inventors included Charles Bourseul, Thomas Edison, Elisha Gray, and Alexander Graham Bell. Their efforts to develop acoustic telegraphy to reduce the cost of telegraph wires led to the telephone. Here is the definition of the term 'téléphonie' (telephony) in the French *Dictionnaire Universel des Sciences, des Lettres et des Arts*:
- *Translated excerpt*: 'Telephony: Art of corresponding to long distances using sound: it is an acoustic telegraphy.'
- *Source*: M. N. Bouillet. (1857). *Dictionnaire Universel des Sciences, des Lettres et des Arts*, Troisième Édition, Deuxième Partie. Paris: Librairie de L. Hachette et Cie, p. 1614.

1855__ Le Métronome Électrique (Electric Metronom)

- *Mr Tassine, Mr Verbrugghe*
- *Comment*: 'There is another—traditional barbarism which every intelligent and energetic conductor should abolish. For choral or instrumental pieces which are to be executed behind the scenes, sometimes without participation of the main orchestra, a second conductor is indispensable. If the main orchestra accompanies this group, the first conductor, who hears this music from the distance, is strictly bound to let hiniself be guided by the second conductor and to follow his lead by ear. But if as frequently happens in modern music the full sound of the large orchestra prevents him from hearing the backstage music, the application of a special mechanism transmitting the meter becomes necessary to establish an instantaneous communication between the conductor

and the distant performers. For this purpose a number of more or less ingenious experiments have been carried out, whose results have not always met expectations. Only the electric metronome set up by Verbrugghe in the Brussels theater leaves nothing to be desired. It consists of copper wires attached to a voltaic pile placed beneath the stage; these wires connect the conductor's desk with a movable baton attached by a pivot in front of a board which is placed at any desired distance from the conductor. The desk is furnished with a copper key similar to a piano key, which has at its bottom a small protuberance of about a quarter of an inch. Immediately under this protuberance is a little copper cup filled with quicksilver. When the conductor wants to mark a beat, he presses the copper key with the forefinger of his left hand (his right hand holds the baton, as usual), where by the protuberance makes contact with the quick-silver. The electrical connection thus effected nfekes the baton at the other end of the wires oscillate. The electrical contact and the movement of the baton take place simultaneously, regardless of the distance. The musicians behind the scenes watching the electric baton are thus practically under the immediate direction of the conductor, who might, if it were necessary, conduct from the middle of the Opéra orchestra in Paris a performance taking place in Versailles. It is only necessary to agree beforehand with the chorus singers or with their conductor (if there is one, as an additional precaution) on the manner of beating the tune: whether the conductor is to mark all main beats or only the first beat in each bar. For the oscillations of the electric baton, taking place in only one direction, give no precise indication in this respect. When I first used this valuable instrument in Brussels, its action disclosed one shortcoming. Every lame the copper key was pressed down it touched another copper plate and, however soft the contact, there was a short noise which attracted the attention of the audience during the pauses of the orchestra, to the detriment of the musical effect. I pointed out the defect to M. Verbrugghe, who substituted for the copper plate the cup with quick-silver previously mentioned. The protuberance of the key enters into it without any disturbing noise. Only the electric spark emitted during the use of the instrument is still noticeable, but its crackling is so weak that the audience does not hear it The installation of the metronome is not expensive. Large opera houses, churches and concert halls should have been provided with it long ago. Yet it is nowhere to be found except at the Brussels theater. This might appear unbelievable if the carelessness of many theater managers, to whom music is only a means toward an end, were not well known. We are only too well acquainted with their instinctive aversion to whatever is off the beaten track, with their indifference to the interests of art, their parsimony where an expenditure for the best of music is needed, and with the ignorance of the basic principles of our art among those in whose hands its fate rests.' *(Berlioz, Treatise on instrumentation—Essay on conducting, 1855)* In November 1855, [...] Verbrugghe came to Paris to assist with the Exposition Universelle

