Stage Lighting & Sound
History of Lighting & Sound Recording
History of Lighting

- The Greeks
  - Performed all day in natural light
  - Simple sets, black curtains to represent night, painted lightning
History of Lighting

- The Romans
  - Borrowed from the Greeks, emphasis on spectacle
  - Big special effects: burned houses on stage, erupting craters
  - Indoor theatres
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- The Romans
  - Borrowed from the Greeks, emphasis on spectacle
  - Big special effects: burned houses on stage, erupting craters
  - Indoor theatres
  - Lit with candles, oil lamps and torches
History of Lighting

- Medieval Period
  - Back to the Greeks
  - Performed outdoors or in churches
  - Relied on natural light
History of Lighting

Cathedral nave

Cathedral – view of the aisles
History of Lighting

Fig. 2. A medieval church setting: conjectural scale reconstruction based on Southwell Minster
History of Lighting

- Medieval Period
  - Productions had common elements
    1. mansions – sets depicting Biblical locations
    2. platea – common playing area in front of mansions
    3. secrets – stage machinery used to create special effects, trap doors and rigging was used to move people
History of Lighting

- The Renaissance
  - Sebastiano SERLIO (1475-1554)
    1. The beginning of modern theatre
    2. Returned to classical sources, rediscovered Roman periaktoi
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    1. The beginning of modern theatre
    2. Returned to classical sources, rediscovered Roman periaktoi
    3. Used candles and oil lamps but began concealing the source
    4. Distinguished between scenic lighting and lighting effects
History of Lighting

- The Renaissance
  - Sebastiano SERLIO (1475-1554)
    4. Distinguished between scenic lighting and lighting effects
    5. Described scene painting in conjunction with lighting

Painted Drop

Visualization of Drop with lighting
History of Lighting

- The Renaissance
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    5. Described scene painting in conjunction with lighting
    6. Described place glass vessels called ‘bozze’ filled with wine or other liquids to produce colored light, the curved bottle also functioned as a convex lens enabling the light to be focused
History of Lighting

- Elizabethan Period
  - Nicola SABBATINI (1574-1654)
    1. Wrote a book on theatrical techniques
    2. Sketched a method for mechanical dousing
History of Lighting

- Elizabethan Period
  - Inigo JONES (1573-1652)
    1. Brought Italian stage and lighting methods to England
    2. Stage methods included forces perspective
    3. Erected many theatres particularly at Whitehall
History of Lighting

- Elizabethan Period
  - Joseph FURTTENBACH (1573-1652)
    1. German architect and scenic designer, studied in Italy
    2. First to suggest lighting above the borders and behind wings
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History of Lighting

- 18th Century
  - Very little innovation since the 17th century
  - Some improvements to candle technology

Royal Danish Theatre, 1740

Footlight
History of Lighting

18th Century

- Aimé Argand (1750-1803)
  1. Swiss inventor, chemist and physicist
  2. Developed the Argand burner in 1782, an oil lamp whose chimney increased airflow and brightness by ten fold
History of Lighting

- 19th Century
  - GASLIGHT
    1. Developed by William Murdoch in late 1700s using coal gas
    2. First demonstrated in 1804 by F.A. Winsor in London
    3. Fixtures used as wing lights, foot lights and border lights

Gas Wing Light
Backstage light with protective cage
History of Lighting

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  - GASLIGHT
    1. Developed by William Murdoch in late 1700s using coal gas
    2. First demonstrated in 1804 by F.A. Winsor in London
    3. Fixtures used as wing lights, foot lights and border lights
    4. Not widely used until the 1840s
    5. Presented various problems
      - Each theatre had to produce its own gas, no central plants
      - Created unpleasant fumes and excessive heat
      - Extreme fire danger, most theatre fire codes come from this
    6. Intensity and cues controlled by a central ‘gas table’
    7. The ‘fishtail’ burner, used after 1850, increased efficiency
    8. Produced a greenish light, but could be ‘gelled’ with colored cloth stretched over the wire guards
History of Lighting

