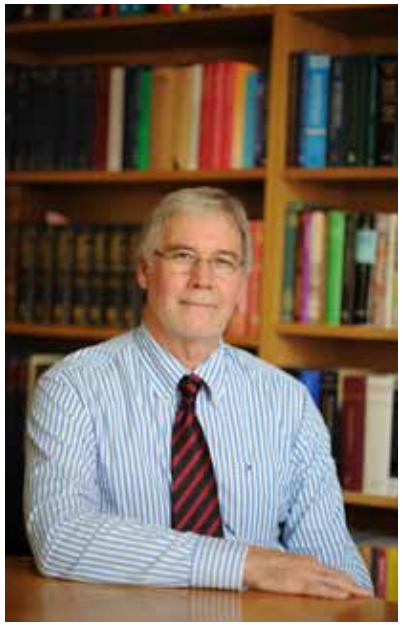
UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Inaugural Lecture Series 2013

Contents

FOREWORD

Good omens



On UCT's website where the annual series of inaugural lectures are advertised, these lectures are described in the following terms:

"Inaugural lectures are a central part of university academic life. These events are held to commemorate the inaugural lecturer's appointment to a full professorship. The inaugural lecture provides a platform for the academic to present the body of research that they have been focusing on during their career. The lecture also provides UCT with the opportunity to showcase its academics and share its research with members of the wider university community and the general public in an accessible way."

This description is correct, but it tells only part of the story. Certainly, appointment to a full professorship, to a chair, is the formal pinnacle of an academic career, and presents a cause for celebration and reflection on the work that brought the incumbent to this position. But hopefully it also signals the beginning of yet further and higher intellectual achievement. The word 'inaugural' is said to be derived from the Latin verb *augurare* ('to take omens') and so this first, formal speech by the new professor is intended also to give us a glimpse of what he or she might achieve in the future.

The description on the website further gives the formal purpose of an inaugural lecture, but it does not reveal the inner motivation of the new professor to give such a lecture. When Professor Uzodinma Nwala gave his inaugural lecture at the University of Nigeria, he listed a number of reasons why a professor should give an inaugural lecture. In his case, due to unusual circumstances, his inaugural lecture was delivered only a few years before his retirement, and was more in the nature of a valedictory, but this does not change the validity of the reasons that he enumerated. These include respect for academic tradition; for the sake of intellectual history ("unless the younger generation understands the point their predecessors have reached … they will not … know the significance of their own contributions"); for the sake of one's mentor, students, and associates; and in order to engage in public discourse on one's work.

This booklet contains a summary of the public inaugural lectures delivered at UCT during 2013, in which new professors demonstrate the wonderful range of research that is happening at the university. We hope that they will inspire the reader to attend these great events on a regular basis.

Professor Danie Visser
Deputy Vice-Chancellor: Research and Academic Affairs

The word 'inaugural' is said to be derived from the Latin verb *augurare* ('to take omens') and so this first, formal speech by the new professor is intended also to give us a glimpse of what he or she might achieve in the future.

New landscapes for labour law

The contract of employment is like the dodo, argues **Professor Rochelle le Roux**; it existed once upon a time, but no living person has ever seen it. Instead of relying on extinct definitions of employment, we need to radically rethink the labour law landscape.

> The number of poor and jobless people is growing. They are angry, insecure and bored, and they are young. We might not want to hear them, but the bells are tolling.”

The contract that defines the relationship between employee and employer – something many of us take for granted in our everyday working lives – has no satisfactory definition, says Professor Rochelle le Roux, director of the Institute of Development and Labour Law, “despite wonderfully creative attempts” by scholars, academics and judges. “The best that can be done is to mix a number of factors together according to some secret recipe, thereby producing a contract of employment, from which will emerge a creature called an employee.”

Why are existing definitions inadequate?

The challenge of a changing workplace

Many modern forms of work can’t be described or explained by current contractual arrangements, explains Le Roux. “Yet the champions of labour law seem determined to regulate only those productive activities that can be accommodated by the contract of employment.”

If they don’t fit, they are simply “artificially beaten into a shape that looks like a contract of employment, using legislative tools and/or jurisprudential imagination.”

Le Roux's research shows that the contract of employment – as a concept embracing all forms of wage-dependent labour – only reached maturity in South Africa towards the end of the 20th century. The main division in employment law for most of the 20th century was based on social rank and status, rather than dependence and independence.

By attempting to turn all productive activities into a form of employment, Le Roux argues, employment as an institution would be destroyed, not rescued.

Learning from the past

In seeking for a better definition of employment, Le Roux found herself looking towards models from the past. She extolls the virtues of the European guild system, highlighting how guilds were the primary means for organising work for at least 300 years, from 1100 to 1400, and that some guilds even survived into the 20th century.

"In broad terms, the European guilds were independent, self-governing, mostly city-based organisations in which people shared a trade or profession. These guilds were recognised by local or city governments. Often shrouded in mystery and criticised for being patriarchal and for undermining competition, the guild system was nonetheless a great institution. It represented a warranty of quality, provided social solidarity in times of need and produced great architecture, art, roads and canals that are still admired to this day."

What happened to these guilds? In one word, globalisation. Immigration, industrialisation and the growth of long-distance trade – many of the same forces at play today – proved too much for inflexible guildmasters to manage.

"If a great institution like the guild system, which was deeply embedded in society for more than 300 years, could not survive what was clearly the first wave of globalisation, what can be done to rescue a youthful institution like the contract of employment in the face of globalisation, now reaching tsunamic proportions – or was it always meant to die young?" Le Roux asks.

Our current challenges

Out of South Africa's current labour force of about 18-million, around 6.8-million are unemployed. Of these, 4.5-million are between the ages of 15 and 34. Stats SA surveys have shown that approximately 2.1-million people are informally employed, and that these people are extremely vulnerable and completely removed from the securities most people associate with standard employment.

What can be done about this incredible shortfall? Trade unions could provide social security, Le Roux suggests, "but because they have a limited capacity, we need to think of a more universal platform for providing such security, such as a basic income grant.

"The number of poor and jobless people is growing. They are angry, insecure and bored, and they are young. We might not want to hear them, but the bells are tolling. Have we not reached a stage where the different layers of precautionary principle ask of us to depart from conventional thinking and to go where there is no path to trail – and in doing so imagine and explore truly new labour law landscapes?

"More particularly, has the time not come to accept that employment can be neither the site where the flaws of history are remedied, nor the site where the social risks of life can be absorbed? Is the trader, who walks around with his shop on his back, not entitled to at least the same – or even better – social protection as the secretary who is indefinitely employed?"

In essence, Le Roux is calling for the desocialisation of employment.

