

The History of MAGNETIC RECORDING

by
Mark Mooney, Jr.

Valdemar Poulsen, a Danish engineer, was the inventor of the first magnetic recorder which used wire as the recording medium. His device was hampered, however, by the lack of modern amplification methods.



EDITOR'S NOTE: to attempt to encompass the history of the magnetic recording industry within the confines of a magazine, however large, is an impossibility. What we have been able to gather here, while it chronologically covers the entire period, can, by its very nature only hit the high spots.

It is our hope that this beginning will be continued by others until the whole history, with its many interesting facets has been set down. Many, perhaps most of the men who have helped make this history, are available today. Their individual stories should be written.

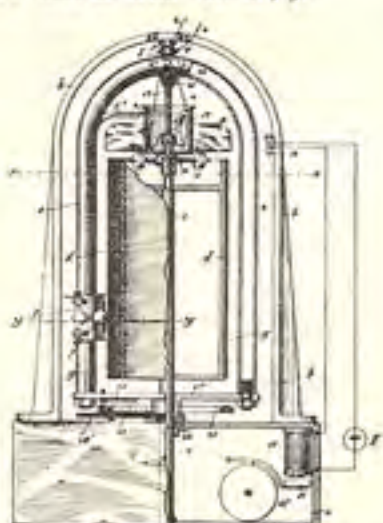
Much of the old apparatus is still extant but some of it already has found its way to the scrap heap. Before it is too late someone should gather one of each machine, tape and development under one roof for a museum of magnetic recording. Perhaps the industry association could undertake the task, perhaps a group of manufacturers or a single manufacturer with the staff and facilities.

It would be a shame if this industry, which has already contributed so much to scientific advancement and better

living, should fail to make casts of its own footprints in the sands of time. The opportunity is here, the time is now.

We wish to acknowledge our indebtedness to those firms who supplied data on their products for inclusion in this history and to many of the old-timers who wrote of the early days. We are especially indebted to Minnesota Mining and Manufacturing Company for access to photographs and data which they have accumulated over the years. We would also like to express appreciation to John S. Boyers, one of the founders of Magnecord and now Chief Engineer of Bell Sound for his help and to old timers Cbed Smiley of Livingston, Colonel Richard W. Ranger of Rangertone, H. J. Hasbrouck and others who have been most helpful in getting these facts together.

The history of an industry cannot be a mere recitation of facts, dates and processes. It is, instead, a story of hopes and dreams and of the men who met the challenges to not only create saleable products but advance the welfare of their fellow men as well.—M. M., Jr.



This is a modified version of Valdemar Poulsen's 1898 "Telegraphon" which has been equipped with an electric motor to turn the drum for use as a dictation machine. The drum is spirally wound with the wire which is the recording medium. The recording head is the mechanism at the top of the drum mounted on a screw. The recording head slowly traveled down the drums as the drum revolved. Poulsen's first "Telegraphon" featured a vertically mounted drum and probably was not electrically powered. Right: the original "Telegraphon" as disclosed in the patent.

Some of the Men Who Pioneered



Frank Healy and John T. Mullin with Magnetophon



S. J. Begun

All of the men shown on these pages were instrumental in making big advances in magnetic recording. Together with others who are not shown, they helped make magnetic recording what it is today.

Left: Frank Healy, General Manager of 3M's Minicom Division, and John T. Mullin, Director of Engineering, shown with one of the German Magnetophones were connected with the Bing Crosby shows, first show to use tape in radio broadcasting in the U. S.

Lower left: S. J. Begun, Director of Research of Brush Development (now the Clevite Corporation) was responsible for getting the first U. S. commercial recorder on the market, the Brush "Soundmirror" first shown in 1946.

Below: J. Herbert Orr, President of Orradio Industries, was one of the Signal Corps team that got into Germany during the war. His firm began to manufacture Irish tape in 1950.

Right: Dr. W. W. Wetzel, General Manager, Magnetic Products, M. C. Hoggal, Production Manager, and R. L. Westbee, Vice President of Minnesota Mining and Manufacturing who produced the first commercially available tape in 1947. It was a paper based black oxide.

Far right: Marvin Camras of the Armour Research Foundation is often called the father of modern tape recording. He is the industry's most prolific inventor and a recipient of the John Scott Award for scientific achievement. He holds more than 95 patents in this country including three design patents.

Lower right: C. E. Smiley, President of Livingston Audio who was the first to produce stereo tapes commercially when there were few playbacks.

Far right, lower: Joseph F. Hards who produced the first monaural tape library and who founded the Magnetic Recording Industry Association in 1953.



J. Herbert Orr

WITH the close of the year 1957 tape recording marked the end of a decade of extremely rapid advancement. In the home, stereo tape was bringing the finest music ever obtained, in the factory giant machines were being controlled from the magic brown ribbon and television, the public's eye on the world, was recording both the pictures and sound on tape. The era of magnetic photography had been born. Tape recorded the heartbeat of industry and guided missiles in space, tape wrote paychecks and kept records in banks and the end was not yet in sight.

While these remarkable ten years pointed to still greater achievements the road had not always been a smooth one. There was sweat and tears and heartbreak along the way from the first days when magnetic recording was presented to the world.

Valdemar Poulsen, a Danish telephone engineer is the acknowledged father of magnetic recording. This man, the "Danish Edison" patented the first magnetic recording de-

vice in 1898 after improving an earlier model he had constructed in 1893. The machine took the Grand Prix at the Paris Exposition in 1900 but by modern standards it was crude indeed. Using wire as the recording medium (tape hadn't been invented yet) it was weak on recording and weaker on playback (there were no amplifiers) yet it did give a creditable performance. The wire ran at astounding speed and as much time was consumed in rewind as in the original recording. Despite these drawbacks improved models of the early machines found wide use in Europe as dictation machines. The American Telegraphon Company, founded in 1903, sold some half-million dollars worth of shares to the public but its high hopes were never realized and the company went into receivership. According to S. J. Begun in his excellent book "Magnetic Recording" the history of the company, especially the testimony presented at a Senate hearing concerning its activities, "read like a cloak-and-dagger dime novel."

in Magnetic Recording



L. to R.: Dr. W. W. Wetzel, M. C. Hegdal, R. L. Westbee



Marvin Camras



C. E. (Chad) Smiley



Joseph F. Haró

Because no magnetic material will record properly without the addition of a bias current to the recording head the earliest recordings were not all they could be. In 1907 Poulsen and Pendersen patented a method of DC biasing which effected a great improvement in the quality of recordings. Many honors came to Poulsen before his death in 1942.

A number of wire dictating machines were made in Germany and sold in some quantity during the 20's, including the first machine to use a magazine loading principle. In America, after the collapse of the Telephon Company magnetic recording all but died. The Navy, however, kept on working and in 1927 W. L. Carlson and G. W. Carpenter made the next great discovery—the AC bias. This was patented by them in 1927.

The other ingredient necessary for the rebirth of magnetic recording had come about when Lee De Forest invented the vacuum tube in 1912. Amplifiers then could be

built and since AC biasing provides satisfactory recordings all the ingredients were present for further growth.

The prophet arose in Germany, a chap named Kurt Stille who talked financiers into forming a patent holding company to sell rights to those who wished to make magnetic recording machines. His efforts met with success and gave rise to a number of recorders including the Blattnerphone which was probably the very first tape machine—even though the tape was of steel rather than the familiar plastic. In 1920 a voice had been heard suggesting the possibility of using powdered magnetic materials on tape but nothing had been done about it. Blattner went to England with his machine and it was actually used to provide sound with some of the early movies.

In 1927 a German named Pfeumer was experimenting with powdered coatings on tapes to be used in place of wire. So far as we know he did not use the magnetic oxide but coated his tapes with powdered metallic materials.

Needless to say, the tapes were rough and sometimes the coating would fly from the machine in a fine spray as the tape flew across the head. In 1931 two large German firms continued his work, A. E. G. the machine, I. G. Farben, the tapes.

S. J. Begun of Brush Development Company (now the Clevite Research Center) designed the Lorenz recorder in Germany. This steel tape machine found wide use in German broadcasting stations. Mr. Begun came to this country in 1935 and was instrumental in the rebirth of magnetic recording on this side of the Atlantic.

