SVI YEAR 2022–23

SVI
St Vincent's Institute
MEDICAL RESEARCH






THE NEXT GENERATION



WELCOME

“We firmly believe that science has the potential to make a significant and positive impact on the society it serves, for the benefit of us all”

Our scientists are motivated by their passion for scientific exploration and discovery, but also by a desire to make a meaningful contribution to society through their work.

This Research Review celebrates our pursuit of ‘science with purpose’, highlighting both progress that has been made over the past year, and our future directions to discover new knowledge and apply it.

Our vision of making medical discoveries that transform lives will be guided in the coming years by building on our strong talent base and further improving our great organisational culture. We will continue to cultivate SVI’s existing talent pipeline, as well as bolster it through recruitment. You will read more in this Report about the goals and achievements of some of the inspirational emerging research talent at SVI.

Research into finding solutions for people with inherited disease, impaired wound healing, obesity, bone disease and dementia has been boosted in the last 12 months with new grant funding and is highlighted later in these pages.
We know that we need to diversify our approach to funding to underpin our sustainability. While continuing to apply to traditional granting schemes, we will also look further afield at other sources, including by making the most of commercial opportunities and stepping up our philanthropic efforts.

Over the coming years, we will prioritise the Aikenhead Centre for Medical Discovery (ACMD) and grow other collaborations, with a focus on clinical links, especially with our campus partner St Vincent’s Hospital Melbourne.

Our partnership with the Hospital in the ACMD, along with several universities and research institutes, will give us the opportunity to participate in new multi-disciplinary projects to solve real-world healthcare problems and improve patient outcomes. We are excited to see the project at long last coming to fruition, and will watch impatiently as the new construction takes shape over the next 18 months. We excitingly had $2.5M in funding awarded by The Ian Potter Foundation over a five year period to help support the initiation of this highly collaborative project. We extend our appreciation to the Foundation and will leverage their commitment to garner further support for this important project.

We are deeply thankful to all of our philanthropic donors, whose belief in ‘science with purpose’ continues to inspire and motivate us. Their generosity allows us to pursue innovative ideas and initiatives, to reach even more people in need. We could not accomplish our goals without their trust and dedication to our mission.

We are grateful to our key government and organisational stakeholders for their ongoing support: the State Government of Victoria (through the Operational

Infrastructure Support Program), the Australian Government (through the National Health and Medical Research Council, the Medical Research Future Fund and the Australian Research Council), the Board of St Vincent's Health Australia and the Trustees of the Mary Aikenhead Ministries.

We also acknowledge the ongoing dedication and professionalism of the members of the SVI Board and the SVI Foundation Board and express our gratitude to them for their invaluable contributions.

We firmly believe that science has the potential to make a significant and positive impact on the society it serves, for the benefit of us all. Thank you for your interest in, and contribution to, this bold aim.

Tony Reeves
Chair SVI Board

Karen Inge
Chair SVI Foundation

Tom Kay Director

SVI acknowledges the Wurundjeri people and the people of the Kulin Nation as the Traditional Owners of the land on which we work. We pay respect to their Elders, past and present.

CONTENTS

A YEAR OF PURPOSE

TURBO CHARGING DISCOVERY

CONSTRUCTION HAS NOW COMMENCED ON THE NEW $206 MILLION BIOMEDICAL ENGINEERING FACILITY, THE AIKENHEAD CENTRE FOR MEDICAL DISCOVERY (ACMD).

This highly collaborative initiative, to be housed in the new 16,500sqm building, is formed by five universities, three research institutions and a tertiary hospital, with links to major international medtech/ healthtech corporations and an active community of start-ups and new ventures.

In 2022, SVI was thrilled to receive a $2.5 million grant from The Ian Potter Foundation to support the ACMD.

Delivered over five years, the grant will help bring the ACMD project to life – supporting people, programs, and equipment.

Bolstering an earlier $2.5 million grant from the Foundation, the new funds will be used for the implementation of specialist equipment, including shared technology and training initiatives, as well as the development of translational capacity through research commercialisation and quality assurance programs.

