Over the last few years, the Faculty of Health Sciences has become a centre of active research and postgraduate endeavour, and achievements by staff and students in 2012 reached new heights. This, despite the huge demands placed on staff in their dual roles as clinicians and scientists in service delivery in the provincial hospital system and the National Health Laboratory Service.
A marked increase in research publications and in Department of Higher Education and Training units has been achieved over the last few years. In 2010, the Faculty recorded only 200 units, with an impressive jump to 283 in 2011, and current estimates for 2012 are at 288 units (journal articles only). This is a huge achievement as many staff in the Faculty collaborate on international, multidisciplinary research projects which result in multi-authored publications and thus generate less subsidy.

A number of publications from the Faculty appeared in two of the highest impact factor (IF) journals in the health sciences in 2012. Some authors from the Faculty published in the Lancet (IF: 38.278) and in the New England Journal of Medicine (IF: 53.298).

In addition, two of the many notable publications of 2012 were authored by Dr Carina Schlebusch (Wits PhD graduate); Professor Himla Soodyall and her team, who published a paper in Science (IF: 31) in September 2012; and Dr Penny Moore, Professor Lynn Morris and colleagues who published in Nature Medicine (IF: 22.46) in October 2012.

The Faculty was awarded two new, highly contested South African research chairs funded by the Department of Science and Technology (DST)/National Research Foundation (NRF). Professor Caroline Tiemessen was appointed to the Chair in HIV Vaccine Translational Medicine, and the second Chair in the Centre for Health Policy, School of Public Health, is still to be filled. Our three existing chairs, Professor Viness Pillay, Professor Maureen Coetzee and Professor Shabir Madhi were successfully reviewed and new, five year cycles were initiated.

A highlight of the 2012 research year was the Biennial Faculty of Health Sciences Research Day and Postgraduate Expo, coupled with the Wits90 birthday celebrations, which attracted a record number of 330 abstracts for oral and poster presentations, as well as 1000 delegates, including researchers, exhibitors, government officials, and visitors from other faculties and universities. The event was opened by the Deputy Minister of Health Dr Gwen Ramokgopa, who highlighted the vital role that Wits researchers play in health sciences research in South Africa and internationally.

**Continued capacity and network building**

The Faculty continues to strengthen its collaborations regionally and internationally through individual researchers as well as through its Faculty Diaspora Programme. Over three years, 23 alumni from the far corners of the world have returned to the Faculty to initiate collaborations and to foster networks.

The hugely successful programme has, amongst other achievements, resulted in a Faculty collaboration with the University of Vanderbilt’s Medical School. Vanderbilt University is ranked at 50 (Shanghai Ranking) in the world university rankings and the Clinical Medicine and Pharmacy section at 20 (Shanghai Ranking). Many researchers and Departments are starting to reap the benefits of this collaboration.

We continued building capacity in the area of clinician scientists through our Academic Medicine programme, funded by the Carnegie Corporation of New York and directed by Professor John Pettifor, which enables clinicians to obtain a PhD. In 2012, a second cohort of four fellows was appointed to the programme.

The Faculty also proudly co-hosts the very successful Consortium for Advanced Research Training in Africa (CARTA) programme which focusses on building postgraduate and research capacity in Africa. CARTA is energetically driven by one of its deputy directors, Professor Sharon Fonn of the School of Public Health.

The Faculty graduated a record number of 49 MMeds and 28 PhDs in 2012. Although we are extremely proud of these achievements, we recognise the need to qualify many more MMeds in light of the mandatory requirement of the Health Professions Council of South Africa for all specialists to undertake research as part of their postgraduate training, and also to increase the number of staff with higher degrees in order to boost supervisory capacity in the Faculty.
Postdoctoral fellow numbers showed a slight but definite increase to 26 in 2012. There is no doubt that postdoctoral fellows contribute significantly to our research outputs and the Faculty has introduced incentives to support its postdoctoral cohort.

**Awards and honours**

I am extremely proud of the many awards and honours bestowed on our staff in the field of research.

Associate Professor Yahya Choonara was awarded the National Science and Technology Forum-BHP Billiton TW Kambule Award for an emerging researcher who has made an outstanding contribution to science, engineering, technology and innovation through research and its outputs. Choonara was also appointed a Third World Academy of Science Young Affiliate in 2012.

Professor Maureen Coetzee was elected to the fellowship of the Royal Society of South Africa. She was also chosen as the American Mosquito Control Association’s John N. Belkin Memorial Award recipient in recognition of her ‘exceptional contributions to the taxonomy, systematics and biology of African mosquitoes’.

