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 1581 music-theory book, Johannes Kepler formulates 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; continues them in NYC
- 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 with Mefistofele 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: Ditograph carries live sound from Metropolitan Opera stage to general-manager Heinrich Conrœd’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 on Edison phonograph
- 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’s 3rd Vesti la giubba earliest-recorded 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 Phnomurgia Nova
- 1900: Acoustic broadcasts from Eiffel Tower via Auxeto-Granophone compressed-air amplified phonograph
- 1907: Recorded and synthesized (“tetharmonium”) opera music transmitted by radio, interferes with Navy wireless
- 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 Sodero'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 when it doesn’t match reviews
- 1939: First scheduled FM radio 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 Electropheone 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 opera 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 cinema transmissions; 2007 multi-language
- 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 Bobida’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; CCTV used onstage in 1965 Boston *Intolleranza*
- 1934: BBC transmits 1st 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 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 Nigh 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
- 1952: Two scenes from La Scala becomes 1st opera on only cable television; uses USAF-developed low-light technology
- 1958: Swedish Television shoots *Le Coq d’Or* 1st opera on only cable television; uses USAF-developed low-light technology
- 1958: Moore’s *Gallantry* is 1st opera based on soap opera, complete with commercials
- 1963: BBC carries *Der Zar läßt sich photographieren* in Hamburg uses motion-image projection (lantern with moving slides)
- 1966: Blue 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 Prince gets French patent 188,089, for “Method and Apparatus for projection of Animated Pictures, in view of the adaptation to Operatic Scenes”

"Sound" movie era:
- 1896: First operetta films shown in Germany; Georges Hatot’s *Don Giovanni* uses video effects that “cannot” be achieved on the stage (requirement of UK channel 4 in 1989)
- 1915: Geraldine Farrar becomes silent-movie star based on success on opera stage as Carmen

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 won by Giuseppe Verdi over telephonic transmission of *La donna è mobile* establishes broadcast rights
- 1927: Term “horser opera” used to describe western movie, based on the word melodrama (“soap opera” in 1939; Weill opera *Royal Palace* incorporates film sequence in score (Berg’s *Lulu* has one in 1937)
- 2005: The World Opera project for geographically distributed performance begins; research labs tackle sync issues