Meanwhile the cry of "Heil Hitler" was rising and in 1933 and subsequently the Nazis took all the recording equipment they could get. In 1935 the German Magnophon was exhibited in Berlin and made a hit because it used plastic tape instead of steel. As conditions in Europe grew progressively worse the curtain was drawn on our knowledge of magnetic recording advances but the Germans were working on improving their machines at top speed. Also in the 1930's the Japanese were doing some work on magnetic recording.

Meanwhile in this country some research was going forward. Bell Telephone built a steel tape machine in 1935 and first demonstrated stereo sound at the World's Fair in 1939. The stereo machine used two Vicalloy steel tapes wound on the same reel which separated and passed over two heads. It is interesting to note that Vicalloy was a very hard steel, harder than the average knife blade and it cost, then, \$1.50 a foot. Bell Labs also built a "Mirophone" so that people could hear how their voices sounded on the phone. The machine was also used for weather reports by telephone. The only organizations in this country that took a serious view of magnetic recording before the war were the Brush Development Company, and Armour Research Foundation.

As seems to happen so many times in human endeavor, the stress of war brought great advances in magnetic recording. With money no object and the necessity of adequate recording devices for the military, developments moved at a brisker pace. About this time, 1940, Marvin Camras, magnetic recording's most prolific inventor became associated with the Armour Foundation and developed a wire recorder which both Armour and General Electric produced. Brush Development also produced recorders of its own design and, in addition, Brush received a Naval Research and Development contract for a machine which would use tape instead of wire.

It is interesting to note that from the time of the collapse of the American Telegraphon Company until 1937 when the Brush Soundmirror was placed on the market no magnetic recording equipment had been made in the United States. The early Soundmirror had a recording time of only one minute on an endless tape.

By 1939 the Germans had achieved good plastic tape although far below the quality we enjoy today. They had also developed a number of machines, including one with a rotating head and within the next two years Magneto-telephone tape recorders were installed at Radio Luxembourg. These had a 30 inch per second tape speed.

Brush, meanwhile, had brought out a paper tape which the Bell Telephone Labs were experimenting with, but it was not placed on the market. Brush also made a coated wire for recording and by 1943 Webcor was building wire recorders for the Navy.

In September of 1944 Brush contacted Minnesota Mining and Manufacturing Company to see if they would be interested in developing a thin tape with a coating of ferromagnetic powder on it. It was pointed out that if successful, this might have some post-war applications as well.

3M's took the job and Dr. Ralph Ouce began experiments to find the right binder. Early efforts failed as the tape was tacky and to make matters worse, the firm had no test equipment or recorders to work with. Every sample had to be sent to Brush for evaluation. By July 1946, however, the binder problem was licked and a group headed by Robert L. Westbee began to see how the lab work could be transposed into production.

A bit later that same year, Brush brought out its re-designed Soundmirror and its own paper-backed tape which had a black iron oxide coating.

The Armour Foundation continued with wire and from 1947 to 1948 Webcor (then Webster-Chicago), Sears-Roebuck, RCA and others did turn out many machines for public use but the wire boom failed to materialize.

It was in 1946 that Magnecord, the oldest maker of professional tape recorders now in business was formed. Their first product was a wire recorder of professional caliber. The firm was formed by four men, John S. Boyers, now Chief Engineer for Bell Sound Systems, Russ Tinkham, now with Ampex, C. G. (Spec) Barker of Filters, Inc., and J. L. Landon. Many of the beginnings of now respected companies were about as John Boyers describes the start of Magnecord:

"The Magnecord organization started with Russ Tinkham and Spec Barker more or less backing each other out one afternoon trying to make some money. They were both, at the time, working for Armour Research Foundation and had seen the great interest developed by Armour's wire recording program, particularly that generated by the so-called 'Master' recorder on which I had done the electronics.

"One of them said to the other that he thought it would be a good idea to get into some money and put up a balloon making these things but he did not know where to get the people. The other—I think it was Tink—said that getting the people was easy, so Barker said 'Getting money was easy'—and they had each other! Tink immediately came to me and suggested we go out for a cup of coffee. I knew something was up, first because he didn't drink coffee—particularly in the afternoon—and on the way over he asked me if I was interested in making some money. I said, 'Certainly—as long as it was honest.' This was in November of 1945. The company was incorporated in May of 1946 and set out to produce the only professional wire recorder ever made. We called it the SD-1, standing for 'Super-Duper'—a name which was thought up one Saturday afternoon. It was during this time that we agreed among ourselves to work not more than 70 hours a week because we found that working 85 or 90 hours a week for any extended period of time was far beyond the point of diminishing returns.

"Our entry into the tape field was through a little device having the trade name 'Audiad.' This was a point-of-sale machine and was sometimes called the 'audible advertiser.' We made 500 or 1000 of the things which incorporated a very simple tape drive at about 6" per second and an AC-DC type amplifier. They could be started by closing an external circuit and would eventually stop when a hole in the tape passed a contact shoe. The storage device was



Here's the **"NEWS in home recordings . . .**
SOUNDMIRROR

"Magnetic Ribbon" Recording is easy to sell because it offers more! It's Magnetic Recording on Paper!

- Even easier to "turn silent"
- Recording can be cut with scissors, sliced, and copied with ordinary tape!
- It's inexpensive! (1) hour recording for only \$3.00!
- Recording on "wood" is now recording a record!

- Permanent 1/2 hour recordings!
- No scratches, no ripples, no broken-up sound!
- It's guaranteed! (1) hour recording for only \$3.00!

Call the **401 SOUNDMIRROR** "Magnetic Ribbon" Recorder
 Write THE BRUSH DEVELOPMENT CO., 3405 Park Ave., Cleveland 14, Ohio



SOUNDMIRROR
 "Magnetic Ribbon" recorder

Brush... **FIRST IN MAGNETIC RECORDING**

Above: one of the first consumer advertisements was this Brush ad for the Soundmirror. Note that the word "tape" was not used, instead it was called "magnetic ribbon." Upper right: shortly after the introduction of the postwar Brush Soundmirror was this Magnetape Twin-Trax recorder made by the Amplifier Corp. of America marketed in 1947. It featured automatic reversing at the end of the tape. Right center: first tape recorder on the American market was this 1947 Brush Soundmirror shown here. Right lower: granddaddy of all "Scotch" brand magnetic tapes was this tape No. 100 with a paper backing and a black oxide introduced in 1947. Only recorder initially was the Brush Soundmirror operating at 7 1/2 inches per second.



merely an elongated box in which the tape was expelled in much the same fashion as is now used on some computers. We had all kinds of difficulties because the things ran so blasted hot they would on occasion melt down the binder then used in the paper base tapes. They had phenomenal success when intelligently used—one fellow in a ten cent store in Madison, Wisconsin, increased his business 35% the first month he had the thing in use.

Going into the tape recorder business on a professional basis was rather difficult since we had already designed a portable wire recorder having magnesium castings, etc. which promised to be a very good machine. However, our New York representative, Harry Miller, convinced Tink and me in room 1126 of the Commodore Hotel at two o'clock one morning that we should make a tape recorder. This was in March of 1948, I am not positive about the year but it seems right. By the time Tink and I got back to

Chicago a day and a half later, we had outlined the genesis of the Magnecord PT-6 line of equipment. In May of that year we showed our first unit—I believe it was at the National Association of Broadcasters in Los Angeles. Within three days we had written \$45,000 worth of business whereas the previous year our entire gross business was, if I remember correctly, \$24,000. PT-6 machines are scattered all over the world, I suspect the total number is in excess of 35,000 by now. (Editor's note: Magnecord, which is now a division of Midwestern Instruments has just announced that production of the PT-6 line will be resumed with stainless steel fronts and new equalization.)

