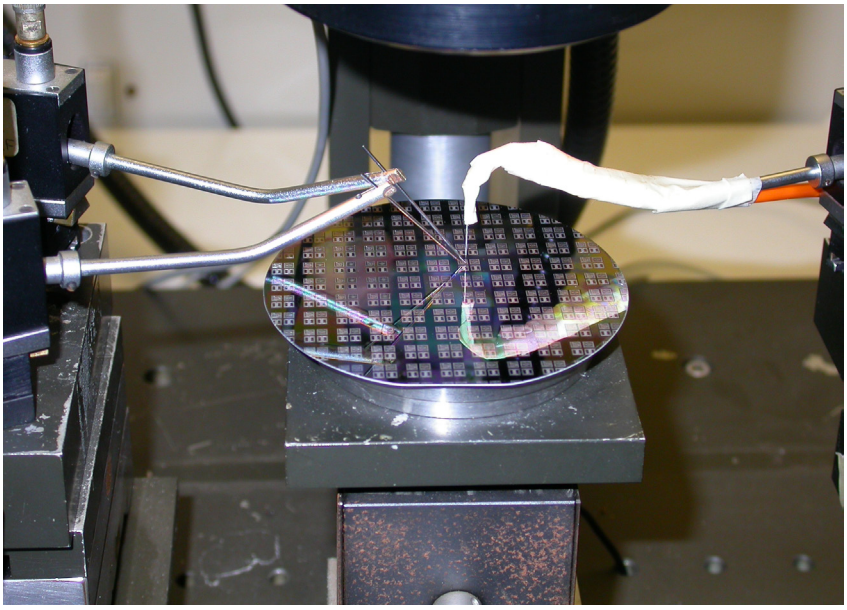
Commercialising the INSiAVA intellectual property

Market leaders in chip manufacture, such as Intel Corporation, have comprehensive research initiatives focused on solving the interconnect dilemma (the need for faster and smaller semiconductor products with greater functionality). The research team at the Carl and Emily Fuchs Institute for Microelectronics (CEFIM) at the University of Pretoria (UP) is pushing the boundaries and is close to a technological breakthrough that could solve this dilemma.



→ The optical performance of new INSiAVA silicon light sources is characterised by a fibre-optic measurement probe on a micro-manipulator.

It is envisaged that the most significant applications of the injection-enhanced silicon in avalanche (INSiAVA) technology will be in products that rely on a high switching speed. These include video applications, for instance, in the entertainment and security industry, and imaging, such as medical imaging or geographic information systems (GIS). The potential advantage of chip-to-chip optical interconnects, which could send data a thousand times faster than copper wire, potentially has a huge market in all computing applications, making it a truly "billion unit" application.

Establishment of INSiAVA (Pty) Ltd

Investor interest was sparked with the registration of a USA patent in 2000 by Prof Monuko du Plessis, Director of CEFIM, together with his erstwhile colleagues, Prof Lukas Snyman and Prof Herzl Aharoni. Subsequently, INSiAVA (Pty) Ltd was established in 2005 as a privately owned start-up company of the University of Pretoria. The South African Intellectual Property Fund (SAIP Fund), managed by Triumph Venture Capital (Pty) Ltd, became a shareholder upon its investment in Phase III of the technology development. It is the sole owner of the valuable portfolio of intellectual property rights that would protect the technology in the world's major economies once those rights have been granted.

The company is also the exclusive licensee of the applicable background intellectual property of the University of Pretoria. The company uses the bulk of its investment capital to contract the University of Pretoria to conduct the technology development programme, aimed at improving the technology to industry specifications for a range of applications.

INSiAVA Inc was established in 2010 as a USA-based subsidiary of INSiAVA (Pty) Ltd, incorporated in Delaware, USA, with an executive office in Atlanta. INSiAVA Inc will be the vehicle through which the international commercialisation of the company's light-from-silicon technology will be undertaken. A European subsidiary might follow.

The International Advisory Board (IAB) will play a key role in directing the development programme and commercialise the INSiAVA technology portfolio. The key roleplayers in this regard are Laurie Olivier, convenor of the IAB, Prof Philippe M Fauchet, the first international specialist appointed to the IAB, who will serve as an anchor member, and Prof Roelf van den Heever, CEO of INSiAVA (Pty) Ltd.

Laurie Olivier is the Atlanta-based partner of Veritas Venture Partners, the oldest existing Israeli venture capital company. His involvement in venture capital commenced in 1989 when he represented the venture capital interests of Anglo-American Corporation. He represented Anglo-American on an East Asian private equity fund and a South African venture capital fund. Since being established as Veritas' USA-based partner in Atlanta, Georgia, Laurie has been Chairperson of the American-Israel Chamber of Commerce (Southeast Region) from 2007 to 2009. He has been retained by the Southern Education and Research Alliance (SERA) as a commercialisation advisor, is a venturing advisor to UP, and has served as an advisor to the VentureLab of the Georgia Institute of Technology in Atlanta. He holds a BEng (Electronics) degree from the University of Pretoria and a BCom (Hons) and Diploma in Datametrics from the University of South Africa.

Prof Philippe M Fauchet is a distinguished professor in Electrical and Computer Engineering at the University of Rochester, New York. He is also a professor at the Institute of Optics, Biomedical Engineering, Materials Science and Physics, and a senior scientist in the Laboratory for Laser Energetics at the same institution. He has more than 25 years of experience in silicon photonics, nanoscience and nanotechnology with silicon quantum dots, biosensors, electroluminescent materials and devices, and optical diagnostics. Over the past five years he has been working on the development of silicon-based lasers and silicon photonic components such as modulators and switches for use in optical interconnects.

