



ihbi

Institute of Health and Biomedical Innovation



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HEALTH

IN OUR

LIFETIME

IHBI YEAR IN REVIEW 2019

Contents

- 02** A message from the Executive Director
- 03** 2019 and beyond
- 04** Clinical application
- 06** Partnering with industry
- 08** International collaborations
- 10** Investment in the future
- 12** Outstanding researcher achievements
- 14** Excellent facilities for translating research
- 18** Capability building
- 20** Support for Higher Degree Research students
- 22** Support for early- and mid- career researchers
- 24** Sharing our knowledge
- 26** Public engagement and contribution

A message from the Executive Director

Wide collaboration advances important areas of IHBI research

Involving industry, clinicians and patients in IHBI research ensures a real-world focus and opportunities for improving health for people with disorders including cancer, neurodegenerative disease, osteoarthritis, injuries and eye disease.



Our partnerships involve industries working on therapeutics and medical devices, clinicians aiming to provide personalised care and improve quality of life, and healthcare decision-makers looking to free capacity and prevent unnecessary re-admissions.

IHBI researchers have collaborated widely in 2019 with partners from around the world—leveraging government and industry support, and using IHBI facilities and capabilities.

Our researchers have leadership and significant input in four Australian Research Council (ARC) training centres, three of which were established in 2019 to produce industry-ready graduates and early-career researchers with translational and entrepreneurial mindsets.

Professors YuanTong Gu and Peter Pivonka lead investigations for the ARC Industrial Transformation Training Centre for Joint Biomechanics to better treat osteoarthritis and other joint-related orthopaedic disorders. Dr Marie-Luise Wille is Deputy Director of the new ARC Training Centre for Multiscale 3D Imaging, Modelling and Manufacturing, while Dr Laura Bray has the same role at the Training Centre for Cell and Tissue Engineering Technologies.

Sponsored clinical trials also enable close collaboration with industry and advance knowledge in fields such as Alzheimer's disease, metastatic cancer, solid tumours and advanced prostate cancer treatment.

Conducting research at strategically important locations—such as the Translational Research Institute (TRI), co-located at the Princess Alexandra Hospital—facilitates research, clinical collaboration and engagement with patients and their carers. Genetic analysis, laboratory modelling, clinical trials and patient samples are part of a multi-dimensional research collaboration that Professor Rik Thompson leads at TRI to enable personalised cancer therapy, using Federal Government support.

Associate Professor Devakar Epari is collaborating with engineers in Switzerland to develop an implant that promotes fast, robust healing. Associate Professor Scott Read has entered an industry partnership to evaluate a dry eye disease treatment.

Building on partnerships with two Queensland health services, Professor Adrian Barnett is focused on freeing capacity in the congested public hospital system.

PhD candidates are important to the IHBI research teams—publishing important findings, contributing significantly to translation and sharing their knowledge internationally while building their own collaborative networks. Paul Dunn secured a National Health and Medical Research Council Dora Lush Biomedical Postgraduate Scholarship to study genetics in a progressive neurodegenerative disease.

Navid Toosi Saidy was the recipient of the Australian Society for Medical Research Postgraduate Student Researcher Award for his role in developing a prototype of a tissue engineered heart valve potentially capable of growing and remodelling with a patient.

IHBI achievements in 2019 stand us in good stead for delivering better health in our lifetime, leveraging our partnerships, maintaining our focus on real-world needs and combining expertise, innovation and cutting-edge facilities.

Professor Lyn Griffiths

IHBI Executive Director
July 2020

2019 and beyond

Real-world focus driving research, healthcare and training

Research excellence is the basis for all IHBI activities, enabling funding to be secured in 2019, collaborations to be established and findings in laboratories to be translated into better healthcare and people's wellbeing.

Major successes in 2019 also pave the way for IHBI researchers to take a leading role in training the next generation of scientists, engineers and entrepreneurs, and combine technology and innovative thinking to shape future healthcare.

IHBI successes include:

- focusing on early intervention to address poor health trajectories in childhood and arrest high rates of chronic disease, including in Indigenous communities
- understanding the needs of patients, their carers, clinicians and industry as part of clinical trials in cancer and neurological disease
- contributing significantly to providing better health through screening patient samples for cancer-causing genetic mutations at the Australian Translational Genomics Centre
- providing input in designing and developing medical devices, such as implants, to improve patient outcomes and minimise complications
- working with clinicians and using computer modelling for pre-operative planning to improve outcomes for people with orthopaedic disorders
- securing support and establishing collaborations focused on training the future workforce and building an entrepreneurial mindset among scientists.

IHBI's future focus involves:

- continuing multi-dimensional research, such as work that Professor Rik Thompson leads across genetics, laboratory modelling and clinical trials conducted at the Centre for Personalised Analysis of Cancers at the Translational Research Institute
- using the latest technology and pairing it with relevant expertise to gain new understanding of tissue, such as tumour cells and immune cell interactions, needed for immunotherapeutic medicines
- combining robotics, artificial intelligence and advanced manufacturing to expand surgical possibilities and improve treatment of complex medical cases
- bringing medicine together with physics, engineering and the humanities to create a future for healthcare that is better and fairer
- building on pioneering work in additive biomanufacturing and biomechanics to future-proof and establish Queensland as an Australian hub.

People, partnerships and publications

Research excellence, collaboration and innovation have underpinned solid results in research income, publications and student numbers at IHBI in 2019.

External
income
\$41 262 164

Publications
1144

Projects
involving
external
partners
390

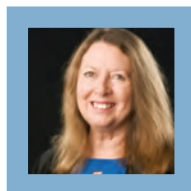
Higher Degree
Research
(HDR)
students
701



Clinical application

Collaborating with clinicians, recruiting patients for studies and having a translational focus ensures that IHBI researchers appreciate the relevance and potential impact of what they do. They aim to bring about better health in our lifetime, using genetics to understand concussion, conducting trials to help people with liver conditions and evaluating gels to overcome burns in cancer patients.

Image: IHBI's Genomics Research Centre



Genetics, concussion and precision medicine

IHBI Executive Director Professor Lyn Griffiths is leading world-first research, aiming to identify genetic vulnerabilities that play a role in the way people react to concussion and whether they develop post-concussion headache and migraine.

Her team at IHBI's Genomics Research Centre is recruiting more than 100 people and their family members who have also experienced concussion. The research involves collaboration with sporting organisations such as the Australian Institute of Sport and the AFL, the Australian defence forces, and neurologists from a specialised New Zealand concussion clinic.

Using funding through the US Department of Defense, the research team will conduct in-house sequencing of each participant's DNA to identify causal mutations that result in people having a higher susceptibility to post-traumatic headache and chronic migraine.

Professor Griffiths said the research will identify biomarkers for diagnosing people and may also guide future therapeutic development.

'We aim to identify the genes that play a role in concussion development and response, investigating individual responses to treatment and developing precision medicine approaches for managing people with post-traumatic headache,' she said. 'We will also collect data to analyse genetic, lifestyle, treatment response and psychological risk factors so that we can build a complete picture of post-concussion headache and migraine.'

After a traumatic brain injury there is a cascade of events that impact the health of neurons in the central nervous system, Professor Griffiths said.

'Research has already shown that mutations in one particular gene can cause a severe type of migraine that runs in families. For people with a specific mutation in the gene, even a minor head bump can lead to very severe post-concussion symptoms.'



Assessing liver disease and avoiding hospital stays

Professor Adrian Barnett is building on a partnership with Sunshine Coast and Wide Bay Hospital and Health Services to free capacity in the congested public hospital system.

He leads a team focusing on people with non-alcoholic fatty liver disease (NAFLD), the most common type of chronic liver disease which impacts as many as 30 per cent of the Australian adult population.

Figures suggest that between 60 and 90 per cent of people with NAFLD are not at risk of chronic liver disease and can safely be cared for in the community, rather than requiring hospital care.

Professor Barnett and his team are working on a trial of a community-based patient assessment activity to assist general practitioners to determine which patients need to be referred to hospital for care and which they can manage themselves.

'Better assessment of low-risk patients will reduce referrals for hospital-based appointments,' he said. 'It will also ensure appropriate care is delivered close to a patient's home—particularly important for Australians living outside of the major cities.'

Conversely, providing better assessment tools is expected to mean that people with advanced disease have a faster referral to hospital, reducing the risk of disease progression or organ failure.

The research builds on existing partnerships with health services, researchers from the University of the Sunshine Coast, QIMR Berghofer Medical Research Institute and University of Queensland. It has National Health and Medical Research Council (NHMRC) Medical Research Future Fund support until 2022 as part of the Keeping Australians Out of Hospital initiative.



Proving the protective power of a gel dressing

Professor Ray Chan has worked with 197 patients with head and neck cancer to show that a transparent, silicone-based gel dressing that prevents transdermal water loss during radiotherapy can reduce radiation dermatitis in patients receiving radical radiation treatment.

'We aim to identify the genes that play a role in concussion development and response.'

His research, published in *Radiotherapy and Oncology*, reported that the gel dressing reduced the risk of developing a wound by 49 per cent in patients receiving radiotherapy for head and neck cancer compared with usual care.

Professor Chan said many clinical studies used topical ointments but none prevented what could be serious wounds requiring burns treatment in head and neck cancer patients.

'Radiation goes through the skin 'killing' cells and affecting the skin's ability to rejuvenate, ultimately leading to radiation dermatitis—a red, itchy and often painful rash,' he said.

'The key is to keep the skin hydrated and provide a barrier to avoid further damage. A gel can be reapplied as needed without the problem of a physical dressing falling off.'

- **Professor Gill Harvey** led a successful bid for the Federal Government's Medical Research Future Fund Keeping Australians Out of Hospital grant, with \$1.85million for a program to prevent unnecessary hospital admissions of aged care residents.
- **Professor Ray Chan** led a successful bid for a National Health and Medical Research Council (NHMRC) Partnership Project for Better Health grant, with \$1.44 million for a nationwide trial of a shared care model between cancer specialists and GPs for the follow-up care for early breast cancer survivors.
- IHBI researchers were part of successful bids for QUT and Metro North Collaborative Research Grants, enabling collaborations with clinicians. **Dr Graham Johnson** will work with Prince Charles Hospital (PCH) heart and lung clinicians on survival of respiratory viruses in humidity. **Professor Kevin Laupland** will work with Royal Brisbane and Women's Hospital (RBWH) intensive care specialists on diagnostic sensitivity related to artery constriction following stroke. **Professor Vivienne Tippett** will work with clinicians at five hospitals on screening for people with health problems after intensive care treatment.
- **Associate Professor Julie Marchant** secured Children's Health Foundation Queensland funding of \$349 569 to collaborate with clinicians at the Queensland Children's Hospital, Indigenous Outreach Clinics and Royal Darwin

Hospital, studying children with bronchiectasis, changing clinical care, reducing hospital stays and improving outcomes.

- **Professor Clint Douglas** was appointed Metro North Hospital and Health Service (MNHHS)/QUT Nursing Chair, providing leadership in nursing, clinical and workforce research, teaching and engagement.
- **Associate Professor Kirsten Vallmuur** secured an Australian Research Council (ARC) Discovery Project, with \$134 496 for a joint MNHHS and QUT appointment in health economics.
- **Professor Anne Chang** secured Children's Hospital Foundation support of \$298 000 for a dual-centre trial on erdosteine for improving outcomes of children with bronchiectasis.
- **Associate Professor Jaimi Greenslade** is using a NHMRC Medical Research Future Fund grant of \$194 682 to collaborate with clinicians from the RBWH, PCH and Logan Hospital implementing a model that rules out heart attack for patients at Emergency Departments with chest pain, addressing overcrowding.
- IHBI researchers are collaborating with clinicians on projects that received funding from MNHHS, matched by QUT. **Associate Professor Tim Dargaville** and **Dr Nicole Bartnikowski** work with PCH nurse researchers to investigate causes of biofilms forming on heart-lung machine tubes. **Associate Professor Makrina Totsika** and **Professor Mia Woodruff** collaborate with clinicians to develop new biofabricated meshes for use in pelvic surgery to treat incontinence. **Dr Nicole Gavin** and **Professor Samantha Keogh** lead a pilot trial with the RBWH Cancer Care and Medical Imaging Services of a new catheter with a perforated design.