concerts Berlioz mentions, on which occasion the five sub-conductors—Tilmant, Bottesini, Hellmesberger, Vautrot and Hurand—were all equipped with electric metronomes at some distance from Berlioz's beat. A cartoon by Cham in ''Le Charivari'' of 2 December 1855 imagined Berlioz wired to performers all over the globe.[...] When he first saw the electric metronom Berlioz, with justifiable pride, pointed out that he had imagined such an invention over ten years before, in his story ''Euphonia'', published in 1844.' *(Macdonald, Berlioz's Orchestration Treatise: A translation and commentary, 2002)* 'Immense preparations had been made for the grand musical ceremony, which took place to-day, at the Exhibition, under the direction of Mr. Hector Berlioz. The band and chorus, for many days past, underwent incessant drilling. The orchestra consisted of 120 violins, 45 tenors, 40 violoncellos, 38 double-basses, and upwards of 200 wind instruments. Only twenty harps, or rather harpîsts, could be found in Paris. Twelve performers on that instrument were therefore invited from London to swell this mighty mass. The chorus consisted of 230 male and 200 female voices, in addition to 70 juvenile choristers. The following was the programme: 1) Cantata for double chorus, Berlioz; 2) Overture, Der Freischütz (the andante played by twenty-four horns), Weber; 3) Chorus from Judas Maccabeus, Händel; 4) Andante and Scherzo finale from symphony in C minor, Beethoven; 5) Chorus and Airs de Danse, from Armida, Gluck; 6) Grand Chorus, ''Bénédiction des Poignards'', sung by eighty bass voices, from The Huguenots, Meyerbeer; 7) Prayer from Mosè in Egitto, accompanied by thirty harps, Rossini; 8) ''Ave Verum'', Mozart; 9) N° 1 and 2, ''Te Deum'' followed by ''La Marche des Drapeaux'', performed by thirty harps, the full orchestra, and six of Alexandre's orgues -melodium. [M. Berlioz] directed his musical phalanx with the assistance of a new machine, the ''metronome électrique'', invented by a Belgian, M. Werbrugghe. This machine contained five branches. A key is fixed to the desk of the conductor, who by touching it with his left hand marks the time electrically, to those at a distance, while his right hand gives the accustomed beat to those in his more immediate neighbourhood. It had not previously been tried in France, but is said to have been succesfully tested in Belgium and Germany.' *(The Musical World, 17, November 1855)*

- *Sources*: H. Berlioz. (1855). *Treatise on instrumentation—Essay on conducting*, enlarged and revised by R. Strauss (1948), including Berlioz's 'Essay on Conducting'. Trans. T. Front. New York: Edwin F. Kalmus, pp. 418–419; H. Macdonald. (2002). *Berlioz's Orchestration Treatise: A translation and commentary*. Cambridge: Cambridge University Press, p. 356; *The Musical World*, 17 November 1855, pp. 746–747; A. Delarue. (1857). Le métronome électrique. In T. Du Moncel (Ed.), *Exposé des applications de l'électricité*, Tome troisième: Applications Mécaniques, Physiques et Physiologiques, Deuxième Édition. Paris: Librairie de L. Hachette et Cie, pp. 123–125 (first published in: *Pilote du Calvados* and in *L'Indicateur de Bayeux*, 13 December 1855).

1856__ The Electric Harmonica

- *Mr Pétrina*
- *Comment*: 'In 1856, M. Pétrina, of Prague, invented an [...] arrangement, to which he gave the name of electric harmonica, although, strictly speaking, he had no thought of it as a musical instrument [...]: The principle of this instrument is similar to that of Neef's Rheotome, in which the hammer is replaced by slender rods, whose vibrations produce a sound. Four of these rods are placed side by side, and when moved by keys, and arrested by levers, produce combined sounds of which the origin may be easily shown. »It is true that nothing is said in this passage of the capabilities possessed by these instruments of being played at a distance; but this idea was quite legitimate, and German peridicals assert that it was accomplished by Mr. Petrina even before 1856. It was the result of what I said at the outset: ''that electro-magnetism may come to the aid of certain instruments, such as pianos, organs, etc. in order to enable them to be played at a distance'', and I also pointed out the expedients employed for the purpose, and even for setting them at work, under the influence of a small musical-box. I did not, however, ascribe importance to the matter, and it is only by way of historical illustration that I speak of these systems.'
- *Source*: T. Du Moncel. (1979). *The telephone, the microphone and the phonograph*. North Stratford: Ayer Publishing Co., 1974, p. 25.

1857__ Phonautographie de la voix humaine à distance (The human voice at a distance)

- *Édouard-Leon Scott de Martinville (1817–1879)*
- *Comment*: Scott de Martinville identified the sheet of phonautograms he deposited with the Institut National de la Propriété Industrielle in 1857 as documenting 'the human voice at a distance'. (Phonautographie de la voix humaine à distance). Edouard-Leon Scott de Martinville recorded someone singing an excerpt from the French folksong 'Au Clair de la Lune' on April 9, 1860, and deposited the results with the Academie des Sciences in Paris in 1861 (16 years before Thomas Edison invention of the phonograph). Four years earlier, in 1857, he deposited with the Institut National de la Propriete Industrielle as documenting 'Phonautographie de la voix humaine a distance (the human voice at a distance)', the first sound ever recorded. Two brief excerpts from two different records on this sheet are the earliest traces of his work played back to date, but his recording methods were not yet sophisticated enough at this time to yield audibly recognizable results. Scott attached another phonautogram to the 'certificate of addition' he deposited with the Institut National de la Propriété Industrielle in 1859. We believe it to be a record made by a tuning fork vibrating at 435 Hz, then just adopted as the official French reference pitch. This is the oldest recognizable sound yet reproduced. Scott recorded someone singing

an excerpt from the French folksong 'Au Clair de la Lune' on April 9, 1860, and deposited the results with the Académie des Sciences in 1861. The existence of a tuning-fork calibration trace allows us to compensate for the irregular recording speed of the hand-cranked cylinder. The sheet contains the beginning line of the second verse—'Au clair de la lune, Pierrot répondit'—and is the earliest audibly recognizable record of the human voice yet recovered.