There was some question as to whether we had a tiger by the tail or the tiger had us by the tail; in any case it was late August when we shipped our first production machine. It was during this period that the 90 hour week became very common. I recall during this period some very

CHRONOLOGY OF MAGNETIC RECORDING

- 1893**—Valdemar Poulsen the "Danish Edison" makes the first magnetic recorder.
- 1898**—Poulsen patents the "Telegraphon" wire recorder.
- 1900**—Telegraphon wins Grand Prix at Paris Exhibition.
- 1903**—American Telegraphon Company formed using Poulsen's design.
- 1912**—Lee De Forest invents vacuum tube making amplification of weak signals possible.
- 1920**—A. Nasavischwily of Germany first suggests use of powdered magnetic material.
Modified Telegraphon marketed in Germany by Kurt Stille.
Karl Bauer, Germany, develops first tape magazine.
Dailygraph, Germany, wire recorder by Echophone Co.
- 1927**—Experiments with powdered magnetic material on paper and plastic by Pfeumer of Germany.
Patents on powdered recording media issued to J. A. O'Neill, U.S.A., Pfeumer of Germany and Ofanhauser.
W. L. Carlson and associates granted patent on AC Bias.
- 1930**—Blattnerphone using steel tape used by BBC and for sound for movies in England.
- 1931**—Development of coated tape by I. G. Farben of Germany.
- 1932**—Textophone recorder, wire, embodied several improvements over Dailygraph. Made by C. Lorenz Co., Germany and associated with International Telephone and Telegraph.
- 1934**—Stahltonmaschine, Germany by C. Lorenz, used steel tape and probably was first machine used for radio work.
- 1935**—Magnetophone made by A. E. G., Germany used plastic tape at 30 inch per second speed.
Bell Telephone Labs, U.S.A., develops steel tape machine.
- 1937**—C. N. Hickam of Bell Telephone Labs demonstrates "Mirrorphone" using steel "Vicalloy" tape.
Brush Development Company brings out "Soundmirror" developed by Acoustic Consultants and using steel tape.
Western Electric produces Mirrorphone using metal tape.
Used for weather reports on phone, etc.
First stereo demonstration at World's Fair by Bell Telephone labs using steel tape machine.
- 1938**—Magnetophon model K-4 developed in Germany.
- 1939**—Tonschreiber, using rotating heads, developed in Germany.
Brush Development Company markets paper tapes, black oxide, also develops coated wire for recording.
Germans had achieved good plastic tape.
- 1941**—Brush, General Electric and Armour Research Foundation make wire recorders for armed services.
Magnetophons of good quality installed in Radio Luxembourg.
Marvin Camras develops A.C. bias method and Armour Research applies for patent on it.
- 1942**—Marvin Camras designs model 50 airborne wire recorder.
- 1943**—Webcor makes wire recorder for Navy.
- 1944**—Minnesota Mining starts experiments on tape and coatings under guidance of Dr. Ralph Oace.
- 1945**—Allies "liberate" German Magnetophon as Germany collapses from Allied push. Investigating teams describe German methods and developments during war years.
- 1946**—Magnecord formed, starts making wire recorders.
Brush Soundmirror prototype using tape first shown.
Shure develops methods of mass producing heads.
Allies ship German machines back to U.S.
Herbert Orr assembles machine in Alabama.
Magnetophon demonstrated by John Mullin to I.R.E. group in May. Ampex Electric Company interested.
Marvin Camras and associates stripe magnetic film.
Tapes being made by Brush Development Company, Indiana Steel Company, and Minnesota Mining and Manufacturing Company. No firm had market production.
Indiana Steel tape was friable metal, not oxide.
- 1947**—Wire Recorders on market include: Polyphonic by Electronic Sound Engineering Company; Pierce by Pierce Wire Recorder Corp.; Brush by Brush Development Company; Pentron by Pentron, Inc. Tape Recorders included: Magnephone by Amplifier Corporation of America; Magnasonic by Sound Recorder and Reproducer Co.; Soundmirror by Brush Development Co.; Ekotape by Webster Electric Co. Brush Development had a magnetic disc recorder called a "Mail-A-Voice."
Minnesota produced its first tape for the market, #100, paper base, black oxide tailored to Magnetophon machines and #110, black oxide on plastic base.
Tape recording demonstrated to ABC by Colonel Ranger.
Magnasynch developed a magnetic film recorder, first to use 16 mm. magnetic film.
Dr. W. W. Wetzel, H. K. Smith and R. Hert of Minnesota Mining developed a red oxide which had superior recording characteristics. However, when they applied for a patent, they discovered that Marvin Camras had a prior claim for the same material. It was the development of this oxide that made modern recording possible. This became tape #111 and was the first commercially produced for the market using the new oxide.
Electrosonic Specialties established. Built Memotape in situational recording and transcription devices for psychiatric treatment.
- 1948**—Both wire and tape show gains. Wire recorders new on market include Air King and Crescent by Crescent Industries; Dynaport by Lear, Inc.; Wire Master by Precision Audio Products; Silvertone by Sears Roebuck; Magnetone by Brush Development Co.; Nemeth and Master by Nemeth Co.; Isophone, a telephone recorder by Oberliken Tool and Die Works; WiRecorder by WiRecorder Corp., Webster Electric, Powell and National Polytronics.
The first Ampex 200 was delivered and ABC bought 12 at \$5,200 each. The ABC Network pioneered tape in the broadcasting field. Berlant Concertone 1401 was marketed.
Magnecord made a dramatic switch from wire to tape.
Crestwood Recorder Corp. brought out Crestwood Recorder using a Canadian made mechanism. International Electronics of Philadelphia also made a machine. Stencil Hoffman made a multi-channel recorder, a transcription recorder and "Minitape," a completely portable machine.
Minnesota Mining marketed the new red oxide tape for the first time.
Berlant marketed the "Stenovox" a 1/2 track dictating machine and Crestwood had a fixed half-track head.
Berlant also developed the idea of multiple heads. Pentron made a telephone answering device. Tape had completely changed the broadcasting industry.
- 1949**—New recorders on the market include: Fairchild, made by Fairchild Recording Co.; Presto by Presto Recording Co.; and the Rangertone by Rangertone, Inc. Magnecord demonstrated the first stereo recorder at the Audio Fair. The first tape splicer, the Carson, by Magneccessories was marketed as was a solution to make magnetic tracks visible.
Audio Devices marketed their first tape, oxide coated, red or black on either plastic or paper base. Tape featured uniform coating and lubrication incorporated. National Standard Company brought out their black oxide "Permo-magnetic" tape.
- 1950**—Recorders on market included: Knight by Allied Radio; Ampro by Ampro Corp.; Ultratone Tapeograph by Audio Industries; Recordofone by Bell Sound Systems; Concertone by Berlant Associates; Magictape by Crestwood; Dormitzer by Dormitzer Corp.; Eicor by Eicor, Inc.; Califone by Califone Inc.; Masco by Mark Simpson Mfg. Co.; DuKane by Operadio Mfg. Co.; Astra Sonic by Pentron; Tapewriter-Scribe by Permoflux Corp.; Revere by Revere Camera Co.; Stencil-Hoffman by Stencil Hoffman Co.; Webcor by Webster-Chicago; Ekotape by Webster Electric; Wilcox-Gay by Wilcox-Gay Corp.; Musictape by York Radio and TV Corp.; Travel Corder, a portable, by Michigan Electronics Co. and recorders by Sonar Radio Corp., Magnetic Recording Industries, Ltd., and Pentron.
Brush Development Co. sold their first multichannel heads and recorder. The first recorded tape catalog issued by Recording Associates. It contained 8 tapes. Wirespondence Club and Tape Respondents International organized.
Orradio Industries marketed first tape, oxide coated on plastic base. Minnesota Mining offered a red oxide on paper base. Tapemaster deck on market.