Partnering with industry

Industry partners bring a wealth of expertise to IHBI research projects and provide insights in development, manufacturing and scale-up. Their support and collaboration enable research, clinical trials, mentoring and networking opportunities that benefit work in infectious disease, neurological disease, joint repair, tissue regeneration and eye disease.

Image: Professor Ken Beagley

IHBI Professor Ken Beagley is collaborating with researchers from three countries and industry partner BlueWillow Biologics, using funding from the National Institutes of Health in the US to develop a chlamydia vaccine.

Professor Beagley has one of only two laboratories in the world known to study chlamydial immunobiology using a specific biological model. It is also unique in studying the effect of vaccination of both sexes on chlamydial transmission in the models.

He will work closely with BlueWillow Biologics, a biopharmaceutical company developing and commercialising intranasal vaccines, with its experts advising and manufacturing chlamydial vaccines—capable of inducing an immune response.

Chlamydia trachomatis (CT) is a sexually transmitted bacterium that causes widespread disease, infecting more than 130 million people worldwide each year.

The infection initially establishes in the endocervix, the opening of the uterus, but it can ascend the genital tract to cause significant disease. Many of the mechanisms associated with chlamydial infection and disease ascension are unknown.

Ascension induces inflammation that leads to pelvic inflammatory disease (PID) in 10 per cent of infected women. PID can lead to infertility and permanent damage of a woman's reproductive organs. Antibiotic treatment efficacy is limited because more than 70 per cent of infections are asymptomatic.

Professor Beagley's research collaboration aims to develop a vaccine against CT to decrease the burden of infertility, reduce HIV transmission and improve the health of young people.

He will co-lead one of three research strands, using a biological model for chlamydial vaccine testing. The research will explore the efficacy of two leading vaccine delivery strategies already proven safe and effective in humans.

Effective vaccines require identification of antigens that induce the production of specific T cells.

An antigen is a foreign substance, usually a component of a pathogen, that can provoke an immune response against a virus or bacteria, protecting against future exposure. A T cell is a type of lymphocyte, which develops in the thymus gland and plays a central role in the immune response.

Professor Beagley's challenge will be overcoming the limitations of natural CT immunity, which include weak and waning responses that do not persist in the genital tract. 'The significance of our research contribution is expected to be development of sub-unit vaccines that elicit a potent, long-lasting T cell response,' he said.

His collaborators include Professor Toni Darville and Dr Nilu Goonetilleke, experts in immunology at the University of North Carolina in the US, and professors Adrian Hill and Sarah Gilbert, experts in human vaccinology and vaccine manufacture at the University of Oxford in the UK.

Contributing expertise in high throughput antigen detection are Associate Professor Xinxia Peng from North Carolina State University and Dr Tim Waterboer from the German Cancer Research Center.

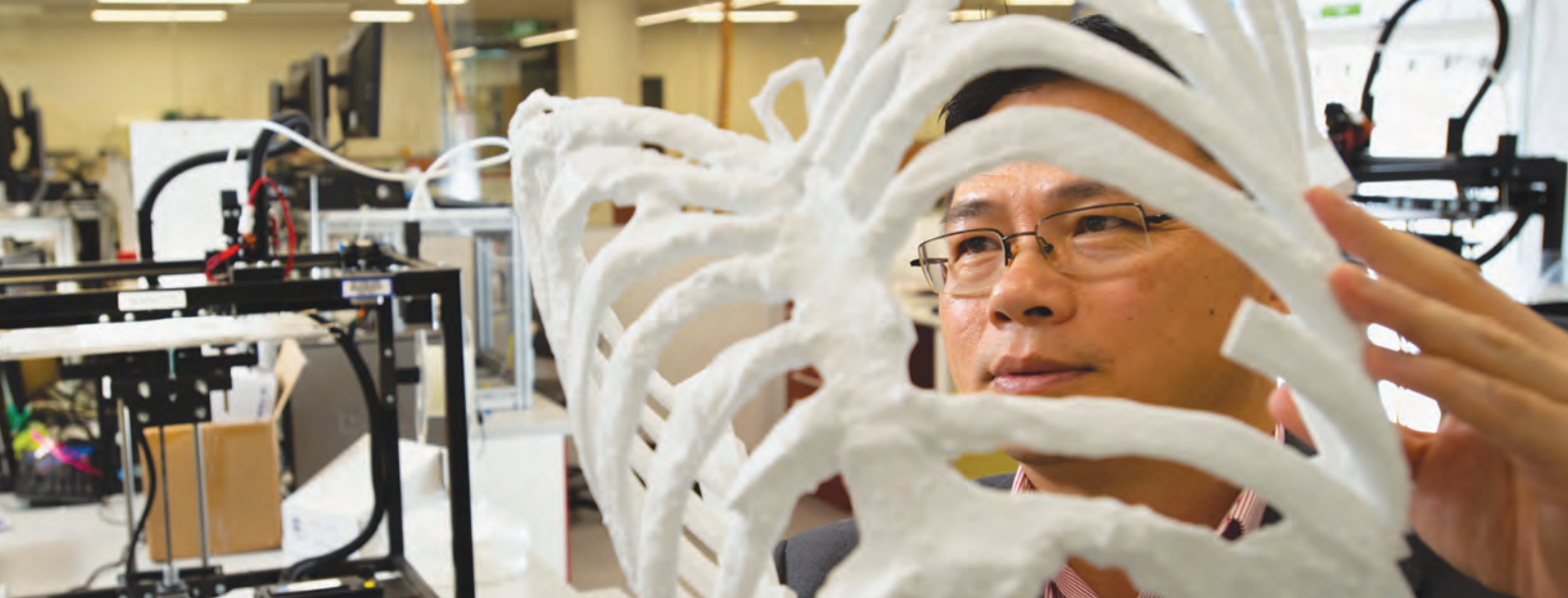
Professors Harold Wiesenfeld and Sharon Hillier from the University of Pittsburgh provide expertise in clinical reproductive infectious diseases.

Also involved are experts at the Jenner Institute, advising and generating viral vectors, tools molecular biologists commonly use to deliver genetic material into cells to express immunogens and induce an immune response.

His IHBI collaborators include Professor Jonathan Harris, an expert in protein synthesis, molecular modelling, protein chemistry and production, and Dr Alison Carey, with expertise in vaccine development, immune responses and the female reproductive tract.

'The significance of our research contribution is expected to be development of sub-unit vaccines that elicit a potent, long-lasting T cell response.'

- IHBI researchers secured Australian Research Council Linkage grants, promoting national and international partnerships between researchers and industry, community organisations and other researchers to encourage the transfer of skills and knowledge as a basis for securing commercial and other benefits of research. **Professor Lidia Morawska** led a successful bid for \$894 000 for *Airborne Ultrafine Particles in Australian Cities* and **Professor Prasad Yarlagadda** led a bid for \$419 000 for *Mathematical Decision Support to Optimise Hospital Capacity and Utilisation*.
- IHBI researchers are forging partnerships with industry, undertaking sponsored clinical trials and clinically-focused collaborations. **Professor Lyn Griffiths** worked with Golden Biotechnology to undertake preclinical trials on a new potential preventive and therapeutic for Alzheimer's disease, and with Biogen to revisit a Phase III trial for Alzheimer's after good efficacy data. **Professor Ken O'Byrne** works with Janssen-Cilag to conduct a Phase III clinical trial for metastatic cancer, and with Amgen on a Phase I/II open label clinical trial for advanced solid tumours. **Dr Ian Vela** and Janssen-Cilag are conducting a Phase III trial for advanced prostate cancer treatment.
- IHBI's Genomics Clinical Trial Centre on the Gold Coast was involved in two global sponsored Alzheimer's disease clinical trials in 2019, with participant recruitment activities undertaken for Roche and Genentech studies. The centre was approached in late 2019 to undertake feasibility for involvement in three further global sponsored Phase II or III Alzheimer's disease clinical trials as well as one Australian sponsored migraine trial.
- Industry partners provided support for research to be conducted as part of the newly established **Queensland Unit for Advanced Shoulder Research (QUASR)**, including Wright Medical, Zimmer Biomet, Surgical Specialities and Materialise. Researchers, clinicians and engineers are part of QUASR, aiming to become a global front runner in shoulder research using virtual and augmented reality, computer modelling, biofabrication, research in biomechanics, tissue and cartilage, industry collaboration, and international partnerships.
- **Adjunct Associate Professor Kateryna Bazaka** entered a partnership with Allergan, with \$193 000 to study nanoparticles used in health, such as the properties of silicone breast implant shells.
- **Associate Professor Scott Read** entered a partnership with Azura Ophthalmics Pty Ltd, with a clinical trial evaluating a dry eye disease treatment. Azura Ophthalmics is a clinical-stage biotechnology company in Israel. The project has clinical sites at QUT, in Sydney and Melbourne.
- **Dr Caroline Grant** secured a Cooperative Research Centre Projects Grant, with \$536 750 to collaborate with Field Orthopaedics to develop a custom shoulder implant.
- The **Johnson & Johnson Innovation Partnering Office @ QUT** celebrated three years of operations in 2019. The JJIPO@QUT is a partnership between Johnson & Johnson Innovation, QUT and the Queensland Government, working with emerging pharmaceutical, medical device and consumer healthcare companies and academic researchers across Queensland. It provides commercialisation training, mentoring and networking support to accelerate translational life science research.
- **Dr Margo Sendall** is working with Brisbane-based Team Transport and Logistics to build a picture of truck driver health, implement change in the industry and increase awareness of importance of healthy behaviours which will lead to better health outcomes.



International collaborations

Pressing global medical issues drive IHBI research, conducted with the best minds from around the world – in industry, academia and healthcare. Research excellence, ongoing collaborative partnerships and funding from international organisations underpin the endeavours and bring promise of better treatments in fields such as age-related disease, fracture healing and cancer.

Image above: Professor Yin Xiao
Image opposite page: Associate Professor Devakar Epari and the biphasic plate.

New materials to overcome age-related disease

Professor Yin Xiao is working with researchers and industry partners in Queensland and Shanghai in China on living tissue replacements to restore function when age-related disease causes damage.

The focus is on restoring function to damaged tissues and organs in the treatment of bone and joint disorders including osteoporosis, osteoarthritis and fractures, and soft tissue trauma including wounds.

Professor Xiao is the Queensland leader and centre director of the Joint Research Centre for the Development of Functional Biomaterials in Advanced Manufacturing of Human Tissues and Organs, established in late 2019 with \$300 000 in support from the State Government.

Establishment of the new joint research centre is largely the result of six years of successful collaboration between QUT—specially through Professor Xiao's Australia-China Centre for Tissue Engineering and Regenerative Medicine—and Shanghai researchers.

They include researchers from East China University of Science and Technology and Shanghai Institute of Ceramics—Chinese Academy of Sciences. Researchers from the University of Queensland are also part of the centre.

Queensland-based and Chinese biotechnology companies are involved in the development and potential commercialisation of the products stemming from the centre's research.

Central to the joint research centre is the ultimate capability of 3D printing in fabrication of human tissue replacements and implants. But new bio-inks that can be manipulated during the process are needed to ensure specific implant properties.

'The ultimate goal is to generate mature biomedical products for bone and cartilage repair, skin regeneration and blood vessel reconstruction to fulfil the huge demand in clinical treatment with advanced biofabrication techniques,' Professor Xiao said.



'Patients will no longer suffer because there are limited suitable donors—or because they are experiencing organ rejection.

'Personalised implants with delicate designs will deliver vastly improved treatment, will reduce the burden on the healthcare system and increase quality of life for patients.'

New materials being developed as part of the centre include bio-ceramic 3D bone grafts, cartilage constructs made using ceramics, polymers and hydrogels, and biomimetic skin and blood vessel grafts.

