2019–2020

SVI YEAR

SVI
ST VINCENT'S INSTITUTE
MEDICAL RESEARCH

Where hope begins

The march towards a new treatment, a novel drug therapy or an ultimate cure always starts with a probing question, a singular hypothesis, a landmark research study.
This is SVI.

SVI acknowledges the Aboriginal lands on which we live and work and pays respect to Traditional Owners, ancestors and Elders.

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DIRECTORS' REPORT

Many of us are fortunate enough to avoid having to think about health issues on an everyday basis. In the early months of 2020, however, as the novel coronavirus took hold, health was at the forefront of every discussion.

In times like these it becomes crystal clear how valuable health is – not only individually, but also economically and for the cohesion of our society.

At SVI, our researchers are always thinking about how to create and harness knowledge of disease in order to improve health. It is our job to help find solutions for those Australians unlucky enough to face health problems every day. While doing this, we are also working with our colleagues to tackle emerging health challenges like COVID-19.

In the last 12 months, our researchers have made some important discoveries. Andrew Deans' group identified a new means to specifically target cancer cells, while Michael Parker and his team showed how some cancer cells become resistant to the effects of chemotherapy. Jon Oakhill's team revealed molecular pathways that cancer cells hijack to survive.

Our Immunology & Diabetes Group is set to apply decades of work on mechanisms of diabetes by embarking on a clinical trial to test a new therapy to delay the onset of type 1 diabetes. Their work in islet transplantation has also led to new treatment options for Australians suffering from hereditary pancreatitis. These studies show how we can deliver impact on disease through translation of research excellence.

It was also great to see Louise Purton's contribution acknowledged in 2019, with her appointment as honorary Professor by the University of Melbourne. SVI is proud of its achievements in fostering research careers, especially of high-flying women in research like Louise.

We are grateful for the valuable contribution made by our Institute and Foundation Boards. One example of this is the work of Foundation Board member Christine Tarascio, who chairs the SVI Discovery Fund. The Fund is a growing permanent corpus of funds donated by philanthropists, which provides a permanent source of financial support for the Institute. The corpus reached $5million in 2019, which means that distributions can commence to aid scientists at SVI in their work. Our Boards were further strengthened in 2019 with the addition of new members Michael Burn and Simon Marton to the Institute Board and Rhonda Barro to the Foundation Board.

Our philanthropic partners are of paramount importance. The supporters of our Rising Star Program help us to recruit and retain promising young scientists, giving them every opportunity to reach their full potential. We also had crucial funding in 2019 for cutting-edge technology to enable research innovation – this included support from The Ian Potter Foundation and from our newly formed Catalyst Circle, a group of loyal SVI supporters who allow us to purchase urgently needed equipment.

The relationship between SVI and St Vincent's Hospital Melbourne is one of both historic and very current importance to us. Medical research is particularly valuable where it addresses unmet needs. It is only by collaborating closely with those with first-hand knowledge of illness that we are able to do this. Our work as a partner with St Vincent's Hospital in the Aikenhead Centre for Medical Discovery has been a priority in the past year.

Thanks to the State Government of Victoria for their Operational Infrastructure Support Program and to the Australian

“In times like these it becomes crystal clear how valuable health is...”

Government, the Board of St Vincent’s Health Australia and the Trustees of the Mary Aikenhead Ministries for their ongoing support of our research efforts.

As we look forward to the next phase of development, we have established four strategic priorities that provide direction in 2020 and beyond.

1. Delivering impact through research excellence and its translation – our aim is to gain increased recognition as a world class organisation where research excellence can flourish in both areas of discovery and translational research. We are committed to ensuring research integrity remains an integral part of our culture.

2. Supporting and attracting outstanding researchers – we will continue to build our workforce capacity through targeted recruitment, and develop our outstanding researchers through research training and support programs.

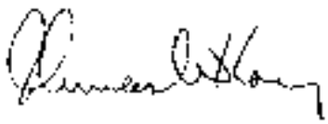
3. Enabling research innovation through cutting-edge facilities and services – our aim is to foster an environment where our researchers can undertake world class studies by leveraging technologies and ensuring a cost-effective operating model.

4. Growing research capacity and capability – we will pursue stronger collaborations and partnerships with like-minded research organisations, partners and industry.

For six decades SVI has taken on the challenge of fundamentally understanding common diseases in order to ultimately conquer them. We have a singular mission, but not a singular disease focus. Our efforts span from the most fundamental mechanisms of disease, through to testing new treatments in clinical trials.

That’s where hope begins.

Tony Reeves
Chair, SVI Board



Tom Kay
Director

“I was told 10 people in one department on the same floor as my office also tested positive.”

Sally has had a difficult 12 months.

Recovering from a burn injury that she acquired at work in Utah, she had to cut short a visit to her family in Australia when her husband was involved in an accident.

Then, while he was recovering, she was diagnosed with COVID-19.

“I work in Summit County Utah, which was classified as a hot spot. I was told 10 people in one department on the same floor as my office also tested positive.”

She felt really lucky that she could get tested.

“At the time they were only testing if you had been in contact with someone who was positive. Even if you had all the symptoms and were very ill, they wouldn’t test you. However, I was considered high risk due to my skin grafts, even though they said they might decide not to submit the test for analysis.”

Sally had felt unwell for a couple for weeks before her diagnosis.

“I had a fever and diarrhoea for a short period. I felt more tired than usual, had a headache, a sore neck and throat and a dry cough. Getting the diagnosis, I felt strangely relieved – I was already getting better, so I felt I was through the tough part and was on my way to recovery. But it was good to know for sure what had caused it.”

Even though her husband and 5-year-old son also had symptoms, they couldn’t get tested and were told to stay in quarantine for 2 weeks. It’s now been a month since Sally was first diagnosed.

“Today I got my second test result back. It was negative. Just this afternoon I’ve been to the grocery store, tractor supply company, Walmart and picked up some plants. I wouldn’t have done any of that if I hadn’t known that I was negative.”

Despite the serious impact of the virus globally, having dealt with serious injury, both her own and her husband’s, put the experience into perspective for Sally.

“I had been injured for 8 months and I now am able to exercise and work on some personal projects. I have also been able to continue my job from home, so I am still connected to the big picture stuff at work.

“The weather is becoming warmer. We have a house with a large property and everything we need to keep us busy. We have also had great quality family time – it is impossible to be bored!”

COVID-19

For more than 30 years, the National Serology Reference Laboratory has worked to promote the quality of tests and testing for infectious diseases. Established in the 1980s as a response to the impact of HIV in Australia, scientists in the Laboratory are now harnessing this expertise in the global fight against the novel coronavirus.

Testing times

Like many scientists, researchers in SVI's National Serology Reference Laboratory speak a dialect of their own.

Their vocabulary, usually hard to follow if you are not fully immersed in their work, is riddled with acronyms like NAT, QC and IVD.

But that was before coronavirus. Today, nucleic acid testing (NAT), quality control (QC) and in vitro diagnostics (IVD) have taken on fresh relevance for everyone in the community.

Dr Pip Hetzel, Director of the group, is passionate about the team's work.

"Our ability to combat the virus is directly correlated with our ability to test for it," she says.

"A major challenge has been our ability to perform accurate and timely testing. Without that, we are not able to track how prevalent the disease is and isolate those who are infected."

Pip explains that there are two different classes of tests that are used to determine if someone has been exposed to the virus.

"The most commonly used test detects the presence of the virus itself."

These are carried out on a sample from a nasal and throat swab. A positive result reveals that the person carries an active infection.

The other type of test looks for the presence of antibodies against the virus. This shows if someone has been previously exposed, or, once a vaccine is developed, if they have developed protective antibodies.

While the frontline tests are now being carried out in a systematic way in Australia, Pip acknowledges that accessing reagents and appropriate equipment was a barrier at the beginning of the outbreak.

"Our ability to combat the virus is directly correlated with our ability to test for it."

"Luckily, because of the equipment and expertise in the National Serology Reference Laboratory, we were able to quickly prime ourselves to support frontline testing for some of Melbourne's hospitals."

Pip says the key issue now is the antibody test. These tests (also known as serology tests) detect antibodies in the blood that have developed as a result of exposure to the virus.

"There are some questions that need to be resolved about whether the presence of antibodies will protect against re-infection with the virus. In addition to this, the new antibody tests now flooding the market need to be evaluated."

She says that work led by Wayne Dimech in the lab will formally evaluate tests being introduced into Australia and overseas on behalf of test kit manufacturers to determine how accurate they are. The results will be shared with the World Health Organisation to ensure that substandard test kits are not on-sold into developing countries.

