IEEE PHILADELPHIA 1903 2003

IEEE in the Delaware Valley from 1903 to 2003

— PART 2 OF 4 —

Electro-Technology has played an important role in the development of the Delaware Valley, and the IEEE has been instrumental in bringing together the professionals who have made it all possible.

During this, the Centennial Year of the IEEE Philadelphia Section, we are endeavoring to highlight many of the projects, products, and services that have taken place here. This is the second of four issues of the Almanack that will tell this story.

THE ALMANACK ISSUES WILL INCLUDE:

1. Electric Power Industry.
2. **Consumer, Commercial, and Industrial Products and Communications.**
3. Computers and Instrumentation.
4. Defense and Aerospace.

A good case can be made that what was accomplished within the territory of the Philadelphia Section is the most innovative and far reaching of any of the IEEE USA Sections. You can form your own assessment after reading this history.

CONSUMER, COMMERCIAL & INDUSTRIAL PRODUCTS AND COMMUNICATIONS

VICTOR TALKING MACHINE CO.

The Delaware Valley was instrumental in developing one of the most popular home entertainment devices during the last 100 years: the phonograph. Invented in 1877, the original phonograph utilized an elongated cylinder type record. In May 1888, the circular disc, horizontal record began to evolve with the demonstration of Emile Berliner's "Gramophone" phonograph at the Franklin Institute, 15 South 17th Street, Philadelphia (now occupied by the Atwater-Kent Museum).

Sequentially this recreational music standard evolved from manual to electric motor operation, 8" records at 78 RPM, to 12" records at 33-1/3 RPM and from mono to stereo.

The phonograph's main components are (1) a free-swinging tone arm, (2) a revolving turntable holding the record, (3) a pickup cartridge which changes vibrations from the records into electric waves, (4) an amplifier which strengthens these waves, and (5) a loudspeaker which changes the waves into sound.

The following is a brief history of the phonograph evolution:

In 1877, German-born inventor Emile Berliner, sold a telephone invention to Alexander Graham Bell. This invention brought Berliner professional prestige and provided him with financial security to pursue an alternative approach to the cylinder type phonograph. Berliner investigated etching sound as a horizontal pattern on a metal disc coated with an acid-resistant material. During recording, the vibrating diaphragm caused the stylus to remove the acid-resistant material from the sound trace on the disc. After an acid-etching process, the disc was used as a master to make stampers for the production of duplicate records in a soft material that hardened when cooled.

Berliner discs provided several advantages over cylinders: ease of duplication; a groove which guided the sound box, eliminating the need for a propelling mechanism; hard groove walls which provided louder reproduction and longer wear; and ease in storage and shipment. However, the process produced extraneous noise. The walls of the grooves were rough due to the etching procedure. Berliner named his hand-propelled reproducing instrument the "Gramophone" and demonstrated it at the Franklin Institute in May 1888. It was not until 1893, when a satisfactory method of producing a stamping matrix for hard rubber records was developed, that Berliner felt he could offer the Gramophone for sale.

In 1895, a group of Philadelphians headed by Thomas S. Parvin set up the Berliner Gramophone Company of Philadelphia as a manufacturing unit. Berliner's basic disc phonograph patents were held by the U.S. Gramophone Company. The Company's operations were at 1026 Filbert Street and the recording studio at 424 South 10th Street in Philadelphia. The hand-propelled Gramophone could not maintain constant pitch while it played, until a satisfactory spring motor was developed by Eldridge R. Johnson in Camden, New Jersey. This motor operated at uniform speed, could be regulated, was quiet in operation, and inexpensive to use. Between 1896 and 1900, almost 25,000 motors were made. From 1896 to the summer of 1898, Johnson made motors, sound boxes and metal parts, and delivered completed instrument to Berliner Gramophone.

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In August 1900, Leon F. Douglas joined with Johnson to form the Consolidated Talking Machine Company. The first recording was made at the 10th Street studio in Philadelphia in May 1900. The new Johnson recording process was used for making the record matrices and an improved Gramophone was introduced. The "His Master's Voice" painting of Nipper by Francis Barrat, which had been purchased by the Gramophone Company Ltd. In England and copyrighted in the U.S. by Emile Berliner, was used in Consolidated's catalog and advertising. Nipper and the improved Gramophone were to become on of the most widely used and recognized trademarks in the world. (You can still see it from the Benjamin Franklin Bridge, on an old RCA building in Camden.)

In December 1900, the trade name "Victor" was introduced for instruments and 7" (177.8 RPM) records.

His Master's Voice

By the fall of 1901, Johnson's disc records had made serious inroads on wax cylinders, which had been recognized by the trade and the public as the standard of quality. Now all large and influential music houses, accepted the Victor machines and records. The Victor Talking Machine Company was incorporated on October 3, 1901. Instruments were assembled in the four-story factory at 120 North Front Street in Camden. The recording laboratory remained at Berliner's 10th and Lombard location in Philadelphia. Records were pressed by the Duranoid Company, until the Camden operation at 23 Market Street began in 1902.

Victor's record catalog consisted mostly of military bands such as Sousa's, banjo soloists like Vess L. Ossman, recitations, and comic songs. There was no classical music or artist of any stature. Ten classical records made in Milan with Johnson's improved recording process on April 11, 1902, were an artistic and commercial success. They were regarded as the first completely satisfactory Gramophone records yet made.

The new sensational tenor, Enrico Caruso, was signed to an exclusive contract by Victor. His voice complemented the acoustic recording and playback processes. Caruso's first American recordings were made on February 1, 1904. The enclosed-horn, talking machine, the "Victrola" was introduced in 1906. It sold for $200 and was an immediate success. The matrix and shipping departments were moved from Philadelphia to Camden and the Victor cabinet factory was constructed along with a new building for executive offices and recording laboratory.

Photo courtesy of Frederick O. Barnum III

Enrico Caruso, the world's most famous opera singer, signs his first contract with Victor, and makes his first Victor recordings in the Company's first recording studio: Room 826, Carnegie Hall, New York City on February 1st. His contract with Victor validates the high quality of recorded music and sets the standard for all other artists and musicians to follow.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

Victor's artist roster during the period of 1910-1913 included George M. Cohan and Al Jolson. Dance records were much in demand. Entry of the United States into World War I in April, 1917, had a great impact on the company; some notable firsts in recordings were made during that year. Symphony orchestra recordings of the Philadelphia Orchestra under Leopold Stokowski were made in October 1917. In November, Victor made Jascha Heifetz's first recordings. A new studio, housed in the former Trinity Baptist Church, gained renown because of its pipe organ and fine acoustics.

The phonograph industry had introduced little basic technological innovation to improve its product. Victor had not completely ignored the possibility of electrical recording, but its effort was hardly up to the challenge.

Electrical recording experiments were conducted in 1913, using an electromagnetic recording head for making recordings from radio and microphone sources. The approach was strictly trial and error.

In December 1924, electrical recording and improved

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acoustical playback equipment was demonstrated in Camden for the technical staff. Both Victor and Columbia obtained rights from Bell Laboratories, for electrical recording and the re-entrant horn acoustical playback system.

On February 2, 1925, the new recording equipment was delivered. The first popular artist, electrical recording was made on March 16, by the Mask and Wig Club Male Quartet and Orchestra of the University of Pennsylvania. A number of new recordings, including "March Slav" by the Philadelphia Orchestra, were chosen for demonstration of the Credenza Orthophonic Victrola, a hand-wound, acoustic talking machine with re-entrant horn. Management ordered 10,000 instruments to be built. A total of 19 other models were introduced in 1925 to be followed by 24 more in 1926. Victor had signed with RCA for radio chassis and electrical playback apparatus. One of the most elaborate models, dubbed the "Orthophonic Victrola - Orthophonic Electrola and Radiola," could play records acoustically or electrically, contained an eight-tube superheterodyne radio, and had a list price of $1,000. The new instruments and recordings received wide public acceptance.

In June of 1926, the Philadelphia Orchestra made its first of many world standard recordings, at the Academy of Music. In December 1926, Eldridge Johnson sold his interest in the Victor Talking Machine Company to a group of bankers. On March 15, 1929, the Victor Talking Machine Company was acquired by the Radio Corporation of America as a manufacturing facility. The merger with RCA enabled Victor records to weather the lean depression years better than any other recording company.