PHOTO BY EUGENE HYLAND

TESTING TIMES

The accurate and timely diagnosis of infectious diseases is critical to reduce spread. In developed countries like Australia, organised lab networks do the testing. In less developed countries, however, it is up to clinicians to use less accurate point-of-care tests. NRL has created a digital solution for developing countries to improve their monitoring of test kit and operator performance, using data uploaded via a QR code. This innovative approach is garnering significant attention for its potential to revolutionise testing for infectious diseases such as HIV, tuberculosis, and hepatitis C in developing countries.

OUT OF BODY EXPERIENCE

'New grants awarded in 2022 are helping SVI researchers to find new disease treatments by using human cells that have been modified in the lab.'

A multi-disciplinary team led by Associate Professor Andrew Deans is aiming to prevent children and young adults dying from bone marrow failure syndromes. Andrew's team are using gene editing to develop new treatments to correct disease-causing mutations in blood stem cells.

Associate Professor Geraldine Mitchell's work on developing bioengineered skin flaps and incorporated blood vessels has the potential to provide a far less invasive and costly alternative to traditional skin flap harvesting, which creates a secondary wound.

Dr Max Lim and Dr Jarmon Lees are using lab-grown 'hearts in a dish' to research different compounds for their potential to offer new treatments for the rare condition, Friedreich ataxia.

RECOGNISING EXCELLENCE

Professor Louise Purton's dedication to gender and disability advocacy has been recognised by the International Society for Experimental Hematology with an award for Leadership in Diversity, Equity, and Inclusion. This is a prestigious, peer-nominated award that recognises Louise's work to push for changes to build a more inclusive environment so that deserving people can thrive.

LETTER FROM THE EDITOR

Professor Carl Walkley has received a highly competitive NHMRC Investigator Grant for his work aimed at understanding the role of cellular RNA editing.

Over the next five years, Carl's research will focus on understanding the effects of changes in Adenosine-to-Inosine RNA editing and how these contribute to disease development with the aim to finding new therapies for diseases like Aicardi-Goutières Syndrome and cancer.

NEW HOPE FOR ALZHEIMER'S

Although almost half a million Australians live with Alzheimer's disease, there are still no drugs to effectively treat it.

Professor Michael Parker and his team are aiming to change that by looking at the potential of specialised immune cells in the brain called microglia which are thought to support healthy functioning of the brain.

Funding from the Alzheimer's Drug Discovery Foundation and the Dementia Australia Research Foundation will support Michael's research into harnessing microglia to develop new treatments for the disease.

TURNING OFF TYPE 1

New funding from the Victorian State Government's mRNA Research Acceleration Fund will help Associate Professor Mark Chong and his team push forward the development of an Australian-first mRNA-based treatment for type 1 diabetes.

Building on recent developments in mRNA vaccine technology, Mark's project aims to create a new drug therapy for people living with type 1 diabetes by reprogramming the body's immune response.

INNOVATION & COLLABORATION

SVI leads agency the Australasian Type 1 Diabetes Immunotherapy Collaborative (ATIC), which was launched in 2022. ATIC's aim is to accelerate the development and delivery of immunotherapy treatments for people with type 1 diabetes.

Supported by JDRF Australia, ATIC is an Australia and New Zealand-wide clinical trial network of endocrinologists, immunologists, scientists and type 1 diabetes community members.

Bioinformatics

Cancer

Healthy Ageing

Immunology

Infectious Disease

Regenerative Medicine

THEME: CANCER
DISEASE: FANCONI ANAEMIA

CUT AND PASTE

The idea that our genes can be 'edited' to cure inherited diseases still seems like a long way in the future but it appears nobody told Dr Astrid Glaser that.

In 2022, Astrid was awarded the inaugural Captain Courageous Fellowship, funded by the Captain Courageous Foundation and Maddie Riewoldt's Vision, for her work on developing new treatment paths for the rare genetic condition, Fanconi Anaemia. Astrid is focusing on gene therapy techniques that could potentially repair a person's DNA.

"Fanconi Anaemia is a serious genetic condition that leads to bone marrow failure at an average age of 8 years old. The only current treatment is a bone marrow transplant which comes with a high risk of complications", she says.