- *Source:* Compiled from various sources.

1874__ Mind-watch communicator

- *Thomas A. Edison (1847–1931)*
- *Comment*: 'It is said that Mr. Thomas Edison is engaged in a new invention, which, if a success, bids fair to make all his other wonders fade into comparative insignificance. The proposition alone is enough to take any ordninary man's breath away, let alone its practical demonstration. It is to render commonucation between opposite ends of the earth possible without telegraph, telephone, or any of the many appliances known to modern society, or even a wire.'
- *Original excerpt*: 'Your friend abroad carries a small machine of this new invention, in size and shape resembling a watch. You carry a similar one. When you wish to communicate with your friend, you take out the watch, the needle of which is in electric sympathy with his machine. The needles oscillates like that of a compass, and when you find the direction in which it points you turn in that direction and think hard. That is all. The claim is that concentrated thought will produce an electric current, and that the mechanism of the new invention is so delicate that it will respond to this current.'
- *Sources*: *Tuapeka Times*, 7 September 1895, p. 2 (quoted in: C. Marvin. (1990). When old technologies were new: Thinking about electric communication in the late nineteenth century, in *Dazzling the multitude: Original media spectacles* (p. 155). Oxford: Oxford University Press).

1874__ Musical or Harmonic Telegraph

- *Elisha Gray (1835–1901)*
- *Comment*: Elisha Gray knew how to generate and transmit sounds with electricity. Thus he asked himself: 'Can I transmit chords, for example, many notes, or signals, on a single telegraph line?' To demonstrate his ability to transmit chords, Elisha Gray built an eight oscillator bank that can be controlled with a piano keyboard. Rapidly, the technical demonstrations attracted people interested in music. Thus, Gray developed a two octave version of the 'harmonic telegraph' and toured the entire United States. The success of sound generation and transmission changed Gray's interests: instead of developing multiplex techniques, he became interested in sound and especially voice. Excerpt of the announcement of the concert at Highland Park,

Chicago, on December 29, 1874 : 'The Blaney Lodge Quartette from Chicago [...] and other favorites vocalists, and a unique and extraordinary feature will be the first public exhibition of Elisha Gray's Electric Telephone, by means of which, a number of familiar melodies, transmitted from a distance, through telegraphic wire, will be received upon violins and other instruments, within the room.'

- *Source*: Anonymous (1881). The harmonic telegraph. *Brotherhood of Locomotive Engineers Monthly Journal*, *15*(3), March.

1875__ 'Une Ville Idéale' (An Ideal City/Amiens in the Year 2000)

- *Jules Verne (1828–1905)*
- *Comment*: The wireless remote control at long distance had been the principal theme of the work of the French physicist and doctor Edouard Branly from 1890 to 1905. The French author Jules Verne wrote in 1875 a speech about the city he lived, and where Edouard Branly was born. Jules Verne, director of Académie des Sciences, des Lettres et des Arts d'Amiens, addresses a meeting December 12, 1875 and tells the membership how he envisions the city of Amiens may be in the year 2000. Jules Verne who would have been 172 in the year 2000 dreamt some day that he was hanging around in a totally unknown city. He predicted that the music of the future, represented for instance by 'A reverie in A minor on the square of the hypothenuse', would be 'neither human or celestial—no lilt, no beat, no melody, no rhythm: quintessence of Wagner, audiomathematical, etc.'. One item of this text described the retransmission by remote control in real time of a music concert between concert halls. In this novel we find the first description of a networked concert—Amiens/London/Vienna/Roma/Petersburg/Peking. Musical recitals are sent by wire from an artist to pianos all over the globe. *(Compiled from various sources)*
- *Sources*: J. Verne. (1875). *Une Ville Idéale en l'an 2000*. Édition annotée par D. Compère, maître de conférence à l'Université de Paris III Sorbonne Nouvelle, Édition CDJV—La Maison de Jules Verne, sous la direction de J. P. Dekiss, Amiens, 1999, pp. 18–29 (quoted in: J. Vareille, P. Le Parc & L. Macé. (2007). Web remote control of mechanical systems: Delay problems and experimental measurements of round trip time, in J. Chiasson & J.-J. Loiseau (Eds), *Applications of time delay systems* (p. 118). Paris: Springer).

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