Research headed by Associate Professor Rose Ffrench and Dr Kim Wilson is aimed at developing tools that can be used to confirm diagnosis and help distinguish between infection, infection resolution and vaccine-induced responses. These will also support the evaluation of a diagnostic test being developed by the Burnet Institute.

The National Serology Reference Laboratory has three decades of expertise developed in the fight against HIV, hepatitis C and other infections. That experience learning the language of testing is what our researchers will now use to help protect Australians from COVID-19.

"One day I hope my daughter can say, 'I used to have type 1 diabetes'."

Twelve year old Libby Rose was eating everything that 'wasn't nailed down' yet losing weight at an alarming rate.

Her mother, Tracy, was understandably worried.

"She seemed to be losing her spark, her big bubbly personality was disappearing before my eyes. She slept all day and barely spoke. I took her to two different doctors at the same clinic over 3 weeks. Gastro was the diagnosis.

"We were awaiting test results when I took her back the third time and said to the doctor 'look at her, there is something seriously wrong'."

A blood test resulted in a glucose reading that took Libby Rose straight to emergency.

The diagnosis was type 1 diabetes. The impact, physically and emotionally, was immediate.

"I was overwhelmed," says Libby Rose.

"I didn't understand what was going on. And because of the stress, my sugar levels kept rising. I was very sick by the time I got to hospital."

Tracy was stressed too.

"The nurses were excellent, teaching me about this whole new world of counting carbs, administering insulin injections… but I cried every day thinking, 'Maths is not my strong suit. How am I going to get this right – calculating carbs, protein, fats and calibrating them into insulin?'"

Living with diabetes was hard for the whole family for the next 9 months, until eventually Libby Rose's body adjusted.

"People with this disease say it takes 2 years for sufferers and their families to adjust to the changes," says Tracy. "I couldn't agree with this more – March 6th this year was our 2 year 'dia-versary'."

Each year, the largest group of new type 1 diabetes cases are children under 14, like Libby Rose. And while researchers at institutes like SVI search for a cure, Tracy wants people to understand the toll the condition takes on young people.

"I want my daughter and others to be able to live a carefree life, free of calculations, side effects, needles, pain, external pumps hidden inside pockets and the concern about long-term health issues.

"One day I hope my daughter can say, 'I used to have type 1 diabetes'."

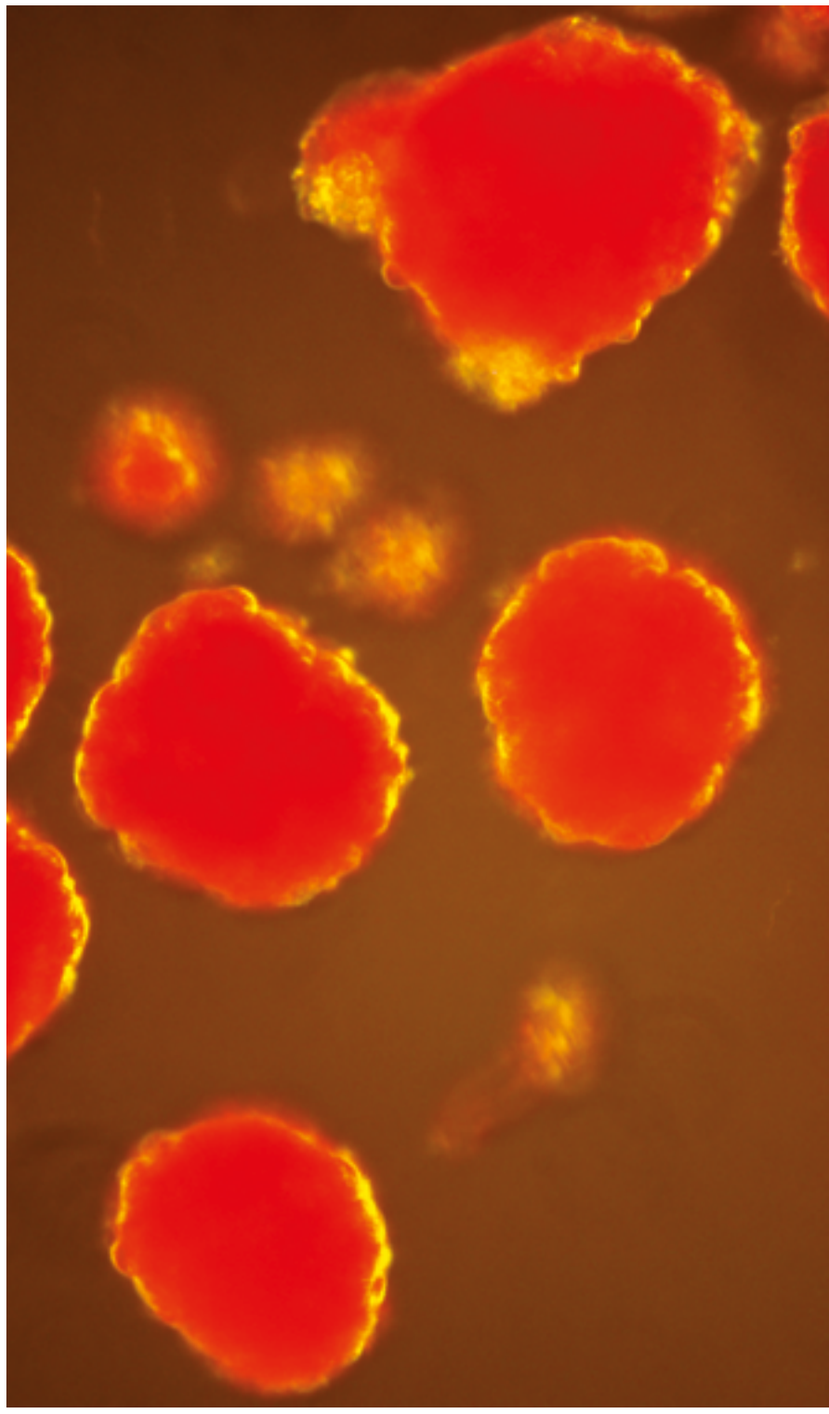
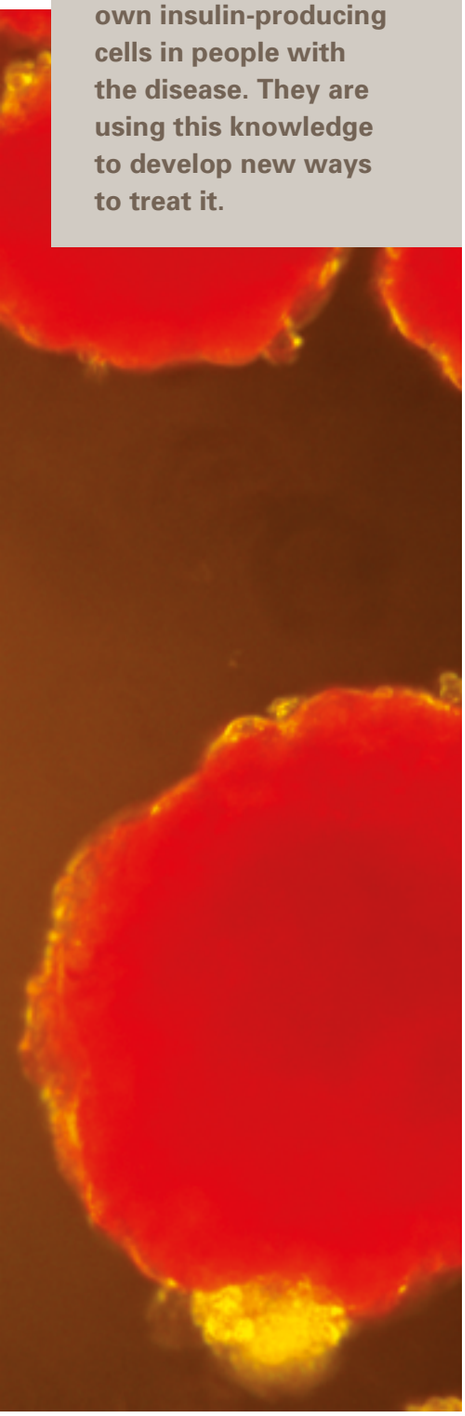


Image: Mouse islets in culture.

TYPE 1 DIABETES

Australia has one of the highest rates of type 1 diabetes in the world. Researchers in the Immunology & Diabetes Unit are working to understand why the immune system attacks its own insulin-producing cells in people with the disease. They are using this knowledge to develop new ways to treat it.



The ripple effect

Scattered throughout the pancreas, like glacé cherries in a fruitcake, are small islands of cells, called islets of Langerhans. In turn, contained within the islets are cells that produce insulin to keep our blood sugar levels from getting too high, or too low.