'Bone marrow transplant - that's if a donor match can be found in the first place - comes with risks even in an otherwise healthy person.' Just like an organ transplant, bone marrow transplant can be rejected but it also carries risks unique to it.

'DREAM BIG'

Cheryll knew from early scans during her daughter's pregnancy, that her grandson Matty wasn't developing as expected.

"They did some tests at our hospital in Tasmania when he was about a month old, but we didn't find out until two months later that he had Fanconi Anaemia."

Fanconi Anaemia is a rare genetic disease that typically leads to a loss of blood production and requires a life-saving bone marrow transplant during childhood. People with the disease have an increased predisposition to congenital abnormalities, and cancer in later years.

Cheryll said they told Matty about his condition when he was about eight years old, when they organised for him to go to a camp for people with rare diseases.

"We told him he was going to meet other people that had the same disease as him. I don't think he really believed there were other people like him until he got there, but once he met the other kids and families, he felt like he had truly found his tribe.

"I try to get his younger brother Nate to participate in as many activities with Matty as possible, and we could see that the camp helped him understand that there were other families with children like Matty."

Matty is thirteen now, and Cheryll says he has started talking about cancer more as he's gotten older. "We're just waiting for that diagnosis."

“Gene therapy holds the potential to provide a new, relatively non-invasive treatment, without the dangerous complications”

“When you transplant bone marrow you also transplant part of the immune system so there is a risk that the donor’ immune cells will attack the patients,” Astrid explains.

“My goal is to repair the underlying changes in a person’s DNA that cause inherited Bone Marrow Failure Syndromes like Fanconi Anaemia.”

“Gene therapy holds the potential to provide a new, relatively non-invasive treatment, without the dangerous complications associated with a transplant.”

This kind of ground-breaking research could hold the key to curing a range of inherited conditions and is no longer merely in the realm of science fiction.

“As recently as the 1980s these types of genetic conditions were diagnosed with an “I’m sorry” and a plan to make you more comfortable. There were no treatments,” she said.

“Gene editing technology offers us the potential to locate and fix the diseases that are hard coded into our DNA. This will be a pretty exciting leap forward in terms of how we treat diseases that were once inevitable for those who carry the genetic mutation.”

Although still in its early stages, Astrid’s research has already surprised her.

“I’m actually surprised at how well it has worked,” she laughs.

“In research you expect failures, it’s how you gather data and move forward. But so far, everything we have tried has been successful. ‘I’m hopeful that this system will form the basis of new therapies for people affected by blood disorders.”

“We did the lab tour and just loved it. Everyone is so lovely and makes you feel like you’re part of something”

Despite Matty’s condition, he leads a normal teenage life.

“Anyone who’s met Matty knows he loves a chat, and he’s quite outgoing” Cheryll says with a laugh.

“He attends a phenomenal support school; he has autism, and battles a bit with numbers, but his communication and reading skills are at the grade 12 level.” Matty wears a hearing aid, has a special chair at school to raise him up and down to get his arms close to his desk, and has a motorised wheelchair, due to his hip dysplasia.

But his devices don’t do all the work – Matty does gymnastics at school and goes to an external gym twice a week, to help with his balance. He also swims to help with his muscles and works with an occupational therapist.

Throw in his medical appointments, and you can see Matty’s schedule is both full, and challenging.

Cheryll, Matty and Nate recently visited SVI to attend the FASA (Fanconi Anaemia Support Australasia) Family Day conference at SVI.

“We did the lab tour and just loved it. Everyone is so lovely and makes you feel like you’re part of something,” Cheryll says. “I admire immensely the ‘young gun’ researchers at SVI and encourage them to keep dreaming big.”

They just need to look at Matty, and he’ll keep their dreams flowing.

THEME: HEALTHY AGEING
DISEASE: METABOLIC DISEASE

CURIOUSER AND CURIOUSER

“It’s very simple to be told to lose weight, but it’s not simple to do it.”

Dr Kim Loh is a deeply curious person. For some scientists, solving a puzzle is what drives them but for Kim, the thrill comes in asking the question.