Professor Hoosen Coovadia was also elected as a Fellow of the Royal Society of South Africa.

Professor Barry Schoub received the prestigious Order of Mapungubwe: Silver from President Jacob Zuma for his ‘excellent achievements in medical science and contribution to the field of virology’.

Professor Emeritus Phillip Tobias was conferred with the degree of Doctor of Science, honoris causa by the Nelson Mandela Metropolitan University in recognition of ‘his work in establishing South Africa as the ‘Cradle of Humankind’, his devotion to humanity, and for raising the profile of southern Africa and its people in science and society’. Sadly, the Faculty mourned the death of Tobias in June 2012, a loss that will be felt for years to come.

Professor Glenda Gray and Professor Emeritus Duncan Mitchell were also conferred with the degree of Doctor of Science, honoris causa. Gray’s degree was conferred by the Simon Fraser University in the US and Mitchell was honoured by Wits University. In addition, Gray is the Director of the Perinatal HIV Research Unit which was the first site in South Africa to host a paediatric tuberculosis vaccine study.

The prestigious Vice-Chancellor’s Research Award was presented to Professor Helen Rees. In addition, she was awarded the South African Medical Association’s Lifetime Achievement Award.

Professors Helen Laburn, Shabir Madhi and Viness Pillay were inaugurated as members of the Academy of Science of South Africa in 2012.

Dr Lois Harden was the recipient of a Friedel Sellschop Award.

Dr Bavesh Kana was one of 28 scientists selected from over 750, following a highly competitive review process, to receive an International Early Career Scientist award at the Howard Hughes Medical Institute in the US. The appointment includes a substantial five year research grant.

Erin Hutchinson received a grant to host a series of specialist workshops under the 2012/13 German-South African Year of Science Programme, funded by the DST/NRF and the BMBF (Federal Ministry of Education and Research of Germany). The workshops covered a variety of 3D visualisation techniques relevant to the fields of dental and craniofacial biology, forensic and physical anthropology, and archaeology.
Professor Stephen Tollman was appointed as the Chair of the Wellcome Trust’s Public Health and Tropical Medicine Interview Committee and will also be taking on the role of Principal Scientist for the International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH) Network.

Tollman and Professor Sharon Fonn, together with Professor Kathleen Kahn, were applicants in a Wellcome Trust Strategic Award given to INDEPTH. The substantial grant (R31 million) will fund a project focussed on enhancing the compatibility of data in multi-site research and ensuring effective public access. Following this award, INDEPTH/Wits School of Public Health were awarded R7.5 million by the Swedish International Development Cooperation Agency (Sida), part of which will be used by Wits to establish an MSc track in research-oriented data management. Osman Sankoh, INDEPTH Executive Director and an honorary Associate Professor in the School, is lead co-principal investigator on these awards.

Dr Mignon du Plessis received the 2012 Robert Austrian Research Award in Vaccinology (Africa) at the 8th International Symposium on Pneumococci and Pneumococcal Diseases (ISPPD-8) in Brazil in March 2012.

In addition, some of our undergraduate students excelled at congresses in 2012:

Schalk van der Linde (a final year Bachelor of Dental Science student) was awarded the South African Dental Association (SADA)/Dentsply Student Clinician Programme Award at the International Association for Dental Research Congress held in Johannesburg in August 2012.

Alessandra Prioreschi continued the Faculty’s tradition as a prize winner at the Pfizer-University of KwaZulu-Natal Young Health Scientists Research Symposium in October 2012. Prioreschi won the prize under the Clinical Research category.

A thriving environment

Acknowledgement must be given to all our Faculty researchers. The tangible benefit of their research productivity is immeasurable. However, there have also been intangible benefits to the Faculty, driven by research support, international visitors, research courses, and improved communication in every possible medium, provided by the determined administrative staff of the Faculty Research Office.

Of particular mention is the role played by Professor Beverley Kramer, Assistant Dean of Research and Postgraduate Support in the Faculty, who has committed enormous amounts of energy to our research and postgraduate programmes. Her commitment is of the highest standard and substance.
Ten years of long, hard research towards the development of an HIV vaccine is showing such positive results that there is renewed optimism in the field. A recent collaborative South African and American HIV research team is conducting key research towards this goal, described here by team member Dr Penny Moore of the Wits School of Pathology and the Centre for HIV and STI at the National Institute for Communicable Diseases of the National Health Laboratory Service.

Those in the academic research world know that an impact factor of 22 is stellar – it signifies outstanding international recognition in a grading system where an impact factor of 5 is considered great.