In type 1 diabetes, the body's immune system targets and destroys these insulin-producing cells. As a result, people with the disease can't control sugar levels in their bloodstream and need to inject insulin to survive.

Islets can be extracted, with considerable difficulty, from the pancreas, but only by removing the whole organ. Professor Helen Thomas first learnt to do this in mice, rather reluctantly, when she was a PhD student.

"I hated it!" she remembers.

"It takes a lot of practice and a very steady hand to remove a pancreas undamaged. There is then quite a delicate procedure to separate the islets from the rest of the pancreatic cells. So many things could go wrong – and they so often did!"

It is now more than a decade since the Immunology & Diabetes team at SVI, along with their colleagues, modified the process to be able to extract islets from the pancreas of organ donors in order to transplant into people with difficult to treat type 1 diabetes.

Since then, 33 people have received donor islets, and most of these recipients no longer require insulin injections. Three of the recipients have now been insulin independent for a decade.

This outcome is what the team – which includes Professor Tom Kay and Program Manager, Dr Tom Loudovaris – had planned. However, more surprising to them are some of the other impacts of the Program.

> "Perfecting the procedure has been the source of some major break-throughs ..."

Perfecting the islet isolation procedure has been the source of some major breakthroughs in understanding type 1 diabetes.

In a world first, Associate Professor Stuart Mannering was able to coax immune cells out of islets that had come from a donor with type 1 diabetes. He has been able to carefully characterise the immune cells caught 'at the scene of the crime'.

In other work, the team extracted islets from the pancreas of people suffering from hereditary pancreatitis. For these people, the only treatment for their chronic pain is removal of the pancreas. By extracting and re-transplanting their islets, the patient is able to avoid developing type 1 diabetes.

Human islets not suitable for transplantation have been shared with Helen's collaborators across Australia and the world. This means that the generosity of organ donors and their families has helped the search for better ways to sense changes in blood sugar, test drugs to improve transplant outcomes and improve insulin secretion.

From those first mouse islets extracted by Helen, and with the generosity of organ donors and their families, a program of research has grown with impact well beyond what was imagined.

“I remember thinking ‘don’t bend down, don’t move suddenly’ because maybe I’ll do something that wipes me out.”

Grant is on the phone from the farmhouse he built with his own hands in country Victoria. He’s a straight talker and right now he’s straight-talking about the moment his GP diagnosed his heart disease.

“I felt so very vulnerable. The words he said just sat in the middle of my forehead. And I remember thinking ‘don’t bend down, don’t move suddenly’ because maybe I’ll do something that wipes me out.”

Grant lived a jam-packed life. A project manager’s job in construction in Melbourne, a 2 hour commute from the country and as much tennis as he could fit in between.

It was after one of those games of tennis that Grant felt ‘a bit off’.

“I thought it was indigestion. I used to grab something quick on the way to the game and wolf it down. I thought I just ate too quickly.”

But when the sensation lingered, Grant’s GP checked him out and told him he would need a stent.

“One side of my heart was completely blocked off, and on the other side there were four spots that were also badly blocked. I reckon it (my heart) was about 97% closed. How on earth I didn’t die, I don’t know.”

A stent is a wire mesh tube that’s inserted into a clogged artery. A tiny balloon is inflated inside the tube to open it. Grant now has five stents.

Grant has always been careful about his health. He looked after himself, ate properly and exercised, as a precaution. His father had died of ‘hypertension’ quite early in life, when Grant was a child.

“I didn’t think ‘Oh, I’ve got the same thing as Dad.’ I never had a lot of deep detail. But in the end, I guess, my genes caught up with me.”

Grant thinks that perhaps that’s where new avenues of research are possible; looking at markers of heart disease. Giving people the toolkits to understand and manage their own health.

“If we can understand the importance of family history, of your GP knowing exactly what to look for, then maybe we can avoid the trauma and disruption of experiences like mine.”

Grant’s near-death diagnosis was 10 years ago. In 2020, he’ll celebrate his 50th wedding anniversary with Pamela at the farm they built themselves. On the end of the line, you can hear his smile.

HEART DISEASE

Cardiovascular disease (including heart disease and stroke), diabetes and chronic kidney disease are major contributors to the chronic disease burden of Australians. Researchers at SVI are working to find new prevention and treatment strategies for these conditions.

The right questions

At any seminar he attends, Associate Professor Jock Campbell will settle into one of the front rows, fold his arms and close his eyes. Proof that he is not napping comes when he invariably raises his hand to ask a question of the speaker.

A good natured, yet somewhat gruff physician-researcher, Jock has spent his whole career asking difficult questions – in seminars, of patients, and in the lab.

In 2019, Jock had a study funded by the National Heart Foundation that aims to answer the question, 'Can we find better ways to identify those at risk of heart disease and kidney failure?'

Jock says, "We currently use decades-old practices to identify people at risk of heart and kidney disease. Not only are these outdated, but also, they are not adapted for the Australian population. I think we can do better than that."

Jock says that better screening methods will allow us to target treatments to improve health outcomes for older Australians. Cardio-vascular disease kills one Australian every 13 minutes and its prevalence increases with age.

Jock is using data from Australia's largest longitudinal study of the evolution of heart failure and other cardiovascular diseases, including heart attacks and stroke.

This collaborative study, led by Jock, involved more than 4,000 people aged 60 years and over. Participants provided information about their health and blood samples and underwent echocardio-grams at baseline and during follow-up over a period of 7 years.

"Cardio-vascular disease kills one Australian every thirteen minutes."

Jock is using this valuable resource to go 'back in time' and look at how the levels of various molecules in the blood of the participants might help to identify individuals at increased risk of disease.

"Because we know the health outcomes of the participants, we should be able to identify markers that signal problems earlier in the course of the disease, and then apply these prospectively to identify people at increased risk of developing disease in our community today."

"If successful, Jock's study will arm general practitioners with the right questions, the answers to which will allow them to identify patients at increased risk of future cardiovascular and chronic kidney disease and offer them appropriate preventative therapies."

An admirable goal for the ultimate asker of questions.

“I didn’t know there was more than one kind of breast cancer. I didn’t know there was more than one kind of chemo.”

Melanie’s best friend Janice encouraged her to have a mammogram.

“Janice’s first mammogram identified a lump which was subsequently removed. Thankfully it was benign. But because of this experience, she put pressure on me to book in for one.

“About 3 weeks before my first wedding anniversary, I got my results. My husband was away, working FIFO in the Pilbara at the time, so I had to tell him over the phone that I had breast cancer.”

Melanie is a psychologist, and after a few moments of ‘Oh my God, I’ve got cancer’, her professional side took charge.

“I set up support people; I contacted family and friends and said, ‘Can you stay in contact with Mum and Dad over the next few months?’ ‘Can you stay in contact with my husband and my brother?’ The second thing I did was to tell my clients and make sure they were all fine. I finished doing that the day before my surgery.”

Melanie’s learning curve was steep. Lots of appointments, lots of scans and tests and lots of decisions to make.

“I didn’t know there was more than one kind of breast cancer. I didn’t know there was more than one kind of chemo.”