Photo courtesy of Frederick O. Barnum III

1929

World-renowned trademark of His Master's Voice, featuring Nipper, the fox terrier, listening to a talking machine/ phonograph, joins the Radio Corporation of America when it purchases the Victor Talking Machine Company, Camden, NJ on March 15th for $154 million. At the time of acquisition, the Victor Company has grown to a 58-acre complex, containing 31 buildings with over 2.5 million square feet of floor space. Cumulative sales (1901-1929) include over 8 million Victor Victrolas ($413 million) and over 600 million Victor Records ($272 million).

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

The decline of the longstanding phonograph's popularity began in the 1970s with the increasing use of magnetic tapes, and finally in the 1990s, with the compact discs (CD) player with laser pickup.

1949

Photo courtesy of Frederick O. Barnum III

A revolutionary new system for reproduction of recorded sound is designed, developed, and introduced on January 11th by RCA Victor Division, Camden, NJ: a 6 7/8-inch unbreakable, vinylite phonograph record and fast-changing player. Production of 25 million units in 1949 doubles to 50 million units in 1950. This is the world's first 45-rpm phonograph record and player.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

RCA— A HISTORICAL PERSPECTIVE

The Early Years

It has often been said that the story of the Radio Corporation of America outlines the larger story of the era of radio broadcasting. Peculiarly enough the company was not organized with radio broadcasting in mind, although it is significant that the man whose name is so closely associated with the history of RCA and who for many years was its active head, David Sarnoff, had

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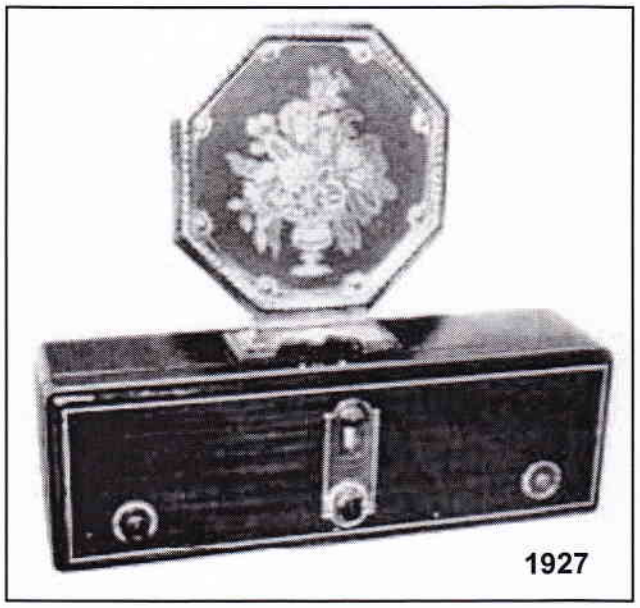
clearly visualized the possibilities of radio broadcasting service and even "electric tuning" long before broadcasting made its first appearance.

During RCA's first year (1919-1920), attention was directed almost exclusively on communications, but in 1921 the first rumblings of what was soon to become a broadcasting boom began to be heard. RCA entered this field on July 2, 1921, when a one-day broadcast was made from a temporary station at Hoboken, N.J., on the occasion of the Dempsey-Carpentier fight. Just prior to the start of broadcasting, RCA had given thought to furnishing radio amateurs reception and transmission apparatus. The line of amateur apparatus was expanded as quickly as possible to include home broadcast receiving equipment and RCA now entered the merchandising field with GE and Westinghouse as manufacturers.

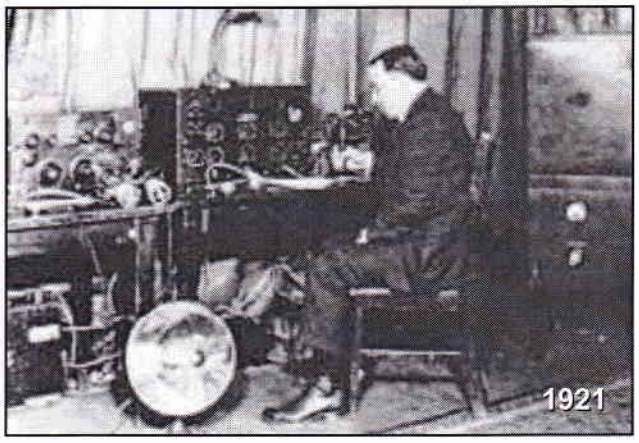
In 1925 a receiver was sold with accessories permitting it to be operated from alternating current. In the same year the electrodynamic loudspeaker debuted.



Radiola 17, the first AC radio.

The Victor Talking Machine Company at Camden had been seriously affected by the growth of radio and had not been particularly successful in its attempts to enter the radio field. In order to obtain manufacturing facilities, RCA purchased the Victor Company, including the manufacturing plant, the phonograph business, and the Victor dog trademark. RCA also took over tube manufacturing from GE and Westinghouse. In 1929, the RCA Communications Company was formed to take over all the business in transoceanic communications.

In 1930, RCA completed the consolidation in the RCA Victor and Radiotron companies of all facilities of



RCA's first broadcast station began operating on December 15, 1921, in Roselle Park, NJ. In 1926, RCA and its associates integrated a complete broadcasting service and formed the National Broadcasting Company.

research, engineering, manufacturing, and sales of RCA products, which included phonographs and records. In 1932, the Photophone business was taken over by the RCA Victor Company. (The RCA Photophone Company had been organized in 1928 to supply the motion picture industries with a system for recording sound on film.)

The final step toward an independent RCA took place in 1932. In 1934 the tube business was augmented by the purchase of certain patents from the De Forest Radio Company. In 1935, the manufacturing and merchandising business was further consolidated by the merger of the RCA Radiotron and RCA Victor Companies.

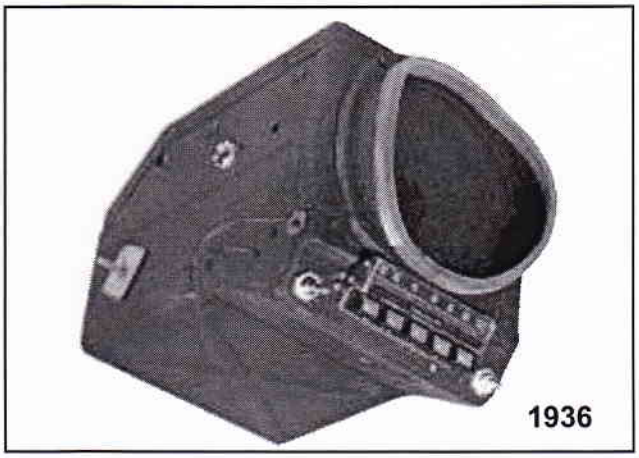


Photo courtesy of Frederick O. Barnum III

The RCA Manufacturing Company, Camden, NJ begins selling radios to General Motors for factory installation into Buick automobiles. This is the first factory-installed automobile radio in the United States.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

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In 1938, RCA was in transition from a radio communications concern to a broadly diversified electronics organization with a growing interest in such new fields as radar, television, and airborne electronics. In April 1939, seven years of intensive research, engineering development and field testing by RCA culminated in the introduction, at the New York World's Fair, the first public television service.

In 1946, the aluminized picture tube was developed, which provided twice as much brightness, with no increase in power needed. This process became standard in all picture tube production throughout the industry. The development of the Vidicon, a miniature pickup tube with a photoconductive surface, in 1949 pointed the way to smaller television cameras in industrial and educational applications.

RCA's Major Milestones from 1906 to 1953 are listed below:

1906 First Victrola produced.

1931 RCA invents Velocity or Ribbon microphone, which becomes broadcasting industry standard.

1936 RCA begins production of first factory-installed automobile radio for Buick.

1937 RCA demonstrates first microwave scanning radar capable of identifying and locating moving ships.

1939 David Sarnoff introduces television to the American public at the NY World's Fair.

1940 RCA develops and demonstrates first practical electron microscope.

1941-1945 RCA produces 5.5 of the 10 million radio proximity fuses used in World War II.

1941-1945 RCA produces first miniaturized airborne video surveillance systems and TV guided missile systems for U.S. in World War II.

