Institution: King's College London (KCL)

Unit of Assessment: 9 (Physics)

Title of case study: Sale of Fluorescence Assay Start-up Company

1. Summary of the impact (indicative maximum 100 words)

The sale of Genapta Ltd. to a North American Instrument manufacturer was successfully completed in December 2008, with the release of the holdback payments and associated validation of its technology, as well as the transfer of know-how to the purchaser. The funds from the sale also benefitted the shareholders, including Cambridge Enterprise Ltd which was able to reinvest funds in new University spin-outs. Genapta was co-founded by David Richards, with product development between 2001 and 2008 of a fluorescence assay system for biochemical screening informed by his expertise in fluorescence detection, resulting from his research during this period.

2. Underpinning research (indicative maximum 500 words)

Since 2000, the research programme of David Richards at King's College London has been concerned with the development and application of advanced photonics for application in nanotechnology and biomedicine. At King's he has held positions as Royal Society University Research Fellow (2000-2003), Reader in Physics (2003-2007) and Professor of Physics (2007-). In particular, his research work has concerned the development of techniques requiring the sensitive spectroscopy detection of fluorescence and Raman scattering; this research has enabled him to develop a strong knowledge of all aspects of fluorescence measurements, especially in biomedical applications.

Until 2003 Richards' research was concerned with the development and application of the technique of scanning near-field optical microscopy (SNOM) to thin film fluorescent nanostructures for the nanoscale analysis of their morphology [1,2]. From 2001–2008 he developed tip-enhanced Raman scattering and subsequently tip-enhanced fluorescence microscopy, with the demonstration of 60 nm resolution fluorescence imaging of single quantum dots and quantum dot clusters [3,5]. These programmes involved the development of new instrumentation, requiring in particular the detection of low fluorescence light levels and using optical fibre light delivery for remote access. From 2005 he developed a programme of research concerned with enhancement and lifetime modification of fluorescence in the vicinity of metal nanostructures [4,5], with particular application in biomedicine. This formed part of a wider EPSRC-funded programme developed and led by Professors Malcolm Irving FRS (PI and Director of the Randall Division for Cell & Molecular Biophysics), Tony Ng (Richard Dimbleby Chair of Cancer Research) and David Richards, concerned with the development of a new optical proteomic technology, employing fluorescence techniques for the identification of protein interactions *in situ* in biological cells. This involved an interdisciplinary network of researchers across King's College London, including the Department of Physics, the Randall Division, the Department of Maths, the Division of Cancer Studies. The research strand led directly by David Richards, concerned with the development of plasmonic nanostructure substrates, led to the development of a novel fluorescence assay for protein internalisation, the final report on which was published in 2010 [6].

In 2007, David Richards brought together, through the establishment of the KCL Centre for Biophotonics, the strong cross-College activity in fluorescence spectroscopy and imaging, with application to biomedical sciences, which had developed within King's since 2000.

3. References to the research (indicative maximum of six references)

[1] R. Stevenson, R. Riehn, R.G. Milner, D. Richards, E. Moons, D.-J. Kang, M. Blamire, J. Morgado and F. Cacialli, *Ultraviolet–visible near-field microscopy of phase-separated blends of polyfluorene-based conjugated semiconductors.* Appl. Phys. Lett. **79**, 833-835 (2001). DOI: 10.1063/1.1389822

[2] D. Richards and F. Cacialli, *Near-field microscopy annd lithography of light-emitting polymers.* Phil. Trans. Royal Soc. A **362**, 771-786 (2004). DOI: 10.1098/rsta.2003.1346

[3]* F. M. Huang, F. Festy, and D. Richards, *Tip-enhanced fluorescence imaging of quantum dots.* Appl. Phys. Lett. **87**, 183101 (2005). DOI: 10.1063/1.2115073

[4]* T. Ritman-Meer, N. Cade and D. Richards, *Spatial imaging of modifications to fluorescence lifetime and intensity by individual Ag nanoparticles* Appl. Phys. Lett. **91**, 123122 (2007). DOI: 10.1063/1.2789700

[5] N.I. Cade, F Culfaz, L Eligal, T Ritman-Meer, FM Huang, F Festy and D Richards, *Plasmonic enhancement of fluorescence and Raman scattering by metal nanotips.* Nanobiotechnology **3**, 203-211 (2009). DOI: 10.1007/s12030-009-9020-x

[6]* N.I. Cade, G. Fruhwirth, S. J. Archibald, T. Ng, and D. Richards, *A Cellular Screening Assay Using Analysis of Metal-Modified Fluorescence Lifetime.* Biophys. J. **98**, 2752-2757 (2010) DOI: 10.1016/j.bpj.2010.03.016

*** Publications that best indicate the quality of the underpinning research**

4. Details of the impact (indicative maximum 750 words)

Genapta Ltd. was founded in December 2000 to develop a high performance optical platform for biochemical screening. Seed-funding for the company was obtained from Cambridge Enterprise (then the Cambridge University Challenge Fund), through one of the co-founders, David Richards, who moved from the University of Cambridge to King's College London in September 2000. Following development of the company's underpinning technology, from 2003 Genapta developed a collaboration with the technology development team of Glaxo Smith Kline (GSK) for the first stage development of a next generation fluorescence screening platform to quantify the transient binding of potential drug compounds to protein targets within a microfluidics developmental drug discovery platform. The further successful development of this technology with GSK and other customers led to the sale in December 2007 of Genapta to a large north American instrument manufacturer, to enable its further commercialization in the competitive drug discovery instrumentation market.

The sale of Genapta involved two hold-back payments. The first holdback was contingent on the successful validation in 2008, which was achieved, of the functionality, fitness for purpose and compliance with agreed technical specifications of prototype fluorescence assay instruments. The second hold-back payment, due in December 2008, was contingent on further terms. Both hold-backs were paid in full, demonstrating the successful validation of the technology and transfer to a major corporation. The sale provided a 20% internal rate of return (IRR) to the early-stage investors. In total the University of Cambridge (through shares held by the University, The Challenge Fund Trading Company Ltd and Cambridge Enterprise Ltd.) received and undisclosed sum from the sale, the majority of which was recycled via the evergreen Seed Funds and used to support new spin-outs emerging from the University.

As Chief Scientific Officer of Genapta, Richards brought to the company his expertise and knowledge in low-light level optical detection and spectroscopy, through his ongoing research on fluorescence spectroscopy and imaging during the period 2000 to 2008. This fed into Genapta's fluorescence assay technology and product development. This was strengthened further by the expertise he developed during this period in the application of fluorescence techniques in biomedicine, built up against a strong research activity in this area at King's College London. The strength of Genapta's underpinning technology was the decisive factor in the attractiveness of the company to a major international instrumentation manufacturer.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Share Purchase Agreement of Genapta Ltd. December 2007.

2. Letter from the Head of Seed Funds, Cambridge Enterprise. Confirmation of investment in Genapta, its sale and date of final release of funds, the benefit to Cambridge Enterprise and the University of Cambridge, and subsequent reinvestment in new spin-outs.

3. Former CEO Genapta Ltd. Confirmation of all aspects including: company foundation; role of Richards and benefit of his research; sale of the company and successful completion of holdback terms.