Professor Xiao said the research will take inspiration from nature in the development of the biomaterials, such as introducing properties that encourage self-healing when implanted in a human body.

Implant design to accelerate recovery of limb use

Associate Professor Devakar Epari is collaborating with engineers from the AO Research Institute (ARI) in Davos, Switzerland to develop an implant that promotes fast, robust healing following a thighbone fracture.

Associate Professor Epari is a co-inventor of the biphasic plate, along with ARI Focus Area Leader Markus Windolf.

The plate enables people to move soon after surgery, preventing joint stiffness, but ensures fracture stabilisation and avoids overloading.

'Our invention addresses the clinical dilemma of plates that are too rigid or too flexible, leading to suboptimal movement of the fractured site,' Associate Professor Epari said.

With support from the AO Development Incubator, the plate is undergoing a clinical proof of concept process ahead of possible certification for introduction in the European market.

Mechanical testing and preclinical experiments were conducted on the plate concept at ARI from 2016 to 2018.

The concept took shape in 2014 and 2015 when Dr Windolf had a research sabbatical at QUT, where he collaborated with Associate Professor Epari on fracture healing research.

The plate standardises a bone-healing environment, increases implant strength for full early weight bearing and prevents implant fatigue failure. It also enables standardised surgical procedures, makes it easier for surgeons to apply, reduces risks and improves patient outcomes.

Associate Professor Epari and Dr Windolf are confident of the plate's success following engagement with—and input from—physicians.

'At the AO Davos Courses 2018, we had feedback from 150 surgeons who were enthusiastic and saw a need.' Associate Professor Epari said.

'In contrast to conventional plates, the biphasic plate—due to its specific design—enables defined motion of the fractured site while avoiding overloading.'

People with fractures of the thighbone just above the knee joint—called distal femur fractures—have the best recovery when they can move soon after treatment, such as walking. Treatment allowing early motion of the knee lessens the risk of stiffness and prevents problems resulting from extended bed rest, such as bed sores and blood clots.

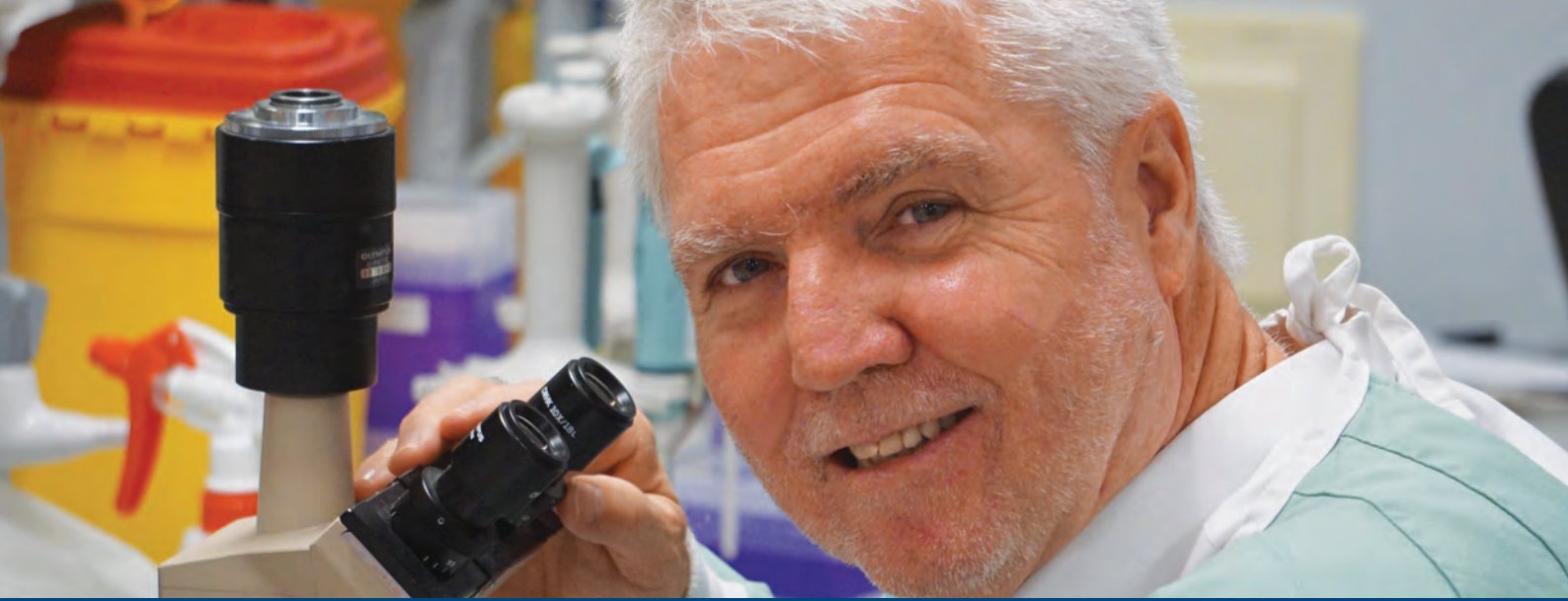
Because traction, casting and bracing do not allow for early knee movement they are used less frequently than surgery.

Surgery may involve fixing a plate at the end of the fracture but does not usually include piecing small fragments of fractured bone together. The fixed plate keeps the shape and length of the bone correct while it heals. Individual fragments will fill in with new bone, called a callus.

'We know that a certain degree of motion is advantageous and promotes the callus formation essential to fracture stabilisation,' Associate Professor Epari said.

OTHER IHBI INITIATIVES

- **Associate Professor Jyotsna Batra** led a bid for a US Department of Defense Idea Development Grant, with \$968 000 to collaborate with clinicians in Canada and researchers from QUT and the University of Queensland. They aim to discover molecules believed to be linked to prostate cancer development.
- **Professor Murray Mitchell** works with partners from Singapore, Italy, the US and the UK and uses \$217 000 in funding from Mead Johnson & Company to investigate nanoparticles in infant formula, maternal milk and cow's milk, and evaluates links to gut health.
- **Associate Professor Paul Leo** is leveraging \$700 000 from the Australian Department of Industry, Innovation and Science to partner with Illumina Inc, a US company manufacturing systems that analyse genetic variation and biological function, and Biocomputing Platforms, a Finnish genomic technology company. The aim is to integrate pharmacogenomics testing into clinical care, developing a test to optimise drug doses and avoid adverse drug reactions using the patient's individual genomic profile.



Investment in the future

Research in areas as diverse as cancer and its treatment, the brain, paediatrics, and child and adolescent mental health is advancing as a result of investment secured in 2019. The support enables genetic analysis, laboratory modelling and clinical collaboration, as well as the establishment of clinical trials—all with the aim of bringing an improved understanding, providing an evidence base and pointing the way to better diagnosis, treatment and quality of life.

Image: Professor Rik Thompson

Professor Rik Thompson is leading a large collaboration using genetic analysis, laboratory modelling, clinical trials and patient samples with the aim of enabling personalised cancer therapy in the clinic.

The collaboration has secured Federal Government support as a Medical Research Future Fund – Rapid Applied Research Translation Initiative, via the Brisbane Diamantina Health Partners, to generate information about prognosis and targeted therapy for personalised cancer management.

Bringing together 13 researcher and clinician groups working with 3D cultures of tumour material from patients, the initiative aims to identify systems in which the cultured cells best mimic the therapy responses in the patient, so that they could be developed as a predictive, personalised test.

The new Centre for Personalised Analysis of Cancers (CPAC), established to facilitate the collaboration, also aims to develop scalable methods suitable for fast-tracking of the information that clinicians need to direct the identified treatment to individual patients.

CPAC research will encompass 13 major tumour types and involve researchers and clinicians from seven institutions and three Brisbane hospitals.

Importantly, CPAC will promote translational research by providing 16 clinical researcher training fellowships.

Personalised medicine holds great promise for improving clinical outcomes for cancer patients, with Professor Thompson pointing to positive clinical outcomes already being observed more generally following treatment with therapies targeting specific mutations across many cancer types.

Immunotherapy, a treatment assisting the body's immune system to fight cancer, is providing such outcomes in about 20 per cent of malignant melanoma patients and in about 40 per cent of non-small cell lung cancer patients who have the appropriate targets.

Professor Thompson said improving the success rates of immunotherapy is likely with better understanding of tumour microenvironments and mechanisms of a cancer's therapeutic resistance.

Developing 3D models of such a tumour microenvironment in a laboratory, using patient samples in the presence of immune cells to closely mimic the actual cancer's behaviour and progression, will enable screening of therapeutics to determine which will be beneficial.

Laboratory models in 3D will also enable researchers in the CPAC to build a picture of the genetic character and diversity of the tumours, known as genetic heterogeneity.

The collaboration stems from existing efforts of several IHBI cancer researchers and will leverage the expertise of IHBI bioengineering experts Distinguished Professor Dietmar W Hutmacher, Dr Laura Bray and Associate Professor Michael Doran to build relevant 3D models.

Professor Thompson said 2D models, that are often used, are inappropriate because they fail to provide important signals from the microenvironment. Therapeutic screening using 3D models is more difficult, time consuming and costly, but it provides more representative information, and is especially important when considering immune infiltration.

He said an important aspect of the CPAC research is to ultimately ensure that the 3D models rapidly provide clinicians with reliable results so patients can be treated without delay.

'Samples will be accessed from patients at time of diagnosis, and during therapy where possible, to examine dynamic changes linked to therapeutic response from patients receiving therapy.'

Where possible, the research will include DNA sequencing, a process of comparing healthy and mutated DNA sequences, that has become indispensable in medical diagnosis.

CPAC will leverage and value-add to the sequencing needs and expertise of the Australian Translational Genomics Centre (ATGC), under the leadership of IHBI's Associate Professor Paul Leo, building on its genomic diagnostic service already offered to more than 2000 Queenslanders. The service represents one of the largest programs of its kind in Australasia. The ATGC's screening identifies cancer-causing genetic mutations, leading to improved treatment outcomes, potentially fewer side-effects and better survival rates for patients.

IHBI Professor Ken O'Byrne and Princess Alexandra Hospital Associate Professor Victoria Atkinson are involved with ongoing immunotherapy clinical trials in solid tumours, providing a clinical parallel for the research.

Working closely with Professor O'Byrne is Professor Derek Richard, undertaking research to identify tumours that are responsive to a novel class of therapeutics. Identifying the specific responsive tumours enables development of predictive biomarkers that serve as companion diagnostics for future clinical evaluation.

IHBI cancer research teams are primarily based at the Translational Research Institute, adjoining the Princess Alexandra Hospital (PAH) and enabling access to facilities in genomics, pathology, screening of drug and shRNA libraries, cell-based cytometry and cell imaging.

Associate Professor Elizabeth Williams leverages the co-location to collaborate with IHBI researcher and PAH urologic oncologist Dr Ian Vela, resulting in the establishment of the Queensland Bladder Cancer Initiative (QBCI). It has brought together researchers, clinicians, other healthcare workers, industry partners, patients, their families and their carers.

The QBCI tackles multiple aspects of translational research and builds resources that will enable improvements in treatment and management of bladder cancer. Driving the research is support through Princess Alexandra Hospital Research Foundation grants from 2018 and 2019. Support will continue through 2020 via donations raised as part of the inaugural PA Giving Day in 2019.

It provides a consumer interface and has already activated three clinical trials.

Professor Thompson said the CPAC was a large collaboration so that it could build a coordinated and cooperative effort to provide an avenue for refining the benefits of cancer genetics, identify the most active targeted therapies for individual patients across a wide range of cancers, provide useful information for clinicians and ultimately improve patient outcomes.