1949 RCA designs, develops and introduces the world's first 45-rpm phonograph record and player.

1953 FCC approves the RCA all-electronic compatible color TV system as the industry standard in the U.S.

Black and White Television

The official inauguration of television service was the harbinger of a new era in mass communications, but it required a keen eye to see in the actual event the shape of the nationwide television service we know today. It was an extremely limited service, covering only the New York metropolitan area, and operating on the "experimental" basis authorized by the Federal Communication Commission. Programs emanating from the NBC transmitter atop the Empire State Building were viewed on a relative handful of 9-inch direct view and 12-inch reflection-type receivers produced at Camden, N.J., for sale in the New York area.

Photo courtesy of Frederick O. Barnum III

RCA President David Sarnoff introduces television (developed by Dr. Vladimir Zworykin and his staff in Camden, NJ) to the American public when he is televised on April 20th by NBC during the dedication of the RCA Exhibit Building at the World's Fair in New York. This is the world's first televised news event.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

Standing before the iconoscope cameras in front of the RCA Building at the World's Fair on April 20, 1939, David Sarnoff announced the beginning of regular television service by NBC. And he added:

> "Now we add sight to sound. It is with a felling of humbleness that I come to this moment of announcing the birth in this country of a new art so important in its implications that it is bound to affect all society....This Miracle of engineering skill which one day will bring the world to the home, also brings a new American industry to serve man's material welfare...."

It was during 1946 that RCA Victor placed the first post-war television sets on the market. The Basic Model was the famed 630TS with a ten-inch picture tube. Marketed at a price of $375, the 630TS' economy, reliability and high quality swept into immediate popularity. The Nations' first quantity produced and marketed receiver, it was televisions equivalent of the "Model T." As much as any other single factor, the 630TS was responsible for the swift appearance of television in American homes during the post World War II years.

In 1945, RCA developed the TK 10 — the first commercial Black and White image orthicon TV Camera — followed by the development in 1954 of the TK-40 — the first commercial color TV camera. The most noteworthy accomplishment in 1945 was the TK-76, the first self-contained high-quality portable television camera for electronic journalism.

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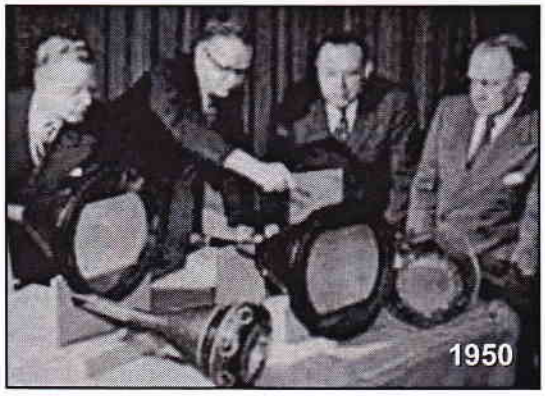
Color Television

As the commercial television system expanded, RCA undertook an energetic postwar program of color television research and development. Although mechanical techniques offered promise in terms of early commercial advantage, RCA decided, soon after the war, to strive for an all-electronic color system fully compatible with black-and-white. Outstanding progress was achieved at RCA Laboratories during 1947 and 1948. Several demonstrations were held showing a color system employing three kinescopes, and combined with an optical system to present a composite color picture.

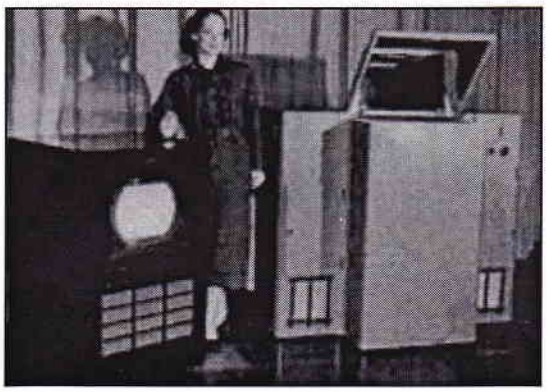
In 1949, the FCC scheduled a series of hearings to consider, among other matters, the establishment of standards for color television transmission. At issue were two competing systems — a non-compatible mechanical color system and an all-electronic compatible color system advocated by RCA.

As the hearings progressed the research staff of RCA Laboratories, supported by engineering groups at the tube plants at Harrison, N.J. and Lancaster, PA, moved with full speed to the development of the final basic element in the compatible system—a single tube capable of producing pictures in full color. The result of this extraordinary effort, demonstrated publicly in March 1950, was the tricolor kinescope, one of the outstanding achievements in early postwar electronics. In the words of General Sarnoff, "Measured in comparison with every major development in radio and television over the past 50 years, this color tube will take its place in the annals of television as a revolutionary and epoch-making device... As the master key to practical color television, it is an outstanding development of our time."

The most important development by far to RCA in the years 1958 to 1962 was the emergence of color TV as a new industry and public service of massive and mounting proportions. By 1961, there occurred—finally—the long awaited color break-through. One by one, TV receiver manufacturers abandoned the sidelines and entered the ranks. By the following year, nearly every major TV manufacturer was actively marketing color, and industry volume reached $200 million. RCA shared in the late 1960s boom in broadcast equipment sales resulting from the conversion of TV stations to color and the launching of new stations. One product was the TCR-100 Video Tape cartridge recorder/player. First placed in service in 1971, the system ushered in a major change in television broadcast operations.



RCA scientists examine five types of tri-color TV picture tubes developed by RCA. L to R: Edward W. Herold, Dr. E. W. Engstrom, Dr. H. B. Law, and Dr. V. K. Zworykin.



Illustrating progress in development of receivers for RCA color television system: right, research model demonstrated to FCC, October 10, 1949; left, developmental model demonstrated December 5, 1950.

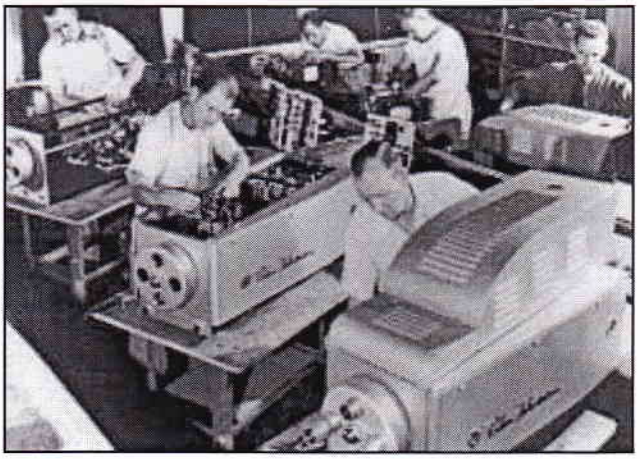


Photo courtesy of Frederick O. Barnum III

On December 17th, 1953, the FCC approves the RCA all-electronic compatible color television system as the industry standard in the US. RCA Victor Division, Camden, NJ begins manufacturing color television transmitters, receivers and antennas for both studio and field use. These are the first mass-produced color television broadcasting systems in the US.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

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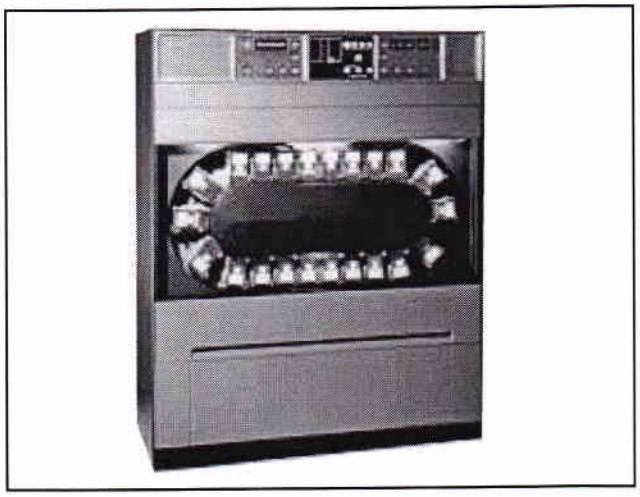

Photo courtesy of Frederick O. Barnum III

RCA Commercial Electronic Systems Division, Camden, NJ produces the TCR-100 video tape cartridge recorder/ player for the worldwide television broadcasting industry. The TCR-100 is the first videotape recorder/player to automatically air pre-recorded commercials, promotions, station identifications and other segments. Each pre-recorded segment could be between 20 seconds and three minutes in length. RCA Camden, NJ receives an Emmy Award for this technical achievement in 1974.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

In 1974, RCA introduced the TR-600 Video Tape Recorder, which took advantage of the increasing emphasis on cost effectiveness by incorporation into its design capabilities formerly offered only as accessories. In 1981, RCA Broadcast Systems, Camden, N.J., introduced the Hawkeye, a portable color TV camera and recorder, which produced a new flexibility in electronic news gathering by making field production by a single person a practical reality.