- 1951—Crosby Enterprises demonstrated first video tape recording machine in November. The Mini-Music continuous tape cartridge was announced by Television Associates of Indiana and Cosimo, Inc. brought out the continuous tape magazine. Webcor announced its two direction recorder.
- 1952—Victor Animatograph Corp. brought out its Magnesound for converting optical movie projectors to magnetic sound projection using striped film. Broadcast Equipment Specialties announced its spring-driven, self-powered portable Tapak. The first language course was offered to the public, a course in French by the Tapespondence School. Crestwood brought out 7½ ips hi-fi machine with separate record and monitor heads. World Tape Pals founded.
- 1953—New recorders include: FME by Federal Manufacturing and Engineering Corp.; Telectro, lowest priced recorder by Telectronic; RCA by Radio Corp. of America; Warren Portable by J. C. Warren Corp. First issue of Tape Recording magazine issued under name of Magnetic Film and Tape Recording. Pentron announces tape dictation machine and 6 channel "electronic orchestra" using ¼ inch tape. Minnesota Mining announces Hi-Output tape. RCA demonstrates their video tape recorder. A-V Tape Libraries expands tape catalog and absorbs Recording Associates library of eight tapes. The Magnetic Recording Industry Association was formed. Joseph F. Harris, first president. The Voicepondence Club was begun using as a base the older Wirepondence Club which it took over. Program for blind begun. Development work started on Fidelipac tape cartridge. RCA announces video tape records in color.
- 1954—New recorders include: V-M Tape-O-Matic by Voice of Music; the Motek Tape Deck and Aspden tape deck kit offered by Fentone Corp.; TDC by Three Dimension Co. First stereo tape catalog, one page, issued by Livingston Electronics. EMC offers educational monaural recordings for school and church. Omegatape enters field with recorded tape. Minnesota Mining and Mfg. Co. announces Extra Play Scotch #190 tape on 1 mil acetate base, a laminated striping for motion picture film, and two tapes on polyester base. Audio Devices issues colored tape and reels. Orradio Industries announces Irish Ferroshoen. Hack Swain issues electronic organ tapes. Revere Camera Company announces Synchro-tape, a striped tape for synchronizing tape recorded sound to home movies. Pentron issues three speaker recorder. Gibson Girl splicer announced and Ekotape offers a projector that operates a slide projector automatically. Dynamu introduces replacement heads for recorders. Reeves Soundcraft receives movie Oscar for magnetic sound in new Cinemascope picture "The Robe." Bell offers tape playback unit to fit record turntable. Carousel recorder by Tapex Corp. announced. Revere announces TR 1000 and Mohawk its Midgetape, smallest recorder made to date. Pentron introduces patented monomastic single control principle. Technical Tape Corporation enters raw tape field. Audiotape now available on Mylar base. First "face to face" tape club formed in Philadelphia. Ampex 600 recorder announced. Audiosphere (Livingston) offers binaural player. Broadcast Equipment Specialties produces tiny pocket tape recorder. Remsel Industries announces Film Harmonic sound device for 16 mm. projectors. Mitchell recorder by Mitchell Mfg. announced. Mylar base tape 1 mil thick announced by Reeves Soundcraft. Bellant Broadcast recorder announced. U. S. Time Corp. brings out magnetic disc recorder and International Radio and Electronics announces the Crown Broadcaster. Ferroprint enters field of raw tape.
- 1955—First stereo conversion kit issued by V-M. Double-Play tape on ½ mil Mylar base announced by Orradio Industries. Bernat-Bach announced the first 16 mm. sound on film magnetic camera. First commercial catalog of recorded tapes issued. First network transmission of color video tape recording. First mail-order tape center announced, the "Tape Shelf." Ameritape announces music from Soviet Russia. Ekotape shows tape deck for custom installation. Telefunken recorder imported from Germany by American Eline. New! Recorded-Tape-of-the-Month Club
- Ampex announces automatic broadcasting station. Stereotone Dictating machine imported from Germany by DeJure. Ampex announces stereo playback machine and speakers. EMC offers monaural playback machine. Bell and Howell enters recorder field. Columbia Records brings out recorder. Grundig recorder imported from Germany. Viking announces decks. Reeves Soundcraft announces Plus 100 tape on ½ mil Mylar base. Flahan invents tape threader. Minnesota Mining offers extra play tape in both acetate and Mylar bases.
- 1956—V-M offers Tape-O-Matic with built in stereo playback. Magnecord announces new Citation line. British Ferrograph imported by Ercosa Corp. Emerson offers recorder. Midwestern Broadcasting School offers correspondence course on tape. The St. Cecilia Co. enters raw tape field. EMI portable (British) imported by Ercosa. Bel Canto first ads appear for recorded tape. First ad devoted entirely to stereo tape appears (Livingston). Reeves introduces slide rule tape timing chart. Ampex demonstrates first video tape recorder. RCA announces "see-hear" tape player to play video tapes through TV set. First coast to coast video tape transmission, Jonathan Winters show on NBC. Pentron announces magazine loaded recorder. Fidelipac tape cartridge and player shown. Bell announces three-speed recorder. Tandberg recorder imported from Norway. Charles Sigbee, first reviewer of recorded music on tape killed in auto crash. Omegatape advertises stereo tapes. Stereophonic Music Society (mail order stereo tapes) organized. Pentron announces stereo playback feature on its recorders. Bel Canto goes stereo. Tape Recording magazine publishes first stereo directory of tapes and equipment. Approximately 150 stereo tapes available. Firms represented include: Livingston, Concert Hall, RCA, His Master's Voice, Webcor, Concertape, Omegatape, Bel Canto, A-V Tape Libraries, HiFiTape, Celestial, EMC, Stereotape, Sony and Sonotape. Tape Recording magazine goes monthly to service growing industry. Ampex announces 122 series of monaural record-stereo playback machines. Presto makes airborne reproducer for music aloft in commercial airliners. Bell Sound offers stereo playback. Dictaphone brings out Dictet pocket recorder. RCA introduced a stereo playback, and EMC, Concertone, Viking and Amplifier Corporation of America were active on the stereo front. Minnesota Mining purchased Bing Crosby Interprints. Westinghouse introduced "talking elevators."
- 1957—Minnesota Mining introduces new leader and timing tape. Pentron issues stereo kit for conversion of older recorders. First Tapebook, "All About Tape on Tape" by Jack Barba published by Tape Recording magazine. Book is listened-to instead of being read. FM multiplexing of background music gains headway. Audio Devices introduces low print through master tape and C-slor reel. Cosimo tape cartridge and player demonstrated. Steradapex for converting recorders to in-line stereo announced. Audio Devices announces Extra Precision instrumentation tape. Minnesota Mining sells first commercial reel of video tape at \$506 per reel. Stereophony, Inc. started in stereo tape business. German Banoha recorder imported by Audio Master. ISI recorder featuring magnetic differential clutch announced. Dynamu markets bionic head. Ekotape announces stereo model, as does Ampex. Bolex markets Synchromat for 8 mm. movie synch with tape recorder. Soundscribe Corporation markets 24 hour recorder with tape speed of 2½ ips. Modernophone announced a Doemphone Memory Trainer using a tape cartridge. Italian Geloso recorder imported by American Geloso Electronics. Revere issues stereo conversion kit. Norelco recorder (Netherlands) imported by North American Philips. Capitol Records issues stereo tape. First stereo tape rental library announced. V-M offers recorder playing either stacked or staggered tapes. Columbia Records enters tape field with stereo tape. 39 companies issuing stereo tapes. Catalog shows over 650 titles in stereo. Magnecord reissues old PT-6 series recorders. 3M's announces tensilized polyester Double Play tape, Scotch #200. Ferrodynamic enters raw tape manufacturing field. Autospenser system for storing marketed by Audiomation Laboratories.



Left: this is an Ampex 200 tape recorder patterned after the German "Magnetophon" which used a special Minnesota Mining and Manufacturing Co. tape—No. 112—which was introduced in April of 1948. Subsequent Ampex recorders were modified to utilize 3M's red oxide tape No. 111. Tape speed of the Ampex 200, like the German "Magnetophon," was 30 inches per second. Right: tape recorder which was instrumental in switching the hundreds of radio stations over the country over to magnetic tape was the "Magnecorder" shown here, brought out in 1948. Magnecorder started making professional wire recorders in 1946 but switched to tape.



considerable discussion as to what the speed of the tape should be. There seemed to be a good reason to settle on 18" per second since this was the sound-film speed. However, Colonel Ranger had brought back from Europe the Magnetophone operating at 77 centimeters per second which, as you know, is very close to 30 inches per second. For some reason or another the NAB decided to halve the 30" per second speed, thus coming up with 15 inches. At the time I agreed to this speed, I had only one head which would perform satisfactorily with reasonable equalization. We decided on the basis of this one head to pin down the equalization and thus live with our troubles. Initially, with production heads we would consider it a normal day when the yield was 1%. Subsequently, through proper tooling and techniques we were able to reverse this to where 98 per cent of the output was acceptable."

Now we must regress a bit to 1945. The Germans were crumbling and as the troops were pushed back the newest tape machines fell into Allied hands. Colonel Richard H. Ranger writes:

"The center of the Magnetophone production was the



In use by 1949 were these Fairchild professional tape recorders. At that time tape recorders were made by Fairchild, Magnecorder, Presto, RangerTone, RCA, Amplifier Corp. of America and Ampex Electric.

A.E.G. in the part of Berlin which finally came under the French. I found that there were parts for eighteen machines available which had not been assembled. The French agreed to let them be assembled and the eighteen were to be apportioned six to the French, six to the British and six to the U. S. When I came back some weeks later, I found the first had gone to the French, the second to the British and the third was to go to the French. Well, we finally got that straightened out and five of ours did excellent service in our Army Broadcasting and the sixth one I brought back to Fort Monmouth, along with some twenty cases of all kinds of technical equipment which would be of interest to the Signal Corps. A good bit of this material was color photography. And, of course, quite a bit was about the three types of tape they were then making. I gave some lectures on what I had found and shipped some of the units to those who asked for them in this country. I figured it was the finest type of reparations we could get and I was glad to be able to pass the information around.

