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SPES BONA

Innovation at UCT

2011

INNOVATION

at UCT 2011

This brochure provides a brief update on Innovation and IP highlights over the last year, augmenting the detailed report that was issued in 2010. It has been an exciting and busy year with a number of spin-off companies, new and granted patent applications, all against the backdrop of the revision of the UCT IP Policy and the implementation of the IP Rights from Publicly Financed R&D Act.

The Working Group on the development of an innovation strategy, which has broad representation from the University community, has continued the work started in 2010, reviewing best practice internationally and developing a framework on which to build the UCT Innovation Strategy. An Innovation Forum is being created where issues can be raised and debated, with wide participation and engagement, to shape and inform the strategy. Some concrete outcomes are expected early in the new year.

>> 2010 Dashboard

Research Contracts Signed
1056
2009: 882

Research Contract Value
R550.0m
2009: R 543.9 m

Total Research Income
R760.5m
2009: R 768.0 m

Foreign Research Funding
R382.5m
2009: R 334.7 m

Local Research Funding
R167.6m
2009: R 209.2 m

Publications
1188.22*
2008: 1086.15 *2009

Invention Disclosures
31
2009: 25

Patent Applications Filed
57
2009: 46

Patents Granted
36
2009: 47

License Agreements
8
2009: 6

Materials Transfer Agreements (Outbound)
29
2009: 21

Spin-Out Companies
0
2009: 1

License Income
R3.5m
2009: R 136,494

Profit UCT Incubated Companies
R0.4m
2009: R 693,630

Total Income from IP
R3.9m
2009: R 830,699

>> Patenting

Patents Granted in 2011

Angiotensin-Converting Enzyme (ACE) Inhibitor Drug Development: Prof Ed Sturrock (IIDMM)

Having published the three-dimensional structure of angiotensin-converting enzyme (ACE) in Nature in 2003, Prof Sturrock and team have gone on to design novel ACE inhibitor drugs. These drugs are widely used to treat cardiovascular diseases such as high blood pressure, heart failure, coronary artery disease and kidney failure.

The current ACE inhibitors on the market have unpleasant and sometimes dangerous side effects, which through clever design the new drugs will overcome. Moreover, there are two parts of the enzyme with overlapping but distinct functions. The one part is primarily involved in blood pressure control while the other acts on a physiological peptide that has potent antifibrotic activity. Thus, the work presents a unique opportunity to work on two important targets for drug development. 2011 saw the granting/allowance of the "Inhibitor 1" and "Inhibitor 3" patents in the USA. In late 2010 the *Inhibitor 1* patent was validated in Germany, Switzerland, Denmark, France and Britain following the grant of the European patent. It is hoped that the Inhibitor 3 patent will follow suit shortly. A 'divisional' patent was granted in the USA for one of the underlying structural patents – "ACE C Domain Crystal".

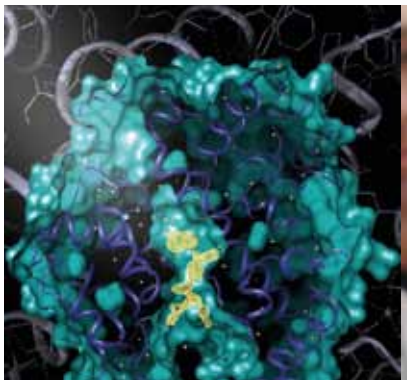
Whilst fund raising is in progress to enable lead ACE inhibitor drug candidates to move through Phase 1 clinical trials, work is continuing using **UCT PreSeed Funding,** in order to establish proof of concept and maximize the value of the core IP and structure-guided drug design.

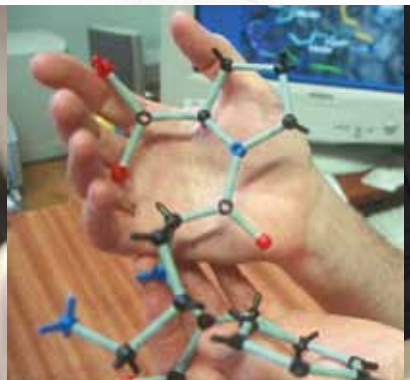
Printed Silicon Electronics: Profs Margit Harting and David Britton (Physics)

Our patent suite relating to printed silicon electronics has been strengthened with the grant of two United States and two European patents over the last two years. The '*Doping of Particulate Semiconductor Materials*' patent application was granted in the USA in 2010, followed this year by grant in Europe, where based on market research, the patent was validated in 15 European countries. September saw the first patent filed in the portfolio *'A Thin Film Semiconductor Device and Method of Manufacturing a Thin Film Semiconductor Device*' being "allowed" by the US Patent Office and it will now proceed to grant. The more recent '*Inkjet Printing of Nanoparticulate Functional Inks*' application was granted in Europe in October and it will be validated in the same countries as the 'Doping' patent within the next few months. The Semiconductors IP will be commercialised by PST Sensors (Pty) Ltd, which is discussed in the spin-off section.