Photo courtesy of Frederick O. Barnum III

RCA Broadcast Systems, Camden, NJ introduces the Hawkeye, a portable color TV camera and recorder, which provides new flexibility in electronic news gathering by making field video production by a single person a practical reality. This is the first compact, broadcast-quality color TV camera and video tape recorder in a single, hand-held unit (first camcorder). For this technical achievement, RCA Camden, NJ receives another Emmy Award.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

Broadcast Communications

Television and radio broadcasting is so much a part of the present-day scene in the United States and round the world, that one could easily overlook that it is still developing and growing. Major changes in techniques and services provided have occurred and still more changes are visible. Using cameras, recorders and switching or mixing equipment, programs are put together from live input material. In most cases today, this process is done ahead of time and the total program is recorded. The process of preparing recorded program material is called production or teleproduction (for television).

Broadcasters compete vigorously to be first with a newsbreak and so want to minimize the time delay from shooting pictures at a news scene until finished material is available for airing. There has been a trend to dong news "electronically," using television cameras and videotape recorders. Called "electronic news gathering" or "electronic journalism," it provides greater immediacy, better quality on-air, and lower cost of operation. Electronic journalism led to a special category of equipment optimized for portability, flexibility, ease of operation, and reasonable performance. RCA's electronic journalism camera, the TK-76 was very successful.

Photo courtesy of Frederick O. Barnum III

The photo above is an aerial view of the Gibbsboro Facility in the early 1980s. The facility was closed in 1985, when RCA closed its Broadcast Systems Division.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

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Broadcast Antennas

To provide a larger and more modern home for its Broadcast Systems' Antenna Assembly and Test Operation, RCA Camden, NJ purchased 130 acres of land in Gibbsboro, NJ in 1954 and built a new facility here in 1957. Continually expanded over the next 25 years, the Gibbsboro Test Facility (lower right photo on page 13) was the largest of its kind in the world. Among the products produced here was the 351.5-foot, 363-ton antenna for the World Trade Center in New York City, which, upon its completion in 1979, became the world's largest multiple TV-radio broadcast antenna (accommodating 10 TV and 15 radio stations simultaneously).

Microwave Relay Systems

The pioneer development of the microwave radio relay system by RCA was started in Camden, N.J., in 1943. It was the first in the world to employ microwave frequencies in multi-hop service. It used the new techniques and components developed for 10 cm radar. The circuits operated originally at 3 GHz but were later shifted to 4 GHz. A 10 MW Western Electric reflex klystron was used as the transmitter and was cavity stabilized. Antennas for transmission and reception were 1-meter-diameter parabolic dishes. A double FM modulation method was used to provide multiplexed voice audio program, and teleprinter channels within a base bandwidth of 150 kHz.

Forestry-type towers, about 35 meters high and spaced 50 to 60 km apart, were used at the relay stations at Bordentown, Ten Mile Run and Woodbridge, New Jersey. The terminals were at Building 8 of RCA, in Camden, and at the Western Union Telegraph Company, 60 Hudson Street, in New York City. The Camden Terminal was later moved to a Western Union location on the Merchants National Bank Building at city Hall Square, in Philadelphia. This New York to Philadelphia circuit was made part of the New York-Washington route of Western Union, and handled commercial traffic on an experimental basis for extended periods, beginning in 1945.

After the commercial success of this radio relay system was demonstrated to the great satisfaction of Western Union, RCA took a contract from the latter and built equipment for a triangular route of 23 relay stations with terminals at New York City, Pittsburgh, and Washington, D.C. This project extended from 1946 to 1948. The equipment was used commercially and continuously by Western Union for over 20 years. Some of the RCA apparatus was donated by Western Union to the Smithsonian Museum after its retirement from service. It is historically significant as the first microwave radio relay equipment in a commercial system in the world.

Many other systems of lengths up to 5,000 km were built by RCA to this same or improved designs. The worldwide use of microwave relaying for wide-band services has followed this pioneer work by RCA.

Transmitters

With the purchase of the Victor Talking Machine Company, Camden, NJ on March 15th, 1929, the Radio Corporation of America was able to consolidate all its radio and television research, engineering and manufacturing into a single location for the first time. Personnel from Radio Corporation of America, New York, NY; General Electric Company, Schenectady, NY; and Westinghouse, Pittsburgh, PA combined forces in Camden for the development of radio and television broadcast and receiving equipment for commercial and government customers. For the next five decades, RCA Camden dominated the worldwide commercial broadcast equipment market, manufacturing studio cameras, audio and video tape recorders, microphones, audio and video consoles, telecine equipment, antennas, and transmitters for radio and television stations around the globe.

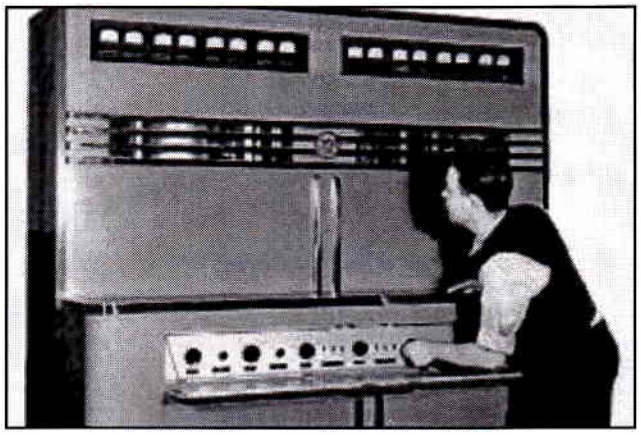

Photo courtesy of Frederick O. Barnum III

Pictured here is the TT-1A television broadcast transmitter, built at RCA Camden in 1938 and first sold to the commercial industry in 1939.

(Photo caption courtesy of Frederick O. Barnum III, author, His Master's Voice in America.)

Image Orthicon

A highlight of wartime research in optics and television was the development of the image Orthicon, started at Harrison in 1941 on the basis of much earlier work and completed at Princeton. With a sensitivity 1,000 times greater than that of the Iconoscope, it provided in wartime, a versatile pickup device for

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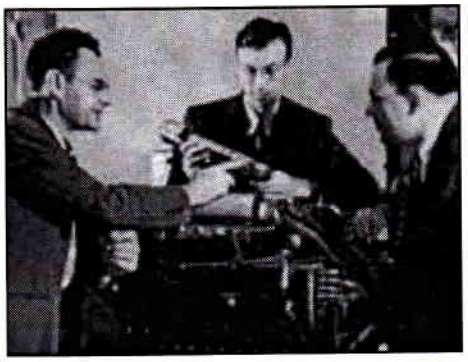
military television systems. For postwar television, it meant completely flexible operation in the studio or in the field.

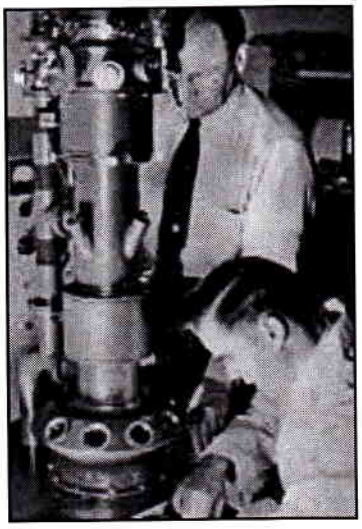


Co-inventors of the image orthicon for TV cameras, Drs. Albert Rose, Paul K. Weimer, and Harold B. Law, are shown with first model in 1945.

Dr. George A. Morton (left) and Dr. John E. Ruedy with intensifier orthicon camera tube which can see in surroundings completely dark to the human eye.

Electron Microscope

In 1962, RCA manufactured and delivered its 1000th electronic microscope, assembled on the same production line in Camden that completed the first commercial instrument nearly a quarter of a century earlier. The microscope attains magnifications of more than 200,000 diameters. This first practical electron microscope enabled researchers to study viruses, such as influenza, for the first time.



Electron microscope with Dr. V. K. Zworykin (standing) and Dr. James Hilier, its developer, November 1940, in Camden, NJ. Hilier's design vastly improved the objective lens in 1947.