"J. Herbert Orr, (now president of ORRadio Industries) had gotten them back to coating Luvitherm magnetic tape at the Wald Michelbach plant before he had a bad auto accident over there which laid him up for some months.

"Actually, several Magnetophones of various vintages were liberated to this country and all of this really started the tape industry in this country."

John T. Mullin, a member of one of the signal corps teams came upon Magnetophones in Frankfurt, disassembled and shipped two of them back to the United States. After the war he demonstrated them on the west coast. The machines which had been used at Frankfurt radio went out to 10,000 cycles and were 'clean.' They produced the finest sound he had ever heard. He photographed the instruction manuals and found that the frequency range of the machines could be extended to 15,000 cycles. Among the disposable surplus he sent back to his home in San Francisco were 50 reels of Luvitherm tape. When he returned home he assembled the machines he had sent piece by piece from Europe and in May of 1946 he made several demonstrations, one of them before an I.R.E. group of about 250 technical people.

The next day he was visited by Alex Poniatoff, Myron Stolaroff, Harold Lindsay and Charles McSharry—the men



Left: this 1949-50 professional tape recorder is a Stencil Hoffman unit in use today at radio station KULA in Honolulu. Right: professional tape recorders developed by RCA about 1950 are shown here. They were used, among other things, to record the Groucho Marx radio show.

who made up Ampex Electric Company. Poniatoff who had formed the company and turned out electric motors during the war was looking for a new product. All of his people, and there were only eight, were interested in something in the high fidelity field and had considered making a hi-fi speaker but when they heard the Magnetophone they knew it was for them. Mullin and his associate, Bill Palmer were retained by Ampex as consultants to assist in building an American machine patterned after the Magnetophone and Ampex started designing a production recorder of its own.

In 1946 wire recording was far in the lead but Minnesota Mining decided to investigate the magnetic materials themselves. The management decision to go ahead resulted in the establishment of a tape recording laboratory group. The binder problem had been solved in earlier experiments and after comparing the German tape, the Brush tape and the earlier experimental tapes it was felt the solution lay in a superior oxide.

It was this decision that brought Dr. W. W. Wetzel into the picture. He was then head of the physics section of the 3M Central Research division. Together with R. Herr and H. K. Smith he set out to find a new oxide. German tapes had low output, poor response at short wave lengths, required high speeds and the uniformity varied widely. They began working on testing equipment for tape—none was available. they had to build it from scratch. Another department started to devise ways in which tape could be produced commercially and the newly organized tape lab under M. C. Hegdal investigated methods of making dispersions and coatings. Another group began work on tape duplication and one man was called in to survey the market applications and encourage machine development. All this and not a single tape had been marketed.

1947 was the year of the breakthrough. The first tape was a black oxide product on a paper backing and went on sale that year. Next came plastic tape and although the market was almost non-existent at the time the future never looked brighter.

It was in 1947 too, that tape swept the broadcast world. To Bing Crosby and the American Broadcasting Company must go the credit for crashing this field.

Crosby Enterprises had sent a man to John T. Mullin's shop where he saw the Magnetophone. He told Mullin it was just what Crosby had been looking for to relieve him

of the tedious editing from disc to disc and the poor quality that resulted in the finished product.

Mullin was then introduced to Frank Healy of Bing Crosby Enterprises and to Murdo McKenzie, the technical director of the Bing Crosby show. Mullin demonstrated the Magnetophones and the men realized that they never could do on discs what Mullin was so easily doing on tape. Mullin recalls that Frank Healy was ready to make a deal for the machines on the spot but McKenzie had heard about a demonstration made by Colonel Ranger of his new Rangertone recorder in New York. He felt that it should be tested also.

Colonel Ranger has very kindly supplied the story of that demonstration held at New York:

"Bing Crosby started transcription broadcasting using discs in 1946. But building a finished program on disc by retranscribing from disc to disc took time and degraded the quality with successive generations, so it was decided to test out all the available media against each other; disc, film and tape. In the summer of 1947 Bing came to New York for a program and it was recorded at WJZ in New York, on disc and film. At the same time, Larry Ruddell of WJZ had piped it on a telephone line over to Muzak, where he arranged for us to record it on tape. The disc recording was done by NBC, the film by RCA. We all got a good recording of the takes. Then some three weeks later, the disc takes had been put together to build a finished program and we were given a sample to match. They then asked us how long it would take us to come up with a tape version. We quite surprised them by saying 'Would tomorrow evening be all right?'

"We got it together just by splicing the tape and then some days later came the blind test of the three versions in the board room of the old Blue Network in the RCA building at 30 Rockefeller Plaza with Mr. Mark Woods, president of the Blue Network in charge. All versions were started together and it was possible to switch from one to the other, A, B or C—with no identification. After this had gone on a little while, Mr. Woods rose and said he did not like it at all; he could not tell what he was listening to, and instead asked for a short section of A, then the same section of B and finally C. Mr. H. Pierson Mapes, vice president of the Hutchins Advertising Agency, representing Bing's sponsor, Philco, was sitting next to me. When



Above: by 1950 the "Record-O-Fone" by Bell Sound Systems was on the market. Like many other units of its day, it used a zigzag tape threading system. Upper left: introduced around 1949, this earliest Eicor tape recorder found use in many schools. Upper center: quite common in early days was a combination tape recorder-disc player of the same type as this Wilcox-Gay "Recordio." Some units would record discs also. Lower center: one of the early tape recorders about 1949 was this Dormitzer machine. Lower: the Warren self contained portable which utilized wet cells and was on the market in 1953.

B was played he asked me, "Which one is that?" When I hesitated to reply he said, "Well, you don't know any better than I do, do you?"

"I was quite sure I did, because it was certainly a case where a father knows his own child. Then on came C and when applause came in the program, the advertising man reacted with 'Rain on the roof!'"

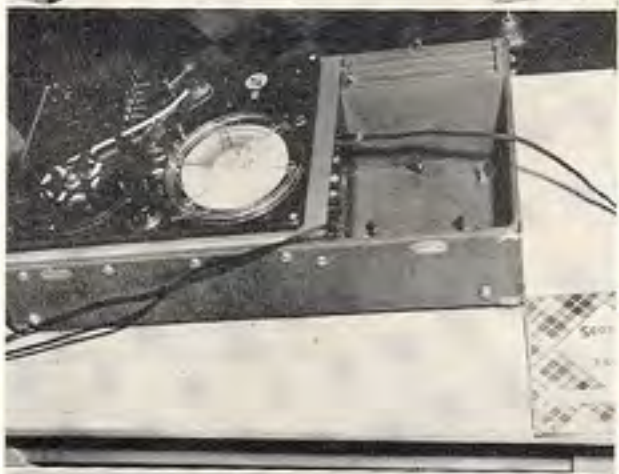
"A 1, 2, 3 vote was taken and it came out five for disc, six for tape and one for film. Then Mr. Woods picked up the votes and read off those for disc—an engineer, an engineer, another one, another, yet another.

"Now who voted for number 2? I did, the treasurer did and all the laymen. You engineers are so used to hearing disc that you think it is the only real sound. Your votes are just no good!"

"As a parting word, may I add that H. D. Bradbury of RCA asked to be excused from the voting as he too felt sure he knew which was which, the same as I did.

"In a couple of months all the Crosby shows were from tape spliced together by Jack Mullin in Hollywood using a modified Magnetophone and the era of taped programs was started."

In the fall of 1947 came a new magnetic material. The lab work of 3M's had paid off and at last it was possible to realize the dream of a readily erasable tape with good frequency response and a more uniform signal output. The answer lay in a new red oxide which today is the familiar coating on plastic tape. With it, 15,000 cycles per second frequency was possible at a tape speed of only 7½ inches per second as against the old standard of 30 inches. It opened up a whole new realm of possibilities in the home recording field by making lower cost, longer playing and high fidelity tape recorders possible. When 3M's moved to patent the new oxide they found that inventor Marvin Camras of Armour had already made application for a similar material.