“I think curiosity is the most important attribute a scientist can have because research is hard. Without curiosity or passion, it can be gruelling.”

“I had initially wanted to become a medical doctor but when I started my Honours degree I became fascinated with insulin as a molecule. I wanted to better understand the cells that make insulin, and to me, that intricate detail became much more interesting than a medical degree,” he said.

This deep curiosity about a tiny molecule has led Kim to become an expert in metabolism.

“Metabolic diseases such as obesity, diabetes and its associated cardiovascular complications are major health concerns that we face these days as we live longer. Indeed, the incidence of age-related metabolic diseases nearly doubles from the age of 45 to 65,” he explains.

“Obesity affects billions of people worldwide and is directly connected to conditions like type 2 diabetes and non-alcoholic fatty liver disease.”

“It’s very simple to be told to lose weight, but it’s not so simple to do it. One of the complicating factors is a phenomenon called body weight rebound. Even if you diet and exercise and lose weight, the body tends to rebound back to its original size in about five years. No one knows why.”

Kim suspects, however, that this rebound may be tied up with a protein that is found in the brain called salt inducible kinase (SIK3).

“We have shown that this protein, SIK3, regulates appetite and controls weight. What we don’t know yet is how to control it.”

When asked about the movie-star famous drugs already being used for weight loss, Kim is circumspect.

“There are drugs designed to treat type 2 diabetes that do also lead to weight loss. These work by targeting the receptors which stimulate insulin and can lower your appetite. But they are quite new and we don’t know their long term efficacy. We are also already seeing body weight rebound when someone stops taking them.”

“Our research is taking a very different approach.”

“SIK3 is well understood to cause inflammation and there are clinical trials for drugs targeting it as a way to control chronic inflammatory disease. We are looking at these drugs for their potential to be an effective, long-term treatment for obesity and its subsequent diseases.”

“Once we fully understand SIK3’s role, we can find ways to control it. I think it’s not unreasonable to hope that in the coming years we will have a very effective, lasting treatment for obesity.”

THEME: HEALTHY AGEING
DISEASE: STROKE

DOUSING THE FIRE

When Dr Ashfaqul Hoque describes what happens in the brain in the minutes and hours after a stroke, he likens it to an ember becoming a raging bushfire.

“In an ischaemic stroke a blood clot blocks a vessel in the brain, cutting off the supply of oxygen and nutrients to the surrounding cells. This causes immediate damage to both nerve and other support cells but then the damage starts to spread rapidly beyond where the blood clot is. It’s like an ember which, fed by high winds and dry grass, becomes an out-of-control bushfire that decimates hectares of land before it is stopped”, he said.

“Occurring around every nineteen minutes in Australia, ischaemic stroke is the most common type of stroke, however, current treatments are effective in fewer than fifteen percent of stroke patients.”

“The biggest problem with current treatments such as clot-busting drugs or mechanical removal of the blood clot is that they must be carried out within four and half hours of the stroke. And they’re not suitable options for everyone. We desperately need new treatments.”

Supported by the SVI Discovery Fund, Ash is ever closer to creating just that.

“Our ultimate objective is to develop a ‘brain protecting drug’ that can be combined with blood clot removal or used alone to slow the damage the stroke causes to the brain.”

Ash and his team are focussing on the development of a drug that works by slowing the cascade of events which damage brain cells during a stroke.

“We know that an enzyme called AMP-activated protein kinase (AMPK) becomes overactivated during a stroke and is a major contributor to brain damage.

“We have discovered a drug that is able to block AMPK activity in brain cells. It basically allows us to put out the ember before it has the chance to grow into a bushfire.”

The research being done by Ash and his team applies state-of-the-art techniques to build a comprehensive map of the causes behind stroke damage.

This is expected to lead to major breakthroughs in understanding how brain cells are damaged by stroke and lead to discoveries that could profoundly improve the recovery and quality of life of people who’ve had a stroke.

“It’s like an ember which, fed by high winds and dry grass, becomes an out-of-control bushfire”

THEME: CANCER
DISEASE: AICARDI-GOUTIERES SYNDROME

HALTING THE ATTACK

The human immune system is like the most highly trained army in the world, recognising and efficiently dispatching invading pathogens through a complex system of attack and defence.