- **Adjunct Associate Professor Kateryna Bazaka** and **Dr Robyn Araujo** were named Australian Research Council (ARC) Future Fellows. Dr Araujo received \$730 000 to analyse interactions that contribute to a living cell's adaptive capabilities. Associate Professor Bazaka received \$907 000 for research into plasma medicine, including its use in improving cancer treatments.
- IHBI researchers were successful in securing ARC Discovery Projects, with **Professor Greig de Zubicaray** leading a bid for \$526 000 to study brain mechanisms used in producing speech. **Professor Zhiyong Li** led a bid for \$420 000 to study arterial plaque growth. **Professor Matthew Simpson** led a bid for \$495 000 to develop 4D models to provide insights in cancer cell biology and responses to various treatments. **Associate Professor Yi-Chin Toh** led a bid for \$390 000 to study the gut microbiome.
- **Dr Leisa-Maree Toms** was the recipient of a National Health and Medical Research Council (NHMRC) Targeted Call for Research into Per- and Poly- Fluoroalkylated Substances (PFAS), with \$415 316 to assess reliability and validity of human biomonitoring of the chemicals, used as fire-fighting foams and aviation hydraulic fluids.
- **Dr Laura Bray** led a successful bid for a Cancer Australia Priority-driven Collaborative Cancer Research Scheme grant, with \$133 000 for developing a bioengineered laboratory model that replicates the cancer microenvironment to advance pre-clinical acute myeloid leukaemia research.
- **Dr Bronwyn Griffin** secured a Queensland Children's Hospital Foundation Mary McConnell Grant, supporting women in paediatric research, with \$50 000.
- **Professor Fiona Coyer** and Dr Michelle Barakat-Johnson from the University of Sydney were successful in the NSW Office for Health and Medical Research's Translational Research Grants Scheme. They secured \$930 095 for the project entitled *A novel implementation of best available evidence into practice for incontinence-associated dermatitis*.
- IHBI researchers are part of a successful Medical Research Future Fund Million Minds project entitled *Translating evidence-based interventions into population-level digital models of care for child and adolescent mental health*. A total of \$4 996 350 has been awarded, with \$474 460 coming to QUT. QUT will also contribute a postgraduate scholarship to the project. IHBI researchers include **Professor David Kavanagh**, **Dr Sanjeewa Kularatna**, **Dr Melanie White** and **Dr Jennifer Connolly**. The project lead is Associate Professor Sonja March from the University of Southern Queensland, with partner organisations in academia, research and healthcare.



Outstanding researcher achievements

Research excellence is at the core of IHBI activities, improving understanding and enabling translation in areas as wide-ranging as lung disease prevention, the impact of vision loss, genetic variation in prostate cancer and effective public warnings for bushfires. Peers, peak bodies and government agencies recognise the excellence through high-profile awards and appointments.

Image: Professor Anne Chang

Highest national recognition for lung disease researcher

Professor Anne Chang is leading a push to prevent lung disease in at-risk children, better understand present treatments and embed research findings into service, practice and policy.

Her significant service to paediatric respiratory medicine was recognised in 2019 with a **Member of Order of Australia (AM)** in the Australia Day Honours. Appointments to the Order of Australia confer the highest recognition for outstanding achievement and service.

Professor Chang leads research involving the first Australian randomised control trial for primary ciliary dyskinesia (PCD) and she is collaborating widely to reduce the burden of bronchiectasis.

Trial to address respiratory infections

Professor Chang is using a Medical Research Future Fund grant to better understand present treatments for people with PCD, who are unable to clear mucus from their lungs and are susceptible to chronic recurrent respiratory infections. About 50 per cent of children and almost all older adults with PCD have bronchiectasis.

The research involves health researchers from five Australian states and territories, health services and Indigenous community leaders. The randomised control trial has the potential to spur other clinical trials and result in the establishment of a trials network.

Professor Chang said the research aims to determine if people with PCD who regularly use one of two common therapeutics have fewer instances of sudden worsening of symptoms, called respiratory exacerbation.

'Acute exacerbations have a major negative health impact on people with underlying lung diseases,' she said. 'They are associated with psychological stress, impaired quality of life, lung function decline and substantial healthcare costs. Management of patients is presently not based on high-level evidence.'

Prevention in at-risk children

In another collaborative project, Professor Chang led a successful National Health and Medical Research Council (NHMRC) Centre for Excellence grant and is working with fellow researchers and clinicians, community advocates, statisticians and IHBI health economist Professor Steven McPhail to prevent bronchiectasis in at-risk children.

A feature of the disease is permanent enlargement of parts of the airways of the lung, causing symptoms such as a chronic cough with mucus production, shortness of breath, coughing up blood, and chest pain.

'Bronchiectasis is recognised to be increasing in prevalence in all settings,' Professor Chang said. 'It is now appreciated that bronchiectasis can be prevented in children at risk of this disease and the on-going progression can be halted if treatment is optimised.'

Collaborative research aims to prevent and reduce the burden, improve lung health, particularly in Indigenous children, and embed research findings in healthcare and policy.

Professor Chang works with collaborators from Griffith University, the universities of Melbourne and Western Australia, Monash, the Menzies School of Health Research, Queensland and Royal Children's hospitals, and IHBI researchers based at the Centre for Children's Health Research.



International awards for leading optometrist

Professor Joanne Wood was recognised with two major international awards in 2019.

Facultat d'Optica-Optometria of Terrassa named Professor Wood the **International Optometrist of the Year** in 2019, becoming the first woman to receive the award. She also received a prestigious international Human Factors and Ergonomics Society award.

For more than 25 years, Professor Wood has collaborated with academics from multiple disciplines to explore the impact of vision loss on aspects of day-to-day living, such as driving, falls among the elderly and paediatric learning.

Research results have been translated into road policies and health practice, while Professor Wood has also advised organisations and professional bodies about road rules and standards for obtaining driving licenses.

International Optometrist of the Year

Professor Wood travelled to Barcelona, Spain in October to receive the award and deliver a presentation in the Romanesque Churches of Sant Pere in Terrassa to first year optometry students at an opening ceremony for the 2019–2020 academic year.

She will deliver a second presentation to the students via video link when they conclude their studies in four years. At that time, two scholarships will be awarded in her name, allowing recipients to attend the British Contact Lens Association conference.

Facultat d'Optica-Optometria of Terrassa presents the award to an optometrist of recognised international prestige who has excelled in academic, research, professional and social impact in recent years.

Human Factors and Ergonomics Society award

The Human Factors and Ergonomics Society presented its 2019 Hal W. Hendrick Distinguished International Colleague Award to Professor Wood.

Presented at the society's international annual meeting in Seattle in the US, the award recognises an overseas citizen who has made outstanding contributions in human factors and ergonomics. The award was bestowed in recognition of her collaborative research with international psychologists with human factors expertise in vision and driving.

Professor Wood and her team are collaborating widely to explore performance issues surrounding vision loss and night time driving, engineering opportunities to improve visibility of street lighting, and opportunities to improve visibility of cyclists and pedestrians at night.

- **Distinguished Professor Judith Clements AC** was recognised as a Queensland Great on Queensland Day for significant contributions to prostate and ovarian cancer research, and developing infrastructure and capability.
- **Associate Professor Jyotsna Batra** and **Adjunct Associate Professor Kateryna Bazaka** received Young Tall Poppy Science Awards, celebrating scientific excellence. Associate Professor Batra was awarded for leading research in genetic variations associated with prostate cancer, while Associate Professor Bazaka was recognised for work on plasma and applications including personalised cancer treatments and biofuel production.
- **Associate Professor Leila Cuttle** was appointed the inaugural chair of the Australian and New Zealand Burn Association Research Subcommittee. The committee develops a more strategic approach for burn research across Australia and New Zealand through collaborative research opportunities, identifying funding and support mechanisms.
- **Dr Petra Lawrence** was appointed an associate editor for the *International Journal of Mental Health Nursing*.
- **Professor Vivienne Tippett** led a team to win an Excellence in Innovation Award at the Cooperative Research Centres Association's annual conference. The team has been working with the Bushfire and Natural Hazards CRC on effective public warnings, such as text message alerts and official warnings on emergency services sites and social media.
- **The Nursing and Midwifery Research Centre Vascular Access Research Team**, including Dr Nicole Gavin and Professor Samantha Keogh, received the Health Services and Implementation Research Award at the 2019 Metro North Hospital and Health Service Research Excellence Awards. The team uses pragmatic research to identify questions arising at the bedside, and meeting needs with technologies and care strategies to reduce complications and costs.



Excellent facilities for translating research

IHBI facilities and researcher placement at strategically important locations combine to enable scientific discovery and progress towards commercialisation and clinical application. State-of-the-art equipment is matched with transdisciplinary teams of researchers, making advances in areas such as cancer, liver disease, infection, Zika virus and neglected lung diseases.

Image: Patient involvement in research at the Centre for Children's Health Research.



Centre for Children's Health Research

Professor Stewart Trost is collaborating with clinical partners at three hospitals and leading research to improve the quality of life of both children fighting brain cancer and those living with bronchiectasis.

Professor Trost mentors an IHBI research team in paediatric exercise, using his expertise in interventions for young patients with chronic health conditions. He is based at the Centre for Children's Health in South Brisbane, established to facilitate collaboration with clinicians at the adjacent Queensland Children's Hospital (QCH).

Support for Professor Trost's research includes a National Health and Medical Research Council Project grant to expand on findings from a pilot project that found children with bronchiectasis had insufficient levels of activity for a health benefit.

He also leads research into the effects of therapeutic exercise in survivors of common brain tumours in children, as part of the Centre for Child and Adolescent Brain Cancer Research (CCABCR).

Bronchiectasis

Bronchiectasis (BE) is one of the most neglected lung diseases, causing symptoms including a chronic cough, mucus production, shortness of breath, coughing up blood and chest pain. People with BE frequently have lung infections that result in hospital admissions. Obesity, depression and anxiety are also reported in significant numbers of adults with BE.

Professor Trost aims to determine if regular exercise will improve aerobic fitness and health-related quality of life in children, reduce the frequency of BE exacerbation and ultimately prevent a decline in lung function and disease in later life.

He led the world's first study of physical activity and sedentary behaviour in children with BE, finding few of them achieved the recommended 60 minutes of daily moderate to vigorous physical activity.

Poor health trajectories for people with BE start early in life, with a lack of fundamental movement skills (FMS), critical to establishing complex movement patterns needed in play, games, physical activities and sports.

'We have found that children with BE exhibit significant delays in their FMS development, thus compromising their ability, confidence and motivation to participate in physical activity,' Professor Trost said.

He is addressing the issues with a tailored eight-week program that promotes exercise, overcomes barriers and increases physical capacity, recruiting children aged 6–12 years from the QCH, Gold Coast University Hospital (GCUH) and Royal Darwin Hospital.

The research aims to prevent the children experiencing BE exacerbation, which is the only known risk factor for compromised lung function and increased morbidity later in life.

Professor Trost will collaborate with IHBI Professor Anne Chang, a paediatric respiratory physician and researcher in cough, bronchiectasis and evidence-based medicine related to children, and QUT Science and Engineering Faculty Associate Professor Chris Drovandi, contributing skills in applying computational statistics.

Contributing expertise in clinical service delivery and costings are fellow paediatric respiratory physicians Associate Professor Brent Masters, from the QCH, and Dr Vikas Goyal from the GCUH, and Griffith University physiotherapist Taryn Jones.

Brain cancer

Therapeutic exercise is also playing a major role in the research Professor Trost is conducting in collaboration with QCH paediatric oncologist Dr Tim Hassall and physiotherapist and IHBI PhD candidate Brooke Kohler.

A 12-week program will involve survivors of childhood posterior fossa brain tumours (PFBT) taking part in exercises while their cardiorespiratory fitness, muscular strength, mobility, physical activity habits and quality of life is monitored.

The program aims to improve their fatigue, mobility, cognitive function and goal attainment as they recover from the most common brain tumours in children.

'Relative to their healthy peers, paediatric survivors of a PFBT have reduced cardiorespiratory fitness,

physical and neurocognitive function,' Professor Trost said. 'The deficits persist into adulthood, leading to activity limitations and an increased risk for disabling secondary conditions such as obesity, cardio-metabolic disorders and poor psychosocial functioning.'

The research aligns with one of the CCABCR's three streams, mirroring patient experience in survivorship.