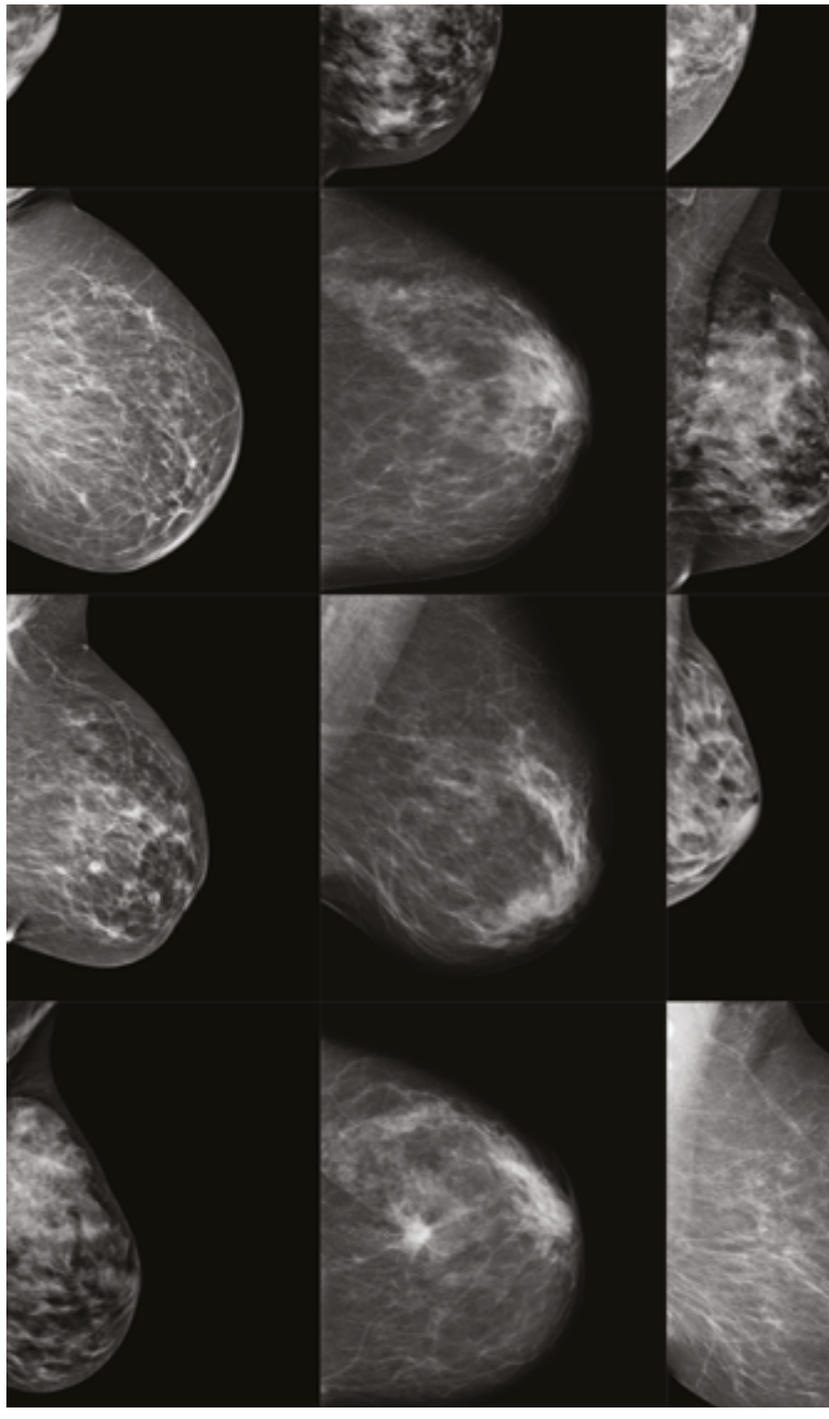
Melanie elected to have prophylactic surgery, a procedure where both the diseased and the healthy breasts are removed as a precaution.

As well as surgery, Melanie had four rounds of chemo followed by 5 years’ treatment with hormone blockers.

“That treatment caused unexpected problems that I wasn’t prepared for. The hormone blockers, which greatly reduce the chance of the cancer returning, have a lot of side effects – joint pain, bone pain and insomnia. I take strong painkillers for the pain.

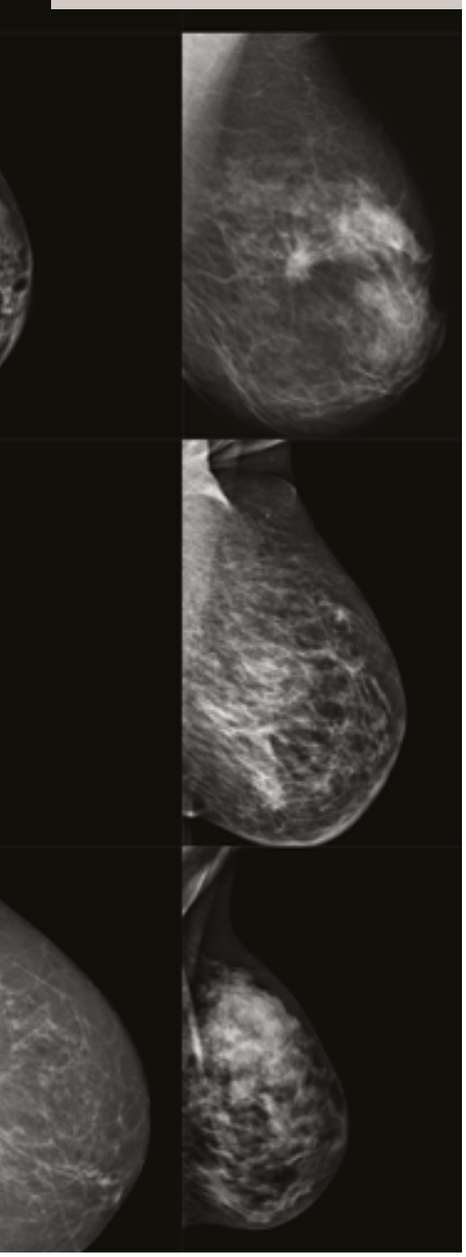
“Despite this, I am grateful for every day that I have been given since my diagnosis. I am thankful for all the researchers who are working to improve diagnosis and to find better, less harsh treatments for early and metastatic breast cancer.

“And I am grateful to Janice, without her pushing me to have a mammogram, I might not be here today.”



CANCER

Finding solutions for a disease as diverse as cancer requires diverse approaches. Researchers at SVI are working to improve diagnosis and treatments, better understand the way the disease evolves and finding ways to improve the health of people who have recovered from the disease.



Spotting breast cancer with artificial intelligence

Having a mammogram can be painfully unpleasant.

After the uncomfortable experience comes the anxious wait for a result to be returned. In that time – about 2 weeks in Australia – the mammogram is 'read' by two experts; if their interpretations of the image disagree, then a third arbitrates.

And while mammogram screening is credited with saving countless lives, there is room for improvement. Even when a result comes back positive, in most cases this does not lead to an eventual cancer diagnosis. And more concerning is that mammograms miss about one in five breast cancers.

Holyoake Research Fellow, Dr Davis McCarthy, along with Dr Helen Frazer, Clinical Director at St Vincent's BreastScreen, is hoping to improve the process.

"One in seven Australian women will develop breast cancer before the age of 85 and around 3,000 Australians die from the disease each year. The key to boosting survival rates is early and accurate detection," says Davis.

Davis, Helen and her colleague Dr Peter Brotchie have been training a computer, using a machine learning, or 'artificial intelligence' algorithm, to improve the analysis and interpretation of mammograms.

The team's current algorithm was trained to distinguish between 'normal' and 'cancer' samples from small patches of mammograms. The team then tested the model using previously unseen images. Their model has 88% accuracy, which is on par with human performance.

"The key to boosting survival rates is early and accurate detection."

The researchers don't imagine that they will be able to do away with human interpretation altogether: their vision is to replace one of the initial two reads of each mammogram with a read done by artificial intelligence. With more accurate results delivered more quickly, they hope to reduce the burden on the individual as well as on the health-care system, which wastes considerable resources following up innocent abnormalities.

Google recently made headlines in a paper showing that artificial intelligence could be more effective in spotting breast cancer than humans. The key difference in the work being done here is that the algorithm is being designed in the Australian setting – training with machines and images that are relevant to Australian women.

Davis and the team are about to embark on a 'real world ' study where they run their algorithm alongside the current system on the approximately 240 scans that are done each day at the BreastScreen clinic, over a period of 3 months. Their aim is to obtain a thorough and honest assessment of the model's performance.

Even more ambitious, they hope to develop the algorithm further so that it can provide an explanation of its prediction – for example, giving an annotated version of a mammogram with the cancerous region highlighted. They will go through iterations of this process until they are confident that the algorithm can be advanced to clinical use.

In this way, with computers aiding in the prediction of breast cancer, the experts hope that they can outperform themselves.

“If we can prevent things like osteoporosis, it’ll make a real difference.”

Catherine Fox is not one to settle for the status quo. As a journalist and author, she’s been shaking up the business world for decades.

Her book *Stop Fixing Women* drove into the heart of gender inequity at the top end of town and won her a Walkley Award.

So when she speaks about her diagnosis of osteoporosis, she quickly pivots from her own health to the bigger picture.

“Older women can be a little bit invisible.

“An awful lot of us develop osteoporosis post-menopause. It can lead to so many issues as we get older. If we’re breaking bones and they don’t knit properly, you have very compromised mobility and compromised quality of life.

“Funding (for research) is incredibly important, not just for the women involved, but for the health system as a whole. If we can prevent things like osteoporosis, it’ll make a real difference.”

Though she had a family history of osteoporosis, Catherine didn’t know she had the condition until her GP talked her into taking a bone density test.

“I didn’t have any symptoms. I didn’t feel ill. But when the results came back, they were pretty bad.”

Catherine immediately went onto a relatively new drug. For 5 years it built bone density and Catherine’s life, though coloured with a new sense of caution, went on with some normality.

In fact, it was during this period that she won her Walkley.

“Both my mother and her sister had osteoporosis. My Aunt Sheila was particularly fragile. She was always breaking bones. The treatment I am on now would have made a big difference to her.”