Above: proposed for use with 33-1/3 rpm turntables was this Presto tape deck that was powered by the phonograph spindle about 1950. Upper right: the Crestwood "Magictape" of about 1949 was a popular tape recorder both for home and school use. Upper center: one of the earliest home recorders was the 1950 Ampro unit shown here in school use. Lower center: early Pentron machine was this "Astra-Sonic" about 1950. Lower: one of the first tape decks to be sold on the home market was this "TapeMaster" unit brought out about 1950.

1948 was a big year for tape also. At the end of '47 wire still dominated the picture with some 17 firms producing wire recorders but only four, Rangertone, Brush, Amplifier Corporation of America and Sound Recorder and Reproducer Company making tape machines.

Early in 1948 3M's marketed the new red oxide tape. In April Ampex delivered its first model 200 machine to Bing Crosby Enterprises, who became a distributor for the new machines. The first demonstration of the Ampex was conducted in April of 1948 in Hollywood to record Crosby's ABC show. The strength of that demonstration prompted Middlebrook, ABC vice president in charge of engineering to buy 12 of the Ampex machines at \$5,200 each—and then 12 more.

ABC's move was a major step in the acceptance of magnetic recording. Capitol records bought two units and the dam had burst. A guaranteed supply of both tape and recorders had turned the trick.

At the end of the 1948 season, Mullin went to New York to tape and edit three shows for ABC there. He became acquainted at that time with Charles Rynd, then a vice president of ABC, who was very interested in tape's future. Later, Rynd quit ABC and became eastern distributor for the Ampex machine, then later became one of the pioneers of the recorded tape field by starting A-V tape libraries.

At the close of the year Allegheny Ludlum Steel Corporation, National Standard Company and Wilbur B. Driver Company were offering recording wire. Brush Development Co. offered plated wire and Indiana Steel Products was marketing Hyflux plastic tape with a metallic coating. Minnesota Mining was offering both paper and plastic base oxide coated tape. 1948 also saw the dramatic switch of Magnecord from wire to tape.

In 1949 the first splicing block was born, the "Carson" splicer which is still sold by Magnecessories. At the same



RECORDING ASSOCIATES tape means . . . undistorted quality . . . full and perfect tone range . . . unmarred quality after thousands of plays — lasts indefinitely

Your favorite music incomparably and indelibly recorded

REEL No. 001—"Cocktail Time"

Track A—

Guilty
Confessin'
If I Had You
I'll Never Be The Same
Sleighride In July

Track B—

It Must Be True
Garden In The Rain
Peg O' My Heart
What's New
Stars Fell On Alabama
Exactly Like You

REEL No. 002—"Cocktail Time"

Track A—

You Go To My Head
I Understand
I'll See You Again
Cynthia
Sentimental Rhapsody
Wizard of Oz

Track B—

By The River Of The Rosas
Somewhere In The Night
It Had To Be You
Almost Like Being In Love

REEL No. 003—"Cocktail Time"

Track A:

I've Got You Under My Skin
Cumana
Tonight We Love
Babalu
Poinciana
Alexander's Ragtime Band

Track B—

We Could Make Such Beautiful Music
How Are Things In Glamour
Mama?
You're Mine - You
Bum, Bum, Pim
Great Day

REEL No. 004—"Cocktail Time"

Track A—

Music Maestro Please
The Best Things In Life Are Free
You're So Understanding
Just One Of Those Things
A Fellow Needs A Girl
Caprice For Strings

Track B—

Deep Purple
Tea For Two
Girl Of My Dreams
Illusion
Holiday For Strings

REEL No. 005—"Organ Reveries"

Track A—

My Heart Stood Still
Blue Room
Lover
I Didn't Know What Time It Was
Smoke Gets In Your Eyes
Why Do I Love You?

Track B—

The Touch Of Your Hand
Bill
All The Things You Are
They Didn't Believe Me
My Blue Heaven
You Tell Me Your Dream

REEL No. 006—"Organ Reveries"

Track A—

Kim Me Again
I'm Falling In Love With Someone
Moonbeams
A Kiss In The Dark
Sweetheart
Among My Souvenirs

Track B—

Rose In The Bud
Remember
I'll See You Again
Lady Of The Evening
Summertime
Peggy O'Neill

REEL No. 007—"Organ Reveries"

Track A—

Love, Here Is My Heart
I Hear You Calling Me
Girl Of My Dreams
Roses Of Picardy
While Hearts Are Singing
Your Eyes Have Told Me So

Track B—

From The Land Of The Sky
Blue Water
Dear Old Girl
A Perfect Day
The Bells Of St. Mary
Suppose I Had Never Met You
Oh What A Pal Was Mary

REEL No. 008—"Concert Hall"

Track A—

Roses From The South
Minuet (Mozart)
Allegretto (Mozart)
Intermezzo (Bizet)

Track B—

Allegro
Minuet in G (Bach)
Londonderry Air
Overture (Shepherd King)
(Mozart)

ALL RECORDINGS ON HIGH FIDELITY PLASTIC TAPE

Tape Recordings Will Save You Money!

More economical than discs for the same playing time

ALL RECORDINGS ON HIGH FIDELITY PLASTIC TAPE

RECORDING ASSOCIATES

113 W. 42nd St., New York 18, N. Y. LOngacre 4-8317

This is a reproduction of the first catalog of recorded tapes which was issued by Recording Associates in New York in 1950 and featured eight reels. This illustration shows the inside two pages. The back page contained an order blank for the tapes. Below: the V-M 711, first home type recorder to offer stereo playback. Prior to this the firm issued a conversion kit to enable users of the model 700 to convert to stereo.

time they put out a solution to make tracks on tape visible. A new tape manufacturer entered the field in 1949, it was Audio Devices who came into the field with both plastic and paper base tapes in black and red oxide formulations. The tape featured uniformity of coating and had a lubricant added.

What most probably is the first commercial stereo recorder was offered by Magnecord in 1949. Stencil Hoffman had made multi-channel recorders a year prior to this time and Marvin Camras has demonstrated stereo sound from tape at the Armour Foundation. As mentioned earlier, Bell Telephone Laboratories demonstrated stereo recordings at the World's Fair in 1939. To go farther back, Alexander Graham Bell in 1892 wrote a paper on binaural hearing over the telephone.

The Magnecord stereo stemmed from a request from Dave Apps of General Motors laboratories for a stereo machine because the monaural recorders they had been using to analyze auto noise did not give them the sound perspective desired. Magnecord built one for GM, then two more which were shown at the 1949 Audio Fair, the first time the public had been treated to stereo.

On the Magnecord was a three-head assembly with a spacing of 1-5/16 inches between the heads. This was later

converted to 1 1/4" and became the standard for staggered stereo tapes.

The response to the original models was good. They built 12 and sold them and then another 25. Hundreds were



AUDIOSPHERE

THE AUDIOSPHERE TAPE LIBRARY

To meet the rapidly growing demand for what may, in its truest sense, be called a HIGH FIDELITY pre-recorded tape, AUDIOSPHERE, Inc., has extended its recording activities into that field and now offers the following initial releases:

The May Festival Series, for example, has been specifically recorded for both the high enthusiast and the music lover and contains superlative programs recorded with professional equipment to the highest standards of the art. The series includes 12 selections recorded in the famous Teatro Comunale in Florence, Italy, with the 57-piece May Festival Orchestra under the direction of one of Europe's most eminent conductors, Vittorio Gui. *Recital* — superb musicianship, majestic and dynamic range and true concert hall presence.

Reel Number (Monaural)	Reel Number (Binaural)	Selections
701	BN701	<i>Schubert</i> : Unfinished Symphony <i>Sibelius</i> : Finlandia
702	BN702	<i>Wagner</i> : Tannhauser Overture <i>Wagner</i> : Flying Dutchman Overture
703	BN703	<i>Massenet</i> : Night on Bald Mountain <i>Borodin</i> : Polovtsian Dances <i>Sibelius</i> : Valse Triste
704	BN704	<i>Debussy</i> : Afternoon of a Faun <i>Schumann</i> : Manfred Overture <i>Glinka</i> : Kamarinskaja
705	BN705	<i>Rossini</i> : William Tell Overture <i>Brabms</i> : Academic Festival Overture <i>Mussorgski</i> : Under the Lindentrees

In addition to the above series, the following releases are now available:

706	BN706	VOICES FROM VIENNA, Vol. I (The Music of Strauss)
707	BN707	VOICES FROM VIENNA, Vol. II

The above two reels are separate programs of the type of material which is responsible for the excellent reception of the Audiosphere disc release. Programmed differently for tape, with much new material added, each of these reels should sell well.