South African Patents Granted

So far three South African patents have also been granted in 2011. The first was developed by **Dr Jochen Petersen** (Chemical Engineering) and external collaborator Dr Mike Dann. This device is able to monitor flows within the heaps of crushed rock that are built to chemically or biochemically leach minerals to recover




metals for the ore. The **HeapFlow Sensor** monitors heat distribution along its fins which is correlated back to liquid and gas flows within the heap. This valuable research tool is likely to impact on the way that mineral heap leaching is conducted by providing insight into the "inner workings" of heaps.

Serial inventor **Prof Michael Claeys** and **Prof Eric van Steen** (both Chemical Engineering) are Inventors on the two other South African patents that were granted. The first invention, which is co-owned by Oldenburg University (Germany) relates to **Improved Olefin Production in Fischer-Tropsch Synthesis.** The process, which involves the radical co-feeding of ammonia (conventionally thought to poison catalysts), dramatically improves the olefin selectivity. The value of these olefins is much higher than other low-value fuels. There is already commercial interest and **UCT PreSeed** funding is being used to evaluate the techno-economics.

Their second granted South African patent was for the world-first **In-situ Magnetometer,** invented in conjunction with Sasol. This device can analyse ferro-magnetic materials at actual operating conditions (e.g.500°C, 50 bar) with the ability to control gas and/or liquid flows through the material.

The In-situ Magnetomer has been well-received by the international research community and a website (magnetometer.co.za) has been established using the **UCT PreSeed Explorer Fund** to promote it, facilitate sales and provide more information about its operation. Unfortunately commercial suppliers want to see the uptake for this novel analytical instrument before committing to include it in their offerings and therefore the initial units will be produced by UCT.

New Patent Applications Filed in 2011

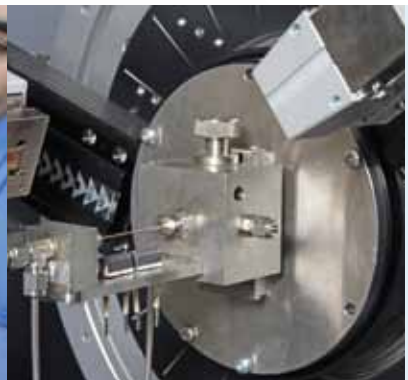
It is great to see a positive new trend emerging, i.e. the increasing number of previous UCT Inventors, collaborating across departments, faculties and/or disciplines, and jointly filing new patent applications. An example of this is a medical device, developed by **Dr George Vicatos** (Mechanical Engineering), **Samuel Ginsberg** (Electrical Engineering) and postgraduate student **Adam Parsons** (Mechanical Engineering). The device is a prosthesis that is inserted surgically into a limb of a child, replacing missing bone and remarkably it is able to 'grow' in step with the child's growth.

Past Inventors **Dr Nick Kairinos** (Plastic Surgery) and **Profs Harting and Britton** (Phyiscs) are collaborating to develop sensors for medical applications and Dr Kairinos is drawing on the skills of other past Inventors to help him with mechanical engineering design.

Dr Vicatos is a veteran prosthetics inventor and his other recent **"Hendricks-Vicatos Maxillary Transport Distractor"** invention (November 2010), used in the reconstruction of the upper jaw (maxilla) was implanted in the first patient this year, by external co-inventor **Dr Rushdie Hendricks** (UCT student **James Boonzaier** was also an inventor). This device is used especially in cases where bone has had to be removed due to cancer. Transport Distraction Osteogenisis (TDO) has developed as a novel way of reproducing new bone and soft tissue. The process involves moving two bone ends apart gradually (distraction) allowing new bone to form in the tiny gap and grow along with the surrounding soft tissues which have also often been removed during surgery. Whilst devices have been available for the lower jaw (mandible) prior to this invention, none was available that was capable of dealing with the demands of the upper jaw in terms of the complex anatomical constraints.