With her treatment on track, Catherine is keen for women to prioritise their own health.

“The focus for me is getting a message to women, that they should check these things out. Because there’s a tendency for us to push our own needs down the list.”

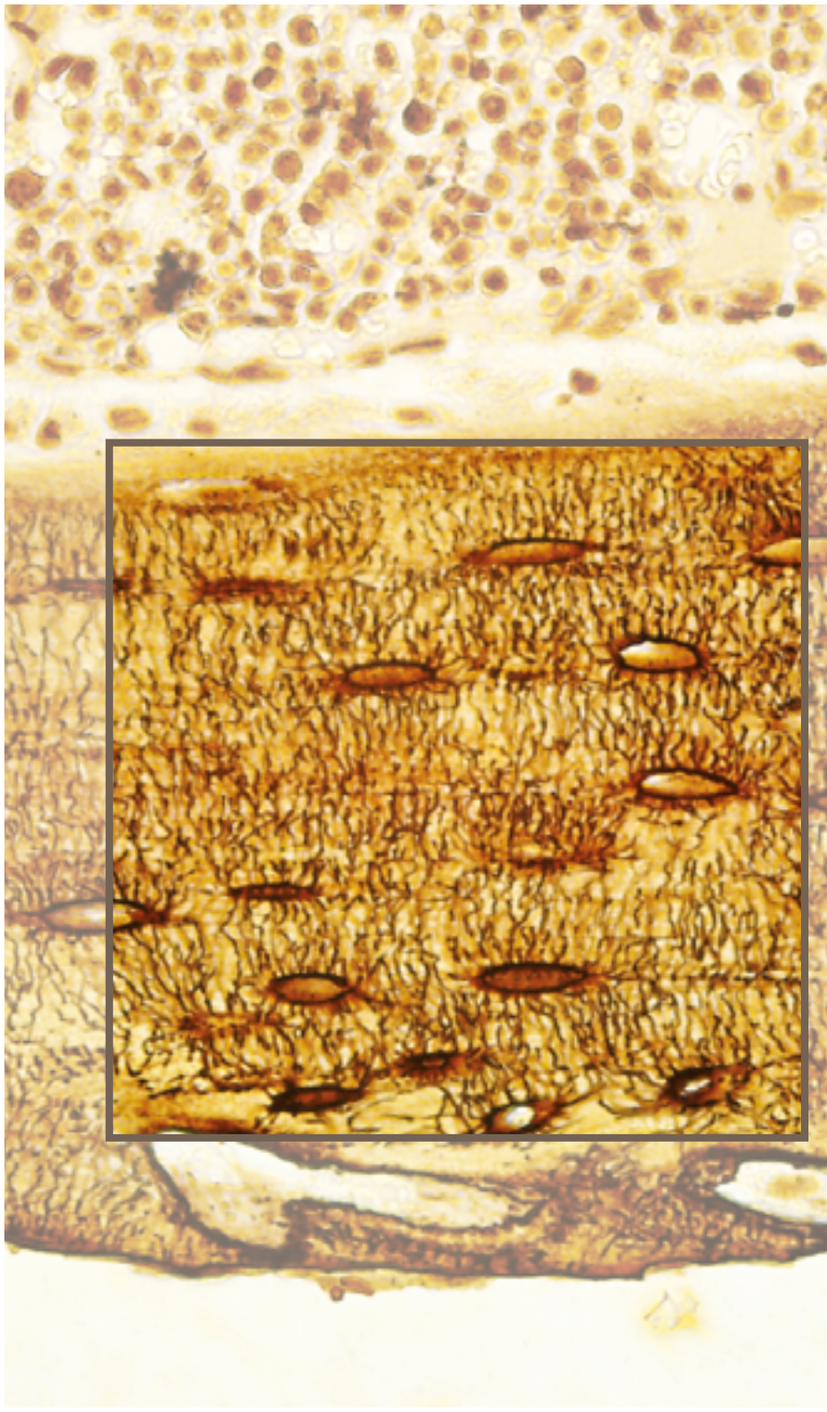
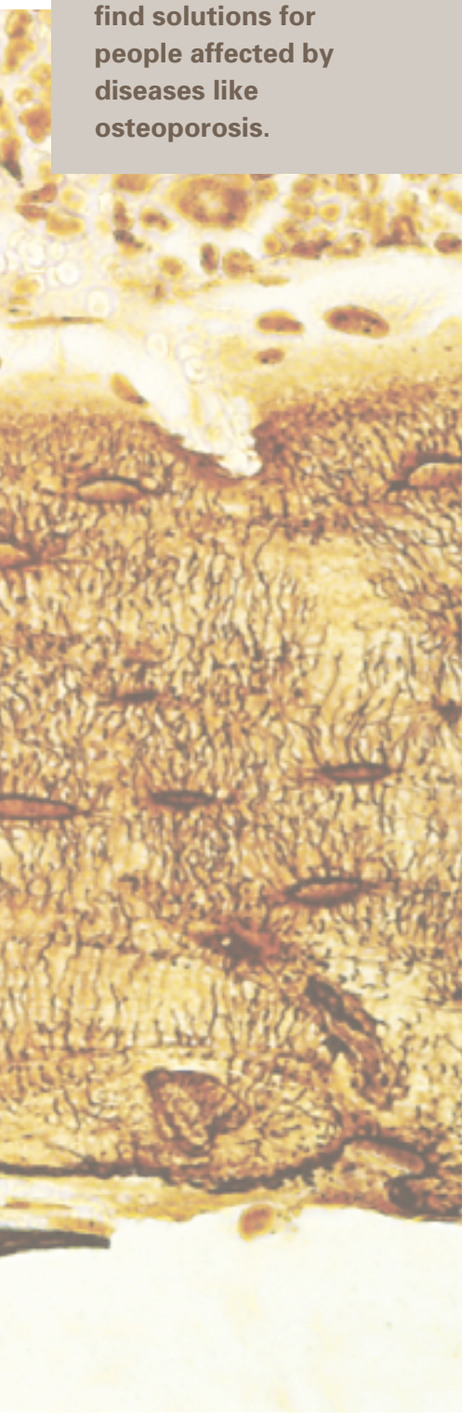


Image: The complex osteocyte network inside bone. Dark ovals show the spaces inside which the osteocytes live, connected to and communicating with each other through finger-like projections.

OSTEO-POROSIS

By understanding the cells that make up bone and how they interact with each other and their environment, researchers in the Bone Disease & Biology Unit aim to find solutions for people affected by diseases like osteoporosis.



Buried alive

Bone is made by cells called osteoblasts.

As they secrete the components that make up bone, some osteoblasts become encased within the hard bone matrix – buried alive – and the resulting cells are called osteocytes.

For many years it was thought that osteocytes were nothing more than passive placeholders, lying entombed, inactive and overlooked, within their bony coffins. However, recently it has been shown that the cells play a much more important role.

Martha Blank is focused on understanding how osteocytes influence the strength of bone.

"Osteocytes are really fascinating cells. They survive for up to 25 years, making them one of the longest living cells in the body. They also make up 90% of all the cells found in our bones, and yet we know very little about what they do," says Martha.

She explains that osteocytes reach out long finger-like connections through miniature tunnels to connect with other osteocytes, allowing them to maintain a sort of 'helicopter overview' of bone health.

"This allows them to communicate with each other about where the skeleton is weak and needs to be strengthened, or where there is damage that needs to be fixed, and then direct other cells to get to work."

Martha's work centres around a particular type of mouse that has a defect in its osteocytes. The bones of these mice look normal by bone density scan, but are in fact extremely brittle. Martha says that this mimics what can happen in people with osteoporosis.

"Sixty percent of fractures occur in people with normal bone density scans."

"We know that if your bone density is low you are more likely to have a fracture. But these tests are imperfect – 60% of fractures occur in people with normal bone density scans."

Martha explains that bone is made up mainly of collagen fibres and bone mineral. The amount and arrangement of collagen and mineral is thought to contribute to bone strength and flexibility.

Martha and the team in SVI's Bone Cell Biology & Disease Unit have shown that the osteocytes in her mice deposit more mineral in their bones than normal, making their bones more brittle. This means she has discovered a new function for osteocytes – they are not just overviewing what is going on, but actually controlling how much mineral is in the bone.

One in two women and one in four men will break a bone in their lifetime. For women, this risk is greater than that of heart attack, stroke and breast cancer combined. A man is more likely to break a bone due to osteoporosis than he is to get prostate cancer.

As our population ages, more people will be affected by osteoporosis, making them more vulnerable and putting further pressure on our healthcare system.

"Simply put, if we understood better the factors that contribute to bone fragility, we would be able to better identify people at risk of fracture, and also use that knowledge to find ways to improve bone strength," says Martha.