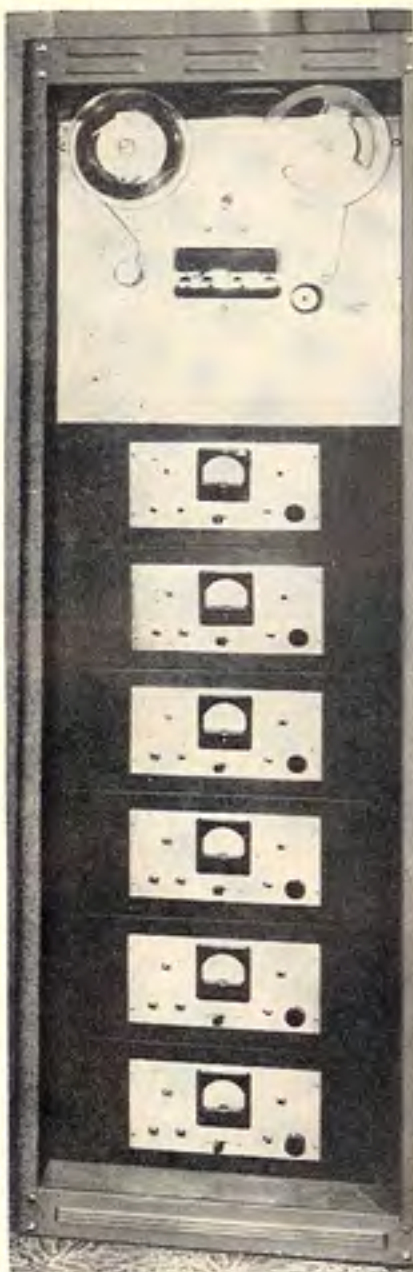
708	BN708	<i>Pfitzner</i> : Little Symphony, opus 31 (performed by the Vienna String Symphony, Collegium Musicum Wien, under Kurt Rapf)
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Dukas: Sorcerer's Apprentice
(performed by the Florence May Festival Orchestra under Vittorio Gui)

All programs are on 7" reels, 7.5 IPS, and are available either as full-track or BINAURAL recordings; they are priced at \$10.00 each for either monaural or binaural tapes.

FOR THE DISCRIMINATING MUSIC LOVER
HIGH-FIDELITY
MAGNETIC TAPE RECORDING

AUDIOSPHERE, INC. LIVINGSTON, N. J.



Left: the Pentron electronic orchestra. This unit had six separate channels on 1/4 inch tape, one for each of the six instruments in the band. It was shown in 1953. Right: a reproduction of the first stereo tape catalog. This single sheet was put out by Livingston in May 1954. Below: Livingston designed and sold this stereo player, the first on the market to provide something for the public to play its tapes on. It had staggered heads, as had the first Magnecords.

made after this.

The first music in stereo, used to demonstrate the machines was not for sale. Apparently the National Symphony Orchestra was the first large orchestra to be stereo recorded. The Navy Band was the first band to be stereo taped and such dance and jazz aggregations as Benny Goodman, Lionel Hampton, Woody Herman, Jerry McPartland and others appearing in Chicago were stereo taped by crews from the factory on an experimental basis. Many of these original tapes are still in existence.

1950 saw manufacturers entering the field of tape recorder manufacture almost by the dozen. At the end of the year there were twenty new names added to the list. Some are still making recorders, such as Ampro, Webcor, Allied Radio, Concertone, Masco, Revere, Ekotape, Stancil-





The founders of the Voicespondence club, John Schirmer, of Chicago, seated at right in photo, founded the Wirespondence Club back in the days of wire recorders (1950). When tape began its ascendancy the club was called the Voicespondence Club and was, and is, operated by Charles Owens, (seated at left of photo) and his wife Melva as a hobby. Right: the late Fred Goetz who organized Tape Respondents International in 1950 in California. He operated the club as a private venture until the time of his death when its operation was continued by Jim Green of Little Rock, Arkansas. Both clubs have a large membership.

Hoffman and Wilcox-Gay. Others have been discontinued over the years between then and now.

ORRadio Industries, fathered by J. Herbert Orr who was one of the members of the Signal Corps team that had liberated German equipment, began to make Irish tape in Alabama. It was plastic base with an oxide coating. The same year, Minnesota Mining brought out a new paper base tape #101.

1950 also saw the formation of two organizations to encourage the exchange of wire recordings and tapes between individuals. John G. Schirmer founded the Wirespondence Club while working for Webster-Chicago (Webcor), and on the west coast, Fred Goetz started the Tape Respondents International.

1950 also marked the birth of what was to become an industry within an industry—the sale of tape recorded with music of speech.

The pioneer in this field was Joseph F. Hards who writes:

"Back in the early part of 1950 I had a small business known as Recording Associates. My primary interests were the sale of a disc library to industrial plants, wired music operators and radio stations. I became interested in the developments in magnetic tape and made up what was to my knowledge the first catalog of recorded tapes. We had a series of about eight subjects and while the project never did get off its feet, we did sell a few. The research given this project was responsible for the further introduction of the A-V Tape Library which, under the auspices of Audio and Video Products I developed and produced."

On the west coast, Col. Fogel of Tempo tapes entered the field and a bit later Magnecord brought out "Magne-recordings by Vox" which were European tapes with duplication done by Larry S. Toogood, one of the pioneer duplicators. The early efforts were chiefly program material and background music.

1951 was marked by the introduction of a new firm to the tape field, Reeves Soundcraft who brought out a red

oxide, plastic base tape. Ernest Frank was their director of research. This year also saw the first demonstration of video recording on tape when Crosby Enterprises, now the Minicom Division of Minnesota Mining, showed the first black-and-white TV images played from tape. Two continuous type cartridges were brought out, the Cousino and the Mini-Music by Television Associates of Indiana. Webcor brought out their first two-directional recorder, a feature which they have maintained through the years.

In 1952 a course in the French language was issued by the Tapespondence School, now Audio-Visual Publications, of Middlebury, Vt. Prof. Ferdinand Marty was responsible for this development. A self-contained spring wound portable, the Tapak, was made by Broadcast Equipment Specialties and the Victor Animatograph Corporation brought out the first device to convert optical projectors to magnetic sound on film—the Magnesound. Crestwood built a 7½ ips hi-fi machine with separate record and monitor heads. By 1952, the wire recorder was definitely on the way out. Harry Matthews, of Texas, founded World Tape Pals.

1953 brought a rash of new products and improvements and also marked the beginning of the Magnetic Recording Industry Association. Telectrosonic brought out the least expensive recorder, a machine selling for \$79.95 and Federal Manufacturing and Engineering entered the field with their FME recorder. The Voicespondence Club, taking over the older Wirespondence Club as a base began operations and immediately instituted a program for the blind. Reeves introduced their "Lifetime" tape the first 1½ mil tape using DuPont Mylar base. Reeves Soundcraft also received a motion picture "Oscar" from the Academy of Motion Picture Arts and Sciences for the development of magnetic sound on film. The award was made for the Cinemascope picture "The Robe."

In April of 1953 Joseph F. Hards wrote to all the manufacturers of magnetic equipment and suggested the formation of the Magnetic Recording Industry Association. A formation meeting was held and was attended by: Herman



Left: the Revere Camera Company of Chicago developed its Synchrotape to permit more accurate synchronization of sound from tape with home movies. The tape was striped and the flicker of the projector shutter provided a stroboscopic light effect to time the recorder and projector. Adjustments in speed were made manually. Right: automatic control of slides for home and business was provided by this Model 207 Ekotape. The top track of the tape was used for voice or music and the lower track for signals which, through a relay, operated a slide projector and changed pictures without an operator touching the controls. Earlier devices included a photo cell mounted on a recorder which picked up the light reflected from white tabs attached to the back of the tape.



Kornbrodt, Audio Devices, James Pickett, Bell Sound Systems, Robert Leon of Brush Development Co., Irving Rossman of Pentron and Don Ward of Reeves Soundcraft. The first elected officers were: Joseph Hards, President, Russell Tinkham, Ampex, Vice President, Herman Kornbrodt, Audio Devices, Secretary, Victor Machin, Shure Bros., Treasurer, and the balance of the Board of Directors was made up of Bob Leon, Brush and Paul Jansen of Minnesota Mining. Work began almost immediately on standards for the industry and to C. J. LeBel, of Audio Devices went the hard job of general chairman of the Standards Committee.

