

Origin of modern opera, modern science, and modern communications satellites:

- 1520-1591: Vincenzo Galilei: father of modern acoustics, sung drama, and Galileo (whom he taught experimentation); after reading Galilei's music-theory book, Johannes Kepler formulates his 3rd law of planetary motion, leading to modern satellites

Telephony:

- 1821: After a demonstration of Charles Wheatstone's "enchanted lyre," *Repository of Arts* predicts wired opera broadcasts
- 1848: "Telakouphanon" (acoustic telephone) service delivering opera to homes for a fee predicted in *Punch*
- 1849: Antonio Meucci, technical director of Havana Opera's Teatro Tacón (and former stagehand and effects technician at Florence's Teatro della Pergola) begins experiments on sound transmission by electricity via wire
- 1876: *The New York Times* predicts box-office drop at Academy of Music if opera available to homes via telephone
- 1877: Aria transmitted Providence to Boston; *Punch's Almanack for 1878* predicts telephone delivery of opera to homes
- 1878: *Don Pasquale* carried by telephone lines in Bellinzona, Switzerland from opera-house auditorium to nearby room
- 1880: Microphone developed specifically for opera at David Moseley & Sons, Manchester, England; Edward P. Fry probably 1st person to listen to opera at home via telephone (applauds what he likes); opera carried 80 km from Zürich to Bâle
- 1882: Scotland's National Telephone Company allows home/office access to operas at Dundee's Theatre Royal
- 1885: Opera-at-home subscription service begins in Lisbon, 180,000 *reis* for a 90-opera season; *The Electrical Engineer* reports in 1888 subscriber headphone listening (possibly earliest reference to consumer headphones)
- 1887: *Faust* carried live from Paris to Brussels (Massenet's *Le Mage* carried live from Paris to London listeners in 1891)
- 1889: Théâtrophone pay-for-time opera-by-cable begins in Paris, spreads globally; Marcel Proust subscribes
- 1893: Hungarian Telefon-Hirmondó opera-by-wire service offers 1st newscasts (ended by World War II destruction)
- 1908: Dictograph carries live sound from Metropolitan Opera stage to general-manager Heinrich Conreid's office

Playback & recording:

- 1733: Music from Handel operas played by Henry Bridges's Microcosm clock (Handel program draft from 1732)
- 1784: Automaton built for Marie Antoinette plays Gluck opera music on hammered dulcimer
- 1860: Oldest opera recordings ("phonograph"), from Massé's *La reine Topaze*; not played back until 2009
- 1878: 1st aria recorded with intention of playback, Marie Rôze singing from Gounod's *Faust*
- 1885: Music-box opera discs, 1st mass medium for sound; lead to disc changers and coin-operated players (1st juke boxes)
- 1889: Oldest known surviving aria recording intended to be played, bass Peter Schram singing from *Don Giovanni*
- 1900: Metropolitan Opera librarian Lionel Mapleson begins 1st non-interfering location performance recordings
- 1903: *Ernani* 1st "full-length" (abridged) opera recording (40 disks); nearly complete *Pagliacci* recorded in 1907
- 1907: Caruso records *Vesti la giubba* 3rd time; earliest million seller; digital deconvolution later (1976) restores sound
- 1976: First commercial digital 16-bit audio recorder (Soundstream) & recording: *The Mother of Us All* at Santa Fe Opera

Sound broadcasting:

- 1673: Acoustic opera transmission beyond the house ("plazacast") suggested by Athanasius Kircher in *Phonurgia Nova*
- 1900: Acoustic broadcasts from Eiffel Tower via Auxeto-Gramophone compressed-air amplified phonograph
- 1907: Recorded and synthesized ("telharmonium") opera music transmitted by radio (possibly 1906; historians disagree)
- 1910: Radio broadcasts of live operas transmitted directly from Met; 2nd marred by radio-telegraph beer message
- 1919: Opera radio broadcasts in Chicago and New Brunswick, NJ via military transmitters, latter heard live 2000 miles at sea
- 1920: Melba sings in UK (pre-BBC) with enough power to be outlawed; Teatro Coliseo whole season aired in Buenos Aires
- 1921: Opera radio broadcasts common in Berlin, Chicago, & Denver; 1922 Salt Lake City *Bohème* has mother-son lovers
- 1926: Teatro Colón, Buenos Aires, orders own opera broadcast transmitter (1911 London Opera wireless used for ticket sales)
- 1928: African-American composer Harry Freeman's *Voodoo* (trimmed) broadcast on WGBS in 1928 before stage premiere
- 1929: Cesare Soderò's *Ombre Russe* broadcast in totality on NBC radio before opening on stage
- 1931: Regularly scheduled Saturday-afternoon Metropolitan Opera radio broadcasts begin (haven't stopped yet)
- 1937: CBS commissions Gruenberg's *Green Mansions* as "non-visual opera" with sound effects (1st radio commission 1932)
- 1938: *Carmen* broadcast from edited film recording on WQXR (Salzburg Festival operas recorded on sound film in 1937); edited Lily Pons note in 1949 delayed Metropolitan Opera broadcast of *Lucia* causes scandal
- 1939: First scheduled FM broadcast includes opera *Francesca da Rimini*
- 2006: Sirius Satellite Radio begins offering a 24-hour Metropolitan Opera channel

