

PC Programs FOR ENGINEERS

The IEEE Virtual Museum

The IEEE has a wealth of services for its members (and for nonmembers). One of the most interesting of these is the IEEE Virtual Museum. This is a Web site that contains a treasure house of information for the engineering community. The Web site URL is given at the end of the article. When you access it, be prepared to find yourself thoroughly hooked. The resources cover the gamut from the video and sound transcript of Neil Armstrong's Apollo 11 moon walk to the battles between Edison and Westinghouse over whose electricity (dc or ac) was safer. You can even watch Edison take you on a personal tour of his light bulb factory!

Program: IEEE Virtual Museum

Purpose: This column explores a Web site containing instructional, historic, and technical information about a wide range of electrical engineering and related subjects. The information is presented under four main topics, Exhibits and Stories, People, Technologies, and Events. In addition, there is a search utility that can be used to pinpoint specific topics. Some details and some examples from each of the sections follow.

Exhibits and Stories

This section has two subsections, *Socket to Me: How Electricity Came to Be* and *The Beat Goes On: How Sounds Are Recorded and Played*. The first subsection starts out with "The E- Behind Everything." Make sure that you don't have your audio turned up very high when you click on this because there's a kite flying in a thunderstorm (with "real" thunder). The



other topics in the subsection are listed in Figure 1.

There is a wealth of interesting stories contained in these topics. The "Telegraphs and Telephones" topic tells how Alexander Bell said "Mr. Watson, come here I want you," not only as the first room-to-room telephone message but also 27 years later as the first trans-continental telephone message. To the latter, Watson replied, "It'll take me five days to get there now."

Many of the topics contain interactive animations. The "Television" topic contains one that shows how the camera scans an object and how it is displayed on the screen. "Transistors and Chips" covers the development of the transistor from the first one (Bardeen, Brattain, and Shockley) in 1947 (a picture is included)

all the way up to the famous "ants" speech given by Gordon Moore (co-founder of Intel) about the number of transistors in the world. You can actually watch and listen to him give the speech. In the topic on lasers, you can watch and hear a lecture about how lasers work. In the "Electricity and the Body" topic, you can see a picture of the first X ray of a human body part ever made. It was done in 1895 by Wilhelm Röntgen of his wife's left hand (complete with wedding bands).

The second subsection is *The Beat Goes On: How Sounds are Recorded and Played*. The topics are shown in Figure 2. Among the highlights that you might

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The E- Behind Everything
 Making Electricity Work: Putting Theory Into Practice
 Telegraphs and Telephones
 Light and Power
 Radio
 Television
 Transistors and Chips
 Computers
 Nuclear Power
 Lasers, Fiber Optics, and Other Bright Ideas
 Electricity and the Body

The Birth of Recording
 The Jazz Age
 The Talkies
 Swingtime!
 The Age of Hi-Fi
 Digital Audio

2. Topics found in the "The Beat Goes On: How Sounds are Recorded and Played" exhibit.

1. Other topics in the "The E- Behind Everything" section of the IEEE Virtual Museum.

want to check out are a picture and a sound recording of Enrico Caruso (in "The Jazz Age" topic).

In "The Talkies" topic you can see and listen to a 1930s Bell Telephone Laboratories animated film explaining how sound was added to film. In "Swingtime!" you can see a young Glenn Miller and listen to his orchestra. In the "Digital Audio" topic you can listen to the Chemical Brothers and Tim Rowlands and Edward Simons in concert (this takes a Quicktime plug in).

People

This section contains lots of information about some of the most well-known names in electrical engineering history.

Andre-Marie Ampere
 Edwin H. Armstrong
 John Logie Baird
 John Bardeen
 Alexander Graham Bell
 Walter H. Brattain
 Marie Curie
 Lee De Forest
 Thomas Alva Edison
 Edison's Children
 Michael Faraday
 Philo T. Farnsworth
 Enrico Fermi
 Benjamin Franklin
 Luigi Galvani
 Joseph Henry
 Heinrich Hertz
 Guglielmo Marconi
 Glenn Miller
 Samuel Morse
 David Sarnoff
 William Bradford Shockley
 Nikola Tesla
 Alessandro Volta
 George Westinghouse

3. These are just some most well-known names in electrical engineering history that are included in the "People" section.

Some of the names are shown in Figure 3. Photographs are also included. Some of the historical tidbits are fascinating. Ampere's career spanned the French revolution. His father was a civil servant who was executed by the guillotine. Armstrong's invention of the superheterodyne circuit (an extension of his invention of the regenerative circuit as a junior at Columbia) made him a wealthy man. His invention of FM, however, led to protracted law suits and patent litigation and led to his sad suicide. Brattain's parents were teaching in China when he was born. He grew up on a cattle ranch in Washington and later claimed that he put his cattle-herding skills to good use when he went to work in large research groups in laboratories. Curie died of leukemia most likely acquired from the long exposure to high levels of radiation involved in her research. Edison had an unusual courtship. He taught his fiance Morse code and used it to communicate with her at boring parties by tapping messages into her hand. According to Edison, he proposed by tapping "Will you marry me" into her hand. She responded by tapping "Yes." Morse was a successful portrait painter who became frustrated at being away from home so extensively. He looked for a way to use electricity to communicate long distances. Werner von Siemens was jailed for participating in a duel. He used his time in prison to conduct chemistry experiments and patented a gold and silver electroplating process.