The CCABCR is Australia's first research centre solely focused on paediatric brain cancer, treatment, and survivorship, bringing together researchers, doctors and facilities to improve survival rates and the quality of life of people with brain cancer.

Centre collaborators include researchers from QUT, QIMR Berghofer Medical Research Institute (QIMR-B) and the University of Queensland as well as clinical infrastructure and specialists from Children's Health Queensland Hospital and Health Service.

IHBI Professor Greig de Zubicaray conducts research as part of CCABCR, with a focus on risk factors for speech and language impairment and long-term outcomes in survivors of childhood PFBT.

Dr Natalie Bradford is addressing survivorship and palliative care needs in children and adolescents with brain cancer.



IHBI building at Kelvin Grove

Professor Nathan Subramaniam secured funding for new equipment

in 2019, enabling investigation of different tissue regions and advancing IHBI work in cancer, liver disease, chronic disease and ageing, bone and tissue engineering, and regenerative medicine. The equipment will also pave the way for collaborations between Queensland researchers, clinicians and institutions.

Professor Subramaniam led a successful bid for Ian Potter Foundation support for a Nanostring GeoMx Digital Spatial Profiler, to be based at IHBI's Kelvin Grove building. It enables better understanding of molecules in a tissue section.

For the first time Australian researchers in liver disease, head and neck cancer, breast, prostate, lung and brain cancer can study tissue regions and predict the response path of highly targetable clinical therapies.



Images: Translational Research Institute (TRI) left and Medical Engineering Research Facility (MERF) right.

Australian researchers will be able to investigate different tissue regions, such as tumour cells and immune cell interactions which directly influence how tumours respond to immunotherapeutic medicines.

The equipment will also enable collaboration with colleagues and clinicians at the Metro North and Metro South hospital and health services, the Mater, the University of Queensland, Queensland Pathology and peers at QIMR-B.

Professor Subramaniam and Dr Gautam Rishi will use the equipment to further their research in liver disease and iron disorders, while Dr Arutha Kulasinghe will advance his work in head and neck cancers.

Saliva and liquid biopsy researcher Associate Professor Chamindie Punyadeera will benefit from its use, bringing non-invasive cancer diagnosis a step closer. Professor Ken O’Byrne will be able to advance his translational work in lung cancer.

Additional IHBI research to benefit covers areas as diverse as prostate cancer and metastasis, tissue engineering and regenerative medicine, as well as biofabrication and tissue morphology.

Professor Subramaniam said the equipment has the potential to significantly advance translation of research and bring immunotherapies into clinical use for treating people with chronic disease around the world.

‘There is a lack of understanding of the underlying biological interactions between treatments and disease,’ he said. ‘This novel technology gives researchers the capability to examine intercellular interactions and biology with spatial information—and would provide a significant leap in their understanding of the physiology in tissues such as the liver, bone and brain.’

Professor Subramaniam and Dr Kulasinghe will promote the equipment’s benefits through their collaborators and networks and plan to share their knowledge through regular training opportunities, open access publications and presentations at Queensland, national and international conferences.



Medical Engineering Research Facility

Associate Professor Tim Dargaville is working at IHBI’s

Medical Engineering Research Facility (MERF) and collaborating with clinicians at the co-located Prince Charles Hospital (TPCH) to overcome infection linked ventricular assist devices (VADs).

VADs are surgically implanted in people with end-stage cardiac failure who are waiting for a transplant, with an external pump and battery connected to the heart using a lead that breaches the skin’s natural barrier. Called a driveline, the lead creates an entry point for bacteria, resulting in infection.

Associate Professor Dargaville said his research aims to improve integration where the skin is breached, involving the development of a driveline coating and the conducting of tests with a skin model grown in MERF’s laboratories.

Using a method called melt-electrowriting that Associate Professor Dargaville helped to pioneer at IHBI, the coating can be developed to create favourable conditions for fibroblasts, cells with a critical role in wound healing, and keratinocytes, the predominant cells of the outer layer of the skin. The conditions enable a seal to be created against infection.

The research involves Associate Professor Dargaville and Dr Eleonore Bolle collaborating with TPC's Critical Care Research Group, under the leadership of Professor John Fraser, as well as surgeons, microbiologists and engineers from Monash University, the Alfred Hospital and the CSIRO.

'We have a multidisciplinary team of cardiac surgeons, engineers, chemists and biologists and access to the largest cardiothoracic surgery unit in Queensland,' Associate Professor Dargaville said.

'We have the opportunity to dramatically improve the quality of life of people with VADs, with fewer dressing changes, less wound management and fewer return visits to hospital.'



QIMR Berghofer Medical Research Institute

Dr Francesca Frentiu is collaborating with

researchers from the QIMR Berghofer (QIMR-B), using a biosecurity insectary to understand the ability of two mosquito species to transmit Zika virus.

Dr Frentiu is part of an infection and immunity research cohort based in IHBI laboratories at QIMR-B, using the co-location to conduct studies involving the dengue mosquito found in north Queensland and the Asian Tiger mosquito from the Torres Strait.

She has used the biosecurity insectary to replicate the environment where the two species could thrive, similar to what is experienced around Cairns.

A strain of Zika was tested from the Asian lineage that caused microcephaly during an epidemic in Brazil in 2016. Microcephaly is a medical condition in which the brain does not develop properly, resulting in a smaller than normal head.

Results show that the dengue mosquito poses the greatest danger of spreading Zika in Australia.

'We found 50 to 60 per cent of the dengue mosquitoes could effectively transmit the virus 14 days after becoming infected, compared to 10 per cent of the Asian Tiger mosquitoes,' Dr Frentiu said.

'Discovery of Zika in the ovaries of the dengue mosquitoes showed another potential route of infection transmission through mosquito

populations. It is possible that if infected larvae were able to reach maturity still infected with Zika, they could then pass the virus to humans. This is an area where further research is needed.'



Translational Research Institute

Prostate cancer researcher Dr Nathalie Bock has taken a step towards understanding

the role of various cells in the bone of patients with therapeutic resistance and metastasis.

Her research involves collaboration with IHBI experts at the Australian Prostate Cancer Research Centre – Queensland, based at the Translational Research Institute, and 3D model production at the IHBI-based Australian Research Council (ARC) Industrial Transformation Training Centre in Additive Biomanufacturing. IHBI facilities supporting the research include the Advanced Microscopy and Cytometry Facility and the Histology laboratory.

Dr Bock uses 3D laboratory models that more closely replicate the human bone microenvironment than traditional 2D research models.

'Using the 3D models, we have been able to see cancer cells partly displaying functional and molecular features that have been observed in real bone tumours,' she said.

'There are potentially more gaps we will be able to bridge if we separate the bone formation process from the bone resorption process in our 3D models.'

The formation process involves osteoblasts, cells originating in a person's bone marrow and working in teams on bone building process. They work in tandem with osteoclasts, cells that break down bone tissue as part of critical processes to maintain, repair and remodel bones.

Dr Bock said some cancers, such as breast cancer, produce over-activity of osteoclasts, while prostate cancer progression in bone is characterised by a dominant role of osteoblasts.

Ultimately, the research aims to understand the roles of the various bone cell types in metastatic castrate-resistant prostate cancer in the bone microenvironment. A predictive platform can then be built, featuring patient-specific cells for testing therapeutics as part of a personalised medicine approach to treatment.

FACILITIES AND LOCATIONS

Our state-of-the-art **IHBI Building** at Kelvin Grove in Brisbane has laboratories and work areas designed to encourage collaboration and innovation. Facilities include:

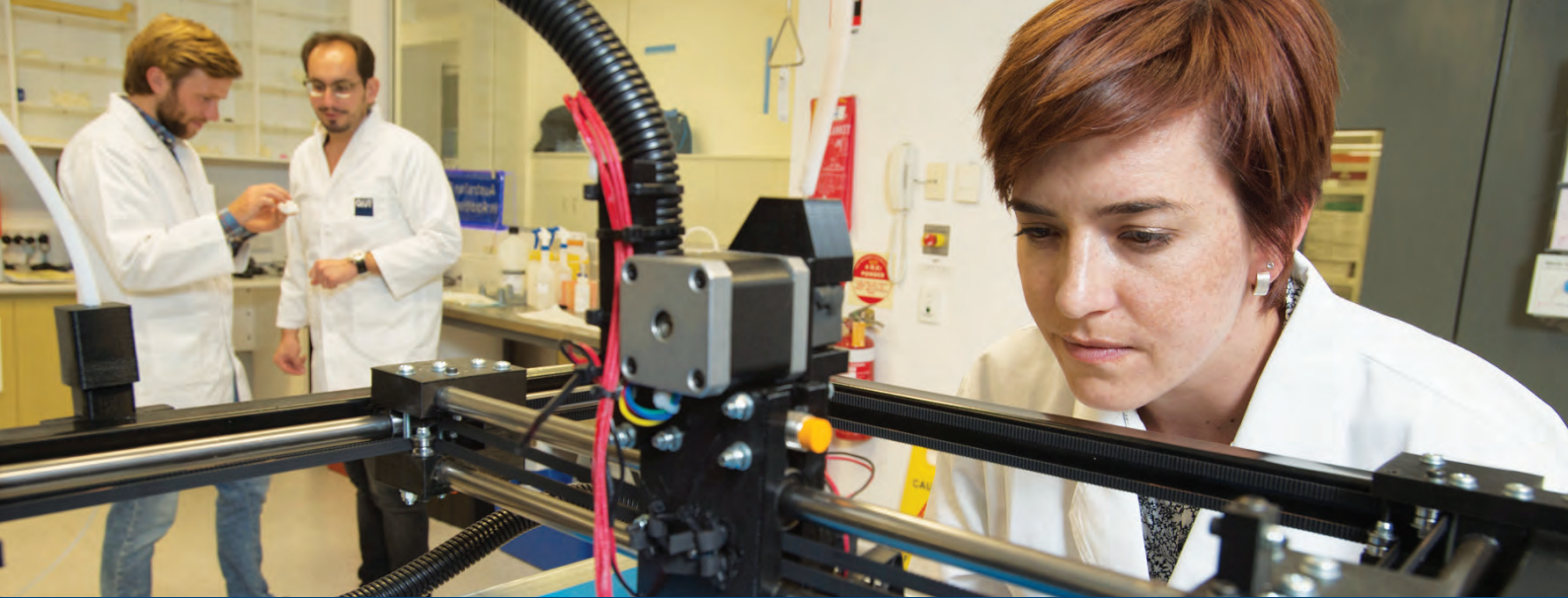
- genomics laboratories to understand disease susceptibility
- primary cell culture laboratories for researching skin and bone properties
- a gait laboratory to assess a person's movements
- vision laboratories with specialist optometry equipment for eye health and vision insights
- co-location with the QUT Health Clinics, enabling research to progress from laboratories to people.

The **Translational Research Institute** has more than 140 IHBI members focusing on translating research outcomes to clinical trials and practice. Biopharmaceuticals and treatments can be discovered, developed, clinically tested and manufactured in one location. IHBI research areas include cancers of the prostate, bladder, breast, endometrium, brain, head and neck and lung, and melanoma, and areas of DNA damage repair, neuroscience of addiction and fear, and trauma. IHBI @ TRI houses the Australian Prostate Cancer Research Centre – Queensland, the Cancer and Ageing Research Program, and the Centre for Personalised Analysis of Cancers. The research aims to improve clinical management through development of new diagnostic biomarkers, therapeutics and treatments.

The **Medical Engineering Research Facility** is working to bring medicine back together with physics, engineering and the humanities to create a future for healthcare that is not only better, but fairer. It supports research and development, validation, translation and training for surgeons, allied health professionals, researchers and industry in medical devices and surgical techniques.

The **Centre for Children's Health Research**, adjacent to the Queensland Children's Hospital, brings together child and adolescent health researchers to create a critical mass of expertise in childhood cancer, Indigenous health, infectious diseases, physical activity, obesity, burns and wound repair.