Stereo:

- 1881: Clément Ader demonstrates stereo transmission from Paris Opéra; Victor Hugo is "charmed" by the sound
- 1895: UK Electrophone opera-by-wire service offers stereo headphones (headphones used for opera at least since 1888)
- 1925: Berlin Opera broadcasts stereo radio via two radio stations (possibly earlier)
- 1952: *The Los Angeles Times* reports Orpheum Theater equipped with stereo sound for Met's 1st cinema transmission
- 1973: Texaco Metropolitan Opera Radio Network becomes world's 1st live in stereo (initially to 12 U.S. cities)
- 1976: New York City Opera's live telecast *The Ballad of Baby Doe* carried to more than half of all U.S. households in stereo

Community television:

- 1877: Letter to *The Sun* [NY] describes possible live transmission of opera pictures and sounds to theatres worldwide
- 1919: Hugo Gernsback suggests in *Radio Amateur News* live radio sound to accompany filmed pictures in cinemas
- 1952: Met *Carmen* transmitted to 31 cinemas in 27 cities; TV stations must relinquish network feeds for the event
- 1986: Basel Opera *Lucia* plazacast, followed by Houston Grand Opera in 1995 and then others
- 2006: Metropolitan Opera live HD plaza, Times Square, and international and HD cinema transmission
- 2007: SF "Opera at the Ballpark" begins at AT&T Park (32,000 at 2010 *Aida*); 2008 D.C.; 2012 Dallas (Cowboys Stadium)

Home television:

- 1882: Albert Robida's *Le Vingtième Siècle* predicts (& illustrates) opera delivered to homes via "téléphonoscope"
- 1891: Edison predicts opera television (in color) to be shown at 1893 World Columbian Exposition in Chicago (not shown)
- 1928: Fritz Reiner proposes conductor camera for remote cueing
- 1934: BBC transmits first opera on TV, highly condensed (half-hour) version of Bizet's *Carmen*
- 1936: BBC carries Coates's *Pickwick* on TV before stage opening; Lockhart-Mummery predicts live 3D color TV opera
- 1937: *La serva padrona* becomes 1st full-length opera broadcast on TV; child actors lip-sync singers in *Hansel & Gretel*
- 1938: Paul Nipkow Sender in Berlin broadcasts *Der Schauspieldirektor* opera from film (repeatedly); BBC-commissioned Hughes radio opera *Cinderella* televised (1951 NBC *Amahl and the Night Visitors* is 1st commissioned originally for TV); dancers, choreographed by Anthony Tudor, "step-sync" a live BBC *Tristan* with off-screen singers
- 1947: New London Opera Company (UK) *Don Giovanni* 1st opera telecast from stage (Cambridge Theatre); Met 1948
- 1949: *NBC Opera Theater* starts 16-year run; U.S. commercial TV broadcasters commission many operas in Golden Age
- 1953: First compatible-color television program seen at home is NBC Opera Theater's *Carmen*
- 1954: DuMont Television moves to New York's Central Opera House (began *Opera Cameos* in 1953)
- 1958: Swedish Television shoots *Orfeo ed Euridice* at Drottningholm as a test for Pelé's 1st football/soccer World Cup
- 1963: Menotti's *Labyrinth* uses video effects that cannot be achieved on the stage (requirement of UK channel 4 in 1989)
- 1966: New Met house wired for TV (with camera position in cloak room to show furs being checked); never used
- 1967: Bayreuth *Lohengrin* rehearsal part of 1st round-the-world satellite television broadcast
- 1971: New York City Opera's *Le Coq d'Or* 1st opera on only cable television; uses USAF-developed low-light technology
- 1976: New York City Opera's *Barbiere* uses 1st live TV subtitles (not in opera house until 1983 despite 1881 UK patent)
- 1989: Bavarian State Opera's *Ring* shot in HDTV, followed next year by Seattle (*War & Peace*) and Met (*Semiramide*)

"Silent" movie era:

- 1852: Paris Opera special-effects master Jules Duboscq patents 1st photographic motion-picture projection system (in 3D)
- 1888: Edison files caveat with U.S. Patent Office for motion pictures, saying their purpose is for opera; Le Price gets French patent 188,089, for "Method and Apparatus for projection of Animated Pictures, in view of the adaptation to Operatic Scenes"
- 1896: First operetta films shown in Germany; Georges Hatot's *Faust*, released by Lumieres in 1897, based on Gounod's opera
- 1898: *The Daughter of the Regiment* is the 1st filmed opera (two minutes) to be shown; *Martha* is shot on film and, then, in
- 1899: *Martha* is shown at the Eden Musée with live performers singing behind the screen; technique popular though 1922 cinema opera *Jenseits des Stromes* (with projected score at bottom of screen; other systems for cueing musicians in opera movies used small conductor image or signal lights built into the set)
- 1899: Georges Méliès's *Cendrillon* movie based on the same year's Massenet opera of the same name
- 1902: *Faust et Méphisto* by Alice Guy, 1st female film director, for Gaumont (not her 1st movie)
- 1915: Geraldine Farrar becomes silent-movie star based on success onstage as *Carmen*
- 1919: Hugo Gernsback proposes live sound, distributed by radio, to cinemas projecting silent opera movies

"Sound" movie era:

- 1894: First synchronized-sound movie uses music from Planquette's opera *Les cloches de Corneville* (restored in 2000)
- 1900: At Phono-Cinéma-Théâtre at Paris Exhibition, synchronized-sound arias are screened, including Victor Maurel singing arias from *Don Giovanni* and *Falstaff* and Émile Cossira singing aria from *Roméo et Juliette*; 1905 Cinémato-Gramo-Théâtre
- 1902: Aria from *Carmen* in an Alber's Electro Talking Bioscope movie in Netherlands
- 1906: Cinemafono Pagliej sound-movie system introduced in Rome specifically for opera
- 1907: "Complete" *Faust* (22 arias), using Chronophone system
- 1908: Cinophon short *Ach wie so trügerisch* synchronizes an actor to Caruso's recording of *La donna è mobile*
- 1913: First complete opera shot in U.S. with synchronized sound, *Pagliacci*
- 1952: Two scenes from La Scala *Aida* are part of 1st Cinerama movie
- 2009: Opéra de Rennes *Don Giovanni* live 3D to cinemas (before *Avatar*); 2010 Folkoperan *Faust*; 2011 ENO *Lucrezia*
- 2011: Non-live stereoscopic 3D *Carmen* from London's Royal Opera opens in cinemas worldwide followed by *Butterfly*

Crossed fields & miscellany:

- 1726: Production of *Giulio Cesare* in Hamburg uses motion-image projection (lantern with moving slides)
- 1842: Antoine Claudet shoots 1st snapshot (short-exposure photograph) of ballet dancers from "the Italian Opera" in London
- 1853: Parliamentary news delivered by telegraph to patrons of Royal Italian Opera House, Haymarket, London
- 1885: Live remote baseball viewed at Augusta, GA opera house; idea spreads nationwide for half-century; 1st sportscasts
- 1899: Lawsuit by Giuseppe Verdi over telephonic transmission of *La donna è mobile* establishes broadcast rights
- 1926: Vitaphone moves to the Manhattan Opera House, where *Don Juan* sound feature is recorded
- 1927: Term "horse opera" used to describe western movie, based on the word *melodrama* ("soap opera" in 1939); Weill opera *Royal Palace* incorporates film sequence (Berg's *Lulu* has one in 1937)
- 1928: Weill's *Der Zar läßt sich photographieren* has record playback in score; Krása's 1938 *Brundibár* has barrel organ
- 1949: Term "space opera" used to describe science-fiction (related "time opera" for time travel used starting in 1955)
- 1951: Oscar-winning film-score composer Bernard Herrmann writes opera (opera composer Erich Korngold won Oscars for 1936 & 1938 movies); Menotti directs film of his *The Medium* (previously directed for TV in 1948 and stage in 1946)
- 1958: Moore's *Gallantry* opera based on soap opera, complete with commercials
- 1987: Adams's *Nixon in China* is 1st "newsreel opera" or "CNN opera;" Yavelow's *Countdown* called 1st "computer" opera
- 1994: *Countdown* (above) called 1st opera in cyberspace; *Honorio in Ciberspazio* called 1st Internet opera (1st webcast 1995)
- 2000: *Virtopera* performed in multiple countries and on the Internet
- 2006: The World Opera project for geographically distributed performance begins; research labs tackle sync issues