‘Recent research and clinical trials mean that we have a better chance than ever before of developing a vaccine for the HIV-1 virus, with which 42 million people are currently infected worldwide, 30 million of them in Africa,’ says Moore.

For a vaccine to be licensed, it must ideally protect more than 90% of people, as is the case with the polio and smallpox vaccines. Several trials still need to be run before a possible HIV-1 vaccine can even be considered for production and licensing, but there is more hope now than ever before that it can happen.

‘In South Africa, millions of people are on antiretroviral drugs or ARVs, which saves their lives but does not solve the problem of halting infection, which is what a vaccine does,’ says Moore, explaining that vaccines work in two ways:

They stimulate the cellular arm of the immune system, or they cause the immune system in HIV uninfected people to produce antibodies that pre-arm them and stop them from ever becoming infected.

In the context of an HIV vaccine, researchers are working on both arms, but Moore’s research team has been working exclusively on the second one for the past 10 years.

‘Our approach is to look at people who become infected with HIV and to question how their immune system sees the virus and reacts to the virus, and to ask whether we can learn from that to develop a vaccine,’ she explains.

Since 2003, the research team has been studying a group of several hundred women who are part of the Centre for the Aids Programme of Research in South Africa cohort in Durban led by Professor Salim Abdool Karim.

These women live in a high HIV risk area. KwaZulu-Natal has the highest HIV infection rate in South Africa; hence the risk that these women will become infected in their lifetime is high.

The women were not infected when they were enrolled in the study and Moore’s research team has predominantly been studying 40 women who have become infected during the 10 year period.

‘The women have shown incredible commitment to the process, initially returning for testing once a month and subsequently once every three months over the past five or more years,’ she continues. ‘They give blood for testing each time they visit and they receive good care at the two clinics – one in Durban and one in a rural area – where they also receive ARVs if or when they need them, as per the South African guideline for CD4 counts.’

‘We look at the antibodies that develop in these women to see whether they mount a good immune response to HIV.'
Everyone who gets HIV develops antibodies but the problem is that the antibodies are strain specific, meaning that their antibodies will only recognise their specific virus. Adding to the complexity is the fact that the HIV virus mutates very quickly,’ says Moore.

A key step forward in this field of HIV research worldwide is that 20% of people develop what is called ‘a broadly cross-neutralising antibody’, which is what is required for a vaccine. In other words, a percentage of people are able to produce antibodies that recognise most viruses. Seven of the women in the group of 40 are able to do this.

‘Most of the seven are on ARVs and it seems that only people with very high viral loads develop the special kind of antibodies required,’ says Moore. The paper in Nature Medicine mainly focussed on two women from the group who go by the anonymous numbers of CAP177 and CAP314.

‘We observed that what the virus does to escape from the first antibodies produced by the immune system approximately three months after infection, is to coat itself with a sugar called 332. The immune system then starts producing antibodies to the sugar.’

‘In these two women this results in antibodies that bind to the sugar of 80% of all HIV viruses and therefore become broadly cross-neutralising, and that is exactly the kind of antibody we would want in a vaccine. It’s a big step forward and while it is still a long way from making a vaccine we can now use this research to design a new approach to making a vaccine,’ says Moore who presented this research at two major international conferences in 2012: the AIDS Vaccine 2012 Conference in Boston, US, and the 19th Conference on Retroviruses and Opportunistic Infections, in Seattle, US.

Collaboration on this research is essential, as the Nature Medicine paper attests, with no less than 20 authors (16 from South Africa and four from the US) who have partnered on this research over the past 10 years. ‘The best science these days is based on collaboration as you bring people with widely differing skills to address the question,’ comments Moore.

‘We also have a wonderful team of students working with us, including two exceptional PhD students from Wits – Kurt Wibmer and Jinal Bhiman – who are co-authors on this paper.’

Moore gives special credit to Professor Lynn Morris, also of the Centre for HIV and STI and the School of Pathology, who has been her mentor for many years and is a co-author on the paper.

‘She is an exceptional scientist and mentor who has spent many hours helping me learn how to do science and opening doors for me to increase my exposure to leading HIV scientists at universities worldwide,’ she says. Moore emphasises the importance of strong mentorship for scientists trying to establish themselves as independent researchers developing new areas of research. ‘There is a huge shortage of mentors in South Africa.’

The final question is when can we hope to see an HIV vaccine become available?