Another 2011 invention that is poised



to see early commercial success is **Prof Michael Claeys** and his student **Nico Fischer's "In-Situ X-ray Diffraction Cell",** which is proving to be a cutting-edge research tool. This cell can be retrofitted to existing X-ray diffractometers or synchrotrons to enable materials such as catalysts to be studied at elevated temperatures and pressures in changeable gaseous or liquid environments. The construction and design overcome a number of shortcomings that restrict the use of current commercial systems and will open up new areas of research.

The XRD Cell will be manufactured by an "emerging spin-off company" that is currently being incubated within UCT and is focused on producing Catalysis Test Units. New prototypes of the modular equipment, which now incorporate LabVIEW for computer-automated control and data capture, will bear the trade mark "Ikey™" following a recent decision by UCT to register the well-known rugby-oriented trade mark for use in a new class that will cover the equipment, extending the UCT brand. The business has grown out of the **Centre for Catalysis Research** in the Department of Chemical Engineering and the products will be officially launched at the premier catalysis conference, CATSA.

A further five new inventions were also disclosed by the Physics dynamo **Profs Margit Harting and David Britton** and team members, relating to **printed silicon electronics.** These will be included in the portfolio that will be commercialised by PST Sensors (Pty) Ltd – read more under Spin-offs.

After filing patents for several high-tech inventions **Samuel Ginsberg** has created a not "off the wall" but rather "on the wall" invention in the form of, an ingenious **picture hanger.** This invention will certainly take the frustration out of hanging pictures and especially aligning groupings of frames. One of those amazingly simple inventions when you see it, that we hope will prove to be as indispensible as a paperclip!

Ricin is a very toxic RIP II type lectin and to date no effective antidote is known for it. Whilst its toxicity has often been misused and has featured in high profile cases this invention of **Prof Kevin Naidoo and Ranga Jayakody** (both Chemistry) relates to the design of inhibitors of this immunotoxin. These **"Ricin Inhibitors"** are anticipated to have value as a therapy for various cancer diseases or HIV infection.

The modern laparoscope, an instrument used in 'key-hole' surgery in the abdomen and pelvis, relies on Hopkins glass rod lenses and a fibre-optic light source with a camera and external cables. **Dr John Lazarus'** (Division of Urology) invention, **"Airscope",** a wireless laparoscope using the latest in electronic miniaturisation, makes most of these peripherals obsolete. An experimental prototype has already been developed and it has illustrated the feasibility of these novel wireless endoscopy systems, which have improved ergonomic maneuverability and reduced weight.

>> Spin-Off Companies

2011 has been a peak year for spin-off companies, which UCT only formally recognises on conclusion of an Agreement relating to Intellectual Property (license/assignment), or a Shareholders Agreement.

Antrum Biotech (Pty) Ltd

A license agreement was signed with **Antrum Biotech (Pty) Ltd** (www.antrumbiotech.com) for the commericalisation of an **extrapulmonary TB diagnostic test** based on IP that was created by **Prof Keertan Dheda** (Lung Infection and Immunity Unit). The early-stage prototype development was supported by the **UCT PreSeed Fund** and the company has gone on to secure IDC funding to pursue further development. A comprehensive business plan has been developed as the basis for next-stage fund raising to take the medical device through the last phases of prototyping into trials and then commercialisation.

The TB Test Strip provides rapid testing for pleural TB or in other compartments; this test differs from normal lung TB/sputum diagnosis for which other diagnostics are available, or are under development. With the test being conducted at the patient bedside, the doctor can immediately prescribe appropriate medication instead of waiting long periods for cultures in a pathology lab.

The IP protection entered the national phase in 2011, with patent applications being filed in South Africa, Brazil, China, India, Indonesia and Nigeria along with a regional African application (ARIPO).

Seraptix CC

Another medical device spin-off involving **Prof Jonathan Blackburn** (IIDMM), **Seraptix CC,** has entered into a License Agreement for the commercialisation of **Biosensor.** Seraptix is also involved in a UCT-led Grand Challenges Canada project that will pursue the develop of the diagnositic. Unfortunately due to the stage of IP protection, more cannot be revealed on this!

