The votive offerings are small models in the form of eyes and the upper part of the head. They were left by satisfied patients for the Greek god Asklepios, whose best known temple of healing was built at Epidaurus in 350 BC.

A display of defects of vision and their correction includes a short history of the lens from the time of Roger Bacon (1214–1292) who first recognized the potentiality of lenses as an aid to vision—the legend that St Jerome (340–420) invented spectacles can be discounted. The earliest lenses were made of glass or quartz and were very crude. Contact lenses, although suggested in 1827, had to wait for their full development until the advent of transparent plastics in the 1930s. The display includes a copy of the *Lancet* dating from this time, with the original article describing the use of contact lenses. This is one of the more recent of the literary exhibits, some of which reveal a much grimmer attitude towards the art of healing.

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The fossil skull of *Ichthyosaurus* lent by the British Museum (Natural History).

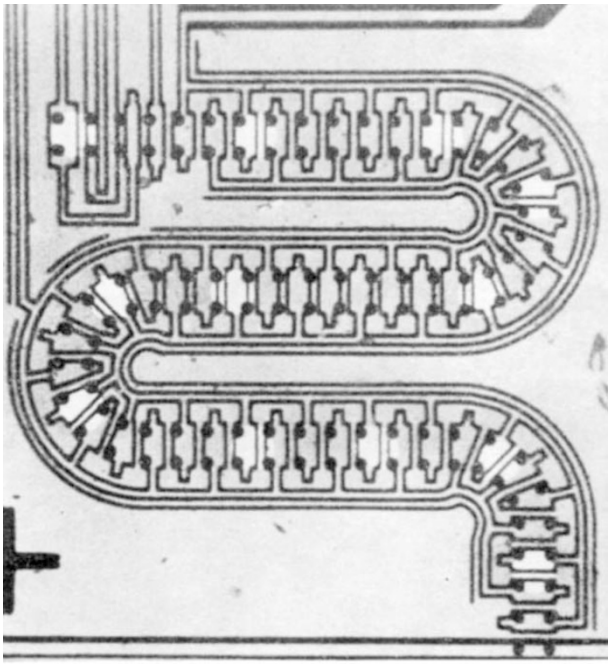
A fearsome display of instruments includes those of a Gallo-Roman oculist named G. Firmius Severus, whose name appears on his seal. There is also the eye salve he used—diasmynes—which was prepared from myrrh. Although operations for cataract are known to have been carried out by Alexandrian physicians in the third century BC, the great advances in eye surgery were not made until the nineteenth century. Several of the sets of tweezers, scalpels, scissors, syringes and such like on show date from this period. There are also some bright and shining examples of early diagnostic instruments, such as the combined tongue depressor and lamp, and the aural speculum that was illuminated by a candle. History is brought up to date by a demonstration of optics in partnership with electronics to make easier the counting of blood cells.

COMPUTERS

Memory Bubbles

A NOVEL data storage and processing technology for computers and telephone switching systems, involving the movement of minute magnetic domains, or bubbles, through thin sheets of an orthoferrite, is being explored at Bell Telephone Laboratories. The system leads to memory densities of about a million bits per square inch, with data rates, through a shift register, of three million bits per second. No practical devices based on this technique have yet been built but their potential for cheap, compact, and low power storage may mean that they will find applications in the next generation of computers—as back-up memory stores, for example.

The main advantage of this type of system, besides the small size of the bubbles which are only a few micrometres in diameter, is that the electronic control system can be very simple. The bubbles can be created, erased and moved anywhere in thin sheets of magnetic material by local magnetic fields generated by current passed through printed conductor arrays on the surface, or by controlling the surrounding magnetic field and using an overlay pattern of a magnetically soft material like 'Parmalloy'. The energy required to move the bubbles is only a fraction of that needed to switch a transistor. The bubbles are formed spontaneously as almost perfectly cylindrical domains in a critical field along an "easy" magnetic axis which is made perpendicular to the plane of a thin sheet of orthoferrite. The orthoferrite, ytterbium, thulium or samarium-terbium, is grown as a single crystal and is substantially isotropic in one plane so that the domains can move equally easily in any direction in this plane in response to the localized magnetic fields. Single bubbles, or groups of them, are being made to perform a variety of functions—logic, memory, switching and counting—and although the conventional random access memory organization does not seem to be particularly suitable, the fact that logic and memory now appear almost indistinguishable suggests that other ways of arranging the information may be appropriate.



This circuit, a photolithographic pattern on the surface of a sheet of thulium orthoferrite, can move magnetic "bubbles" (large white dots) through a shift register. The magnetic bubbles are 4 thousandths of an inch in diameter.