But when an overzealous immune system mistakes friend for foe the results can be devastating.

"Fundamental to a functional immune system is the ability to correctly distinguish between material from our own cells and from a virus," says Dr Jacki Heraud-Farlow from SVI's Cancer and RNA Biology Laboratory.

One of the first steps in an immune response is the body's recognition of common 'molecular signatures' of pathogens that allows it to initiate inflammatory pathways and recruit immune cells. Inflammation is an important part of the body's defence and healing processes.

Double-stranded RNA (dsRNA) is one of these molecular signatures from certain viruses. However, because our own cells also produce dsRNA, our body has had to develop ways to distinguish between the two. If our body can't make this distinction, it mounts an autoinflammatory response directed at its own dsRNA. Essentially, the body comes under friendly fire.

DEFYING THE ODDS

When Bianca's first baby was born, she and her husband were over the moon. But when Ace was about three months old, they knew there was something wrong.

"Ace was really unsettled and crying uncontrollably, so I took him to hospital," says Bianca. "He was referred to a paediatrician, however, he got progressively worse, so he was re-admitted. They found some damage to the basal ganglia part of his brain, but they couldn't provide a diagnosis, so I just threw myself into some physical therapy with him."

Five months later Ace received a diagnosis: Aicardi-Goutières Syndrome, a degenerative neurological condition with no available treatment. Ace has calcification in his brain, with small and thin blood vessels putting him at risk of stroke. The disease means he has lack of control in some parts of his body, and problems with his fine motor skills.

"Originally, they thought that Ace would have to use his head to control his electric wheelchair, which he got when he was 9. But as soon as they put him in, he was straight on the joystick and knew exactly what to do," says Bianca.

"He hasn't just mastered his wheelchair; he's also swimming twice a week and loves horse riding and bike riding. He also enjoyed for his first ever school camp to Sovereign Hill this year!"

“I love what I do and see it as a real privilege. Having support for my work gives me the gift of time to shed light on a disease in a way that can make a real difference to very young lives.”

This happens in a disease called Aicardi-Goutières Syndrome (AGS), an often fatal genetic childhood disorder that affects the brain, immune system and skin. In some people with AGS, mutations in a gene called ADAR1 disrupts the ability of their cells to distinguish their own dsRNA and that of a virus.

With no known cure and limited treatment options, AGS is an especially cruel disease. This is why Jacki’s research aims to provide crucial new insights and, one day, potential new treatments for this and other autoinflammatory diseases.

“We have identified new genes that modulate and can prevent inflammatory responses to our own RNA,” says Jacki. “The next steps are to build new knowledge of how dsRNA is recognised and regulated in cells so that we figure out new ways to target this pathway.

“Not only can we apply this to understand and identify new therapeutic targets for AGS but also to provide potential avenues to modulate the inflammatory pathways in other diseases. It will also offer new insights on how our immune system responds to viral infection.”
Jacki is one of SVI’s ‘Rising Stars’, recognised for her excellence as an early career researcher both here and further afield.

In addition to being a recipient of the Christine Martin Fellowship which was funded by 5point Foundation, Jacki was recently awarded an NHMRC Ideas Grant to build new understanding of the pathways controlling inflammatory responses.

“I love what I do and see it as a real privilege. Having support for my work gives me the gift of time to shed light on a disease in a way that can make a real difference to very young lives.”

During the Covid lockdown period, Ace surprised his family by learning to use a voice output device, which helps him to communicate with his classmates and join in conversations with his family and make requests for things he needs and wants.

“That is a milestone we can’t quite believe he has reached in his lifetime,” Bianca says.

A milestone made even more impressive, when you consider that when Ace was first diagnosed, Bianca and her husband Ian were told that the worst-case scenario was that he wouldn’t live past his 10th birthday.

“He’s now 11 and we look back on that and think that all things considered, he’s a very healthy child. He doesn’t have hospital admissions, he doesn’t get sick, he doesn’t have seizures and he’s not on any other medication, we’re so grateful he surpassed the 10-year mark. Others in our position haven’t been as lucky as we have.”