Technologies

This section contains introductory discussions of a large collection of today's technologies. Some of the topics covered are listed in Figure 4. Many of these topics

are interesting to read. The "Carbon Transmitter" topic describes the development of the device that served the telephone industry for almost 100 years. The "Compact Disks" topic describes the process by means of which CDs are mass produced from a master. The "Electron Tubes" topic has an interesting picture of a diode made by John Fleming in about 1904. In the "How Did the Telegraph Work?" topic there is a picture of Samuel F.B. Morse's experimental telegraph from about 1836. It has a large wooden frame which Morse (he was an artist) called the "canvas stretcher." "How Does a Motor Work?" includes an animated single-pole-pair, single-wire-loop motor. "How Is a Laser Made?" includes a short video from Charles Townes (inventor of the MASER) describing laser operation. "Integrated Circuits" has a picture of the first integrated circuit made by Jack Kilby of TI in 1959. "Light Bulbs" includes two black-and-white movies showing early light bulb construction. In the "Battery" topic, you can play an interactive game to see which fruit or vegetable can generate the highest electric potential. In the "Etheric Force" topic you can read how Edison actually "almost discovered" radio in 1875, 24 years before Heinrich Hertz proved the existence of radio waves. In the "Transformers" topic, there is a video that describes how Michael Faraday's induction ring became the first transformer.

Events

This section contains one of the most fascinating collections of information in the museum. A partial list of the topics is given in Figure 5. The topic on ac versus dc tells of the battle between Edison (dc)

Cassette Tapes
 CAT, MRI, and Ultrasound
 Compact Disks (CDs)
 Digital Audio Recorders
 EKGs and EEGs
 Electron Tubes
 Farnsworth's Image Dissector
 Fiber Optics
 How Does a Computer Work
 How Is a Laser Made
 How TV Works
 Integrated Circuits
 Nuclear Power Generators
 Quadraphonic Stereo
 The Pacemaker
 The Transistor
 Transformers
 What Is an Electrostatic Generator
 X Rays

4. Some of the topics covered in the "Technologies" section.

AC vs. DC: The Struggle for Power
 Altair, a Computer in a Kit
 Building the Great Eastern
 Chess Records
 Colossus: Computing's Mystery Machine
 Did the Telegraph Broaden Women's Sphere?
 Disco and Discs
 Dolby Laboratories
 Electric Car
 ENIAC
 First Broadcast from Another World
 Franklin Flies a Kite
 Home Music Copying Laws
 Morse Code: Language of the Telegraph
 Napster
 Panic at Three Mile Island
 Pearl Street Station: The Dawn of Commercial Electric Power
 Play Dough: The Big Business of Televised Sports
 Pong: Yes, People Really Played It
 Shippingport: Using the Atom to Generate Electricity
 Telephone Lines Connect the Coasts
 The Chipmunks
 This Won't Hurt a Bit: Using Lasers in Medicine
 Zuse's Computers

5. A partial list of the topics available in the "Events" section.

and Westinghouse (ac) for supremacy in electric power distribution. One of Edison's ploys was to claim that ac was lethally dangerous. He recommended that the state of New York use it for executing criminals. He wanted them to call the electric chair the "Westinghouse Chair," and coined the term "Westinghoused" for "electrocuted." In the "Altair, Computer in a Kit" topic, there is a picture of the Altair 8800, the first computer for popular use. The "Building the Great Eastern" topic tells the story of the giant coal/sail ship and how it was used to lay the first transatlantic cable. The "Telegraph/Women's Sphere" topic tells how the predecessor of modern Internet dating occurred in the 19th century as romance between men and women telegraph operators. The "Fessenden" topic tells the story of his Christmas Eve broadcast in 1906, the first music and voice program transmitted over long distances. The "First Broadcast from Another World" topic has the video transcript of the 1969 *Apollo 11* moon landing with Neil Armstrong's fa-

mous "That's one small step for man ..." The "Mass Producing Records" topic has a movie of RCA Victor records being pressed one at a time. In the "Nipper and Friends" topic you can read the story of the black and white fox terrier who "listened" to "His Master's Voice" on RCA Victor record labels and ads. In the "Chipmunks" topic you can hear a recording of the world's most talented rodents. This is from the early 1960s. If you're old enough, it will be a real memory trip for you.

One of the most useful features of the museum is that it includes internal links from every topic to any of the museum's related resources. This includes related exhibits, related people, related events, and related technologies. In addition, links are provided to other Web resources. Examples are the Edison National Historical Site, the Smithsonian, the Danish Museum of Electricity, the Deutsches Museum in Munich, and many others.

Availability: The museum may be accessed at:

<http://www.ieee.org/museum>

If you go there, prepare to be fascinated. You will find items like (my favorite) the radio at sea topic. This tells the story of Jack Binn, the 25-year-old radio operator of White Star Liner Republic. In dense Atlantic fog, in 1906, an off-course Italian liner, the *Florida*, crashed into his ship. His radio cabin's walls were destroyed in the crash, but for 12 hours he stayed by his post in the icy cold on his sinking ship. His efforts guided rescue ships to the scene, and, except for two passengers and four crew members killed in the actual crash, all passengers and crew were saved. Jack was awarded a medal for his heroism from the French government. In addition, three years later, in recognition of his heroism, the White Star Lines offered him the most prestigious radio operator's position in its entire fleet. It was on the *Titanic*! Fortunately, he declined. CD ■