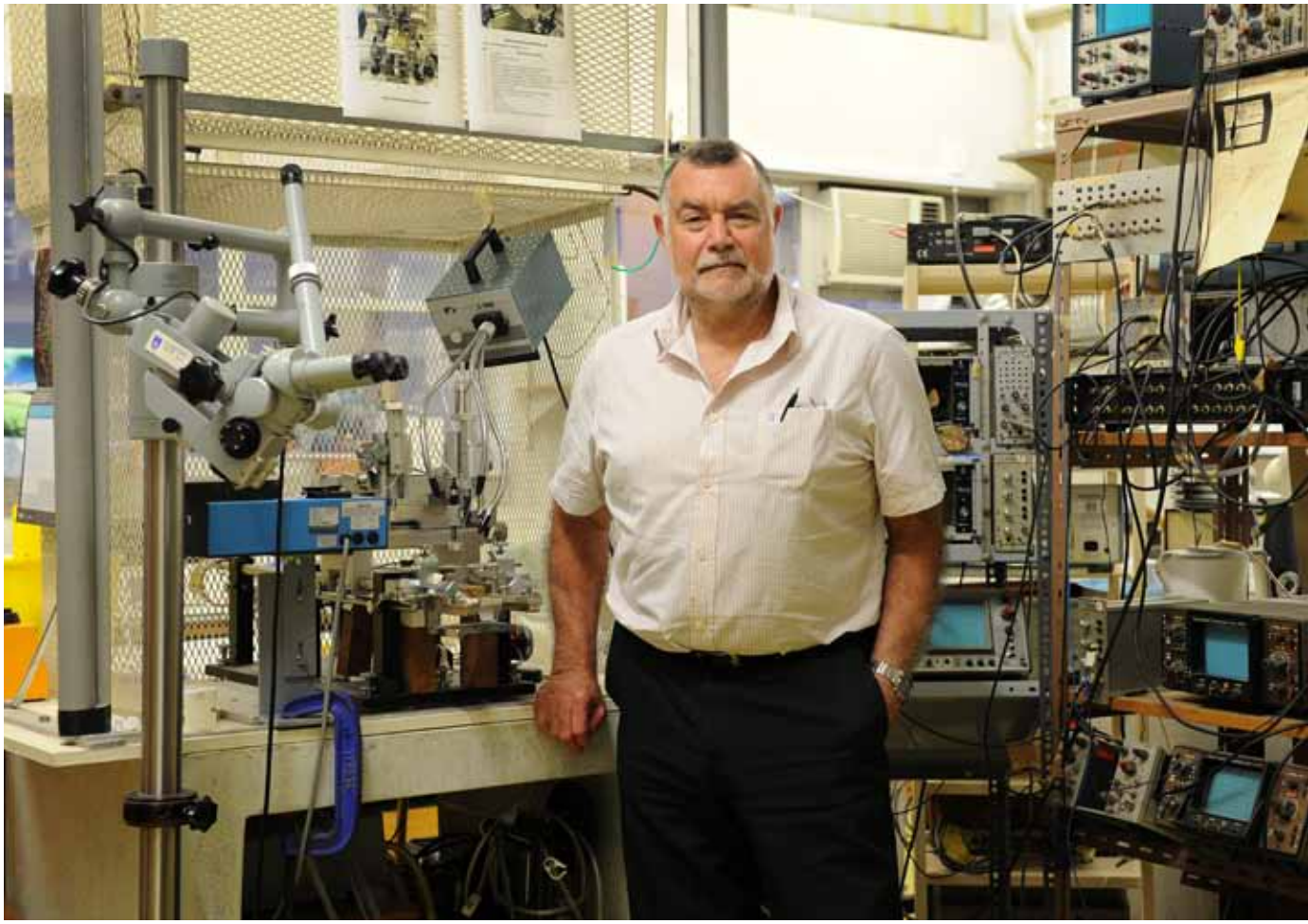
"As long as we link social rights and benefits to employment, we encourage employers to take measures that allow them to avoid labour law. Employees, like all other workers, should labour for wages that reflect the value of their efforts – and not for future social security entitlements that have little bearing on the value of the services rendered."

Professor Rochelle le Roux gave her inaugural lecture, *Employment: A dodo or simply living dangerously?,* on 27 February 2013.

Rochelle le Roux is a professor in the Faculty of Law and, since the beginning of 2012, director of the Institute of Development and Labour Law. The institute promotes research in the areas of labour, employment and social security law and focuses on the interface between development, labour and employment law and social policy in sub-Saharan Africa. She has published widely on the topics of harassment in the workplace as well as the contract of employment and its interface with the Constitutional right to fair labour practices. Her current research focuses on the scope of employment and the rise and regulation of new forms of work. In 2011 she was elected to the board of the South African Reserve Bank as a non-executive director and in the same year she was appointed to the board of the South African Institute for Drug-Free Sport by the Minister of Sport and Recreation.

Mapping the brain

So much has been written about the brain, and yet so much remains to be explained, observes **Professor Lauriston Kellaway**. The project to map the human brain continues, greatly aided by the expansion of neuroscience in the last decade, the work of top South Africans in the field, as well as our own capacity to learn and wonder.



"Why do we love? Why do we dislike? Why do we feel threatened? Why do we feel inspired? Why do we feel depressed? Why do we want to kill our fellow human beings?" asks Professor Lauriston Kellaway from the Department of Human Biology. "These are all questions that are answerable if we really understand how the brain functions."

Plastic brains

In understanding how the brain works, it's important to keep in mind that it's changing all the time: "Our brains are extraordinarily plastic, meaning that we are activating synapses and forming new synapses all the time. We have the ability to learn well into old age," Kellaway explains.

But this malleability means that our brains are also shaped by the world around us. Cognitive neuroscience has demonstrated that the human brain can be shaped by external influences, "… so we really do need to understand the interaction between our brain and the environment in which we find ourselves".

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Roots in Africa

The decade between 2000 and 2010 – dubbed the Decade of the Brain – saw an explosion of scientific data with many thousands of papers being published. This decade also witnessed growth in the field of neuroscience with the number of delegates attending conferences hosted by the Society for Neuroscience – one of the biggest societies of its kind internationally – increasing to over 34 000.

Kellaway argues that the development of neuroscience has deep roots in Africa, referencing how the continent and South Africa more specifically have contributed some of the finest thinkers in the field. Among them are UCT alumni and prominent neuroscientists Rodney Douglas and Kevan Martin, who currently co-chair the Institute of Neuroinformatics in Switzerland.

"Both are South African, born and bred. Both are graduates of UCT and have had an enormous influence in the development of neuroscience. They bring together a core team of multi-disciplinary experts – ranging from neuromorphic engineers, to computational and mathematical gurus, biologists and neurophysiologists – currently supporting a huge team of doctoral and postdoctoral students at the institute."

Kellaway gives another example as evidence of the influence of South Africans in the world of neuroscience: UCT graduate Henry Markram is director of the Human Brain Project, a large-scale, decade-long European research project that aims to simulate the most exact human brain ever in a supercomputer – a world first. The goal of the project is to pull together all existing knowledge about the human brain and to reconstruct it, piece by piece, for simulation models. These models could usher in an entirely new understanding of the human brain and its diseases, as well as new computing and robotic technologies – one of the many reasons why this project has been granted the biggest funding award in the history of neuroscience (€1-billion) by the European Union.

