

One anniversary which must not pass by is that of fibre optics. Four decades on the technology continues to evolve and the business looks more encouraging than it has for a while. Fibre optics began life as a medical instrument but now is a multi-billion dollar industry which supports much of the III-Vs business.

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Fibre's 40th birthday

As confirmed by Wikipedia, the history of fibre optics, or 'dielectric optical lightguides' stems from a non-communication application. In Victorian times the total internal reflection principle on which fibre optics rely was exploited to illuminate streams of water in public fountains. The non-telecom applications continued to figure in development, when fibre bundles were used by doctors - the first fibre optic semi-flexible gastro-scope was patented in 1956. From this came the world's first practical glass-clad fibres, opening up and broadening the market application.

But it took nearly another decade before Kao and Hockham at the Standard Telecommunication Laboratories (STL*) in Harlow, UK, presented a paper at the IEE: 'Dielectric-fibre surface waveguides for optical frequencies'. They were able to fabricate higher purity fibres and in effect kick off the fibre telecoms industry. That said, like with other great inventions - the jet engine or laser, for example, enthusiasm for fibre was slow to engage. In fact, the story is that some in the audience at the IEE were actually laughing. How foolish those in question must have felt a while later.

Kao and Hockham's paper did more than describe their work to date, it set down the principles which must be met if fibre was to become a practical medium for communications. It relied on the signal attenuation being reduced below 20dB per km. It seemed a tall order because the prevailing benchmark was over 1000dB/km, hence the scepticism.

Then in 1970 Corning Glass Works managed to produce a fibre of the requisite purity to get over the 20dB with existing glass. In 1977 the attenuation came down to 5dB/km. It was then that British Telecom built the world's first field trial, running from Hitching to Stevenage, neighbouring towns close by STL. This was where III-Vs came in - it used GaAs-based narrow stripe laser diodes at one end and silicon avalanche photodiodes at the other. Because

engineers actually ran real public phone calls through the fibre, historians reckon this was when fibre optic really took off in telecom. From 1967 to 1971 several more firsts were set by STL in video transmission including the first colour TV signals presaging modern day video conferencing and consumer services such as video-on-demand.

But the first to benefit were submarine links between Europe and North America. The rest of the industry expanded more slowly than some expected and it took until the 1990s and the advent of the Internet before fibre telecoms really took off. Meanwhile, the UK's lead was eclipsed by other global activities. Despite satellite comms, for over three decades most voice calls and data and Internet traffic has relied on transatlantic, fibre optic submarine links.

Fibre has penetrated the office networks too, but cost barriers exist for the much-anticipated fibre-to-the-home. The cost of the opto components is not the stumbling block rather it is the expense of installation and civil engineering.

Nevertheless, the application of fibre optics continues to expand seemingly endlessly. They can be found in all kinds of instrumentation and sensing. In fact one of the key non-telecom applications remains for inspection of concealed parts within the body or a jet engine.

Right up to date: astronomers have linked two Keck telescopes in Hawaii using single-mode fibres. In effect the first step on the way to producing an array of telescopes offering sub-milliarc second angular resolution so they can study black holes in other galaxies (see: www.keckobservatory.org/news/science/o6o113_ohana/index.html).

*STL in Harlow, Essex (now Nortel), in 1960. STL was the R&D arm of STC, at the time one of the world's leading suppliers of telecoms equipment.