• 19th Century
  • LIMELIGHT
    1. Invented by Thomas Drummond in 1816
    2. Used hydrogen & oxygen to heat a block of limestone to incandescence, produced a very intense white light
    3. Lime was enclosed in a hood and fitted with a lens, 1st spotlight
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    3. Lime was enclosed in a hood and fitted with a lens, 1st spotlight
    4. Not widely used until the 1850’s
    5. Also used for sun and moon-light effects
    6. Expensive to operate and potential fire hazard
History of Lighting

- 19th Century
  - ARCLIGHT
    1. Carbon arc first demonstrated by Sir Humphrey Davy in 1808
    2. Two carbon electrodes were brought together close enough to ‘spark’ allowing electrical current to arc across the gap
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  - ARCLIGHT
    1. Carbon arc first demonstrated by Sir Humphrey Davy in 1808
    2. Two carbon electrodes were brought together close enough to ‘spark’ allowing electrical current to arc across the gap
    3. First used at the Paris Opera House in 1846
    4. Huge batteries in the basement provided power
    5. Combined with a reflector and lens arclight was used for both followspots and floodlights
    6. Required experienced operators to maintain the gap distance between electrodes
History of Lighting

- 19th Century
  - INCANDESCENT LIGHT
    1. First demonstrated by Thomas Edison in 1879
    2. Used a carbon filament contained in a evacuated glass envelope, burned for 40 hours

Patent diagram, 1880

16w bulb, 1890
History of Lighting

- 19th Century
  - INCANDESCENT LIGHT
    1. First demonstrated by Thomas Edison in 1879
    2. Used a carbon filament contained in a evacuated glass envelope, burned for 40 hours
    3. Tungsten filament developed in 1909
    4. First used by the Paris Opera House in 1880
    5. The Savoy Theatre in London was the first theatre to use electric light exclusively in 1881, powered by a 120 hp steam engine
    6. Many theatres refurbished their gaslight system with electric lights, vastly increasing the intensity of light in the theatre
    7. The advent of dimmers allowed for precise control of intensities
History of Lighting Design

- Adolphe APPIA (1862-1928)
  1. Established modern practices of non-illusionistic theatre

Sketch for Parsifal, 1896
History of Lighting Design

- Adolphe APPIA (1862-1928)
  2. Influenced by Wagner’s concepts of artistic unity

Sketch for Die Walküre, 1896
Adolphe APPIA (1862-1928)

3. Advocated three dimensional scenery

Set for Orpheus and Eurydice, 1912
History of Lighting Design

- Adolphe APPIA (1862-1928)

  4. Saw light as the visual counterpart to music
     light responds to movement and mood

Sketch for *Tristan und Isolde*, 1923
History of Lighting Design

- Adolphe APPIA (1862-1928)
  5. Established the role of the director, one person envisioning and supervising the mounting of a production

Sketch for *Pasifal*, Act 3, 1896
History of Lighting Design

- Gordon CRAIG (1872-1966)
  
  1. Began as an actor, worked as a designer, director and theorist
     saw theatre as an independent art form

Sketch for The Steps, 1905
History of Lighting Design

- Gordon CRAIG (1872-1966)
  2. Saw stage elements as tools like a painter’s brushes

Sketch for *The Steps*, 1905
History of Lighting Design

- Gordon CRAIG (1872-1966)

  3. Had many of the same ideas as Appia, but publicized them better worked with Stanislavsky on *Hamlet* at Moscow Art Theatre in 1912

Sketch for *The Steps*, 1905
History of Lighting Design

- Gordon CRAIG (1872-1966)

4. Saw theatre as a visual medium and heavily influenced modern design, his sketches indicate grand size and epic lighting
History of Lighting Design

- Gordon CRAIG (1872-1966)

  5. Developed the idea of a unit set capable of expressing the entire spirit of a work
History of Lighting Design

- Robert Edmond JONES (1887-1954)
  1. Studied in Europe 1912-15 with Gordon Craig
  2. Sought to make theatre design evocative and not descriptive
  3. Wrote *The Dramatic Imagination* (1941), definitive text for metaphorical and non-illusionistic theatre design
    “Lighting a scene consists not only in throwing light upon objects but in throwing light upon a subject.”
History of Lighting Design

