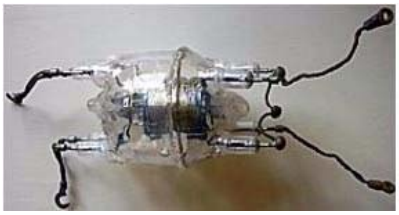

Associazione
Storia della
Elettronica
ASE - museoedelpro

ASE in Italian is the acronym for Association on the History of Electronics. It was founded in 2013 to preserve the memory of significant achievements in this branch of knowledge, which evolved so rapidly that even brilliant outcomes of a recent past were quickly forgotten. Some people were lucky enough to participate, each for his small part, in the evolutionary process. They are well aware of the efforts and commitment required at each development step and simply refuse to throw everything in the trash before having left a trace for the use of the new generations and perhaps even for themselves, with a hint of nostalgia for a past in which every conquest seemed within reach of everyone.

With this spirit started the collection of electronic devices and vacuum tubes today listed on the association's website, http://www.ase-museoedelpro.org/. The name of the museum recalls that the first pieces were in the availability of the EDL / Edelpro group, small engineering structures that had operated in the design of advanced electronic systems, with an ASIC Design Center, also in the context of European actions for microelectronics. Over the years, due to the considerable size of complete equipment, it was decided to favor the acquisitions of electron tubes only, which anyway allow us all to appreciate the progress of the entire electronic science over the years.

Fig. 1 - ASE through the years. Left, an expandable two-input inverter, the only surviving relic of the CDC/Bendix G20 mainframe computer installed in the Computing Centre of the Naples Polytechnic. Around 1970 the late Professor Fadini asked for some hundreds replacement boards, in order to maintain the computer. Soon later Professor Savastano asked for an interface set to interconnect a Hitachi 505 analog computer to a HP 2100A minicomputer, for the just born Study Center on Hybrid Computers. In the middle, an acknowledgment to EDL / Edelpro from European Silicon Structures for the design of a set of four full custom CMOS ASICs, containing all the digital electronics of a radar display system. The customer was Selenia, now Galileo. On the right, a more recent plate from the Tube Collectors Association for the articles on the history of British and American tubes published on the ASE website.

Today the collection is essentially virtual, samples being stored on shelves. Cards were prepared for each set and electron tube type, with photos showing both the general appearance and construction details, adding all the information available in the catalogs and in the technical press of the time.

The section dedicated to **electron tubes** lists over than one thousand special types, transmitting ones, magnetrons, klystrons, Heil oscillators, traveling wave tubes, UHF planar tubes, magnetic field sensors, light and vacuum sensors, noise generators. Also experimental and non-conventional types are listed, as phasitron modulators, beam-switch amplifiers and selectors, trochotron and dekatron counters, ultra-high-rel amplifiers for submarine telephone repeaters. The most relevant part of this section shows tubes intended for radar applications from the mid thirties. Actually there are samples covering most of the developmental steps of the British radar, from ‘silica valves’, to

‘doorknobs’ or ‘giant acorns’, to ‘micropups’ and ‘milli-micropups’, to continue then with cavity magnetrons, klystrons and other ancillary devices. The collection includes the very early laboratory prototype of the GEC eight-cavity magnetron, which was used in the characterization of the E1189 brought to America and Canada by the **Tizard Mission**.

Fig. 02 - Left, a sample of silica valve, the NT57, used in the early operational British sets in the second half of the thirties. Top right the first laboratory prototype of the eight-cavity E1189 magnetron. It was used at GEC by E.C.S. Megaw to characterize his low magnetic field and low profile pulse design, a variant to the CW prototype devised by Randall and Boot at Birmingham. The sealed E1189 sample no. 12 was brought to America and Canada by the Tizard Mission, originating there countless copies and variants. Bottom right, a REL 3D, Canadian copy of the E1189, made by Northern Electric. Just the accidental discovery of the E1189 prototype, coming from a warehouse of the disappeared GEC, allowed us to reconstruct the history of the development of the British magnetron.

Several samples of radar tubes developed in other countries during the war were also added to the collection, so to compare British-Canadian types with similar tubes designed in America, in Germany and in Japan.