Bianca says that it gives her hope that research is actively focused on understanding the causes of the disease. “We’re just a normal family. Ace’s condition is genetic, so what happened to us could happen to anybody, and I am grateful that Jacki and the team at SVI are spending their time on something that is very important to us.”

“Ace is living his life with joy and happiness. Despite everything, Ace has allowed us to do some really great things that wouldn’t have been possible if he wasn’t who he is.”

“That is a milestone we can’t quite believe he has reached in his lifetime”

THEME: IMMUNOLOGY
DISEASE: TYPE 1 DIABETES

PEARLS OF WISDOM

Tom: "The best work comes from different people working together on the same problem"

Truly successful working relationships, the ones that span decades, life changes, and locations are not as common as you might think.

That's because it is rare for people to always be headed in the same direction at the same time. If ego or personality doesn't get in the way, good old life often does.

Tom Kay and Helen Thomas have one of those unicorn relationships. A truly successful partnership that has spanned thirty years, countless publications, scientific breakthroughs (and failures), and a clash over whether or not Crowded House are better than the Triffids.

"When I first met Helen, she was young, kind of a hippy, and violently disagreed with me about Crowded House, which is clearly one the world's greatest bands," Tom recalls with a chuckle.

Disparate musical ideology aside, neither could have predicted that this was the beginning of a working relationship that would still be going strong today.

"I had just come back from the US and was working alone in a lab at WEHI," Tom said.

"I had been pushing to be able to hire someone to work with me and they gave me this folder full of people who had applied for various positions and told me to pick one. I saw Helen's application which mentioned some technology and studies I was interested in, so I called her."

Helen jumped at the opportunity to return to Australia, coupled with the possibility of expanding her skills in an area she had developed a deep interest in.

"I was one of three members of Tom's lab when I started, and we were part of a bigger laboratory. I was really interested in the work they were doing. I had been immersed in molecular biology overseas and continued with that in Tom's lab, looking at how insulin-producing cells in the pancreas identified themselves to the body's immune system. This work, my very first project, with 30 years of effort on both of our parts, has now blossomed into the BANDIT clinical trial," she said.

Cramming different personalities together in a lab and then subjecting them to the stresses of research can break apart even the closest of working relationships but Tom and Helen have enough in common that they have made it work.

"We balance each other out, I think. Tom is very personable, and I am shy. He is fantastic at making connections with other researchers and this has been great for our research program. We have become good friends over the years.

"Helen is highly skilled, and her scientific proficiency and laser-like focus on getting things done gave me the room to pursue clinical work and take on other responsibilities. She just doesn't understand music, which is fine, she can't excel at everything," said Tom.

When asked what advice they would give to scientists just getting started in their careers, their answers are similar.

“If I had to give a fledgling researcher any advice it would be to plug into a team environment. Yes, you might be able to do it on your own - and some do - but the best work comes from different people working together on the same problem,” says Tom.

“I would definitely advise people to work with someone they like, trust and respect. And work with people who respect and appreciate you in return,” said Helen.

Despite almost coming to blows over 90s alternative rock vs pop, Tom and Helen have built a laboratory and a team that is changing the lives of people with type 1 diabetes.

Helen: “...work with people who respect and appreciate you”

THEME: IMMUNOLOGY
DISEASE: TYPE 1 DIABETES

BETWEEN TWO WORLDS

“I think scientists are the most resilient people I’ve ever met. They have to be.”

Even though from the outside it may seem like clinicians and medical researchers have similar goals, the ways they approach their work are more different than you might think.

Clinicians move at pace. They have a set number of hours in a day to see as many patients as they can, whereas research scientists have no option but to move more slowly. Scientific discovery takes time.

Dr Michelle So exists in a sort of borderland between both worlds.

“I trained as an endocrinologist initially because I liked that you could intervene early enough in a disease process to really make a difference,” she said.

“In my clinical work, I was deeply affected by the poor quality of life I was seeing for some type 1 diabetes patients. Despite available treatments, people were still having to endure amputations and a host of other equally poor outcomes. There had to be more I could do.”