- Robert Edmond JONES (1887-1954)

Sketch for Macbeth, 1920
History of Lighting Design

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Sketch for Macbeth, 1920
History of Lighting Design

- Stanley McCANDLESS (1897-1967)
  1. Considered to be the grandfather of lighting designers
  2. Taught the first stage lighting design class in 1926 at Yale
  3. Wrote *A Method of Lighting the Stage* (1932) in which he proposed the first systematic method for theatrical lighting, later known as the McCandless Method
History of Sound

- The Greeks
  1. Placed emphasis on actor’s voice in speech, recitative and song
  2. Music was integral, accompanied choral odes
  3. Amphitheatre architecture provided excellent acoustics
  4. Some researchers think masks offered amplification, though this is mostly disproven due to the excellent amphitheatre acoustics
History of Sound

○ Research into Sound
  • Leonardo da Vinci (1452-1519) : sketched design for a tube speaker
  • Joseph Louis Gay-Lussac (1778-1850) : determined velocity of sound at sea level (1130 ft/s)
  • Felix Savart (1791-1841) : measured frequencies of musical pitches
  • Hermann von Helmholtz (1821-1894) : developed laws of harmonics, resonance
History of Sound

- PHONAUTOGRAPH (1857)
  1. Invented by Leon Scott (1817-1879)
  2. Visibly recorded sound vibrations on blackened paper
History of Sound

- PHONOGRAPH (1877)
  1. Invented by Thomas Edison (1847-1931)
  2. Fruit of experiments to develop a telephone signal repeater
  3. Edison foresaw many uses such as the answering machine, dictation
  4. Built with tinfoil cylinder as recording medium
History of Sound

- **PHONOGRAPH** (1877)
  5. A.G. Bell patented the Gramophone using a wax cylinder (1881)
  6. Emil Berliner developed a flat disc for recording (1887)
  7. By 1900 the standard was a shellac disc spinning at 78 rpm, allowed mass production of discs
History of Sound

- PHONOGRAPH (1877)
  8. Western Electric developed the electric pickup (1918)
  9. Sawyer created the crystal (piezoelectric) pickup (1931)
  10. DC motors replaced by rim-drive system, increasing quality (1938)
  11. Shellac replaced with vinyl plastic, allowed smaller groove and higher speeds, 45 and 33 1/3 rpm (1944)
  12. Stereo sound developed (1957)
History of Sound

- MAGNETIC RECORDING

1. Oberlin Smith suggested the wire recorder (1888)
   Valdemar Poulsen made first working model in 1898
History of Sound

- MAGNETIC RECORDING
  2. First audio tape (paper/FeO) created by Fritz Pfleumer (1928)
  3. Different mediums experimented with including a tungsten/steel strip so dangerous it had to be housed separately from the operator, a reel of tape for a half-hour program weighed 25 kg (55 lbs)
History of Sound

- MAGNETIC RECORDING
  4. Polyester replaced paper as substrate (1957)
  5. Polyester tape found wide use in the music industry, easy to edit
  6. Phillips introduced the 8-track cassette tape (1963)
     gained popularity in car stereos
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  7. Sony released the Walkman (1979) used stereo cassette tape, was portable and easily editable
History of Sound

- DIGITAL AUDIO

1. Charles Babbage (1791-1871) theorized analytical engine (1842), his Difference Engine was the predecessor to modern computers.
History of Sound

DIGITAL AUDIO

2. Harry Nyquist (1889-1976) wrote about sampling theory (1928) - sampling is a method of turning analog signal into digital information

3. NHK demonstrated digital audio tape (DAT) recorder (1967)

4. Phillips introduced prototype compact disc (CD) player (1979)

5. Phillips and Sony developed CD standard for mass production (1980)


7. First CD marketed in the US (1983)