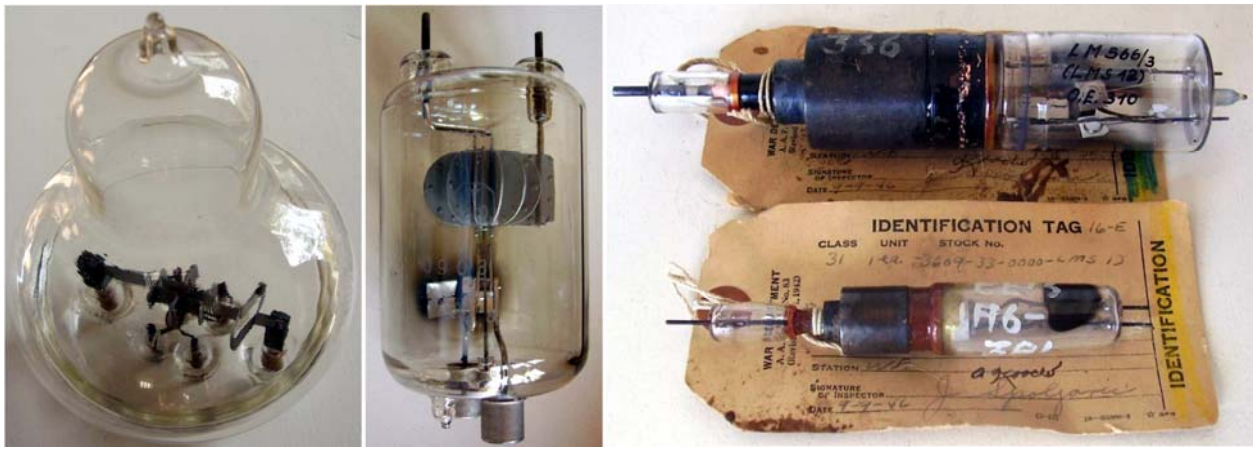

Fig. 03 - Left, a sample of TS6, also referred to as ‘giant acorn’ or ‘doorknob’, was designed by GEMA in Germany for the Seetakt, a radar set operating around 400 MHz. It was also built in Italy by Fivre. The T-310, made in Japan during WWII, resembles the Telefunken LS180, used in the transmitter of the Wurzburg set. The two very unique samples of German cavity magnetrons on the right were brought back to light from some dusty shelf in the War Department after about 75 years: the LMS12 above operates at 10 GHz, while the LMS13 below was scaled down, to operate at 18 GHz.

The families of the already coded tubes can be accessed, with an optional description, at the page:
http://www.ase-museoedelpro.org/Museo_Edelpro/Catalogo/tubes/tubes_intro_.htm.

Whenever possible, the history of interesting tube families has been completed with the addition of equipment designed around those tubes. This is the case, for example, of the many trochotron beam switch counters shown in the collection, for which it was also possible to find and completely restore a digital frequency meter using just trochotrons and their companion Nixie indicators.

Fig. 04 - Left, a beam switch selector LBS-1, forerunner of the trochotron, and a sample of the first external magnet 6700 trochotron manufactured by Haydu Brothers, on the design carried out at Burroughs. Right, a digital frequency meter, the FR-114/U, based upon six trochotron counters driving 6844 Nixie readouts.

The ASE site also hosts the cards of various electronic communication and measurement devices, among which are noteworthy several Tektronix analog oscilloscopes

Fig. 05 - Tektronix oscilloscopes. Left, a small 515A intended for service. The Lavoie LA-265 was a clone of the Tektronix 545: dual time base and distributed gain vertical amplifier, rated for 30 MHz minimum bandwidth. The third oscilloscope is one of the 547 used by the late Prof. Angelo Luciano, the one who made so many people understand the secrets of electronics. The instrument had been partially cannibalized, but today the restoration is almost complete.

Many instruments and electronic equipment are still waiting to be cataloged. Some interesting families can be accessed from the links below.

- **Communication**
- **Signal generators and frequency meters**
- **Oscilloscopes**
- **Multimeters and DC standards**
- **AC measurements**

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