ATWATER KENT MANUFACTURING COMPANY

The origin of the Atwater Kent Manufacturing Company dates to 1896, when a young A. Atwater Kent dropped out of Worcester Technical Institute in Massachusetts to start his own business in his father's machine shop. Kent manufactured and sold small electrical items. In 1902 Kent traveled to Philadelphia on a business trip and decided upon the city as the site of his new company. The Atwater Kent Manufacturing Works opened in a rented loft at 48 North Sixth Street. It manufactured electrical products including batteries and inter-communicating telephones. In 1906 Kent developed an ignition system for automobiles that integrated a series of weak sparks into a single hot spark. The Unisparker, as it was called, soon became the industry standard. The product's success caused the company to move to a larger facility in the Germantown section of the city in 1912. By the late 1910s Kent's company was exclusively making electrical parts for automobiles. During World War I, U.S. government contracts were awarded to the company to produce optical gun sights and fuse setters.

In 1921 the company received an order for 10,000 headsets. Kent realized that with some retooling his company would be in a position to capture part of the growing market for radios. In 1922 Kent produced his first radio components and in 1923 his first complete radios. By 1924 the company had outgrown its Stenton Avenue campus and moved to a new $2 million plant on Wissahickon Avenue. This plant, constructed in sections, would eventually cover 32 acres. (The Roosevelt Boulevard Expressway goes between the two building of this plant, which was occupied by the U.S. Signal Corps in the North building, and Bendix in the South building during World War II. After the war, Philco occupied the South building, and the Veterans Administration occupied the North, and it still does today.)

In 1925 the Atwater Kent Manufacturing Company became the largest maker of radios in the nation. Supporting the manufacture of radios was the "Atwater Kent Hour," a program broadcast throughout the country in the mid-1920s. The show featured top entertainment, including Bob and Ray, and became one of the most popular and acclaimed regular radio programs of the era. In 1929 the company reached its peak performance with over 12,000 employees manufacturing nearly one million radio sets. The plant itself was considered an architectural sensation and received hundreds of visitors annually.

At this time Kent downplayed the table models for which the company was known and focused on more expensive cabinet models. But he had misjudged the buying public. By 1931 the country was in the midst of the Great Depression. Because of the general economy and

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competition from other manufacturers, the average cost of a radio had been reduced from a high of $128 in 1929 to $78. Those companies that concentrated on more affordable models, such as Philco, soon captured the market. With declining sales the Atwater Kent Manufacturing Company closed in 1936. When he died in 1949, Kent held 93 patents for improvements in automobile ignition systems and electronics.

Editor's Comments: *I remember hearing that Atwater Kent did not want to abide by Franklin Roosevelt's National Recovery Act (NRA of those days) that restricted industry from repressive labor practices, so he just shut down and retired to Hollywood and held parties for starlets.*

RADIO — PHILCO

World War I brought with it the first wireless communications and in 1920 Westinghouse changed wireless from a commercial tool to a means of mass communication with the opening of KDKA and the broadcast of the Harding-Cox Presidential elections. Home radio was born.

At the time radio receivers required DC power supplies. The SLI (Starting-Lighting-Ignition) battery, invented in 1911 to be used with automobile electric starters, was a natural for the "A" battery, and Philco developed a self-charging, electrolytic power supply or "B" Eliminator for "V" or plate supply. This business was a bonanza for Philco and fit beautifully with its marketing strategy and distribution organization. But this prosperity was short-lived. In 1927, RCA announced the AC radio tube and the bottom dropped out of the market for both the SLI battery for radio use and the "B" Eliminator.

Faced with this dramatic loss of business in a few short months, Philco went into the home radio business with a vengeance. In 1928, Philco brought out its first receiver, the Philco Neutrodyne-Plus, a conservative design with a built-in power supply. After an initial successful market test, Philco decided to go all out. It developed a line of quality products and made the decision to install mass production conveyer belt systems in a new plant at C and Tioga Streets. It acquired the Timmons Radio Products Corporation, a manufacturer of electrodynamic speakers.

The existing distributor network was just right for these quality receivers and Philco's market share quickly rose. But all this took a lot of money; so, shortly after the stock market crash of 1929 Philco went to the Philadelphia Banks and borrowed $7.0 million, an enormous sum for a small company at that time. In 1930, Philco rounded out its line by introducing an inexpensive new table model, the "Baby Grand," sometimes referred to as the "Tombstone" or "Cathedral" model. Its distinctive shape is frequently seen in old movies.

Philco Baby Grand Radio – 1930

By 1930, Philco had become the largest radio manufacturer in the world, out-selling its nearest rival, RCA Victor, by two-to-one, a position it retained for the next 30 years. It had also become the largest manufacturer in terms of employment in Philadelphia and had paid back its bank loans. During this same year, Philco acquired the Automobile Radio Corporation and established a new subsidiary, the Transitone Automobile Corporation, with product development and marketing facilities in Detroit, but production in Philadelphia.

In the early 1930's Philco established arrangements with both Sylvania and Hygrade (later Hygrade-Sylvania and then Sylvania) to manufacture radio tubes under the Philco name. In the latter part of the thirties, Philco entered into a further agreement with Nation Union to establish a production facility at Lansdale, PA, for radio and cathode ray tubes.

THE FRANKLIN INSTITUTE

In 1824, thirty-four years after Ben's death, Philadelphia's Franklin Institute was founded for science education and research. Its provision for free instruction to young men led to the first Philadelphia public high school (Central High), and soon after to institute sponsorship of Pennsylvania's first engineering and architectural schools. The success of the industrial exhibi-

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tions begun, in 1824, led to the Franklin Institute Science Museum opening in 1826, at 17 South 7th Street in Philadelphia (now occupied by the Atwater Kent Museum), and moving in 1934 to 20th and Benjamin Franklin Parkway. The intent of the Science Museum was to increase understanding of science and technology through exhibits that demonstrate basic scientific principles and phenomena and to motivate students to pursue of careers in these areas by offering special programs such as science fairs, student seminars, lectures, and science workshops.

In the Fels Planetaruim, a Zeiss projector and other instruments project images of celestial phenomena on the stainless steel dome ceiling. The observatory, on the museum roof, is equipped with two large telescopes. The Franklin Institute included 250,000 volumes and more than 5,500,000 U.S., British, and Swiss patents and was one of the largest collections of scientific and technical information in the nation. Franklin Memorial Hall, with its marble statue of Benjamin Franklin by James Earle Frayer, is a national memorial to Franklin.

The research laboratories adjacent to the museum provided facilities for more than 300 scientist and behavioral specialist. Research areas included aerospace, applied physics, applied sciences, chemistry, electrical, mechanical and nuclear engineering, operational research, materials science and engineering, and science information services. The Bartol Foundation Laboratories, in Swarthmore, conducted studies in physics, cosmic rays and astronomy.

The Institute's annual Medal Day Awards encourage scientific research by providing scholarships for achievement. Recipients of the Franklin Medal, its highest honor, include Thomas Edison, George Mascair, Niels Bohr, Orville Wright, Albert Einstein, and Enrico Fermi.

UNIVERSITY OF PENNSYLVANIA

Systems Engineering — A Formal Beginning

Before World War II and ever since, Systems Engineering has been practiced in the Bell Laboratories, and during World War II the field of operations research became prominent. It became evident to a few engineers that operations research was in most respects a part of systems engineering.

After several experimental seminars on "systems engineering and operations research," the Moore School of the University of Pennsylvania organized, through a national committee, a Workshop in Systems Engineering. This was held in 1959 on campus, with representatives from more that 50 institutions in attendance. There were extensive talks of what constituted the elements of systems engineering and examples of major applications. This workshop had a profound effect, with numerous specialized courses and, finally, a curriculum in the undergraduate sense and a specialty in the graduate sense becoming broadly available.

It is believed that the Moore School graduate seminars which preceded the workshops, were the first university courses in systems engineering, and that the workshop started the growth in systems engineering courses and curricula which exist in abundance today.

As an aside, we might mention that the workshop was attended by an officer of the Ford Foundation, and it was from his discussions with members of the Moore School staff at the time, that talks were initiated which led to a $3 million Ford Grant for Engineering at the University of Pennsylvania.