"You wonder why it happened to you. What made me different?"

Louisa is a nurse at Melbourne's Alfred Hospital. Ten years ago, she was 35, a new-ish mother and just diagnosed with multiple sclerosis.

"I was extremely fatigued but put it down to having two young kids. Then I had a week when I was just incredibly tired and I felt this numbness crawl up from my feet, up my shins and over my knees. I had double vision. I was too tired to think anything of it."

Louisa's husband is a doctor and wasn't quite so unconcerned. He insisted Louisa get some tests. When she did, the diagnosis was clear.

"The doctor looked at my eyes and there was something in them that was quite a telling sign. I had an MRI which showed about 60 lesions in my head and a couple on my spine.

"It was a massive shock to me. I look after other people all the time and never imagined I'd get sick.

"You wonder why it happened to you. What made me different? It would help to know."

Louisa's diagnosis was a relapsing-remitting form of the disease, meaning she has relapses with periods of remission occurring in between. After a dose of steroids, she was put on a self-injecting medication.

"It took me a long time to get back to my previous state of wellness. It was a battle just to walk to the end of my street."

Louisa recovered and within 4 months she was back at work at the hospital.

A decade on from her diagnosis, and with a new treatment regime, Louisa thinks she's lucky.

"Ten years and I'm doing well. I try my best to do the right things to keep myself healthy. I know that some people do all that and it doesn't help. So what we need is research to help find the cure.

"I think people will be particularly aware of how important research is at the moment, given the COVID-19 pandemic. We're all relying on researchers to find cures."

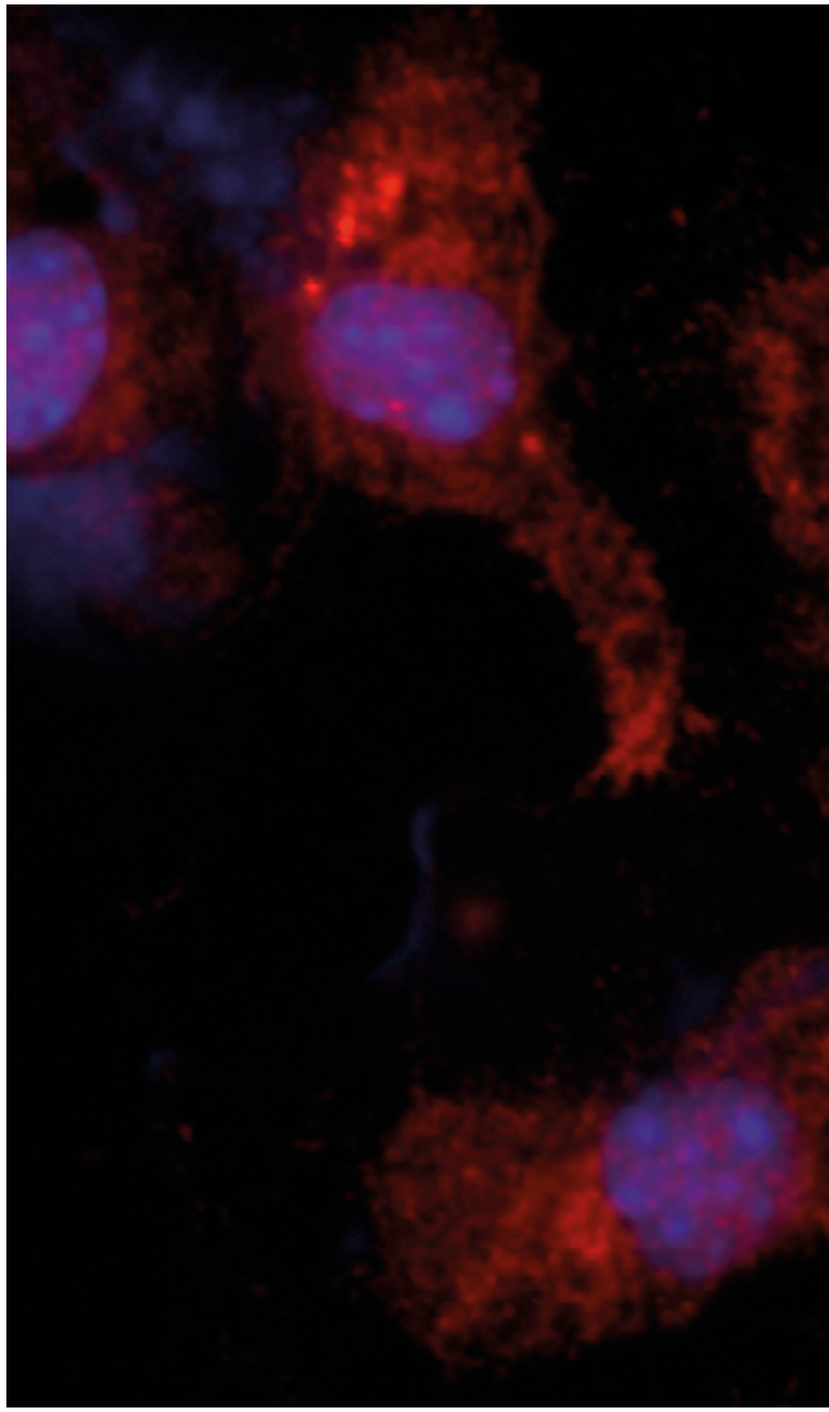
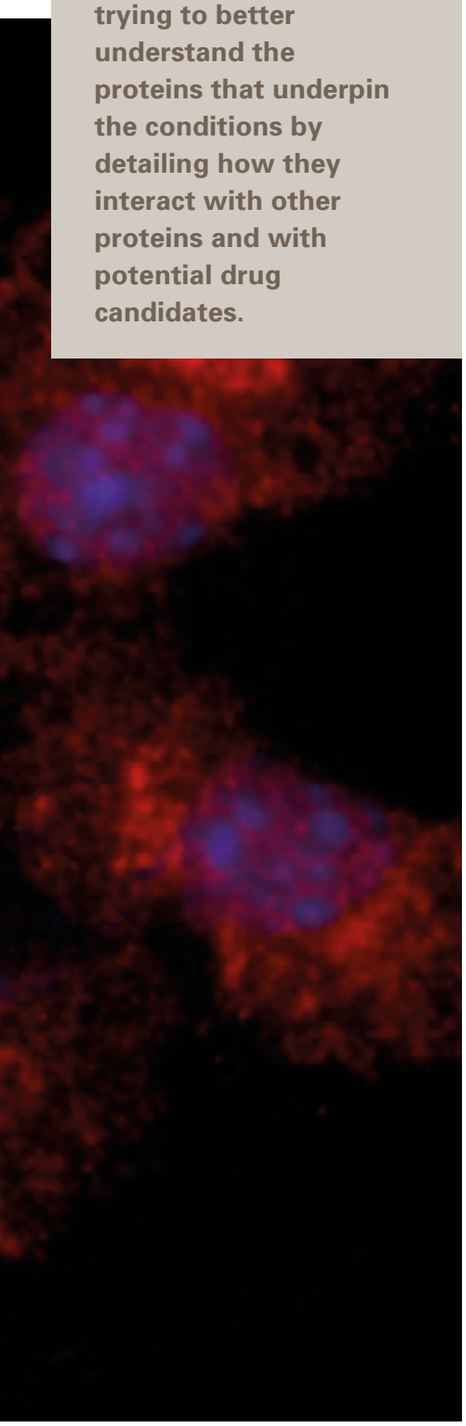


Image: Microglial cells in culture

MULTIPLE SCLEROSIS

Researchers in the Structural Biology Unit are working to find better treatments for neurodegenerative diseases like Alzheimer's, multiple sclerosis and Parkinson's. They are trying to better understand the proteins that underpin the conditions by detailing how they interact with other proteins and with potential drug candidates.



Mysteries of the microglia

The existence of the blood-brain barrier was long seen as proof of the brain being off limits to the immune system.

The dense constellation of cells that form the barrier was thought to limit access to the brain, and like a bouncer at an exclusive nightclub, rebuff entry by the immune system's white blood cells.

However, recent evidence suggests that the brain has its own built-in immune system, with the white blood cell's cousins, the microglia, already in the club.

These microglia are increasingly seen as the new frontier in tackling neuro-degenerative diseases like Alzheimer's and multiple sclerosis.

Multiple sclerosis is an autoimmune condition in which the immune system progressively eats away at the protective covering of nerves, resulting in damage that disrupts communication between the brain and the body. More than 25,000 Australians are affected.

Dr Jon Gooi says that many questions regarding the disease are yet to be answered. And it is hoped that microglia may hold the key.