A heated debate amongst neuroscientists central to the Human Brain Project relates to the claim of the proposed construction of a cellular human brain within the next decade. Kellaway contextualises this by presenting data drawn from his work on computing cortical synaptic density at an electron microscopic level. He highlights the enormity of the technical and time-consuming challenge – and this confined only to a few microns of the cat cortex and without knowing which entities are actually interconnected!

Referring to the pivotal role played by South Africans in the world of science, Kellaway asks: "What is it about towns in South Africa, like Cape Town, Kuruman and Beaufort West, that has produced these world-renowned scientists of such vision and genius?" – quipping that perhaps a diet of boerekos, Mrs Ball's Chutney and biltong could have played a role.

Our brains are extraordinarily plastic, meaning that we are activating synapses and forming new synapses all the time. We have the ability to learn well into old age.

Professor Lauriston Kellaway gave his inaugural lecture, *Neurons, Cells and Circuits: The roadmap to understanding brain function*, on 10 April 2013.

Lauriston Kellaway's deep fascination with the intricacies of brain function developed in tandem with the establishment of the first neurophysiology research laboratory in UCT's Department of Human Biology during the early eighties, and is illustrated by his passion for teaching neuroscience to medical and science students. His research interests lie in the basic neurosciences and encompass neural structure and function ranging from visual research, cortical mechanisms of sensory information processing, neural damage as a result of stress and intervention mechanisms in neurodegenerative diseases. He is also involved with a number of collaborative research studies and the International Brain Research Organisation as a tutor and mentor in neuroscience training schools in Africa. He is currently the chair of the South African Neuroscience Society.

A journey along the double helix

While stem cell technology is a real and potential key to cures for inherited disorders, the watchword is caution, believes **Professor Jacquie Greenberg** – who is furthering the field in South Africa with care and consideration of the complex social issues surrounding her research.

> Stem cell prospects are the fuel of false promises. Many people want to hear they can be helped, but we must balance hype and hope.

"Stem cell prospects are the fuel of false promises. Many people want to hear they can be helped, but we must balance hype and hope," cautions Professor Jacquie Greenberg, co-head of the UCT Stem Cell Initiative.

Greenberg maintains that although much of the current thinking around genetic therapeutic intervention has been saddled with the baggage around the science and the ethics of culturing embryonic stem cells, new stem cell technology – induced pluripotent stem cells (iPSCs) – has changed that.

Careful progress

In 2012, Japanese scientist Shinya Yamanaka won the Nobel Prize for pioneering technology to turn cultured skin and other cells into iPSCs. Scientists can now take primitive and adult human cells and develop these into any type of cell in the body, even sperm. They are an ideal source of cells for the 'disease-in-a-dish' study of conditions affecting inaccessible tissues such as those found in the eyes and brain, which are the organs that are affected by the genetic condition that she researches.

Collaborating with researchers in Oxford and Japan, scientists from the UCT Stem Cell Initiative have established the first iPSCs from South African patients suffering from an inherited

neurodegenerative disease, spinocerebellar ataxia type 7 (SCA7). They are also in the process of deriving cells from patients with the neuromuscular disorder myasthenia gravis, chronic autoimmune neuromuscular disease characterised by skeletal muscle weakness.

But geneticists working with stem cells are not just "tinkering with cells", says Greenberg. Although iPSCs skip some of the ethical debate associated with embryonic stem cell research, the technology is still very new.

"What we do must be scientifically safe and ethically sound."

The burden of knowing

Greenberg wrapped up her PhD in 1990 in UCT's Division of Human Genetics, now part of the Department of Clinical Laboratory Sciences. The work stimulated an enduring interest in late-onset neurodegenerative diseases, such as inherited ataxias and Huntington's disease, a genetic disorder that affects muscle co-ordination and leads to cognitive decline and psychiatric problems.

Importantly, this research alerted her to the complex ethical considerations of genetic counselling – and the dilemmas of predictive testing. Typically, the onset of these diseases occurs between the ages of 30 and 50, and there's a 50% chance of a mother or father passing the disease on to their sons or daughters.

"It's a Sword of Damocles," says Greenberg. "Would one, as a child, *want* to know? Would one *need* to know? Should anyone be tested for a condition that is fatal, and devastating to both the patient and the patient's family?"

It's a complex area – both in terms of research and ethics – in which she's made a significant contribution. In 1996 Greenberg became one of the first genetic counsellors to register with the Health Professions Council of South Africa, and she served on the UCT Research Ethics Committees for both humans and animals for several years. She is also course convenor of one of only two master's programmes in genetic counselling in South Africa – a vital service in a country with numbers well below the World Health Organisation's recommended two genetic counsellors per million people.

The future is not yet now

Since 1990 Greenberg has worked closely with long-standing colleague Professor Raj Ramesar, head of the Division of Human Genetics, on a screening programme for retinal degenerative disorders. Currently, the registry has clinical and genetic data on a wide range of patients affected by inherited retinal degenerative disorders.

To date, this research – which is supported by Retina SA, and funders such as the Medical Research Council and the National Research Foundation in South Africa – has led to several advances in the identification of the genetic causes of the disease, specifically discovering retinal disease genes RP17 (CAIV) and RP13 (PRPF8). These genes were originally mapped uniquely to South African families in the 1990s.

As a result, the affected families are receiving better genetic management and will be able to track developments and, potentially, even participate in research towards future therapies for their disorders. An offshoot of this work is the ophthalmic genetic service now offered by four genetic counsellors trained at UCT.

As for their future work, the UCT Stem Cell Initiative is generating stem cell lines for other conditions. These will be used for future investigation into disease modelling, and possibly the development of therapeutic modalities.

"We do research not for the sake of science, but for the sake of patients – and to do what we do better. As excited as we are about stem cells, we need to restore balance. There are many people who hope it's a cure for the future; and yes, it is, but the future is not yet now."

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Professor Jacquie Greenberg gave her inaugural lecture, *A Journey Along the Double Helix: Around the human genome in 42 years,* on 17 April 2013.

Professor Jacquie Greenberg has been involved with molecular genetic diagnostic testing at UCT and Groote Schuur Hospital for over 40 years. Not only was she one of the first genetic counsellors to register with the Health Professional Council of South Africa, but she was also the first woman to be elected as chair of the Southern African Society of Human Genetics. Based in the Human Genetics Division in the Department of Clinical Laboratory Sciences at the Faculty of Health Sciences, Greenberg is also an affiliate member of the Institute of Infectious Disease and Molecular Medicine, and a National Research Foundation C1-rated scientist. She served on the committee of the National Department of Health team tasked with drafting regulations and guidelines for the new National Health Bill's section on human cloning and stem cell research.