Chest Radiograph

From 1925 to 1943, Professor Charles Weyl, Moore School of Electrical Engineering, University of Pennsylvania, and several of his colleagues, worked on problems related to the making of X-ray films of the chest. There were elements of systems engineering in the project, although that name had not yet gained popularity.

What follows is a summary of an effort to improve apparatus and techniques for making and using X-ray films of the chest. The work was supported by the American Lung Association, several insurance companies, and by manufacturers of X-ray equipment.

The chief objective was to find out how to produce X-ray films of the chest that would display as accurately as possible signs by which physicians could diagnose diseases of the lung. Although there was no specific cure at that time for tuberculosis, accurate knowledge of the progress of the disease from physical signs and particularly from X-ray films was essential to decisions as to how to treat each patient.

Weyl's first contribution was the development of the pulse relay, which was designed to cause the X-ray exposure to be synchronized with a particular phase of the cardiac cycle. For this work, Professor Weyl was awarded the Edward Longstreth Medal, by the Franklin Institute, in 1930. This pulse relay was initiated by the pulse in the carotid artery. A time delay was inserted so that the X-ray exposure occurred in diastole, i.e., when the heart and vessels were nearly stationary. The use of the pulse relay produced stereoscopic films taken in the same phase of the cardiac cycle; all parts of the chest were perceived in three dimensions with minimum blurring (unsharpness).

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It became clear about 1932, that a major objective should be to find out how physicians in hospitals and tuberculosis sanitoria were producing X-ray films of the chest, what were the physical characteristics of those films, and how the equipment and exposure techniques could be modified to improve the quality of the films This required the design and construction of portable equipment to measure high voltage, X-ray tube current, and other technical factors, and particularly to measure radiographic results without excessive exposure of individuals to X-rays.

It was found that each of the several areas in the chest corresponded in photometric density to the density beneath a particular thickness of aluminum, regardless of the wide variations produced by the several different techniques. Therefore, it was not necessary to make chest films in each hospital or sanitorium; exposing the aluminum ladder provided the key information as to the density and contrast chest films made at that institution.

Work on chest radiography in the Moore School came to a conclusion early in the Second World War, when staff members chose to participate in activities directly related to that war. Furthermore, the basis for the production of high-quality chest films had been established. Finally, thanks to antibiotics, and other developments in biology and medicine, tuberculosis is no longer a major problem. Such is the fast-changing face of science and technology.

On February 11, 1915, Bell of Pennsylvania launched one of the first transcontinental long distance services.

PHONE COMMUNICATION — BELL TELEPHONE AND AT&T

Invented 126 years ago, the telephone has evolved considerably. Even now, the cell phone has further revolutionized communications with its mobility. The following is a brief history of the telephone's evolution in the Delaware Valley.

In 1877, Thomas E. Cornish, a Philadelphia electrician, returned from Boston with Alexander Graham Bell's newly invented telephone and the thought of a new communications business. Cornish obtained rights to form The Telephone Company of Philadelphia, and the first two telephones in the state were installed in his home and in a Chestnut Street appliance shop. In the summer of 1877, he employed two former telegraph company men to install the first Philadelphia switchboard from which he ran iron wire lines to three potential financial supporters. (Alexander Graham Bell and a group of patent owners had begun the leasing of telephones, and granting licenses throughout the country.)

Initial efforts to expand the infant telephone business, were filled with hardship and adventure. The telegraph company considered the building of a telephone plant an infringement of its prerogatives, and persuaded city officials to refuse Cornish permission to string wires. His workmen were arrested, and he was warned to quit or be driven out. Cornish persisted and founded the first Philadelphia exchange. In 1878, the first telephone directory made its appearance, listing 23 subscribers. On September 18, 1879, The Bell Telephone Company of Philadelphia was incorporated and Cornish elected president. At that time, the telephone directory contained 420 subscribers.

Meanwhile, the telephone was also being introduced in other Pennsylvania cities. In 1880, Horace A. Clute of Western Union was licensed by the American Bell Telephone Company as its agent for eight nearby counties. He immediately devoted his full time on the development of the telephone, which then had 75 subscribers. In 1882, a charter was issued for "The Southern Pennsylvania Telephone Company." By then, parts of New Jersey had been added to Clute's original territory.

The climax to a series of mergers from the late 1800s

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and early 1900s occurred in 1907 when the Bell Telephone Company of Pennsylvania, serving most of today's Central Area, was formed from the Bell Telephone Company of Philadelphia and the Delaware and Atlantic Telegraph and Telephone Company of Pennsylvania. The Lehigh Telephone Company, with headquarters in Allentown, consolidated under the Bell banner in 1930.

In September 1945, the last direct competing telephone system in the country, the Keystone Telephone Company joined Bell ending the customer irritant of having two or more competing telephone companies serving the same city or town.

In 1881, Bell of Pennsylvania began recording technological break-throughs. The placement of the first underground cable, using a wooden box for conduit, was recorded as a major event.

Two years before the legendary blizzard of '88, the first toll lines linking Philadelphia to New York opened. Three years later Pittsburghers could call Philadelphia, but not without a trek to the telephone office to place their calls because only local telephones were within the reach of home sets.

Invention of the repeater—an amplifying device to boost voice signals—made the spanning of increasingly greater distances by telephone possible. Repeaters were first used commercially in the Bell System on a toll line near Pittsburgh in 1904. Transcontinental service began in 1915, with the completion of the first call between Philadelphia and San Francisco.

In 1906, independent telephone companies in Hazelton and Allentown introduced a primitive form of customer dialing. It was the addition of the dial to candlestick sets that spawned a communications revolution in the 1920s. In 1923, machine-switching panels, designed to serve big cities, were installed in Philadelphia's Sherwood office.

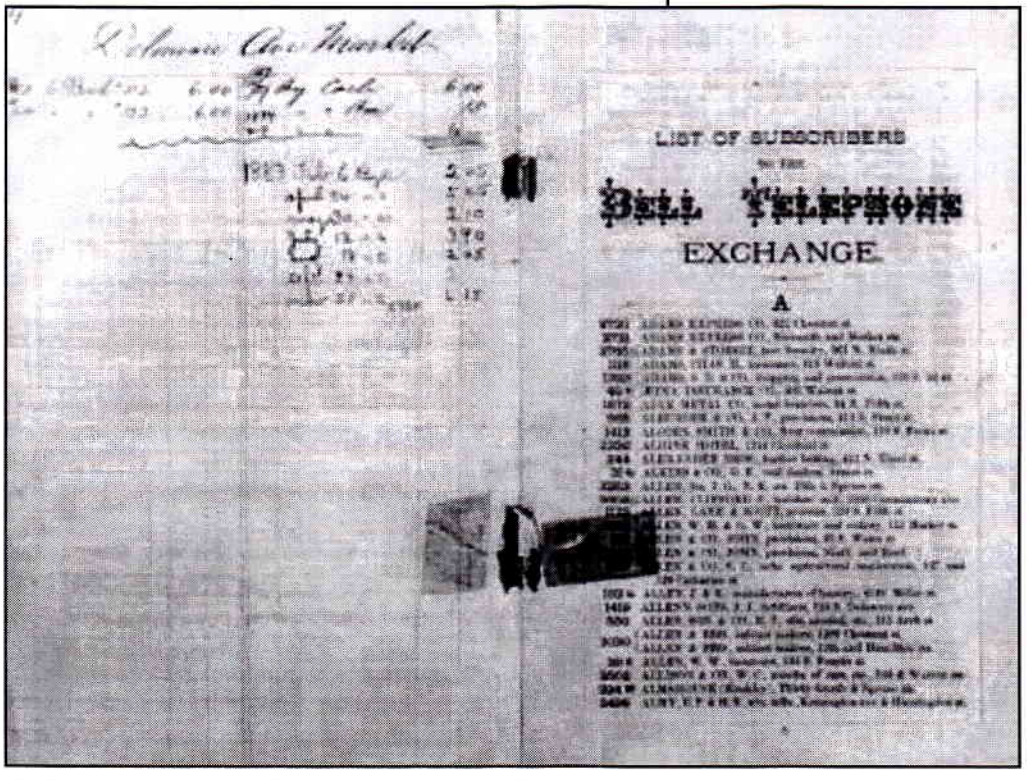
In 1925, creation of Bell Telephone Laboratories as the research and development resource for Bell companies, triggered a string of technological firsts for Bell of Pennsylvania and provide the fast-growing company with improved ways of working and serving its customers.