Prof Roelf van den Heever is chief executive officer (CEO) of INSiAVA (Pty) Ltd. He has extensive business experience, with the added advantage of understanding the academic environment, having served as head of the Department of Computer Science at the University of Pretoria from 1969 to 1997. He established the EPI-USE Group of Companies, which operates in 10 countries and employs in excess of 800 people. This group grew out of a high-tech software development initiative that was started at UP in 1982. He is therefore well acquainted with business planning, international business matters, the startup of companies, and supporting corporate governance considerations due to his responsibilities in this group. He can thus make an important contribution to the management of the company at a strategic level.

While the current phase of research and development is being conducted by the University of Pretoria under contract of INSiAVA (Pty) Ltd, the company has started concentrating on the specification of the technology for prospective applications and the development of demonstrators that would underpin commercialisation of the technology for various applications.

The shareholders have appointed a board of directors to oversee the company's strategy and operationalisation, as well as the commercialisation of its intellectual property portfolio. The chairperson of the board is Prof Robin Crewe, Vice-Principal (Research and Postgraduate Studies) at the University of Pretoria. Prof Roelf van den Heever, co-founder and chairperson of the EPI-USE group of companies, is chief executive officer of INSiAVA. The other directors are Wellington Chadehumbe, CEO of Triumph Venture Capital, an internationally trained investment banker and venture capitalist, Prof Roelf Sandenbergh, dean of the Faculty of Engineering, Built Environment and Information Technology at the University of Pretoria, and Mark Eccles, a corporate lawyer and partner in Triumph Venture Capital.

International Advisory Board – preparing for global success

An international advisory board (IAB) is being established by the board of INSiAVA The IAB will play a key role in directing the development programme and to commercialise the INSiAVA technology portfolio.

The IAB is convened by Laurie Olivier, an alumnus of the University of Pretoria. He is the globalisation advisor of a number of South African technology startup companies, including INSiAVA (Pty) Ltd. His extensive experience in venture capital investments and private equity will play a crucial role in nurturing the available expertise that might ensure INSiAVA's ultimate success.

Olivier has been involved in INSiAVA since the founding of the company in 2005. He has played an important role in introducing representatives from the University of Pretoria to eminent venture capital funding institutions in the USA. With his understanding of the venture capital environment both locally and internationally, he will continue to play an invaluable role in the commercialisation of the University's intellectual property, particularly the portfolio assigned and/or licensed to INSiAVA (Pty) Ltd. He is particularly knowledgeable about applying a trans-Atlantic venture capital investment model, resulting in a public offering of shares, a private sale of a technology or a company, particularly when dealing with high-technology innovations such as the INSiAVA technology. Having facilitated the growth of start-up companies on both sides of the Atlantic Ocean, he is keenly aware of the importance of keeping technology ownership close to its research and development base, while commercialising it in the USA to provide an optimal return on investment.

According to Olivier, INSiAVA fits this trans-Atlantic venture capital model perfectly. An added advantage is the fact that the direct benefits of commercialising the technology will flow back to South Africa. "As it is a fundamental technology, it represents a potential global breakthrough in an important market," says Olivier. "By developing competency around this venture, the University of Pretoria will be positioned as a world leader in silicon photonics."

The role of the IAB is to develop strategies that will pave the road for future international commercialisation of the INSiAVA technology. The members of the IAB will accumulate as much international expertise as possible in the venture in order to develop a global network of excellence. "As we enter the final research phases, we need a combination of world-class researchers and individuals who are experienced in the commercialisation of intellectual property," adds Olivier.

> **"This is fundamental technology that represents a potential global breakthrough in an important market."**

The IAB is expected to provide guidance on the research endeavours of the University of Pretoria, which will, in turn, develop technological depth at the University. An important objective is to develop a centre of excellence in silicon photonics at the University of Pretoria, recognised internationally among the best in the world in this field.

"This initiative has the commitment and support of the University at executive level," says Olivier. "Following INSiAVA's success, the way will be paved for other research initiatives at the University with commercial potential to follow a similar route."

With the investment of a further R30 million in funding in October 2010, the technology can enter the final phase of its research and development, preparing it for commercialisation within the next three to five years. "During this phase, the IAB will play an important role in developing business relationships overseas so that the company can be in a position to raise international venture capital by 2013," explains Olivier.

"Once the viability of the technology has been demonstrated for selected applications, the company will consider various commercialisation avenues based on the advice of the IAB. This could include options such as developing a fab-less company (subcontracting microchip production), engaging in a joint venture with an industrial partner, or licensing the intellectual property."

When fully constituted, the IAB will comprise a combination of scientifically and commercially orientated members who are world leaders in their fields. The commercial members would comprise a combination of representatives from leading companies, smaller silicon photonics-focused entities and start-up companies, as well as industry and academic representatives. It will also have a balanced geographic representation.

The first international specialist appointed to the IAB was Prof Philippe Fauchet, who will serve as an anchor member of the IAB. "Prof Fauchet is one of the top three researchers in the world in the field of silicon photonics," says Olivier.

The executive management of INSiAVA (Pty) Ltd can now proceed with the recruitment of additional IAB members. Negotiations are ongoing with a number of eminent international scientists and entrepreneurs.