The Rolls Royce of clinics

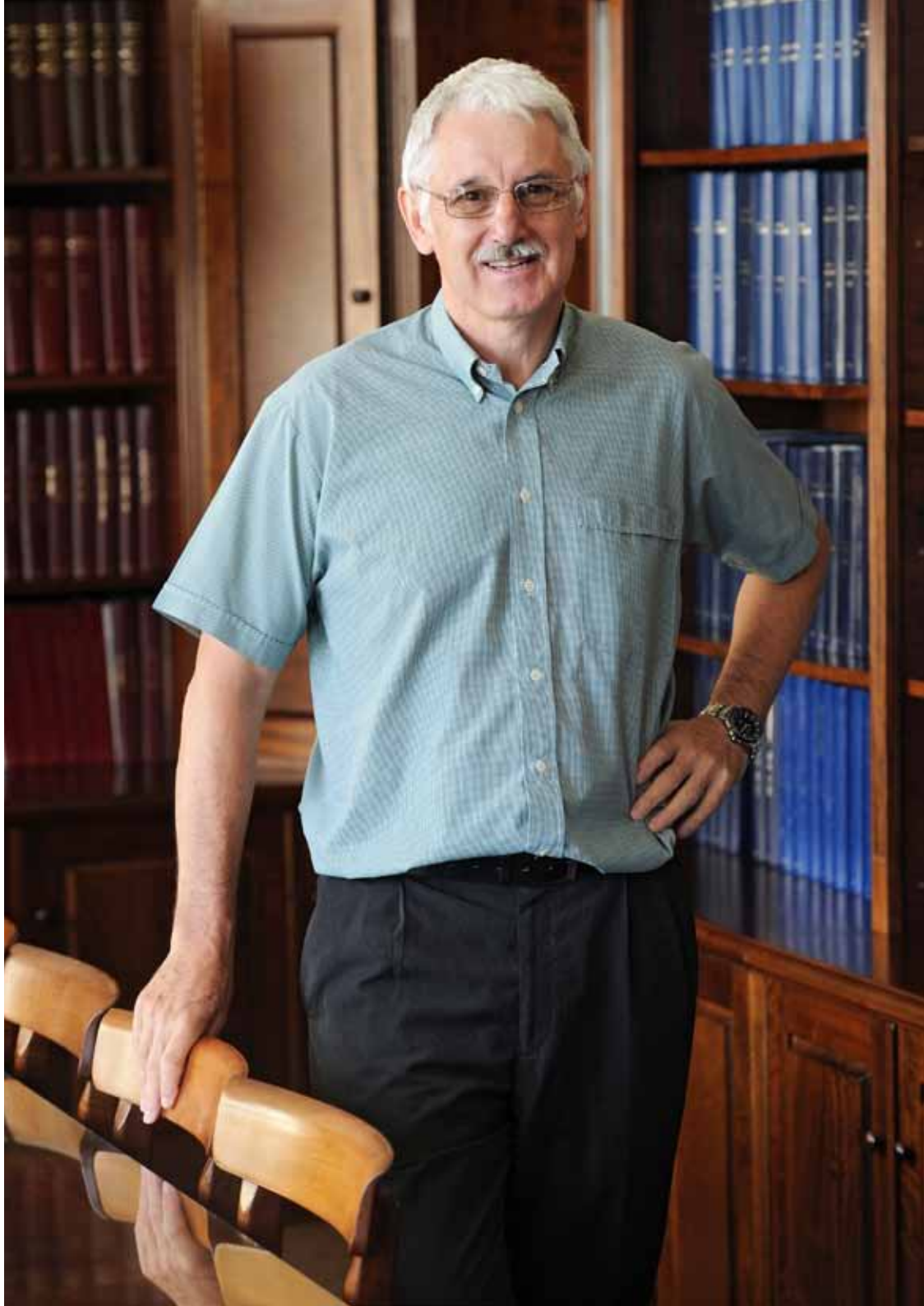
Sandie Thomson is revitalising the gastroenterology unit at Groote Schuur Hospital: redesigning the space, expanding the role of new technologies and driving the establishment of a tele-education hub that will help students train for work in sub-Saharan countries.

> I'm honoured that UCT had the foresight to give this surgeon the opportunity to put the gastroenterology unit back on the map.

Trained as a surgeon at Aberdeen University, the oldest English-speaking medical school in the world (founded in 1495), Professor Sandie Thomson once found himself in the role of anaesthetist during the donor harvest for the first liver transplant in Boston, US. A surgical fellow in the Harvard nutrition programme, he had attended the procedure purely out of interest. The patient had required 46 litres of blood during the transplant, but once the donor liver was implanted, had a new lease of life. The surgeon, Roger Jenkins, went on to head the Lahey Clinic transplant service and was the first in the US to establish a living donor liver transplant programme.

While this anecdote may have gone unnoticed during this May 2013 inaugural lecture, it hints at Thomson's versatility and curiosity – attributes that continue to drive his work today.

Bred on the golf links at Lossiemouth, Scotland, Thomson first took up a Royal Air Force (RAF) cadetship at Aberdeen University and became a member of the University Air Squadron, where he flew Chipmunks, single-engined aircraft used as RAF trainers after World War II. Back then, he probably couldn't have imagined a career as a gastrointestinal surgeon at the toe-end of Africa.



Now he heads Groote Schuur Hospital's multidisciplinary gastroenterology unit, based in UCT's Medical Gastroenterology division.

New tools and technology

It's a field that has seen major advances since the pioneering work of Solly Marks, the 'father' of gastroenterology in South Africa. Marks established Groote Schuur's gastroenterology clinic in 1959, and fostered strong relationships with his surgeons. These relationships, in particular with Professors Philip Bornman and Jake Krige, have been the backbone of the unit for many years.

Many advances have been made since the essential tool, the flexible fibre-optic endoscope, revolutionised the speciality in 1957. South African Basil Hirshowitz, a gastroenterologist at the University of Alabama at Birmingham, pioneered the incorporation of optical fibre to create flexible endoscopes capable of transmitting high-quality images around corners. Other key elements of image quality were developed by Harold Hopkins, who improved the lens design so vital to modern endoscopes. (Hopkins also invented the zoom lens for TV cameras, first used by the BBC at Lords Cricket Ground in 1948.)

Endoscopes now have video cameras and ultrasound machines attached, and further miniaturisation has led to the development of a camera in a pill (which the patient swallows), allowing doctors to inspect the entire intestinal tract by telemetry.

> For a long time the gastrointestinal unit exuded excellence, and I hope to create a functioning unit again.

Refurbishing a Rolls Royce

Thomson's appointment to the Chair of Gastroenterology carries a clear personal mandate: to put the engine back into the dormant 'Rolls Royce' – the country's first gastrointestinal unit, established by UCT in 1959 – after a hiatus of eight years.

"For a long time the gastrointestinal unit exuded excellence, and I hope to create a functioning unit again," says Thomson, reflecting on the unit's proud history as a gathering place for international scholars and a place of prolific research on the human digestive system, from the treatment of peptic ulceration, through to pancreatic secretion and colon cancer genetics.

The motoring metaphor Thomson alludes to suggests a simple solution: fit new parts, grease up the engine, and fire it up.

Getting into gear

Thomson believes it's important to put gastroenterology medicine and surgery back on the national health care agenda. However, the challenge of dealing with routine cases which spill into the unit from the broader Peninsula and Cape Flats, hampers the development of those services associated with a tertiary training hospital.

Thomson's plans, which are well under way, involve re-equipping the Groote Schuur gastroenterology unit and developing the basic endoscopy services in the other metropole hospitals to alleviate the patient load.