In September Bing Crosby Enterprises showed the recording and playback of color TV. In December RCA demonstrated their color video tape recorder also. November of 1953 saw the first issue of *Hi-Fi Tape Recording Magazine*, then under the title of *Magnetic Film and Tape Recording*.

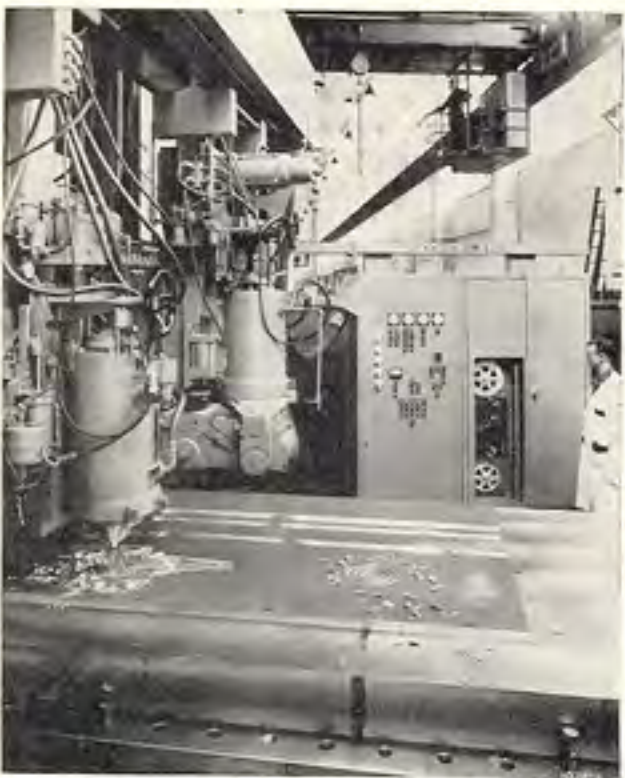
The tape manufacturers were busy with new products in 1954. Reeves Soundcraft brought out their 1 mil Plus 50 Mylar base tape. Minnesota Mining announced their Extended Play 1 mil acetate base, and a laminated striping process for movie film. ORRadio Industries brought out the Ferrosheen process of tape coating and Audio Devices colored reels and colored tape, V-M entered the recorder field and Omegatape entered the field of monaural recorder tape, as did EMC with educational and religious recordings.

The pointer toward the future came from Audiosphere, a division of Livingston Electronics who announced a catalog of eight stereo tapes, even though the stereo Magnecords then in existence were about the only machines that could use them. They also designed a player and amplifier on which the public could play the tapes. Ched Smiley, Livingston President and stereo pioneer writes:

"Livingston entered the stereo tape field, wistful, alone and afraid, the only participant in the infant industry. Initial releases were on the only medium then available, 7½ inch per second, staggered binaural tapes with a very small library.

"Acting as an industrial bell-wether, Livingston sponsored the manufacture of an inexpensive stereo playback unit, an inexpensive stereophonic amplifier and a line of

associated accessories. The first two years of Livingston's hectic beginning were dominated by solving the problems encountered in their role as lone missionary for home stereo. This included endless demonstrations all over the country at audio fairs, dealers, representatives, distributors and just anybody who would listen. Techniques in stereo recording, duplicating and processing had to be developed. Also, the library had to be expanded and once again Livingston found itself in the role of a missionary essentially



Machine tool automatic control by magnetic tape is demonstrated by this aircraft spar and skin milling machine system designed by the Giddings and Lewis company. Tape unit in background caused milling head to perform precision cuts called "plunge," "pocket" and "channel" on aluminum sheet in foreground.



Left: among cartridge developments is the Mini-Music made by the Television Associates of Indiana which appeared in 1951. The small plastic container held a continuous loop of tape. Right: the Cousino Audio Vendor uses graphite lubricated tape in a moebius loop. Both devices are used for talking displays and similar applications.

exhorting the flock to climb on the stereo bandwagon."

While it took a few years to do it, these early efforts bore fruit as is evidenced by the swing to stereo that came in the next two years.

1955 was the year in which V-M offered a stereo conversion kit for its recorders, bringing stereo to the low priced field. Bernt-Bach developed a magnetic head to fit a motion picture camera and thus sound on magnetically striped film was possible in 16 mm. Audio Devices brought out its extra-precision coating for tape and ORRadio Industries announced Double Play tape on 1/2 mil Mylar base. At the dedication of the new Minnesota Mining Research Laboratory, network transmission of color video from tape was shown using RCA equipment. The signal originated in New York and was brought over coaxial cable to St. Paul.

In 1956, V-M offered stereo machines with the playback feature built in. Nortronics made the first non-encapsulated stereo head and Pentron a magazine loaded recorder. Big

surprise of the year was the breaking of the Ampex Video Tape Recorder at the NARTB show. Operating at only 15 inches per second it swept the industry almost as the Magnetophone had done in radio days. RCA offered stereo playback equipment and tapes. RCA also announced preliminary work on a hear-see video tape player for playing video tapes through the home TV set. It used 1/4 inch tape at 10 feet per second. In October the first coast to coast network show, the Johnathan Winters show, was telecast from tape.

Audio Devices led off 1957 with their low price through tape and a new reel. Capitol records joined in producing stereo tapes and Minnesota Mining built the world's largest plant for the production of tape. The first video tape recorder to go to an independent station was delivered by Ampex and the first catalog devoted to listing stereo music became available from *Tape Recording* magazine. At the year's end it showed more than 650 different tapes from 39 different companies.



George Eash began his development of the Fidelipac cartridge and its accompanying player in 1953 but it was not publicly offered until 1957. The unit was among the first to have a long playing time. Right: the Cousino cartridge, a further development of the earlier Audio Vendor. Both units may be used for stereo and future tape developments may be along these lines.



Above: the first video recorder was developed by Crosby Enterprises and shown publicly for the first time in November of 1951. The Crosby name has long been associated with tape recording, singer Bing Crosby having been instrumental in getting tape recording into U. S. radio back in 1946. Left: the RCA video recorder which was demonstrated in September 1953 with color TV recording. The first net transmission of color TV took place in September 1955 between New York and the new Research Laboratories of Minnesota Mining and Manufacturing Company in St. Paul, Minnesota on the dedication day.

Looking back over the years from the vantage point of the end of 1957 one can see the remarkable progress that has been made. Some of it has been slow and halting and at other times the dash of new developments has been so swift that it was difficult to keep track of them.

Over the years since 1893 sound has been developed from the weak recordings and playbacks of the early Telegraphon to the full range of stereophonic reproduction both at home and on the screen. Film is being replaced in television by magnetic tape just as fast as the new video recorders are delivered. In the closing months of the year 1957 the first commercial was made on location using tape. The actors and equipment were in a mountain location and the TV signal was beamed back to the studio and video recorded.

Each of the large tape manufacturers has under construction new plants for the manufacture of tape for both industry and the home—and their plans for the future are giant sized.

The roster of men who have made this growth possible is a long one, from scientists, engineers and production men to those who controlled the purse strings and had the confidence in the future of an industry to venture into an untried field. We wish we could list them all and our apologies to those who have been omitted because of lack of space, are sincere.

The prognosis for the future can be written from the records of the present. The growth in sales of tape recorders is one indication. In 1950 sales of wire and tape recorders totaled 110,000, in 1951, 100,000, in 1952, with wire recorders pretty much out of the picture sales were 150,000 units. In 1953, 200,000, in 1954, 225,000, in 1955, 360,000 of which 60,000 were in the more than \$600 class. 1956 figures show about 400,000 and '57, not yet compiled will go still higher. Production of stereo machines has exceeded monaural and with the development, by Ampex, of

high speed duplicating machines, music on tape and stereo broadcasting has grown by leaps and bounds.

The Magnetic Recording Industry Association is likewise increasing in membership and stature and now has more than 30 member firms.

In this short history we have not been able to follow the fantastic developments in the industrial side of tape recording: geophysical recording, telemetering, computing, etc., which have shown growth similar or greater than the audio side of magnetic recording. That would be another story.



The Ampex Video Tape Recorder was developed in great secrecy and first demonstrated in the NARTS show in May of 1956. The machine created a sensation and the networks immediately placed orders. This is the first unit to be delivered to an independent station, the King Broadcasting Company which operates KING-TV and KGW-TV in Oregon.