"Microglia act as the first and main form of active immune defence in the brain," says Jon.

He explains that microglia are very busy cells, constantly on patrol for signs of trouble. If they detect a threat, like an invading pathogen or a damaged nerve cell, they kick into action and literally gobble it up.

But it seems they may also have a dark side. In some disease states, like multiple sclerosis, it is thought that the cells become overactive, triggering inflammation in the brain and contributing to the disease.

"And figuring out how to manipulate these cells might provide solutions for diseases like multiple sclerosis."

"If we could understand how the microglia are controlled, we might be able to better understand certain neurodegenerative diseases. And figuring out how to manipulate these cells might provide solutions for diseases like multiple sclerosis."

Jon and the team are designing drugs that can interact with a receptor found on the surface of microglia that is thought to modify the behaviour of the cells. They hope that these drugs may be able to reduce the inflammation caused by microglia.

Using sophisticated computer-based modelling methods, the researchers have sifted through 5 million compounds and identified 12 promising drug candidates that look like they might interact with the receptor. They will test the effect of these candidates on microglia grown in the laboratory.

"The tools that we develop will help us to dissect the exact role of microglia in the disease process – whether they help or hinder – and may also provide new drug candidates for the treatment of multiple sclerosis."

SVI STAFF 2019

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Prof Natalie Sims (Deputy Director)
Prof Helen Thomas (Associate Director)

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Gabriela Crespi
Dr Jon Gooi
Nancy Hancock
Dr Stefan Hermans
Dr Jacinta Holmes
Jasmina Markulic (PhD Student)
Dr Luke Miles

Immunology & Diabetes

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Eleonora Tresoldi
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Ruike Wang (Masters Student)
Angela Wang (U/Grad Student)
Emily Wilson
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Yangnan Zhang (Masters Student)

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A/Prof Jon Oakhill
Dr Kim Loh
Tiego Diaz (Visiting PhD Student)
Dr Sandra Galic
Rosa Goncalves (U/Grad Student)
Dr Ashfaqul Hoque
Dr Christopher Langendorf
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Dr Naomi Ling
Luke McAloon
Lisa Murray-Segal
Dr Kevin Ngoei
Danise-Ann Onda (U/Grad Student)
Ashley Ovens (PhD Student)
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Jacinta Silovic (Summer Student)
Lindsay Sparrow (Honorary)
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Luke Van Jager (Honours Student)
Nicholas Waters (Honours Student)
Jenna Weall (U/Grad Student)
Dr Chieh-Hsin Yang
Dingy Yu

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Dr Fei Fei Gong (PhD Student)

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Niloufar Ansari (PhD Student)
Martha Blank (PhD Student)
Blessing Crimeen-Irwin
Pat Ho
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Thaisa Freitas Carvalho de Lima (Visiting Academic)
Emma McGowan
Narelle McGregor
Ingrid Poulton
Juliana Rodriguez (Visiting International PhD Student)
Daniela Sahib (U/Grad Student)
Yao Sun (PhD Student)

Stem Cell Regulation

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Clea Grace (PhD Student)
Dr Jessica Holien
Diannita Kwang
Samuel Lee
Slavisa Ninkovic (visiting PhD Student)
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Brendan Stevenson
Lenny Straszkowski
Dr Shuh Ying Tan (PhD Student)
Dr Gavin Tjin
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Shakty Nadarajah (PhD Student)
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Imogen Reay (U/Grad Student)
Dr Michael Sharp
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Vanessa Tsui (PhD Student)
Sylvie van Twest

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Dr Christina Azodi
Ruqian Lyu
Dr Puxue Qiao
Sam Tanner (Masters Student)

O'Brien Institute Department

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Dr Tara Karnezis
Dr Shiang Yong (Max) Lim
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Dr Nadeeka Bandara
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Jordan Clarke (Masters Student)
Dr Frank Fontaine
Yi-Wen Gerrand
Thanvi Gullapalli (U/Grad Student)
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Husni Idris (Masters Student)
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Dr Musarat Ishaq
Samarth Khandelwal (Honours Student)
Sita Kirkwood
Dr Anne Kong
Dr Jarmon Lees
Dr Simon Maciburko (PhD Student)
Oliver Miles (Visiting Clinical Masters Student)
Steven Morgan (Masters Student)
Jason Palmer
Dr Vinochani Pillay
Ayesha Rosdah (PhD Student)
Lipi Shukla (PhD Student)
Priyadharshini Sivakumaran
Andrew Treller (Honours Student)
Kam Truong (PhD Student)
Kiryu Yap (PhD Student)
Eric Yuan
Mr Stephen Tham (Honorary Research Fellow)

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Prof Anthony d'Apice
Prof Kong Wah Ng
Prof Richard MacIsaac

Principal Research Associates

A/Prof Ora Bernard
A/Prof Duncan Campbell
Prof Peter Cowan
Dr Barry Dixon
Prof Michael Henderson
A/Prof John Slavin
Prof Gregory Steinberg

Senior Associates

Dr Lance Macaulay
Prof Harshal Nandurkar
A/Prof Evange Romas

Associates

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Dr Renwick Dobson
Dr Nirupa Sachithanandan
Dr Meaghan Wall
Dr Hang Quah
Dr Raymond Martyres
Dr Johannes Kern
Dr Georg Varigos

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Nicola Peniguel (Events and Donor Relationship Manager)
Will Pye (Philanthropy Executive)
Kayla Smith (Donor Care Coordinator)

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Nicky Harris (Head of Finance; Company Secretary) (from December 2019)
Dr Anne Thorburn (Head of Operations) (to December 2019)
Dr Nathalie Braussaud (Head of Operations) (from November 2019)
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Emma Armitage (Business Development Manager)
Trent Boekee (IT Client Support Officer)
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Elizabeth Campbell (Legal Counsel)
Theresa Clarke (Administrative Officer)
Metta Clarissa (Finance Officer)
Christopher De Lima (Finance Assistant)
Dr Christophe Demaison (Head of Business Development)
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Lisa Kuspira (Media & PR Adviser)
Kirsten Muscat
Kate Nowell (Facilities & Safety Officer)
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Jon Rhoades (IT Manager)
Helen Ritchie (Human Resources Manager)
Dan Thomas (Facilities & Safety Manager)
Tiffany Tran (Administrative Officer)
Lisna Wirrawan Liauw (Payroll Officer)
Jing Zhang (Finance Officer)
Monica Zhang (Snr Finance Officer)

National Serology Reference Laboratory

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Wayne Dimech
A/Prof Rosemary Ffrench
Diana Piccoli
Lena Arvanitis
Dr Thein Thein Aye
Dr Susie-Jane Braniff
Fabian Busby
Penny Buxton
Liza Cabuang
JingJing Cai
Jenny Catimel
Shannon Curley
Kylie Davies
Cathryn Dunkley
Vincent He
Marina Karakaltsas
Megan Kean
Geraldine Kong
Scott Kurowski
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Thuy Le
Tamara McDonald
Sadaf Mohiuddin
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Louie Opasinov
Dr Derya Sahin
Jacqueline Saykao
Kathy Smeh
Anna Swierc-Lech
Roseena Taqi
Helin Toma
John Tomasov
Frank Torzillo
Rosanna Torzillo
Maria Tosic
Marlene Tschaepe
Guiseppe Vincini
Sandra Walker
Dr Kim Wilson
Kate Zhang

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Fei Fei Gong, PhD University Melbourne
Claudia Selck, PhD University Melbourne

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Prof Richard Fox
Ms Karen Inge
Prof Shitij Kapur
Prof Thomas WH Kay
Mr Stephen Marks
Mr Simon Marton (from November 2019)
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Ms Fiona Rowland
Dr Marcus Tierney
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The Honourable Katharine Williams

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Ms Rhonda Barro (from May 2019)
Ms Kallie Blauhorn
Ms Jennifer Coutts
Mrs Caroline Daniell
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Sir Gustav JV Nossal AC

SVI Foundation Co-Patrons

Susan Alberti AC
John Theodore Ralph AC

Financial snapshot

Income

Competitive research grants	39%
Contracts and other income	32%
Legacies, bequests & donations	17%
Government infrastructure support	9%
Investment income	3%

Expenditure

Research	48%
Contract services	27%
Administration	10%
Transfers to collaborators	6%
Building operations	6%
Foundation	2%
Commercial development	1%

Statement of Financial Position as at 31 December

	2019 ($)	2018 ($)
ASSETS		
Current assets	7,770,867	18,363,357
Non-current assets	30,389,767	18,336,792
TOTAL ASSETS	**38,160,634**	**36,700,149**
LIABILITIES		
Current liabilities	9,363,241	9,248,524
Non-current liabilities	215,320	187,896
TOTAL LIABILITIES	**9,578,561**	**9,436,420**
NET ASSETS	**27,263,729**	**27,263,729**
EQUITY		
– Retained surplus	26,600,704	26,708,690
– Reserves	1,981,369	555,039
TOTAL EQUITY	**28,582,073**	**27,263,729**

STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME FOR THE YEAR ENDED 31 DECEMBER

	2019 ($)	2018 ($)
Revenue	15,091,458	13,866,845
Other income	16,110,077	12,665,0217
TOTAL REVENUE	**31,201,535**	**26,531,866**
Consumables and general research expenses	(8,183,458)	(6,557,567)
Employee benefits expense	(17,380,094)	(14,688,545)
Depreciation and amortisation	(1,019,444)	(1,448,812)
Administration expenses	(2,727,689)	(2,748,917)
Transfers to collaborators	(1,998,061)	(507,930)
TOTAL EXPENSES	**(31,308,746)**	**(25,951,771)**
Surplus/(Deficit) for the year	(107,211)	580,095
Other comprehensive income (loss):		
Transfer of retained surplus from the National Serology Reference Lab		1,823,889
Net gain (loss) on revaluation of financial assets	1,426,329	(928,937)
Total comprehensive income for the year	**1,319,118**	**1,475,047**
Total comprehensive income attributable to members of the entity	**1,319,118**	**1,475,047**

NOTE 1: GOVERNMENT GRANTS

National Health and Medical Research Council:		
– Independent Research Institutes Infrastructure Support Scheme	1,202,588	1,074,130
– Research grants	7,789,414	5,354,475
Australian Research Council	293,944	473,728
Victorian State Government – Operational Infrastructure Support Program	1,766,773	2,312,305

The summary financial information shown above does not include all the information and notes included in the entity's statutory set of financial statements. The full set of Statutory Financial Statements can be obtained upon request to the Chief Financial Officer. The Statutory Financial Statements comply with the Australian Accounting Standards and an unqualified audit opinion was issued by the auditors, William Buck Audit (Vic) Pty Ltd.

SVI FOUNDATION REPORT

In our roles, we meet with philanthropists who seek to advance medical research and, through it, enhance medical care.

Their motivations go beyond altruism to purposeful investment. They seek to partner with institutes that carry out medical research at the highest levels and help bring health and healing to patients as quickly as possible. We are frequently asked, 'What's your elevator pitch?'

Our response is not just that SVI researchers are very good at what they do. Their capabilities go beyond top-notch scientific knowledge and achievement.

Our scientists are highly specialised, but with a broad remit: the cause, prevention, and treatment of the most common diseases in Australia.

They conduct fundamental research of the highest quality, proudly, unapologetically; it's the hope that drives our mission. But our researchers' charge is twofold: to discover new knowledge and translate it to innovative new therapeutics and diagnostics.

SVI operates within one of the world's most dynamic biomedical hubs. We collaborate with St Vincent's Hospital, the University of Melbourne, in the Aikenhead Centre for Medical Discovery and with other national and international research institutes to maximise our impact.

Our researchers are recognised for their entrepreneurial spirit. They're not afraid of new challenges. Like a start-up enterprise, they're okay that not every experiment or study will bear fruit. Our researchers know that hard-earned breakthroughs require new ways of looking at old problems.

So why invest in SVI? Because philanthropic funding that specifically supports ground-breaking, high-risk fundamental research has the power to revolutionise health outcomes.

Direct application to patients does not happen without the underpinnings of fundamental knowledge – unless we first answer a range of complex biological questions. Without these insights, it is impossible to envision future advancements in treating common disease, let alone future cures.

This is the kind of research we excel in at SVI. It forms the foundation for discoveries that will improve the health of our community. It is where medical breakthroughs originate, where cures take root.

But the research at SVI goes beyond basic discovery. We are building on the research advances SVI has spearheaded over the past 60 years and translating them into applications and commercial products to make hope reality for patients sooner, not later.

> "To those who invest in us, and believe in us, we say a heartfelt thank you."

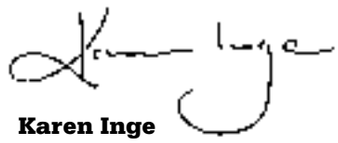
Simply put, we seek to close the distance between discovery and application, between laboratory and bedside, and create a healthier future for Australians.

With philanthropic support, we can accelerate the pace at which discoveries translate into new drugs and products that benefit patients.

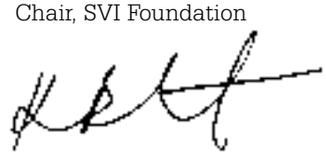
We invite you to invest in a group of extraordinary scientists and seed the next generation of life-saving research. Help give our researchers every advantage they need to push the boundaries of medical research and redefine what is possible.

All that we accomplish within the SVI Foundation begins with and is made possible by the dedicated volunteers who compose the Foundation Board. We thank you for your commitment and support.

To those who invest in us, and believe in us, we say a heartfelt thank you for all that you have done and continue to do. Please know that your ongoing confidence in and support of our scientists and students is a tremendous source of motivation for all of us at SVI.



Karen Inge
Chair, SVI Foundation



Kate Barnett
Chief Executive, SVI Foundation

A LEGACY OF HOPE

"She was just a terrific person with real integrity."

Val Dunn's generous spirit

The late Val Dunn was renowned for helping those less fortunate than herself, gaining a reputation during her nursing career at St Vincent's Hospital as someone who looked out for the underdog.

Yet, according to close friend and former colleague Ann Cook, Val was also the life of the party, and would not have enjoyed the self-isolation aspect of the COVID-19 pandemic.

Image: Val Dunn as a trainee nurse (1957)

"She loved people and could really kick on at a party, so she would have struggled not seeing her friends," Ann says.

"But she was also the most generous person I have ever known."

That generosity was evident when Val passed away at the age of 79 from cancer, gifting SVI a bequest that will help researchers at the Institute advance their crucial work.

Val herself spent many years on the healthcare frontline, and the hospital was akin to a second home to her. In fact, Val trained at St Vincent's Hospital, before graduating in 1959 to work in the Emergency Department — an interesting place to be, especially during night shift.

"There was a Fitzroy local homeless man at the time, who went by the name of The Captain, who routinely spent a night in the Emergency Department, along with his ferret which he transported in his pram," Ann recalls.

Ann notes that Val would have gone to the ends of the earth to help patients during the COVID-19 pandemic.

"She was often letting the homeless people of Fitzroy stay in the hospital overnight," Ann says.

"She was generous to the extreme and she really loved people.

"Val would really listen to other people's stories and she had this way of making you feel special."

Val was also the lead nurse in the redevelopment team planning the building of the new hospital in 1995, reportedly ensuring that every patient in the hospital had a view. She was also renowned for offering support to the many young country girls who travelled to St Vincent's to train as nurses.

Val attended SVI's Support Group Dinner, where she heard about the young and ambitious researchers who are working to find treatments for common diseases that affect many Australians.

In the final days of her illness, Val's life came full circle as she was treated by the caring staff at St Vincent's, the very place she had once nursed so many back to health.

"She was just a terrific person, with real integrity," Ann says.

"I feel like a better person for just having known her."

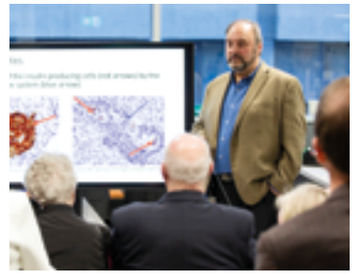
A YEAR IN PICTURES















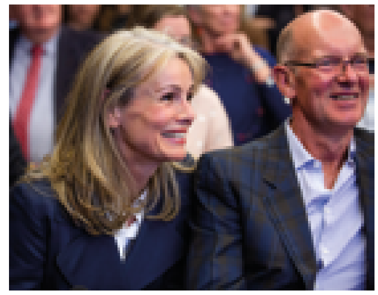


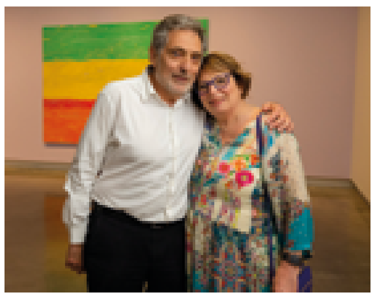

We had the opportunity to create wonderful memories with our supporters, researchers and visitors to the Institute during the year.

















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Whilst every endeavour is made to ensure accuracy, we apologise for any unintended errors or omissions. If you have any queries please contact Kate Barnett, Chief Executive, SVI Foundation on (03) 9231 3265 or at kbarnett@svi.edu.au.

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