The unit's physical space is being redesigned to accommodate and expand the role for new technologies and their appropriate application. Incorporated in this is a tele-education hub, an important improvement given increasing student numbers and a responsibility to train students for sub-Saharan countries.

"These changes will provide a solid service platform to build a base for the expansion of research activities in the unit," Thomson says. "I'm honoured that UCT had the foresight to give this surgeon the opportunity to put the gastroenterology unit back on the map."

Professor Sandie Thomson gave his inaugural lecture, *Gastroenterology: Awakening the Dormant Rolls Royce,* on 8 May 2013.

Professor Sandie Thomson is Chair of Gastroenterology at UCT and the lead member of the World Gastroenterology Organisation's tele-education project. His academic career started at Aberdeen University, and has since taken him to Harvard (to take up a surgical nutrition fellowship and do research on indirect calorimetry), Duke University (with an International Guest Scholarship from the American College of Surgeons), and what is now the University of KwaZulu-Natal, where he started publishing in trauma and became interested in the use of rigid and flexible endoscopy in gastrointestinal surgery. He is now based at UCT, heading up Groote Schuur Hospital's gastroenterology unit.

What makes a champion?

What's the DNA of a great performance? Can you be genetically predisposed to succeed? **Professor Malcolm Collins**, a medical biochemist and chief specialist scientist within the UCT Research Unit for Exercise Science and Sports Medicine, reflects on his research, and his own journey towards success.

> Although science recognises the individual ... nothing could be further from the truth in the scientific world. Any progress that an individual makes in science is done as part of a team.

Malcolm Collins recalls that even as a student at the South African College High School (SACS), he always knew he wanted to be a medical scientist.

"My uncle gave me a copy of this book when I was in high school, called *The Atoms Within Us*, and one of the chapters was on the protein, insulin," says Collins. "For a biology project, I decided – foolhardily – that I was going to make a three-dimensional structure of this protein. So I got the sequence, toothpicks, polystyrene balls and paint, and thought I was going to produce this.

"Needless to say, it was a dismal failure," he says with a wry smile.

This early interest in biochemistry set Collins on course to becoming a leading voice on another family of proteins, collagen – the main structural protein of various connective tissues in animals, including tendons and ligaments; specifically, on common exercise-associated and occupational overuse injuries.

On the shoulders of giants

While today Collins heads up Human Biology at UCT, is a National Research Foundation (NRF) B2-rated scientist,

> One of the most intriguing questions that I've asked in the realm of exercise science is: 'What makes a champion? How is a champion made?'

and a member of the editorial teams of several international scientific journals, including the *British Journal of Sports Medicine*, he remains humble about his success, and gives credit to his colleagues.

"Science is done in historical context, and as I have looked back over the last twenty years, I've come to realise that there have been key milestones in my life, that at the time were probably insignificant, but which probably played a very big role in determining where I am today, professionally.

"Although science recognises the individual … nothing could be further from the truth in the scientific world. Any progress that an individual makes in science is done as part of a team. I have not got to where I am today and made any achievements without other people."

He's similarly modest about his appointment as a senior scientist within the South African Medical Research Council (MRC)/ UCT Research Unit for Exercise Science and Sports Medicine (ESSM) in 1998: "I was a biochemist; I knew very little about exercise, but I needed a job, so I applied for the job and got it, and have been there ever since."

(Collins fails to mention that his exercise experience is first-hand: he's an endurance fanatic, regularly competing in ultra-marathons and multi-stage trails.)

Nature vs nurture

What has been the highlight of his time at ESSM? "One of the most intriguing questions that I've asked in the realm of exercise science is: 'What makes a champion? How is a champion made?'"

This follows the age-old debate about whether champions are nurtured, a natural phenomenon, or a combination of the two. At the time Collins started at UCT, scientific opinion leaned overwhelmingly in favour of nurture.

With a bit of encouragement from Professor Tim Noakes, Collins agreed to investigate the genetics of performance. He has gone on to become a recognised authority on the genetic basis and molecular mechanisms of connective tissue injuries; the genetic elements that determine the endurance phenotype, and the inter-individual physiological responses during participation in endurance events – in other words, finding evidence for the role that nature plays in shaping a champion.

While the final call on nature vs nurture in the 'champions' debate has still to be made, Collins' own journey (and by his own account) suggests that scientific success might start with a predisposition, but is in many ways the product of nurture, nudges and collaboration.

Professor Malcolm Collins gave his inaugural lecture, *Understanding Biological Mechanisms of Sports Medicine: An unexpected journey* on 7 August 2013.

After completing a post-doctoral fellowship at the University of Washington in Seattle, Malcolm Collins was appointed as a senior scientist within the MRC/UCT Research Unit for Exercise Science and Sports Medicine in 1998, going on to become an associate professor in 2007 and a full professor in 2013. His doctoral and postdoctoral work in extracellular matrix biology, in particular collagen gene expression, stimulated his current research focus on the molecular mechanisms causing common exercise-associated musculoskeletal soft tissue (tendons, ligaments and skeletal muscle) injuries.

Revolutionising healthcare through innovation

The entire healthcare sector needs a shake-up, says **Professor Jonathan Blackburn** – one that ensures the cost of new drugs is not crippling and that diseases are treated in a far more nuanced manner. This medical biochemist is intent on leading the charge.

> We should really be prescribing drugs to patients on the basis of an accurate diagnosis and knowledge of the impact of the patient's genotype on that medication.

With world-renowned chemical biologist Michael Blackburn for a father, and Sir John Cockcroft – whose work on splitting the atom won him a Nobel Prize – as a maternal grandfather, one might say that Jonathan Blackburn was destined for a career in biochemistry.

Born in Cambridge, Blackburn started his academic career at the University of Oxford, where he received his PhD in chemistry for his studies on penicillin biosynthesis under the supervision of Professor Sir Jack Badwin. He went on to complete his postdoctoral research at the University of Cambridge on the directed evolution of new enzymes, in the group of Professor Sir Alan Fersht.

Solutions for the developing world

Now based at UCT's Institute of Infectious Disease and Molecular Medicine, he strives to understand and predict, in unprecedented

There's huge opportunity for both biotechnology companies and academics to get involved in the drugs-creating world. There are opportunities to develop compounds that might be suitable for diseases, particularly in the developing world, where – clearly – the pharmaceutical economic model won't work.

depth, the individual nature of disease progression and drug response. He does so by applying his knowledge of mechanistic enzymology, protein biochemistry, molecular biology and proteomics, to create new biomolecules by in vitro evolution.

"There's huge opportunity for both biotechnology companies and academics to get involved in the drugs-creating world," says Blackburn.

"There are opportunities to develop compounds that might be suitable for diseases, particularly in the developing world, where – clearly – the pharmaceutical economic model won't work."

This business advice comes from someone with first-hand experience: in 1999, Blackburn founded a start-up biotechnology company, Sense Proteomic, to commercialise the protein function microarray technology invented in his academic group (taking a leave of absence from Cambridge to do so).

Following a takeover by Procognia in 2002, Blackburn became the chief scientist of the merged organisation – which employed more than 70 scientists worldwide – a post he held until early 2006. As a biotech entrepreneur, he has raised around R75-million in venture capital financing, and is the inventor on nine granted patents and 14 pending patents.