In 1943, Bell cut over the newly developed No. 4 toll switching machine in Philadelphia. In 1948, Bell System's most advanced switching-machine, the No. 5 Crossbar, was installed in Media. It was also the first equipped Automatic Message Accounting system.

In 1956, an Automatic Call Distributor went into service for the first time anywhere at West Chester. From 1958 through 1962, the Conshohocken Accounting office served as the proving ground for the use of large-scale computers for billing and maintaining customer records. The first Electronic Data Processing (EDP) bills were mailed to customers in 1960.

In 1966, a big telephone jump across the Atlantic took place when the first direct dialed long distance call was made from Philadelphia to Geneva, Switzerland. Bell System's 1967 trial of the Centralized Records Business Office in Upper Darby and the first commercial exchange offering of Picturephones see-as-you-talk service, in Pittsburgh in 1970 were efforts whose time was yet to come.

During the '60s, electronic switching, its most costly research and development project, began to bear fruit. Bell of Pennsylvania was committed to this new technology that promised undreamed of service and economic possibilities. The company launched its move into the electronic age in



Early phone books had the space to lead two lives. This one doubled as a ledger.

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1967, with the cutover of the first Electronic Switching System (ESS) in Philadelphia's Germantown office. Bell System's phase-out of panel equipment was completed in 1978. In 1977, the fourth ESS, a solid-state super switcher with an hourly call processing capability of 550,000 calls, was installed in Wayne and Pittsburgh as joint Bell-Long Lines operations.

In the summer of 1965, the pioneer Traffic Service Position System (TSPS) office opened in Philadelphia to make operator service calls dialable by customers, and replace the switchboards of yesteryear with the pushbutton operator consoles of tomorrow. The 1970 Philadelphia debut of the TSPS was first of many TSPS conversions across the state. They streamlined the handling of operator-assisted calls and made possible the centralization of operator services in fewer more efficient locations.

The last half of the 20th century saw the breakup of the AT&T Company and the introduction of the cellular phone. It has been said that Bell created the telephone and Theodore N. Vail created the telephone business. Certainly the personality and personnel policies of Vail helped to build the telephone company's reputation as "a good place to work."

MEGGER — SCIENTIFIC AND ENGINEERING INSTRUMENTATION

For over 100 years, the Biddle Company, now a division of AVD International has been the premier provider of electric text equipment and measuring instruments for electric power applications. Originally, the James G. Biddle Co., its worldwide-know equipment band names include Multi-Amp, Biddle, and Megger. Its diverse testing products provide for cable fault location, protective relay testing and on-line monitoring of substation equipment.

Prior to 1962, Biddle was located within Philadelphia, but it then moved from 1211-13 Arch Street to facilities in Blue Bell, Montgomery County, and is now located in Norristown. Subsequently, a high-voltage testing laboratory was added for testing up to 1,000 KV ac.

Corporate development of Biddle included many mergers and buy-outs. In 1888, Biddle joined the 28-year old James W. Queen & Company, which manufactured and imported scientific and technical equipment. Queen & Company included other future innovators, such as Arthur H. Thomas, F. J. Stokes, and Morris E. Leads. In 1895, Biddle formed his own company that, through many ownership changes, has continued by name to the present. Initially, the business was for importing and reselling scientific and engineering instrumentation primarily from Europe. Most sales were for instruments, but also included X-ray, radio, and battery equipment. In 1910, Mr. Biddle became the American distributor of the English produced "Megger" tester. World War II caused Biddle to start manufacturing this tester from 1942 to the present. After the war, product innovation became a way of life and Biddle products began to dominate the imports.

In 1988, the James G. Biddle Company was purchased by AVO International, Ltd., and in 1990 AVO was purchased by T.B.G., Inc.

Subsequently, the division name was changed to "Megger." The following company innovations and product introductions identified by Mr. Biddle and by his staff, have had major impacts on scientific and engineering instrumentation:

- Likely the first X-ray tube used in the U. S. imported from Germany and sold to Westinghouse.
- The first portable insulation tester Megger sold in the U.S. was imported from England.
- The first centrifical and chronometric tachometers used in the U.S.
- Introduction of state-of-the-art, precision, electrical instruments and standards with Germany the most important source.
- In 1957, it manufactured the first commercially available capacitive discharge device for power cable fault location. This technique is now used throughout the world.
- In 1951, it made available the first Partial Discharge Detector, vital to the electric power and aerospace industries.
- It was the first American company to produce and sell very-low-frequency, high-voltage test sets for cable and generator testing.
- It was a pioneer in the design of resonant high-voltage power supplies. It patented and introduced the first parallel resonant test sets.

Transformer Turn Ratio (TTR) Test Set

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Delta 2000 (Capacitance & Dissipation Factor) Test set

- It introduced the first partial discharge free test terminations using deionized water — now in worldwide use.
- It was a world innovator in introducing an insulation test system using a micro-computer to automatically perform sophisticated measurements.
- It pioneered an electronic instrument to measure extremely low resistance with relatively heavy current.
- It introduced a range of products for measuring the quality of power transformers, ranging from portable to factory test systems.

TECHNITROL

Based in Philadelphia, Technitrol, in Trevose, PA, is now a world-wide manufacturing company of electrical components, electrical contacts and assemblies and other precision-engineered parts and materials for manufacturing in the data networking, broadband/Internet access, telecommunications, military/aerospace, automotive and electrical equipment industries.

Technitrol has two business segments: (1) Electronic Components Segment (50%) is engaged in the design, manufacture and sale of a variety of passive magnetic-based components for leading manufacturers of electronic equipment; and (2) Electrical Contact Product Segment (50%) is the world's leading producer of electrical contact and contact assemblies for markets such as appliances, automotive, commercial and industrial machinery.

Technitrol, at its Allegheny Avenue plant in Philadelphia, in the '80s and '90s (before the Document Counter and Dispenser group was sold to G&D America, Inc.) developed and manufactured highly sophisticated currency dispensers and document counters for the global market. Currency dispensers assist bank tellers and are used in ATM machines the world over. Speeds of 1000 U.S. bills per minute, can be counted by one machine; others can count 750 documents per minute. Even in the '80s, 24 bills in up to four denominations could be dispensed in about 4 seconds.

VISHAY INTERTECHNOLOGY

In 1962, Dr. Felix Zandman, the current Chair or the Board and Chief Executive Officer, a physicist, founded Vishay, in Malvern, PA, to develop and manufacture "Bulk Metal" foil resistors.

In the 1950s, Zandman received patents for photo stress coatings and instruments used to reveal and measure the distribution of stresses in structures under life load conditions, such as airplanes and cars. That led him to the development of ultra-precise and ultra-stable foil resistors that continue to provide performance far beyond any other resistor available.

In the '60s and '70s, Vishay established itself as a market and technical leader in foil resistors, "PhotoStress" products, and strain gages. In the '80s, Vishay expanded into high volume resistors by growth and acquisitions (Dale Electronics and others). In the '90s, it expanded into the high-volume capacitor market by major acquisitions including Sprague Electric, Roederstein, and Vitramon. Since 1997, Vishay is also in the discrete semiconductor market. Lately, it acquired other leading manufacturers of passive components and transducers.

Today, Vishay is a $2 billion (sales in 2002) global company with a blue-chip customer base such as IBM, Intel, Samsung, Siemens, Nokia, Sony and many others. Vishay sales in 2002 were 38% in Asia, 31% in Europe, and 31% in the Americas.

BROADCAST CHANNEL 3

Philadelphia's Channel 3, celebrating its 70th anniversary in 2002, was first granted permission to operate as experimental station W3XE in 1932, but actually had begun experimenting with the new medium as far back as 1928. Since then, Channel 3 — Philadelphia's first television station and NBC's first and largest affiliate — has continued to be an innovator in news and entertainment, but it is now part of CBS.

As an experimental station in 1932, Channel 3, then operating out of the Philco plant at C & Tioga Streets, lived up to its label. Founded by Philco, the station first broadcast into the homes of 100 of the company's employees, mostly engineers. As the Philco engineers tinkered with

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the new technology, the station aired employee talent shows and travelogues to check the quality of the broadcast signal.