PST Sensors (Pty) Ltd

One of the most significant portfolios of IP developed at UCT, by **Profs Margit Harting and David Britton** (Physics), spans an entire value chain, with novelty and inventiveness at every stage – basically stand-alone companies could be built around each stage in the future. It is all focused on the production of printed silicon electronics, which will become a disruptive new technology to enter the global electronics industry.

A key challenge has been how to bring this powerhouse on-line and to approach the commercialisation. Technology demonstrators are the key and the focus of current work – initial devices provide the identical function to known devices that are based on existing technology (e.g. thermistors for temperature sensing) permitting industry to test the innovative technology side-by-side. Devices have performed well indicating their potential to achieve higher performance and radically lower cost.

UCT will be assigning the IP portfolio which comprises some 13 patent *families* to **PST Sensors (Pty) Ltd** (www.pstsensors.com), a company in which the inventors (Harting & Britton) and UCT will hold equity. PST Sensors is already negotiating deals with global players in the electronics industry to develop components that will be integrated into their products.

Other inventors associated with the IP portfolio are Ayodele Odo, Manfred Scriba and Ulrich Männl.

>> PreSeed Fund Progress

UCT has a PreSeed fund (R 500,000 per annum) which supports projects in the early innovation space so that on completion, IP can either be licensed and commercialised or projects are well positioned to attract next-stage, external innovation funding. The fund, operative since 2008 has already yielded a number of successes and some recent highlights provided below.

Low-Cost Radar System: Prof Mike Inggs (Electrical Engineering)

Prof Mike Inggs and his team in Electrical Engineering have developed a 'Parasitic Radar' system for low-cost air surveillance. This type of radar would offer an alternative to expensive conventional air traffic control (ATC) systems and is useful for border control and coastline monitoring.

Parasitic radar makes use of electro-magnetic emissions from FM radio and television broadcast systems as well as cell phone base stations, which generally have good coverage worldwide. Complex data processing algorithms assess how these waves 'reflect' off moving objects, allowing an object like an aeroplane to be tracked in essentially real time. This low-cost radar will greatly improve the level of aircraft monitoring across the continent and will be ideal for implementation in South Africa and other African countries.

The PreSeed Funding enabled the concept to be sufficiently proved and demonstrated to attract the interest of a commercial partner. The know-how has been licensed to the South African firm who will now conduct further development and commercialise the radar system; UCT will continue to be involved.

S-Web Wireless Sensor Network: Dr Hanh Le (Computer Science)

Wireless sensors are being increasingly used for environmental monitoring (fires, tsunami's, weather conditions), are deployed in disaster situations and used in smart homes. Current trends are for these sensors to be deployed and then to automatically establish themselves as a network, reporting to a 'base station'.Dr Hanh Le of Computer Science developed an S-Web model (named for its spider-web-like structure) that enables the sensors to self-organise, but more importantly to communicate with each other and the base station in an energy efficient manner so as to conserve battery life and prolong the life of the monitoring network. S-Web displayed significant improvement over standard communication techniques and has been developed further using a 'Dartboard' concept to manage the hibernation of blocks of sensors (a PCT patent application is in progress).

PreSeed funding was used to practically demonstrate the S-Web network and forged collaboration with the UCT Electrical Engineering Department. The project developed software that enabled communication off different programming platforms (base station vs. sensor) to be achieved successfully. It also highlighted the practical difficulties associated with 'beam shaping' to define the communication sectors radiating from the base station. A commercial partner is currently being sought to pursue further development.

Projects in Progress

A number of exciting projects are in progress and span a diverse range of technologies, such as: **titanium recycling; breast augmentation; 3-D laser cutting;** and an immobilized Cytochrome P450 microarray screen for use in high throughput, **quantitative drug metabolism assays;** and **hypertension drug** development.

A particularly noteworthy project involves the development of a **hearing aid** created by **Dr Lebogang Ramma** (Department of Health & Rehabilitation Sciences – Audiology) and **Samuel Ginsberg** (Electrical Engineering). Whilst the IP is not patentable, novel software is being created and the hearing aid has been constructed in a simple, user-friendly format (largely due to the software control) that will be affordable, locally assembled and meet the needs of public health provision. Once the basic unit has successfully entered the market, the patentable IP creation will start, with a number of breakthrough ideas waiting in the wings. UCT has teamed up with a commercial partner who is already working alongside the PreSeed project.

This publication was produced by the Reseach Contracts and Intellectual Property Services (RCIPS) at the University of Cape Town.
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