Time for change

So what's the current challenge – and corresponding opportunity? "The majority of prescription drugs on the market today only work on about 40% of the people to whom they are prescribed," Blackburn explains. "That's not generally recognised.

The majority of prescription drugs on the market today only work on about 40% of the people to whom they are prescribed.

"This doesn't mean to say that for 60% of patients there isn't a drug. It just means that the doctor who wrote the prescription didn't know exactly what was wrong with the patient, didn't prescribe the right drug to target the exact disease, and didn't take account of the patient's genetic makeup.

"So it seems to me it's time for a new paradigm in this whole healthcare sector," says Blackburn. "We should really be prescribing drugs to patients on the basis of an accurate diagnosis and knowledge of the impact of the patient's genotype on that medication."

Professor Jonathan Blackburn gave his inaugural lecture, *Discovery and Innovation in Chemical Biology: Biosynthesis, microarrays, mechanisms and diagnostics* on 21 August 2013.

Jonathan Blackburn is the South African Research Chair in Applied Proteomics and Chemical Biology at UCT. As an academic, he previously held a Royal Society University Research Fellowship in the Department of Biochemistry, University of Cambridge and was a Fellow of Fitzwilliam College, Cambridge. He is the co-founder of the not-for profit Centre for Proteomic & Genomic Research, which provides infrastructure and expertise in the functional genomics sector and is funded by the Cape Biotech Trust. Today, Blackburn serves on a number of local, national and international committees and sits on the editorial advisory boards of the *Journal of Proteome Research*, the *Journal of Proteome Science & Computational Biology*, and *Expert Reviews of Proteomics.*

Catering for the individual

Mike Lambert's research helps athletes improve their performance and reduce their chance of injury. His secret? Tailored solutions based on an individual athlete's needs.

> Embrace individual variation. If you don't consider it, you'll always come to the wrong conclusions, or you'll miss important information.

Professor Mike Lambert from the South African Medical Research Council (MRC)/UCT Research Unit for Exercise Science and Sports Medicine (ESSM), has a reputation as a world-class scientist, a pedigreed long-distance runner, and a great mentor. Known as 'The Oracle' among his students, Lambert has graduated 63 honours, 12 master's, 15 MPhils and 17 PhDs in his career to date, and is currently supervising nine UCT doctoral students – a record unmatched at the Sports Science Institute of South Africa.

"I'm sure that's against the law for the University of Cape Town – I mean, *nine* PhD students?" quips ESSM Director Professor Tim Noakes. "There are only a few people who can, and Mike is the sort of person who can. He is utterly without ego. If he never received any acclaim, he'd be perfectly happy. That makes him the ideal coach and the ideal person to direct anyone, because he's not concerned with how the outcome is going to reflect on himself; he wants the best outcome for the student."

Lambert's career as a world leader in sports and exercise science had a somewhat unusual beginning: his first job was as a research technician with the Natal Parks Board, where he did work as varied as studying antelopes and counting seedlings. "Among his many adventures," says Professor Lauriston Kellaway, "he vividly recalls being

charged by a black rhino while counting his seedlings. This may have been the trigger to his running career."

It also preceded – although the degree of causality is unclear – Lambert's move to the world of exercise science. He left his job at the Natal Parks Board to take up an honours degree in exercise physiology at Rhodes University in 1982. After completing his MSc in exercise physiology at the University of South Carolina (where he also met his wife, [*now Professor*] Vicki Lambert, also based at ESSM), he enrolled for a PhD under the supervision of Professor Tim Noakes at UCT.

Driven by practical questions

After his PhD, during which time he became "quite an expert in making rats get fit", Lambert turned his attention to humans. Today, his research focuses mainly on the factors associated with fatigue, performance and safety in sports and exercise – motivated by the belief that "the type of work we do should always be driven by practical questions".

"How many millions of athletes are there in the world who are training every day and haven't a clue whether they're doing it right or wrong?" asks Professor Tim Noakes. "You would think that somewhere in the world we would have that answer, but we don't."

Lambert is attempting to bridge this gap, by applying his research to the fitness regime of the Springbok Sevens rugby team: every morning, each member of the Springbok Sevens squad fills out a short questionnaire that coaching staff use to determine which players are fit to train and for how long, and who needs to rest.

This system is based on one of Lambert's core beliefs: that a one-size-fits-all approach is doomed to failure. "Embrace individual variation" is one of his performance mantras. "If you don't consider it, you'll always come to the wrong conclusions, or you'll miss important information. So, right from my early days, I learned the importance of embracing individual variation and not trying to hide it in my statistical analysis."

How else is Lambert's work shaping the world of sports science? Take BokSmart, in which Lambert's research was pivotal. The programme, launched in 2009 to combat the number of catastrophic injuries occurring on South African rugby fields, has already shown positive results.

Or a recent decision by the International Rugby Board inspired by Lambert-led research: in 2013, new scrum laws were being trialled, with the two packs required to bind before the ball is thrown in, to minimise injuries caused by the 'hit'.

Or the impact of a mobile gyms project on the performance of young rugby players. During a 2002 visit to Craven Week, where the cream of South Africa's schoolboy rugby talent is on show, Lambert noted the difference in size among players, and realised that this was in large part due to unequal access to weight-training facilities.

With biokineticist Justin Durandt at his side, Lambert led a charge that saw the South African Rugby Union dispatching 36 mobile gyms to poorer areas around the country, allowing young players who previously had no access to weights and exercise machines to become as fit and strong as their more privileged counterparts. To date, the percentage of Craven Week players with access to weight-training facilities has increased from 64% in 2002 to 82% at last count.

What's Lambert's attitude towards these successes? "There is still so much work to do," he says.

> The type of work we do should always be driven by practical questions.

Professor Mike Lambert gave his inaugural lecture, *The Science of Exercise Performance: Translation into practice: Novo prospectus* on 28 August 2013.

Mike Lambert is a National Research Foundation C1-rated scientist and editor of the *South African Journal of Sports Medicine*, based at the South African Medical Research Council (MRC)/UCT Research Unit for Exercise Science and Sports Medicine. His academic career began with a bachelor's degree in animal science in 1978 at what was then the University of Natal, followed by a degree in exercise physiology at Rhodes University, and then an MSC from Columbia, South Carolina. Upon returning to South Africa in 1985, Lambert joined Professor Tim Noakes' research unit when exercise science was in its infancy. Since that time, the field has developed rapidly, branching into sub-disciplines of sports medicine, sports physiotherapy, and more recently, biokinetics.

History's footnotes: insights from the margins

Nigel Penn spends a great deal of time scanning the criminal records of years gone by. He's not a lawyer, nor is he in the penitentiary system. Why does he do it? He's found that history's marginalia can uncover compelling stories of yesterday's society and culture.

Through his writing, Professor Nigel Penn found himself resurrecting an historic figure who had "lain dormant in documents" – Estienne Barbier, a French hired gun in the service of the VOC (the Dutch East India Company), who had led a rebellion against his employer in 1738 from the frontier district of Agter Paarl.