A partnership between IHBI and **QIMR Berghofer** involves up to 60 IHBI researchers being housed in the QIMR-B complex, enabling access to specialist health and medical research laboratories. QUT research strengths in health sciences, automation, big data, mathematics and technology complement QIMR-B biomedical science expertise. Collaboration enables translational research with a focus on infectious diseases, neuroscience and neuroimaging.



Capability building

IHBI provides significant support to enable our best minds to develop in their research, including skills training, mentoring and the formation of collaborative teams with a focus on commercial relevance and industrial transformation. A major step was taken in 2019, with the establishment of the Centre for Biomedical Technologies and the appointment of its Director, Associate Professor Travis Klein.

Image: Dr Marie-Luise Wille

Centre for Biomedical Technologies

The centre aims to improve treatment of complex medical cases stemming from injuries, infection and age-related issues. Regenerative approaches, robotics and artificial intelligence, and advanced manufacturing are used to expand surgical possibilities and reduce complications. Ultimately, the research is conducted to provide better patient treatments and quality of life into the future.

It is part of a recent move to establish QUT research centres representing high-quality and focused research activity aligning to the university's key research strengths. The purpose of the centres is to develop critical mass in research capabilities that are nationally and internationally leading.

The centre's activities will also improve training to enable better career opportunities for PhD candidates and early-career researchers.

The centre has researchers with leadership and significant input in four Australian Research Council (ARC) training centres, producing industry-ready graduates and early-career researchers with innovative, translational and entrepreneurial mindsets.

Improving understanding of joint biomechanics

Professors YuanTong Gu, Peter Pivonka and Graham Kerr are IHBI's lead investigators for the Australian Research Council (ARC) Industrial Transformation Training Centre for Joint Biomechanics, announced in October.

The new training centre aims to improve understanding of joint biomechanics and treatment of osteoarthritis and other joint-related orthopaedic disorders, bringing personalised surgical treatments a step closer.

At the core of the centre's research is computer modelling and simulation, enabling the design and evaluation of patient-specific implants, as well as tools for pre-surgical planning and decision making, surgical training and post-surgical assessment.

Expert shoulder surgeons Dr Ashish Gupta and Dr Kenneth Cutbush are part of the collaboration, ensuring clinicians have the information needed about a patient's joint biomechanics, how surgery may affect functional outcomes, and the impact on post-operative recovery.

Also involved are QUT professors You-Gan Wang, Cameron Brown and Yin Xiao, associate professors Travis Klein, Devakar Epari and Emilie Sauret, and Dr Neha S Gandhi.

Partners include the University of Queensland, the University of New South Wales and industry partners Wright Medical, Zimmer Biomet, Surgical Specialities and Logemas. Collaboration extends overseas to the University of Stuttgart in Germany and the University of Western Ontario in Canada.

Professor Pivonka said the centre will establish QUT and Queensland as a biomechanics hub in Australia and will train high-quality young scientists and engineers to develop the next generation biomedical engineering workforce.

3D imaging, modelling and manufacturing

IHBI's Dr Marie-Luise Wille is the Deputy Director of the ARC Training Centre for Multiscale 3D Imaging, Modelling and Manufacturing, working with researchers from around QUT and the Australian National University.

The centre has been established with \$3.98 million in Federal Government funding, with research and industry collaborators in Canada, Germany, Norway and the US.

Among the IHBI researchers are Distinguished Professor Dietmar W Hutmacher, with expertise in biomaterials, biomechanics, medical devices and tissue engineering, and Professor Prasad Yarlagadda, with expertise in artificial intelligence in manufacturing, prototype manufacturing, tool design and non-traditional manufacturing.

Dr Wille said the centre's research has application in industries as diverse as oil, gas and energy, medical technologies, and advanced manufacturing.

The centre's aim of producing industry-ready graduates will contribute significantly to underpinning growth in the industry sectors.

PhD candidates and post-doctoral researchers will be given an opportunity to participate in professional development programs such as BridgeTech, training researchers and entrepreneurs to effectively navigate the medical technology commercialisation pathway.

Cell and tissue engineering technologies

IHBI's Dr Laura Bray is part of an initiative developing world-class training programs and enhancing industry partnerships to overcome barriers in manufacturing processes and encourage investment in cell-based and tissue engineering therapies.

She is Deputy Director of the ARC Training Centre for Cell and Tissue Engineering Technologies, established with close to \$5 million in funding as a collaboration between Monash University and QUT to produce industry-ready graduates and early-career researchers.

Dr Bray said regenerative medicine, tissue engineering and cell therapies are promising new technologies to overcome the health burden associated with ageing populations and increasing chronic disease incidences.

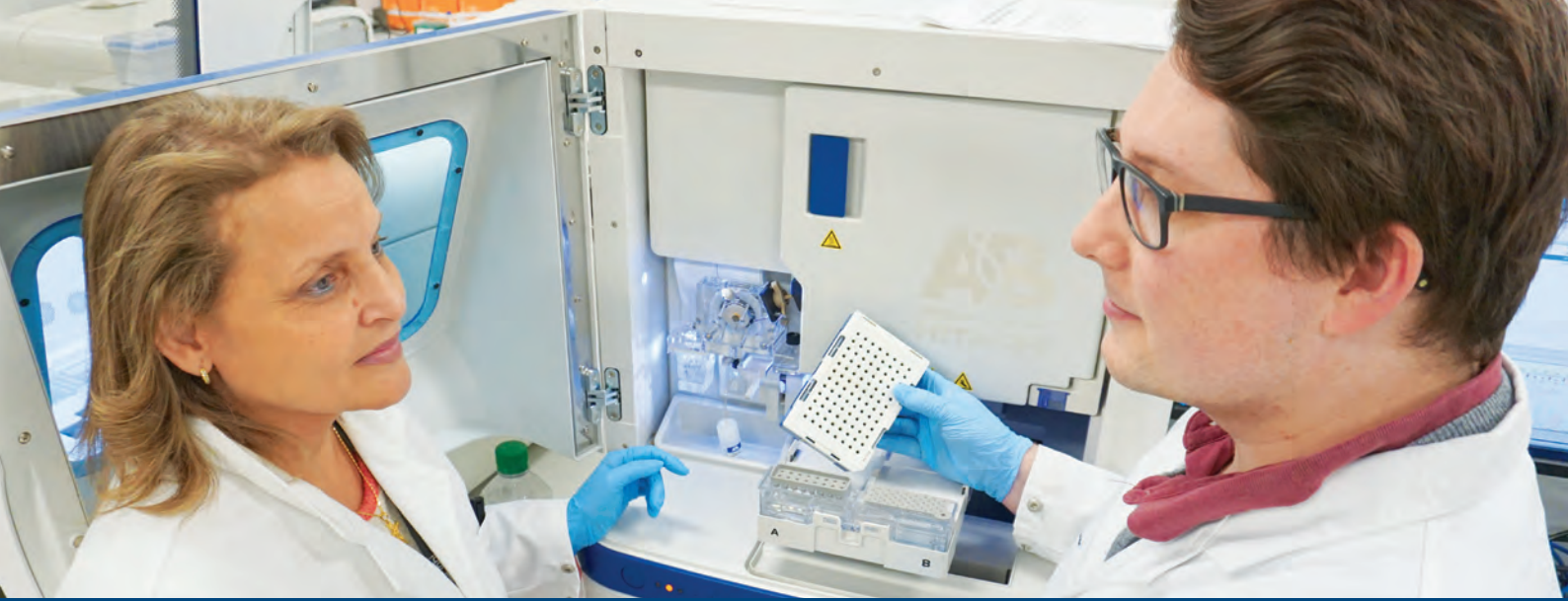
IHBI researchers collaborating as part of the ARC centre include Distinguished Professor Hutmacher, molecular cancer geneticist Associate Professor Jyotsna Batra and polymer chemist Associate Professor Tim Dargaville.

Nine other IHBI researchers add critical mass to the centre, as well as QUT colleague Professor Uwe Dulleck—a leading behavioural economist from QUT's Centre for Behavioural Economics, Society and Technology—who will contribute expertise to ensure optimal consumer uptake of the technologies developed within the centre.

PhD candidates and researchers will be provided opportunities to participate in professional development programs, building skills and demonstrating effective navigation in medical technology development and commercialisation.

- QUT received enrolments into its second cohort of the **Masters of Diagnostic Genomics** program and its nested degrees, the Graduate Certificate and the Graduate Diploma. The degrees had 75 students in 2019, with four becoming inaugural graduates. Coursework is online, allowing students to study while working. Laboratory placements were a success, enabled through partnerships with private industry and QUT's genomics laboratories.

- IHBI's Medical Engineering Research Facility (MERF) offered a comprehensive, Royal Australasian College of Surgeons-accredited, **General Surgical Anatomy Course** to enhance the participants' knowledge of anatomy in relation to general surgical procedures. The course attracted 38 participants and covered approaches to common injuries and disease causes.
- IHBI hosts and delivers the **Bridge and BridgeTech** programs, successful in attracting \$1.4million in funding for a further three years from the Federal Government through MTPConnect. The funding is matched by industry partners from the pharmaceutical and medical technology sectors, involved in developing and delivering the program to address the gap between academia and industry. It has provided training for more than 300 in the pharma sector and 140 from medtech.
- A fourth cohort entered their final year of QUT's **International Masters in Biofabrication** in 2019. Students began overseas studies at the University of Wurzburg and the University Medical Center Utrecht, and will submit their theses in 2020. The masters is a joint degree between QUT and partner universities in Germany and the Netherlands, training the next generation of experts.
- The Centre for Accident Research and Road Safety – Queensland's **postgraduate education program** received the Prince Michael International Road Safety Award for leadership in educating future road safety professionals.
- Four researchers commenced as IHBI's Strategic Research Fellows, building capacity in targeted areas. **Dr Oscar Oviedo Trespalacios** will lead a project in reducing distracted driving and **Dr Susanna Cramb** will focus on cancer and diabetes development, management and inequity. **Dr Divya Mehta** will study gene interaction with environmental factors such as stress in psychiatric disorders and **Dr Mark Adams** will investigate non-small cell lung cancer, using \$193 596 from Cancer Australia.



Support for Higher Degree Research students

Conducting research as part of transdisciplinary teams enables IHBI Higher Degree Research students to build skills and establish successful careers. Support includes opportunities to travel to present their research, build networks and advance knowledge in fields such as genetics, biodegradable prosthetics and microscopy.

Image: PhD candidate Paul Dunn with Genomics Research Centre research fellow Dr Neven Maksemous.

Genetic causes of poorly understood brain disease

PhD candidate Paul Dunn is building skills beyond the research laboratory, with IHBI support to present at conferences, build collaborations and engage in community outreach activities.

Mr Dunn has secured a National Health and Medical Research Council (NHMRC) Dora Lush Biomedical Postgraduate Scholarship as he studies the genetic causes of cerebral autosomal dominant arteriopathy with subcortical infarcts and leucoencephalopathy (CADASIL).

CADASIL is a progressive neurodegenerative disease that can cause strokes, vascular dementia, cognitive decline, migraine, severe depression and even epilepsy.

'It is progressive and has severe symptoms that can often have a devastating impact on quality of life,' Mr Dunn said.

Mr Dunn is part of the Genomics Research Centre's diagnostics team, providing him access to a National Association of Testing Authorities, Australia accredited facility and collaboration with physicians and researchers from around QUT, in Newcastle, the US, UK and in Vietnam.

The team has used next generation sequencing to conduct diagnostic testing for mutations in the NOTCH3 gene, traditionally believed to cause CADASIL. The testing was unable to detect potential disease-causing mutations in 78 per cent of patients with CADASIL symptoms.

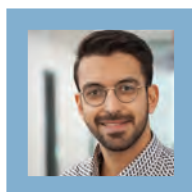
'That suggests there are additional genes and mutations responsible for CADASIL that are yet to be discovered,' Mr Dunn said.

Using the NHMRC scholarship, Mr Dunn aims to identify mutations and genetic risk factors that cause CADASIL in patients who do not have NOTCH3 gene mutations.

Blood from patients with CADASIL symptoms has been sent to the GRC clinic for diagnostic testing from neurologists in Australia and New Zealand.