But it wasn't long before the staff began toying with the station programming as well. In 1939, W3XE telecasted the first college night football game, Temple University versus Kansas, and the following year started regular telecasts of the University of Pennsylvania home games, which it continued until 1951. That same year, the station became NBC's first affiliate, broadcasting network shows into an estimated 150 homes. Channel 3 continued to break new ground by broadcasting 60 hours of the 1940 National Republican Convention, the first major coverage of a national political conclave and the first "remote" telecast locally. The signal was sent to the station's tower, then located in Wyndmoor, PA to Princeton, NJ, and on to the Empire State Building in New York City from which NBC broadcast it nationally.

In 1941, the station gained commercial status under the call letters WPTZ-TV, the first commercial television station to be licensed in Pennsylvania by the Federal Communications Commission and the second in the country.

Throughout the 1940s, Channel 3 continued to develop both its station and the medium. In 1941, the station brought viewers the first telecast of Philadelphia's annual Mummers' Parade, and in 1942, produced and broadcast the first soap opera nationally, *Last Year's Nest*.

In 1946, Channel 3 got its first commercial sponsor, ARCO (the Atlantic Refining Company), which sponsored Penn football. But it was Gimbel Brothers that became the stations first "full-show" sponsor that same year with *All Eyes on Gimbels*. Local actress, Jane King, hosted the first half of the show, demonstrating the department store's products, and Uncle Wip, probably the first kiddie show host locally, introduced a company of talented youngsters who sang and danced.

But it wasn't until the early 1950s, when the television set started to become a fixture in many homes, that television programming really took off locally. Channel 3 was the forefront then, too, giving TV its first celebrity, Ernie Kovacs. Kovacs' early programs for NBC, *It's Time for Ernie*, in 1951, followed by *Ernie Kovacsland*, and *Kovacs On The Corner*, originated WPTZ-TV's Philadelphia studios.

The 50's also saw significant pioneering in children's programming. Australian Lee Dexter made his *Bertie the Bunyip* character an enchanting and popular fixture in children's TV along with characters Sir Guy, the Wily Fox, and Fussy and Gussy.

In June 1953, Channel 3 became an NBC owned and operated station. NBC acquired the station through an exchange of broadcast properties with Group W. and, in February, changed WPTZ-TV's call letters to WRCV-TV.

In June 1965, Channel 3 took on the call letters KYW-TV as Group W once again assumed ownership of the Philadelphia station. Until that time, KYW-TV had been operating in Cleveland and with its move to Philadelphia, the popular station took with it *The Mike Douglas Show*, the first live syndicated program to originate in Philadelphia.

But, all of Channel 3's innovation hasn't been in entertainment. In 1968, KYW-TV pioneered the *Eyewitness News* format, which is now used throughout the country. This concept allowed reporters to deliver their own stories, a revolutionary development since, in those days, all stories were prepared by the station anchormen. The revolution goes on today as Channel 3's new anchors break new ground in the cable industry.

Today, Channel 3, located on historic Independence Mall, can reach into millions of homes — a figure that would have been incomprehensible to the Philco engineers tinkering with 100 sets in their living rooms. And although empoyee talent shows are gone forever, W3XE's great experiment continues every day as its grandchild, Channel 3, goes on breaking new ground in broadcasting.

AYDIN

The former Aydin Corporation in the Philadelphia area owned three product companies in the late sixties and early seventies: Aydin Controls, Aydin Monitor Systems and Aydin Vector. Aydin Controls eventually spawned Aydin Computer Systems and were both concerned with computer display terminals and graphics systems. Their products served primarily the utility industry in control rooms and plant monitoring.

Aydin Monitor Systems, and Aydin Vector provided telemetry products and systems for aircraft, spacecraft, and missile test programs of U.S. government agencies and prime contractors. They were operated as independent entities by Aydin Corporation until being combined as Aydin Telemetry in the late 90's. Aydin Telemetry was subsequently acquired by L3 Communications Corporation and became a part of L3 Communications Telemetry East division in Bristol, PA.

Aydin Monitor Systems specialized in ground based aerospace PCM telemetry products and systems for reception and processing of telemetry transmitted by aircraft and spacecraft. Aydin Vector designed and produced telemetry products for integration into airframes, spacecraft, and missiles. Both divisions were prime suppliers to most major manned and unmanned space programs, and many aircraft and missile test programs.

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THRESHOLD TECHNOLOGY —

Leader in Voice Recognition

Threshold Technology, Inc., headquartered in Cinnaminson, NJ, near Philadelphia, was founded by Thomas B. Martin and Marvin Herscher, in May 1970, and is the technological and industrial leader in the new and promising field of electronic speech recognition.

Threshold pioneered the development and manufacture of successful systems, which have proved both reliable and cost effective in various applications at some of America's largest corporations.

Incorporated in 1970, Threshold became publicly owned in early 1972. In October 1973 Threshold and EMI Limited, a billion-dollar London-based international electronics and leisure conglomerate, established a joint United Kingdom Co, EMI Threshold Limited, which markets and services Threshold systems in Europe.

For many years, people have sought a way to control machines to, "tell a machine what to do." Since the computer became an integral element of business and industry, scientists and engineers the world over have been seeking a way to "talk to the computer," to speak information directly into its memory for storage, computation, subsequent print-out and use.

Voice communication has been viewed as the ultimate step towards simplifying the dialog between humans and machines. Historically, the mode of our communication with machines or computers has been determined by the operational requirements of equipment. Controlling machines required learning either the "language" or the machine or the manipulation of special dials or keys in the proper sequence under a rigid format. Any deviation from this unnatural machine language produced errors, which were not easily recognized. Now, however, that problem has been solved.

Threshold Technology, Inc. manufactures and markets recognition systems, which for the first time allow one either to "talk" information directly into a computer, with no intermediate keying or hand-written steps involved, or to control electro-mechanical systems with voice commands.

PACE Column

PROFESSIONAL ACTIVITIES COMMITTEE FOR ENGINEERS . . . . . Ed Podell, PACE Chair

HIGH TECH JOBS THREATENED BY FOREIGN WORKERS

— The following article was excerpted from the NY Times, May 30, 2003, Page C-1 —

SPECIAL VISA'S USE FOR TECH WORKERS IS CHALLENGED

— By KATIE HAFNER and DANIEL PREYSMAN

SAN FRANCISCO, May 29 - With the economy in a slump, a growing number of American technology workers say their jobs are going not only to lower-cost foreign workers abroad, but also increasingly to workers who enter the United States under a little-known visa category known as L-1.

In the nearly three years since the technology bubble burst, the use of L-1 visas to bring in workers — with a large percentage from India — has become a popular strategy among firms seeking to cut labor costs. **The number of these temporary visas granted rose nearly 40 percent to 57,700 in 2002 from 41,739 in 1999.**

The visas are intended to allow companies to transfer employees from a foreign branch or subsidiary to company offices in the United States. But they are now routinely used by companies based in India and elsewhere to bring their workers into the United States and then contract them out to American companies — in many instances to be replacements for American workers. The number of Americans who have been replaced by foreign contract workers is unknown. American companies that use contract workers have said that the decision to do so is based on factors like skills, and not on cost alone.

Some immigration experts are questioning the legality of this use of the visa. Officials at the Bureau of Citizenship and Immigration Services (BCIS), a division of the Department of Homeland Security that oversees the granting of L-1 and other work visas, say the bureau is conducting an assessment of the L-1 visa to determine whether there is misuse.

"If this is a company offering the services of their employee to go work for another company, it sounds dubious," said Bill Strassberger, a spokesman for BCIS.

"To bring someone in ostensibly as an intracompany transfer and then put him to work for somebody else and then to say that we're paying him still, that just sounds like someone's trying to really stretch the envelope on that visa category," Mr. Strassberger said.

In response to the controversy, Rep. John L. Mica, a Republican from Florida, introduced a bill in May to prevent companies from hiring foreigners with L-1 visas. (See *www.house.gov/mica/pr03/1.htm*)

"When you have people using this to bring in lower-cost labor to displace Americans, it's something we need to address," Mr. Mica said in a telephone interview.

During the boom years, the technology industries successfully lobbied Congress to expand the number of foreign software engineers who could be permitted to fill programming needs in the United States. In 2000, Congress increased the annual cap on more restrictive temporary visas — known as H-1B visas — for highly skilled foreign workers to 195,000 from 115,000. That quota will drop automatically to 65,000 on Oct. 1 unless Congress approves an extension, a move that is considered unlikely.

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