In resurrecting Barbier, Penn comments, "I illuminated the terrible injustice of the VOC and the corruption against which he [Barbier] fought. His rebellion also exposed the race and class divisions causing friction among the Cape's frontier communities at the time. He was a turbulent, angry fellow, but impelled by a sense of what he felt was just. I felt I understood him because, in a sense, I had created him."

It's an ironically postmodernist fate for an historian to end up as a character in a novel in which history itself is a ghostly footnote in the basement of a brewery.

Barbier later became the central character in André Brink's novel *On the Contrary*, while Penn himself also turns up in another of Brink's works, as historian Nigel Penn in *The Rights of Desire*, based on Penn's *The Fatal Passion of Brewer Menssink: Sex, beer and politics in a Cape family, 1694-1722*.

"It is an ironically postmodernist fate for an historian to end up as a character in a novel in which history itself is a ghostly footnote in the basement of a brewery."

Microhistory matters

Explaining that "crime records are tainted", Penn says that it's not so much the crime as "the social and cultural world in which, or against which the crime was committed" in which historians like himself are interested: "The real value of criminal records is that they contain evidence about a society's culture that is usually opaque or invisible."

Penn's focus on microhistory, which "narrates events" in microscopic detail, has allowed him to lift interesting characters like Barbier from obscurity, as well as glean invaluable knowledge of cultural details of the time.

For instance, from research into the rape case of a Khoi woman in 1727, he learnt that "aggressive drink rituals were part of low European culture (in the Cape Colony); that Crebis was a Khoikhoi woman's name; and that there were still Khoikhoi speakers in the Tygerberg area in 1727".

Bearing witness

A reader of this case file also develops an intimate, even uncomfortable, understanding of the systemic violence of that time. The case never went to trial; Penn explains: "A preliminary hearing determined that even though Roelofsz [the assailant] was obviously guilty, he could not legally be charged since the only witnesses in the case were either slaves or Khoikhoi. The testimony of a slave was invalid, since they were unfree; and the testimony of a Khoikhoi was inadmissible, since they were heathens."

The real value of criminal records is that they contain evidence about a society's culture that is usually opaque or invisible.

The case was dismissed, despite the victim having been brutally assaulted and set alight.

Microhistory is a hazardous enterprise, Penn observes, but one that would be impossible without criminal records.

Microhistory is a hazardous enterprise, but one that would be impossible without criminal records.

Professor Nigel Penn gave his inaugural lecture, *History from Crime: Criminal records, microhistory and early Cape society,* on 11 September 2013.

Nigel Penn is a lecturer in the Department of Historical Studies, a National Research Foundation C1-rated researcher, and a prolific publisher who has won the UCT Book Award three times. The first award was for his doctoral thesis on the impact of colonial expansion on the indigenous people of the Cape, the Khoisan, published in 2005 as *The Forgotten Frontier*; the second for *Sound from the Thinking Strings*, co-authored with Pippa Skotnes, Stephen Watson and John Parkington; and third for *Rogues, Rebels and Runaways: Eighteenth century Cape characters*, based on research into the criminal records of the Dutch East India Company. He is currently involved in an Australian Research Council-funded project on the role of massacre during the revolutionary period, and one of the editors of a proposed work on the history of violence.

Solutions for TB and lung disease

Described by colleagues as a man of "boundless energy, undaunted courage, tireless persistence, laser-like focus and unwavering discipline", **Professor Keertan Dheda** is adamant that the answer to incurable tuberculosis is an innovative approach to treatment and prevention.

> TB is the most common cause of death in South Africa, and it reduces the GDP by approximately 5% per annum, or approximately R14-billion.

More than 8 000 cases of multi-drug-resistant tuberculosis (MDR TB) are treated in South Africa every year. "In the US, with a population of about 300-million people, they only treat approximately 100 cases of MDR TB a year," explains Professor Keertan Dheda, head of UCT's Division of Pulmonology.

"TB is the most common cause of death in South Africa, and it reduces the GDP by approximately 5% per annum, or approximately R14-billion."

The onset of totally drug-resistant tuberculosis (TDR TB) means that aggressive treatment and prevention programmes are crucial: "We've come full circle, where once again there are large numbers of individuals who have incurable TB being discharged back into the community," argues Dheda, referencing findings recently published in *The Lancet*.

"We urgently need to prevent drug-resistant TB, not only by reducing the overall TB

> We need a co-ordinated national strategy to provide funding for a combination of home-based care (the numbers are too large for institutional care for every patient); community stay facilities where patients can reside on a long-term, voluntary basis (new style sanatoria); and palliative care facilities.

burden – 'prevention' being the buzzword here – but also by minimising transmission.

"We need to devise new regimens – not single drugs – for the treatment of drug-resistant TB."

The effects of TB

A world-renowned researcher and recipient of several prestigious awards including the 2013 Medical Research Council Gold Scientific Achievement Award and the 2010 International Union Against Tuberculosis and Lung Disease Scientific Award, Dheda calls drug-resistant TB a "killer disease".

He cites studies that found that only 50% of MDR TB patients in South Africa have a favourable outcome; and that 75% of extensively drug-resistant (XDR) TB patients die in the first five years.

Furthermore, drug-resistant TB drastically increases the cost of running TB treatment programmes. "Despite drug-resistant TB comprising less than 3% of the total burden of the disease, it consumes almost 45% of the total national budget for TB management – amounting to over R1.2-billion."

Call for national strategy

That's why Dheda is joining the call for places of isolation and palliative care for TB patients. "We need a co-ordinated national strategy to provide funding for a combination of home-based care (the numbers are too large for institutional care for every patient); community stay facilities where patients can reside on a long-term, voluntary basis (new style sanatoria); and palliative care facilities."

In identifying how to diagnose drug-resistant TB rapidly, reduce drop-out rates and interrupt transmission, Dheda points to his own research, published in leading medical journal *The Lancet*, showing the beneficial effects of a new polymerase chain reaction (PCR)-based diagnostic technology (Gene Xpert) using a healthcare worker-led approach.

> It's really 'back to the future' for pulmonary medicine as we're dealing with old problems like incurable TB using innovative tools of the future.

"It's really 'back to the future' for pulmonary medicine as we're dealing with old problems like incurable TB using innovative tools of the future."

Professor Keertan Dheda gave his inaugural lecture, *Back to the Future: Advances in pulmonary medicine and TB control,* on 2 October 2013.

Keertan Dheda is Professor of Medicine, and Head of the Division of Pulmonology, Department of Medicine, at the University of Cape Town. He has published over 130 peer-reviewed papers, including three original manuscripts as study leader in *The Lancet*. His H index is 44 and he holds three patents related to new TB diagnostic or infection control technologies. He serves on the editorial boards of several journals including the *American Journal of Respiratory and Critical Care Medicine, The Lancet Respiratory Medicine and Scientific Reports* (by the publishers of *Nature*). His main research interests are (i) multi-drug resistant pulmonary infections including TB, (ii) the development and validation of field-friendly diagnostics, and (iii) the immunopathogenesis of TB and other human pulmonary infections. He is co-involved with the activities of several international academic societies, and serves as co-chair of the LTBI (Latent TB Infection) sub-group of the Stop TB Partnership.