Mr Dunn's research is being conducted under the supervision of IHBI Executive Director and molecular geneticist Professor Lyn Griffiths, resulting in five peer-reviewed publications. He has presented at numerous conferences and societal meetings, including the Human Genetics Society of Australasia's annual scientific meetings in Brisbane, Sydney and Wellington in New Zealand.

Engagement in community outreach activities, helping hone important communication skills, included Lunch with a Scientist at the Queensland Academy for Science, Mathematics and Technology—a high school in Brisbane.



Technology mimicking human heart tissue

Dr Navid Toosi Saily received a significant boost in the final year of his PhD studies in 2019, becoming the recipient of the Australian Society for Medical Research (ASMR) Postgraduate Student Researcher Award.

The award recognised his outstanding effort in research, as part of an IHBI team developing a 3D-printed prototype of a tissue engineered heart valve potentially capable of growing and remodelling in a patient.

The prototype is developed through the convergence of a biominetic design approach and a novel fabrication technique called melt electrowriting (MEW), closely replicating the architecture and mechanical properties of a person's native heart valve tissue.

Tri-leaflet valves developed using MEW are showing excellent functionality, pointing to their potential for long-term use.

Dr Toosi Saily said the results demonstrate the prototype has the potential to one day replace synthetic prosthetics, encouraging the body to regenerate the damaged heart tissue as the 3D-printed implant slowly and safely degrades.

He said present synthetic and non-biodegradable prosthetics can enhance quality of life and survival for geriatric patients. However, they have a limited lifespan and do not support tissue remodelling and regeneration. Multiple surgeries are often required, especially for paediatric patients.

'It is progressive and has severe symptoms that can often have a devastating impact on quality of life.'

Dr Toosi Saily has shared his findings internationally, securing a student bursary from the World Biomechanics Congress to present the research in Ireland. He also presented at the International Conference of Heart Valve Tissue Engineering in the Netherlands and International Society for Applied Cardiovascular Biology in France.

- **Madge Martin** received the Young Talents France 2019 prize from the L'Oréal-UNESCO For Women in Science program for the study of adolescent idiopathic scoliosis using approaches combining clinical experience and biomechanical modelling. Ms Martin is a PhD candidate at Université Paris-Est Créteil and IHBI's Biomechanics and Spine Research Group based at the Centre for Children's Health Research.
- **Naomi Paxton** received the inaugural Ezio Rizzardo Polymer Scholarship from the Australian Academy of Technology and Engineering, recognising potential impact in polymer science.
- The Australasian Rehabilitation Organisation awarded **Adriana Hada** the Publication of the Year for *Nursing bedside clinical handover*, a pilot study testing an intervention to improve patient outcomes.
- **Vida Alizad, Nadeesha Haputhanthirige** and **Jing Qi** received HDR student travel awards from Parkinson's Queensland as part of World Parkinson's Day. The awards enabled attendance at the World Parkinson's Congress in Kyoto, Japan, where each presented aspects of their PhD research.
- **Anthony Verderosa** won the Australian Society of Microbiology's Nancy Mills Queensland award, supporting his travel and attendance at the society's annual meeting in Adelaide. The Nancy Mills mentoring program is part of the meeting, providing informal networking and career development events for students.
- **Verity Turlove** led a survey of more than 500 Queensland drivers aged 17–25 that found 16 per cent used Snapchat behind the wheel, despite warning notices from the app.
- **Julianne McGuire** was awarded the Jean Ferguson Memorial Award for Early Childhood Education, enabling attendance at a two-day national forum due to be hosted at QUT.

- **Zoe West** was awarded a Light Microscopy Student Bursary Award to attend the Light Microscopy Australia Conference in Brisbane, where she presented her research on macrophages, white blood cells of the immune system that engulf foreign substances, microbes and cancer cells. She was named runner-up for best poster at the conference.
- Ms West was also awarded first place for her poster at the 2019 Australian Wound and Tissue Repair Society's symposium in Melbourne.
- **Tejasri Yarlagadda** presented her honours project at the International Congress for Mucosal Immunology in Brisbane.



Support for early- and mid-career researchers

Outstanding early-career researchers provide significant input in IHBI research and innovations, with support from mentors, opportunities to travel and use of cutting-edge facilities. The researchers build skills and capabilities as future leaders while contributing to advances in immunology, wound care, road safety and cancer research.

Image: Dr Oscar Oviedo-Trespalacios

A real-world need to reduce driver distraction and lower road fatality rates underpins the research of Dr Oscar Oviedo-Trespalacios.

Support from mentors, use of state-of-the-art facilities and an IHBI Strategic Research Fellowship offered in 2018 enable Dr Oviedo-Trespalacios to develop new technologies and ensure safe engagement with mobile phones while driving.

Leveraging the support, he secured an Australian Research Council (ARC) Discovery Early Career Researcher Award in 2019 and won the inaugural Australian College of Road Safety Young Leaders Oration Award for inspiring work and potential for future leadership.

The award ceremony took place in front of 500 of Australasia's foremost road safety professionals and advocates and recognises Dr Oviedo-Trespalacios's growing national and international reputation in distracted driver research.

The research is conducted at IHBI's Centre for Accident Research and Road Safety – Queensland (CARRS-Q), with access to an advanced driving simulator that incorporates a full-sized car mounted on a motion platform.

Dr Oviedo-Trespalacios's mentors at CARRS-Q include Professor Narelle Haworth, the recipient of an Australasian College of Road Safety Fellowship for her outstanding contribution as an internationally recognised researcher in road safety and as a policy advisor at the national and international level.

His research aims to provide innovation and new knowledge in distraction management to help communication technology and vehicle equipment manufacturers develop new products.

It will identify more effective distraction policies and approaches for government road safety and enforcement agencies, in line with CARRS-Q's mission to make international impact on transport, occupational and community safety through research, education and advocacy.

Importantly, it will improve safety for drivers and other road users, contributing to a reduction in the estimated 16 per cent of fatal crashes resulting from distracted driving and significantly reducing the cost of crashes in Australia – estimated at \$27 billion per year.

Dr Oviedo-Trespalacios conducted research in 2017 that found at least half the drivers in Australia use mobile phones daily while driving, doubling their crash risk.

‘Current approaches to prevent distracted driving, such as education campaigns, smartphone apps that block distractions, legislation and police enforcement, have shown limited success,’ he said. ‘We need a paradigm shift towards developing technologies that reduce driver workload associated with distractions to increase safety. Such technologies would aim to guide drivers to self-regulate more effectively in decisions such as when and where to use the phone, for what types of tasks, for how long, and under what traffic conditions.’

The new ARC project will build on research from CARRS-Q mentors including Professor Haworth and collaborator Dr Kristie Young from Monash University.

A previous study found Australian drivers use self-regulatory strategies, but Dr Oviedo-Trespalacios will use the ARC funding to identify successful strategies and factors for optimal driving performance.

At least 80 research participants will be recruited and the driving simulator used to study their driving performance, eye and head movements, and even facial expressions while texting or browsing.

The research will also analyse present sources of distraction such as in-vehicle information systems as well as smartphone devices, consider the flow of information between the distracting task and the driver, and develop a novel algorithm.

The algorithm will estimate the minimum level of attention that a driver requires, with workload considerations that will impact on the task, such as traffic, the environment, driving behaviour and eye movements.

Dr Oviedo-Trespalacios said his research will involve close collaboration with industry, government and academic research partners

‘We need a paradigm shift towards developing technologies that reduce driver workload associated with distractions to increase safety.’

including Monash University’s Accident Research Centre where Dr Young is based, Transport for NSW, VIC Roads, the Transport Accident Commission and Hyundai.

‘It will enhance my network of collaborators from more than 35 countries and around Australia, as well as CARRS-Q stakeholders such as the Queensland Government, Australasian College of Road Safety and national and international road safety advocacy groups.’

Support from IHBI enabled Dr Oviedo-Trespalacios to travel to present his research at conferences during in PhD studies, attend training and development workshops and receive guidance from QUT’s media team to hone his communication skills.

Following completion of his PhD studies, Dr Oviedo-Trespalacios was offered an IHBI Strategic Research Fellowship as part of an investment strategy for achieving research excellence and retaining motivated postdoctoral researchers with interests strongly aligned to areas of institute strength.

- Advance Queensland Industry Research Fellowships of \$300 000 were awarded to **Dr Nathalie Bock** to develop bioengineered models to guide individualised therapy in breast cancer, **Associate Professor Jyotsna Batra** to develop a personalised blood test for better prostate cancer patient outcomes, and **Dr Alexander Martyn** to develop a new compound to treat Alzheimer’s disease.
- Cancer Australia and Cure Cancer’s Priority-driven Collaborative Cancer Research Scheme provided \$199 472 to **Dr Bock** to use bioengineered models for bone metastatic cancer research, and \$100 000 to **Dr Arutha Kulasinghe** to investigate the tumour microenvironment to determine predictive biomarkers of response to immunotherapy. Cancer Australia and My Room co-funded **Dr Jacqui McGovern**, with \$197 556 for her pre-clinical osteosarcoma research.

- **Dr Nataly Stylianou** was awarded a US Department of Defense Prostate Cancer Research Program Early Investigator Research Award, with \$370 404 to improve therapeutic strategies for advanced prostate cancer metastasis.
- A Lung Foundation Australia Early Career Nursing/Allied Health Fellowship was secured, with \$100 000 for **Dr Vanessa Brunelli** to study a supportive care intervention for lung cancer patients.
- **Dr Emily Bryan** won the new investigator award at the International Society for Immunology of Reproduction in Japan.
- **Dr Christina Parker** presented her wound care research at the CRC Association Collaborate Innovate 2019 Conference in Adelaide. She won the 2019 CRC Association’s Collaborate Innovate ECR Showcase, recognising excellence in communicating research.
- **Dr Arutha Kulasinghe** and **Associate Professor Brett Hughes** secured a Garnett Passe and Rodney Williams Memorial Foundation award, provided to support early- and mid-career researchers to establish Australia and New Zealand at the forefront of international practice in otolaryngology, head and neck surgery. The award supports their research in identifying predictive biomarkers for immune system blockages in head and neck cancer.
- **Dr Kulasinghe** was the only Australian recipient of a Scholar-in-Training Award to attend the joint meeting of the American Association for Cancer Research and the American Head and Neck Society in Austin, Texas.
- **Dr Kulasinghe, Dr Shiv Nagaraj** and **Mathilde Dessel** received Brisbane Lord Mayor’s Trailblazer Grants, funding researchers to attend an international conference in their field. In return, they work with the economic development board, Brisbane Marketing, and partners to attract the conference to Brisbane.



Sharing our knowledge

IHBI researchers pursue avenues to share their knowledge, broaden their networks and establish new collaborations, through involvement in major conferences and presentations to global audiences. Their involvement provides opportunities to share data, showcase IHBI research excellence, advocate, shape research agendas and contribute to the public discourse.

Image: Associate Professor Larisa Haupt

Associate Professor Larisa Haupt had a successful 2019, sharing her knowledge of neurogenesis and stem cell research with global audiences and contributing as a member of the organising committee of a major international congress.

TERMIS-AP + ABMC7

Associate Professor Haupt was a member of the organising committee of the Tissue Engineering and Regenerative Medicine International Society's Asian Biomaterials Congress (TERMIS-AP + ABMC7) for 2019.

The committee delivered a combined congress at the Brisbane Convention and Exhibition Centre in October for an estimated 840 registrants, including researchers, clinicians and industry members.

She worked with IHBI researcher and congress co-chair Professor Yin Xiao on a congress program that covered research and networking for those with an interest in developing and using biomaterials and tissue engineering approaches. The ultimate aim is to translate the research to benefit our ageing society.

Associate Professor Haupt said being a member of the organising committee for TERMIS-AP + ABMC7, and preparing for other research forums, involved significant commitment but provided considerable benefit.

'International conferences are vital for ensuring the timely sharing of knowledge that accumulates in laboratories and research groups around the world,' she said. 'That knowledge is transferred to other researchers in allied fields and enables them to build and develop their work in ways that would otherwise not be possible.'

