

TRAVELLING LIGHT

THE RISE OF LUMENISITY

Success doesn't come much bigger than an acquisition by one of the largest and best-known companies in the world. This is exactly what happened to Southampton spin-out Lumenisity, which was bought by Microsoft in 2022.

The deal has seen the software giant relocate staff from Seattle to Southampton, its investment boosting not only the growth of Lumenisity but also the University and the wider local economy.

The story began in 2015, explained Professor Francesco Poletti, one of the company's co-founders. "My academic colleagues and I had come from a successful set of projects developing what we call hollow-core optical fibre technology. We had the impression that it was the right time to try and bring the technology out into the real world. It was getting to the right level of maturity."

Conventional fibre-optic cables guide light through thin strands of solid glass. But after 50 years of development, said Francesco, "this technology has reached fundamental limits." The glass molecules inside the fibres vibrate and scatter, absorbing light

when it passes through them, and they slow it down by approximately 50% resulting in latency – a time delay in the signal's travel. This can, for example, cause glitches in augmented and virtual reality entertainment; remove responsive feel in remote surgery and healthcare; and slow down autonomous systems, presenting a risk that they may not react in time.

"Our technology replaces the glass in the centre of the fibre with a hole," said Francesco. "It's not just a hole – there is a microstructure which is needed to keep light in the centre – but essentially the light is travelling through 99.99% air, or whatever gas is at the centre." This, he explained, has several advantages. "For example, you can transmit much higher laser power without the fibre being destroyed or light distorted. And the fact that light propagates faster is a USP [Unique Selling Point] in industries where very fast transactions matter."

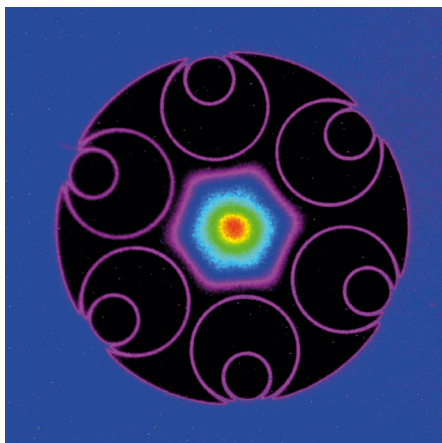


Professor Francesco Poletti

Travelling light: the rise of Lumenisity



First meeting in Romsey board room 2018



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Bigger and better

After initial discussions with the Technology Transfer and Intellectual Property (TT-IP) team in RIS (see page 8), the researchers were put in touch with Dr David Parker, an experienced executive and entrepreneur whose sector expertise would prove invaluable. “Initially we thought about addressing two markets: laser delivery, and high frequency trading, run by people who use algorithms to conduct economic transactions in fractions of a second.”

At the beginning of 2016, the four co-founders – Francesco and David, alongside former University researchers Professor Marco Petrovich and Professor David Richardson – incorporated the company. After renting premises at the University Science Park (see page 32), they received their first round of investment from a high frequency trading business. “This was the beginning of our adventure!”

For the first few years, the fibres were produced in the University clean room. Lumenisity would then cable the fibres, test them and assist their customers with cable installation. But as the company expanded, there was a clear need for bigger and better facilities.

Producing hollow-core fibres requires a clean room, which is a controlled environment with very low levels of airborne particles. Here, high purity glass tubes are cleaned, reformed, shrunk into smaller capillaries and then assembled and fused inside a larger tube. This preform, about 3 centimetres in diameter and one metre long, must then be stretched in a fibre-draw tower. “At the very top is a furnace that melts glass at 2000 degrees, and you end up with a fibre about the thickness of a hair. In our case the process is even more complicated because we have to maintain the microstructure inside the tubes.”

Building their own clean room with multiple drawing towers in the nearby Romsey industrial estate was a big investment which required more funding. In 2020, Lumenisity managed to attract a substantial investment from BGF, the UK and Ireland’s most active investor, and from Parkwalk, the most active investor in UK university spinouts – alongside significant further funding from its existing industrial investors.

It was improvements in the technology itself, said Francesco, which helped secure this second round of funding. “We had achieved a number of impressive world record results, which were remarkable enough to capture the attention of the optical fibre community worldwide.”

Future digital economy

With production moving to the new facility in Romsey, and the team having expanded to around 90 people, Lumenisity began to talk to



Hollow core fibre technology

Microsoft about a supply contract. “They had been following the progress of the technology for years. Our product has considerable advantages in their sector, enabling faster connections between regional data centres. It could also potentially enable the more efficient training of the next generation of ChatGPT, which will need networks of massive data centres.”

It soon became apparent that the volumes Microsoft required were so big that they would be better off acquiring the company altogether. After a long due diligence phase, the transaction was finalised at the end of 2022.

“There are so many positives to this deal,” said Francesco. “They keep investing in the technology, so our team is now much bigger, going on for 150 people – and the plan is for continuous growth. It’s great for the local economy, and for the University, where

they’re directly funding research and PhD studentships, and where they are looking to strengthen the research capabilities.”

The FASTNET Prosperity Partnership, co-funded by EPSRC and Microsoft, is allowing for further development of hollow-core technology. “We’ve achieved a landmark result this year. Our technology has officially surpassed the performance of conventional fibres, not only in transmission speed, and low latency, but also in the attenuation of light.” Light intensity is lost – attenuated – as the signal travels down the fibre, meaning that for long distance communications electricity is needed to re-amplify the signal periodically and maintain its strength and quality. “As the traffic through our global network keeps increasing, electricity consumption is one of the big problems posed by telecommunication networks. Hollow-core technology might make greener networks possible.”

The FASTNET programme’s target is ultimately to increase data capacity by up to 500%, in faster and greener networks that will support the future digital economy. “My hope is that UK and Southampton companies will seize the opportunity to be early adopters, helping us grow and gaining an advantage for themselves.” said Francesco. “My vision is aligned to Microsoft’s vision, which is to roll out this technology on a huge scale for the benefit of society and humanity.”

Worthwhile journey

While his co-founders Marco Petrovich and David Richardson are now full-time Microsoft employees, Francesco splits his time. “When I work for Microsoft, I develop fibre technology for optical communications. When I work for the University, I look at other applications.” These include potential applications in quantum communications, high-power laser delivery, and more. “We’re working with CERN, we’re working with NASA...over the past couple of years. I’ve been personally contacted by something like 40 companies about this technology. It is an incredibly exciting time, and the University of Southampton is at the heart of this revolution.”

Other companies before Lumenisity had tried to bring hollow-core fibre technology to the market. So how did they succeed where others failed? “We had the solid foundation of a mature technology, and we’d secured a key patent,” reflected Francesco. “We invested in advanced modelling tools. Then there was the outstanding business experience brought by David Parker – as academic founders we would have struggled to navigate those early negotiations without him.”

Doubt and failure are never far away when founding a company, he said. “Luck is a factor. But it’s ultimately the strength of your team which will decide whether you survive those crisis moments.”

The Microsoft acquisition might be the headline story, but for Francesco and all his co-founders, the journey itself has been worthwhile. Even without the final happy ending of a rewarding sale, it would have been an incredible experience, and “we would recommend it to all of our academic colleagues.”