Work-family balance: a dangerous myth

Not only is it naïve to assume that a work-family balance is always desirable, argues **Professor Jeffrey Bagraim** – it may also undermine the achievement of work and family success.

"Work-family balance is a linguistic and conceptual trap that limits a wider understanding of the issues at the interface of work and family," says organisational psychologist Professor Jeffrey Bagraim, from UCT's School of Management Studies.

"It is a myth that we should always strive to keep work and family in balance."

Debunking myths

What does he mean? That many assumptions contained in this seemingly harmless turn of phrase don't stand up to scrutiny.

For example, he challenges the belief that balancing work and family is a concern for women only. Referring to the important strides women have made in the workplace over the years, Bagraim asks, "Perhaps women can now endeavour to have it all, but can men?

Women experience work-family conflict, but increasingly feel empowered to seek remedies and accommodations for it. Men also experience work-family conflict, but don't feel empowered to seek remedies and accommodations for it.

"Nationally representative studies in the US among working parents have shown consistently – for nearly a decade – an increasing rate at which the experience of work-family conflict by men exceeds that of women.

"Women experience work-family conflict, but increasingly feel empowered to seek remedies and accommodations for it. Men also experience work-family conflict, but don't feel empowered to seek remedies and accommodations for it."

Citing studies that show that most South African students want to get married and plan to have children, Bagraim also dispels the myth that young people show scant regard for the pressure they might face when trying to balance work and family.

"They are concerned about the work-family conflicts they might confront in their future. They are making choices on where they will work, based on the work-family policies and practices offered by potential employers."

One of Bagraim's fundamental concerns lies within the concept of work-family balance. While balance is important for tight-rope walkers and for riding a bike, he notes, "... it may not be useful as a metaphor for the relationship between work and family. In fact, it may have strong negative implications for understanding that relationship."

Expanding possibility

What hope is there for those who 'want it all'?

Bagraim discards the traditional view that the relationship between work and family is a win-lose situation. Instead, he champions how "a positive understanding of how multiple roles, if accumulated, can lead to positive outcomes".

[Balance] may not be useful as a metaphor for the relationship between work and family. In fact, it may have strong negative implications for understanding that relationship.

"If we work through the disabling myths and integrate the positive possibilities of an expansionist view of work and family, perhaps we'll be able to achieve success in the broadest sense of the word."

Work-family balance is a linguistic and conceptual trap that limits a wider understanding of the issues at the interface of work and family.

Professor Jeffrey Bagraim gave his inaugural lecture, *Work-Family Balance: Debunking the myths and elucidating the positive,* on 9 October 2013.

Professor of Organisational Psychology Jeffrey Bagraim works in the School of Management Studies and serves as the Deputy Dean of Postgraduate Affairs in the Faculty of Commerce. He is a registered psychologist and one of very few organisational psychologists with a National Research Foundation rating. Bagraim's past research interests reflect varied influences in his life, examined through the lens of organisational psychology. These include entrepreneurial intention; corporate culture and power; organisational commitments; and most recently, the work-family concerns of working parents and young adults. Prior to joining UCT, Bagraim worked as a human resource development professional at the City of Cape Town and as a consultant with a niche consulting firm. His current focus is on promoting socially sustainable work through research, policy development and change interventions.

Journey into inner space

Using a combination of X-ray crystallography, electron microscopy and molecular modelling, structural biologists like **Professor Trevor Sewell** are able to peer into the 3D arrangements of proteins – structures essential to understanding nature's complex blueprints.

> [The late seventies were] an extraordinarily fortunate time to study protein crystallography

In the early 20th century, scientists discovered that X-rays could be used to 'see' molecules at atomic resolution using diffraction from crystals. By mid-century the technique had been extended to proteins, but it was only in the late seventies, with the development of more powerful computers, that the discipline of structural biology became viable. At this time, Professor Trevor Sewell was completing his PhD in the UK under the supervision of Sir Tom Blundell, one of the founders of the field.

"This was an extraordinarily fortunate time to study protein crystallography," remarks Sewell. "Many modern methods were invented during this period, and studying at the Department of Crystallography, Birkbeck College, London made it possible for me to meet all the leading practitioners in the field at that time."

Applied understanding

As part of his PhD, Sewell studied an aspartate protease – work that led directly

Developments [in protein crystallography] brought biology into the domain of chemistry and physics, and enabled biotechnology – especially the rational design of medicines and industrial enzymes.”

to the subsequent recognition of a variant of this molecule in HIV, the human immunodeficiency virus.

“Developments [in protein crystallography] brought biology into the domain of chemistry and physics, and enabled biotechnology – especially the rational design of medicines and industrial enzymes,” says Sewell.

The products of this biotechnology are pervasive. They include purifying gels to treat water; nitrilases that degrade the cyanide found in mine water that threatens groundwater supplies; drugs for heart disease and hypertension; and a host of others.

Widely used in the industry for the synthesis of drug intermediates, nitrilases are Sewell’s speciality.

Putting structural biology on the map

The head of UCT’s Structural Biology Research Unit, Sewell has spent some 20 years developing the field of structural biology using combinations of X-ray crystallography, electron microscopy and molecular modelling, putting it firmly on the map at UCT. With funding from the Carnegie Corporation of New York, Sewell established a joint master’s programme in structural biology with the University of the Western Cape, marking the genesis of the field in South Africa.

He also secured the first modern cryo-electron microscopes in South Africa during his directorship of UCT’s Electron Microscope Unit.

That said, significant investment in both the academic and industrial spheres of structural biology, and the many stellar contributions made in the field, internationally, in the last couple of years, mean that Sewell doesn’t have time to rest on past achievements.

“New developments in the field have shifted the goalposts,” Sewell cautions. “It’s no longer acceptable to just visualise the structures. We have to explain how they work.”

Luckily, Sewell has a reputation as a tenacious researcher among colleagues, who speak of how he painstakingly restored an old X-ray machine in order to repeat the classic experiments on X-ray diffraction by fibrous proteins (the kind found in porcupine quills) that he had seen in a book.

In this journey into inner space, it’s encouragement from colleagues and family (who “put up with a workaholic scientist”) that Sewell feels supports him best.

New developments [in structural biology] have shifted the goalposts. It’s no longer acceptable to just visualise the structures. We have to explain how they work.”

Professor Trevor Sewell gave his inaugural lecture, *A Journey into Inner Space: A view of biology from the atomic perspective* on 30 October 2013.

Trevor Sewell completed his PhD in protein crystallography under the supervision of Sir Tom Blundell, initially at the University of Sussex and subsequently at Birkbeck College, London. On his return to South Africa in 1980 he worked at the National Chemical Research Institute of the Council for Scientific and Industrial Research, before being appointed to the Department of Biochemistry at UCT, headed at the time by Professor Claus von Holt. Sewell has served the scientific community on numerous UCT, regional and national bodies, and is a member of several influential professional societies and of the UCT Institute for Infectious Disease and Molecular Medicine.

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