‘There is no immediate answer to this,’ says Moore. ‘All I can say is that another trial is currently being run in South Africa, and that with all of this research, there is a better chance than there has ever been of producing one. In the meantime we will continue teaching people how to avoid getting infected. One day when a vaccine is hopefully licensed, it will be used in combination with other prevention measures as one of many tools in the HIV toolkit.’
Thirty percent of the girls in the Birth to Twenty Plus (Bt20+) cohort are overweight or obese by the age of 18. Professor Shane Norris and his team at the Medical Research Council (MRC)/Wits Developmental Pathways for Health Research Unit (DPHRU) are researching why this occurs.
In South Africa, the overall prevalence of being overweight or obese is particularly high (57%) among women. As part of their focus on diet and obesity in young black South Africans, the DPHRU undertook several quantitative and qualitative obesity-related research projects in 2012.

‘One of our research projects looked at the emergence of obesity risk in the Bt20+ cohort, which comprises black boys and girls living in Soweto, Johannesburg. We found that in a group of 1 800 boys and girls in the 18-year-old age group, there was a dramatic three-fold greater prevalence in girls than in boys,’ says Norris, who is the Director of the DPHRU.

‘Some of the research we undertook was to look at dietary patterns, including the amount of fast food intake which is high: on average seven to eight fast food items a week are consumed, as well as a high percentage of sweetened beverages,’ explains Norris. Fast food is defined as ‘any cooked or prepared food that is bought from a vendor’. The boys tended to drink more sweetened beverages on average than the girls, and the fast food consumption was similar.

‘So what was driving the obesity risk differences between girls and boys? Could it be physical activity? Indeed, we found a difference in physical activity patterns where the girls showed rapidly decreasing activity patterns during secondary school, while the boys retained higher activity levels.’

Why this happens is the big question and in 2012, a body of qualitative research using focus groups and in-depth interviews started exploring everything from eating patterns to body shape attitudes.

‘In one research study, we invited a group of high school girls from Soweto, paired them with their best friend and interviewed them together to explore their attitudes and behaviour around eating,’ Norris explains. This research highlighted that fast food consumption was largely dictated by best friend and peer group influence, and was closely linked to socialising outside of the home. ‘They meet at a fast food venue, often in a mall, which is part of going out as well as an aspirational activity,’ explains Norris.

The outcomes of this behaviour are extremely worrying, and include higher risks of obesity, diabetes and cardiovascular disease.

‘Eating patterns and obesity are highly complex issues and we need to understand these complexities in order to locate an intervention, either in schools or homes or both. Changing behaviour around people’s eating and activity patterns is not easy.’

Two articles were published in the international peer-reviewed journal *Public Health Nutrition* in 2012: ‘Investigation into longitudinal dietary behaviours and household socio-economic indicators and their association with BMI Z-score and fat mass in South African adolescents: The Birth to Twenty (Bt20) cohort’, by Dr Alison Feeley, Eustasius Musenge, Professor John Pettifor and Norris; and ‘We eat together; today she buys, tomorrow I will buy the food: Adolescent best friends’ food choices and dietary practices in Soweto, South Africa’, by Carlijn Voorend, Norris, Associate Professor Paula Griffiths, Modiehi Sedibe, Marjan Westerman and Dr Colleen Doak.

Another notable research project in 2012 looked at rapid weight gain and linear growth in children in low-income and middle-income countries. ‘Rapid weight gain in children of high-income countries is associated with improved cognitive development, but also increased risk of obesity and related adult cardiometabolic diseases,’ explains Norris.
‘We investigated how linear growth and relative weight gain during infancy and childhood are related to health and human capital outcomes in young adults. We used data from five prospective birth cohort studies from Brazil, Guatemala, India, the Philippines, and South Africa. We investigated body mass index, systolic and diastolic blood pressure, plasma glucose concentration, height, years of attained schooling, and related categorical indicators of adverse outcomes in young adults,’ says Norris.

He summarises the findings as follows: ‘The children who grew taller or put on weight at a faster rate in the first two years of life showed improved school attainment without any risk for diabetes or blood pressure/hypertension.’

‘However, faster weight gain from mid-to late childhood onwards showed increased risk of diabetes and blood pressure/hypertension in adulthood. There is also some indication that children who gain more weight during this period are more likely to retain that weight or gain even more later on in life. This indicates how important it is to minimise excessive weight gain in mid- to late childhood.

For a new unit (the DPHRU received joint MRC and Wits unit status at the beginning of 2011), 2012 proved to be a highly productive year with several large research projects ongoing and new studies starting, 38 peer-reviewed publications in print, online or in press, two book chapters and one book published, one masters and three PhD students graduated, and 17 PhD students registered.