'In particular, conferences are also important for building networks, opening our eyes to collaborative opportunities and gaining insights in what industry and clinical partners need from our research.'

IUMRS

The Australian Materials Research Society invited Associate Professor Haupt to chair a session at the International Union of Materials Research Societies (IUMRS) International Conference in Asia. It covered biomaterials, with focus areas including biomimetic materials and biocompatible materials for regenerative medicine and tissue engineering.

The conference provided the rare opportunity for diverse fields to present and see work in an interesting and cross-disciplinary format.

Biomaterials for device applications were explored, as well as functional nanomaterials for therapeutic delivery, diagnosis and detection, biomedical sensing materials, electrodes and devices, and materials with complex and functional biological structures.

The session featured keynote speakers from Peking University and Northwestern Polytechnical University in China and the CSIRO, the University of Melbourne, Swinburne, Monash, QIMR-Berghofer and the University of the Sunshine Coast – demonstrating Australia's strength and critical mass in the field.

IUMRS was held in Perth in September and involved the Australian Materials Research Society partnering with the International Union of Materials Research Societies to stage the largest gathering of materials-focused researchers in the Asia-Pacific region in 2019.

Keynote speakers for the sessions came from China, Japan, Singapore, the UK, Portugal, Spain, the Netherlands, Germany, Denmark, the US and around Australia.

ACCTERM

The Australia-China Centre for Tissue Engineering and Regenerative Medicine (ACCTERM) Research Forum brought together leading researchers from Australia and China to share emerging research findings, strengthen links and develop collaborative projects.

Held in Shanghai, China in November, the forum was hosted by the Shanghai Institute of Ceramics, Chinese Academy of Sciences and QUT. It was co-hosted by East China University of Science and Technology and Shanghai Ninth People's Hospital-Shanghai Jiao Tong University.

The 2019 forum attracted researchers from universities and affiliated hospitals, academic and research institutions with interests in mechanics, nanoscience, advanced technology and virology.

Research covered a wide area of applications, such as dentistry, bone and cartilage tissue engineering, biomaterials and wound healing.

It showcased IHBI expertise in tissue engineering and regenerative medicine, with Associate Professor Haupt presenting alongside IHBI Executive Director and molecular geneticist Professor Lyn Griffiths, professors Graham Kerr, Peter Pivonka, Cameron Brown, YuanTong Gu and Prasad Yarlagadda, and associate professors Travis Klein and Mike Doran.

Associate Professor Haupt's presentation focused on her work in the field of in vitro models of human neurogenesis, the process in which neural stem cells produce nervous system cells called neurons.

- **Associate Professor Leila Cuttle** was an invited international plenary speaker at the Asia Pacific Burn Congress in Singapore in August, bringing together healthcare executives and clinical professionals and providing a platform for sharing experiences, research and innovations for clinical management.
- **Distinguished Professor Patsy Yates** presented a keynote address about achieving quality palliative care for all at the Canberra Health Annual Research Meeting.
- Professor Yates also spoke about nurses, addressing the global cancer burden and reducing disparities in accessing treatment at a side event as part of the 72nd World Health Assembly in Geneva, Switzerland. The assembly attracts government representatives from across the world to discuss issues impacting on health.
- **Dr Francesca Frentiu** gave an oral presentation at the Molecular Insect Symposium 2019 at Sitges in Spain. The symposium highlighted research on approaches in molecular insect science, including insect development, evolution and neuroscience, the effects of climate change, disease vectors, symbiosis, ecology, insects and agriculture, and genetic manipulation.
- **Professor Flavia Huygens** was an invited speaker at the International Caparica Conference on Antibiotic Resistance in Portugal. The conference brought together researchers in prevention and control, taking an integrated approach and presenting a universal vision of the importance of antimicrobial resistance and what can be achieved.
- **Associate Professor Makrina Totsika** presented at three conferences, including an invited plenary address at the Italian Society for Microbiology conference in Florence.
- Associate Professor Totsika was selected for an oral presentation at the E. coli Mucosal Immunology meeting in Ghent, Belgium. The meeting covered topics such as immune responses, environmental factors, host-pathogen interaction prevention and vaccination.

- She also delivered an invited oral presentation at the Australian Society for Microbiology meeting in Adelaide.
- **Associate Professor Beatrix Feigl** gave an invited keynote lecture on the implications of melanopsin photoreceptor dysfunction in eye disease at the biennial symposium of the International Colour Vision Society in Riga, Latvia. Research presented spanned the study of colour vision, including perception and psychophysics, physiology and anatomy, functional imaging, genetics and colour-vision deficiencies.
- **Professor Selena Bartlett** was selected for the Lawrie Austin Plenary Lecture at the 2019 Australasian Neuroscience Society Annual Scientific Meeting, recognising contributions to neuroscience research. The meeting is one of the largest annual biomedical conferences in Australasia.
- **Professor Murray Mitchell** presented the opening address at the annual meeting of the Society for Reproductive Investigation (SRI) in Paris, with 1300 in attendance. As SRI president, he also presented the President's Achievement Award.
- **Dr Judy Munday** received the 2019 Mary Hanna Memorial Journalism Award in recognition of her article in the *Journal of PeriAnesthesia Nursing* entitled Intrathecal Morphine-Related Perioperative Hypothermia in Women Undergoing Cesarean Delivery: A Retrospective Case-Control Study.
- Researchers and Higher Degree Research students working in tissue repair and translational physiology presented at the Human Proteome Organization World Congress in Adelaide. The congress brought together world experts and early career scientists to promote how proteomics advances knowledge of human and planetary health. **Associate Professor Tony Parker, Dr Dan Broszczak** and PhD candidates **Morgan Carlton** and **Jessica van Haeften** presented their research.



Public engagement and contribution

IHBI shares its research findings and expertise with the community, helping people understand and manage their health, appreciate the importance of science and its funding, and consider working or studying in the field. It is part of a network of collaborators, research participants and supporters ensuring IHBI research is relevant, targeted and has community input.

Image: Researchers and clinicians from QUT and the Royal Brisbane and Women's Hospital involved in the education and exercise program at North Lakes.

IHBI was part of a 10-week intervention-based education and exercise program at North Lakes that empowered diabetes and kidney disease patients to better manage their own symptoms.

Metro North Hospital and Health Service LINK funding supported the program between QUT and the Royal Brisbane and Women's Hospital.

Among the program's leaders were QUT Director of Clinical Services and Education and IHBI researcher Robert Mullins, and QUT Nutrition and Dietetics Clinic coordinator Andrea Cawte.

Ms Cawte said the multidisciplinary approach incorporated dietetics, social work, podiatry, exercise physiology, optometry, nursing and psychology, leading to a number of very successful outcomes.

'Participants received high-level advice on eating better and how to exercise—even when they have conditions that may make exercise challenging, because they were assessed, supervised and encouraged by QUT exercise physiology students,' Ms Cawte said.

'Psychologists guided patients through goal setting and coping skills, diabetes educators addressed medication and self-management, and social workers assisted with other issues that could commonly arise throughout their journey.'

Mr Mullins said the program was an example of how key partnerships between hospitals and universities could train the next generation of health professionals and provide greater outcomes for patients.

'It really gives our future health care providers the chance to put their skills into action in a clinical environment,' he said.

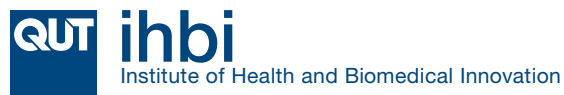
'As a result, people with diabetes for years—or even decades—who don't really understand their condition properly have gone on to lose significant weight, get their fasting glucose and their cholesterol levels under control and report feeling better and more positive overall.'

'It really gives our future health care providers the chance to put their skills into action in a clinical environment.'

- Students from high school Somerville House took part a program for aspiring young scientists, working with IHBI researchers at the adjacent Centre for Children's Health Research. The **Somerville House Science Internship Program** involved seven students embedded in IHBI teams for 18 months, conducting research in allergies, respiratory infection, cough, asthma and airways, and biomechanics and spine research. The students were encouraged to develop scientific skills and translate scientific findings into real world outcomes.
- IHBI researchers were part of the Queensland Office of the Chief Scientist's Flying Scientists program, travelling to cities and towns in regional Queensland to speak to communities about their experiences of working in STEM. Audiences including school students engaged with scientists as they learnt about educational and entertaining topics. **Dr Honor Hugo** and **Dr Audra Shadforth** travelled to Hervey Bay and **Associate Professor Jyotsna Batra** went to Charleville. Longreach welcomed **Dr Tom Cole-Hunter** and Maryborough hosted **Dr Francesca Frentiu**.
- IHBI researchers were part of the World Science Festival in Brisbane, the Asia-Pacific destination for exploring and celebrating the entanglement of science and art through a program of inspiring experiences and engaging workshops. QUT's Signature Event *Innovation by Design: Geeks, Style Gurus and Sciencepreneurs* featured **Distinguished Professor Dietmar Hutmacher**. *Making it Great: celebrating Queensland Invention* featured **Associate Professor Chamindie Punyadeera**.
- Associate Professor Punyadeera was also a keynote speaker at the 2019 Queensland Women in STEM Awards, announced at the World Science Festival. The State Government invited Associate Professor Punyadeera, with both Queensland Minister for Women, the Hon Di Farmer MP, and Minister for Science, the Hon Leeanne Enoch MP, in attendance. IHBI PhD candidate **Clare Villalba** was the inaugural recipient of the Aboriginal and Torres Strait Islander Jury Award in recognition of her commitment to preventing diabetes-related blindness. The awards are a collaboration between women in STEM fields, Queensland Museum in partnership with the Office of the Queensland Chief Scientist, the Office for Women and BHP Foundation.
- IHBI External Engagement Committee Chair **Mario Pennisi** won BIO's Leadership and Legacy Award in Industrial Biotechnology and Agriculture, presented in the US for leadership and dedication to advancing industrial biotechnology and growing the bio-based economy.
- A **Real Health Public Lecture** in July featured presentations from IHBI experts in chronic wounds and treatment, diabetic foot ulcers, leg ulcers and the science

of wound healing. The lecture covered care, prevention, risk factors, research and future treatment. A question and answer panel, morning tea and showcase of IHBI activities at The Cube at QUT's Gardens Point campus enabled members of the public to engage with the researchers.

- The **2019 IHBI Gala Dinner** showcased research to collaborators, industry, clinicians, health administrators and supporters. The event showcased the Medical Engineering Research Facility, celebrating 10 years of enabling research, development and training. MERF brought researchers and clinicians together to enable world-leading research, development and training in critical care, medical devices and orthopaedics. As well as celebrating the present, the dinner provided a look to the future that MERF will help to create, detailing work bringing cutting-edge physics, medicine and the humanities together to build a world in which guided nanorockets rebuild diseased and damaged tissue, robots perform precision surgery, laser technologies diagnose and treat disease, and new materials are used to tackle emerging healthcare needs.
- As part of the inaugural **PA Research Foundation** giving day, IHBI research in bladder cancer, prostate cancer and breast cancer will share in the \$850 000 of funding donated by generous supporters.
- More than \$100 000 was raised for seven IHBI research projects as part of **QUT Giving Day**, highlighting institute research and engaging with alumni, corporate donors, philanthropists and QUT staff.
- **Professor Janet Davies** appeared on the ABC television program *Catalyst*, discussing pollen forecasting, diagnosis and what has been learnt from a thunderstorm asthma event in Melbourne in 2016.
- **Professor Lyn Griffiths** received national television coverage to explain her research in determining whether genetics has a role in concussion following serious injury.
- PhD candidate **Trent Brooks-Richards** won the 2019 QUT Science in Focus competition with an image of a cell scaffold that could one day make grafts for tissue repair and vascular stents more effective. QUT's Institute for Future Environments hosted Science in Focus, uncovering the most surprising, beautiful and technically innovative visuals of important QUT research. Images were displayed on The Cube, offering insights into the unique research processes and objects that QUT researchers use in their pursuit of knowledge.



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