Norris’s exceptional team includes Pettifor, Professor Linda Richter, Professor Christine Schnitzler, Senior Researcher Dr Lisa Miclesfield, Economist Dr Chris Desmond, Senior Scientist Feeley, and Data Scientist Dr Daniel Lopez. Four postdoctoral research fellows are also part of the team.

‘We have also developed several collaborations with national and international institutions, which have resulted in multiple successful grant applications, joint publications, co-supervision, and nested postgraduate students,’ says Norris.

‘In addition, we have facilitated the appointment of many of our international collaborators to honorary positions at Wits.’ In 2012, the following honorary appointments were confirmed:

- Associate Professor Paula Griffiths and Professor Noel Cameron (Loughborough University, UK)
- Professor Aryeh Stein (Emory University, US)

For his tireless dedication and achievement in research, and for the outstanding performance by the DPHRU as a new research entity, Norris received two awards at the Faculty of Health Sciences Research Awards in 2012.
Dr Kerith Aginsky, a professional biokineticist at the Centre for Exercise Science and Sports Medicine, conducted research for South Africa’s national cricket side on a throwing technique that helps cricketers get the ball back to the stumps faster.
'Our research showed that the time taken to release the ball was quicker, which increases the chance of a run out. The accuracy of throwing the ball at the stumps remained consistent,' says Aginsky.

In 2012, she tested a technique created by the Proteas’ strength and conditioning coach, Rob Walter. The national side started using this technique in 2011 and they wanted to see if research upheld Walter’s conviction that it made a difference to the game.

The aim of this technique is to keep the fielder much lower to the ground so that after he picks up the ball he throws it back from a lower body position. The rationale is that it takes time to stand up and release the ball, and the time difference between the two techniques is what we researched,’ explains Aginsky. She worked on this research with the South African National Cricket Academy’s strength and conditioning coach, Greg King, who has a masters in Sports Science from Rhodes University.

The new technique was aimed at inner ring fielders, within 20 to 30 metres from the stumps. They tested it on approximately 20 National Academy players – the up-and-coming players who attended an annual training academy for fitness and coaching sessions at the High Performance Centre in Pretoria.

They used three video cameras to film the fielders, two shooting at 50 frames per second and one high-speed camera at 120 frames per second, positioned at an angle that captured both the fielder and the stumps in each frame.

‘We based our results on the high-speed camera to capture the greatest accuracy in terms of subtle changes from pick up to release,’ Aginsky explains. The same fielders were tested before and after the intervention, with a two month period between the ‘before’ and ‘after’, during which time King worked with the fielders on the new throwing technique. The arm movement remains the same from the lower position, and the players picked up the new technique quickly and were comfortable using it.

The fielders were filmed in two different ways: the first was with a static ball, which they picked up and threw at the stumps; the second was with a dynamic ball, which was hit by the batsman; the fielder then ran to retrieve it, picked it up and threw it at the stumps.

‘We analysed the video footage frame by frame using video analysis software called Dartfish. It’s regularly used as a tool for professional cricket for a number of purposes, including assessing and analysing changes in the game, undertaking two dimensional analyses of bowling techniques and examining harmful bowling techniques,’ explains Aginsky.

‘We found that the low throw with the static ball was approximately 1.5 frames less from pick up to release than the conventional throw; and with the dynamic ball the low throw was approximately 1.2 frames less,’ says Aginsky.

‘One frame can certainly make a difference to the game, not only in terms of getting the ball back to the stumps faster but also in terms of putting more psychological pressure on the opposing batsman as to whether he should run or not because the ball is coming back faster.’

‘Our research confirmed Walter’s finding that there was a definite decrease in the time taken to release the ball and an increase in the chance of a run out. The accuracy remained fairly consistent, and the national side is now using the technique readily.’

Aginsky is widely recognised for the work she has undertaken on lower back injuries in cricket players. In September 2012, she presented a workshop on lumbar stabilisation and ultrasound at the first ever Biokinetics Conference in South Africa. At the conference, the Biokinetics Association of Southern Africa named her as the Young Researcher of the Year.

She and King are members of the newly developed Cricket South Africa Research Committee formed in October 2012. The Committee comprises researchers from a number of South African universities who have been involved in cricket or have a specific interest in it. The Chair is Dr Janine Gray, a physiotherapist from the University of Cape Town, who focusses on cricket injuries and who supervised Aginsky’s PhD on back pain.

Cricket SA will be driving the research undertaken by the Committee, depending on what is required to improve players’ strength, health and performance. ‘A lot of the cricket research to date has been ad hoc and not used. This initiative will help to ensure that it is far more targeted and, where appropriate, implemented,’ concludes Aginsky.