It was with this in mind that Michelle undertook her PhD studies at SVI in identifying the specific immune cells that cause type 1 diabetes. After graduating in 2018, Michelle is now undertaking postdoctoral work at the Institute, while also continuing with her clinical commitments.

She has recently been appointed the Djinda Foundation Rising Star Fellow, which will help fund her work over the next 3 years.

“Moving from purely clinical work to the lab gave me the time to really think through concepts and remember why I was doing this in the first place. That’s something I am deeply grateful for.”

Michelle concedes, however, that joining a lab meant having to shift her mindset.

“Clinicians and scientists look at things so differently. It really was like learning a new language,” Michelle said.

“Working in a hospital you are moving so fast you sometimes don’t have time to eat or think beyond the immediate issue at hand. In the lab you have to take time to consider a problem from multiple angles in order to be fruitful. I think scientists are the most resilient people I’ve ever met. They have to be.”

A part of the baricitinib in new onset type 1 diabetes (BANDIT) project, Michelle hopes to continue in the space between academic discovery and patient care.

“Straddling the research and clinical environment is tricky. But it is only when the results of medical research are understood and adopted into clinical practice, that we really get to see improvement in patient care.”

THEME: BIOINFORMATICS
DISEASE: CANCER

RISE OF THE MACHINES

In his 1968 novel, “Do Androids Dream of Electric Sheep”, Philip K Dick created a world where artificial intelligence had become indistinguishable from human. More than fifty years later, a team at SVI aren’t building androids, but they are creating intelligent machines.

Dr Carlos Pena-Solorzano, recipient of a 2022 Rising Star Award, is part of a team that hopes to one day revolutionise health care, using the power of artificial intelligence (AI).

Currently, reading images such as medical scans or x-rays is done by a human and takes a highly trained eye. Depending on the application, it could also take a few highly trained eyes to interpret a single image.

“We are using images that have already been interpreted by a human, to teach the AI what to look out for. Our hope is to one day help speed up the reporting of results from images such as mammograms,” says Carlos.

Teaching machines to learn seems a better bedfellow for a space program than a medical research institution, but for those in SVI’s Bioinformatics & Genomics Lab, there is no better place for it.

“There is such a huge cross section of skills working together here. We have people with backgrounds in computer programming, statistics, engineering, as well as the more traditional health sciences,” he said.

“It’s exciting working with so many other skillsets. A multidisciplinary team forces you to change the way you approach your work which, I think, makes it better.”

Although AI is now science fact rather than fiction, the rise of the machines is still a long way off.

“We aren’t even remotely close to relying solely on artificial intelligence to interpret medical images or make any kind of diagnosis,” he said.

“We still need humans in the loop to check and balance the results. In the future we might start seeing that change, but it certainly isn’t advanced enough to operate on its own just yet.”

This cutting-edge work is a world away from where Carlos thought his career would take him, but he can’t conceive of ever doing anything else now.

“When I was doing my Master’s degree in engineering, I spent time teaching robots how to see and interpret images. This made me realise that my original goal of working in industrial automation was not the right path.”

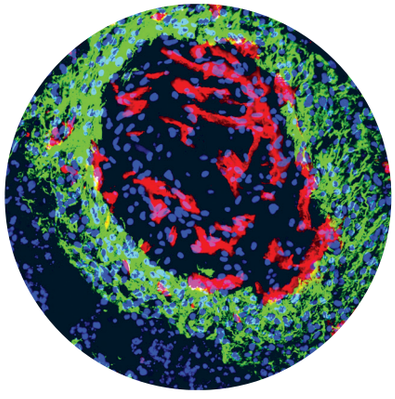
“I knew that I could make a bigger impact in medical research.”

“Our hope is to one day help speed up the reporting of results from images such as mammograms”

THEME: REGENERATIVE MEDICINE
DISEASE: FRIEDREICH ATAXIA

HEART OF GLASS

“We have, essentially, grown a beating heart in a dish to understand exactly why people with the disorder develop heart problems.”



CROSS-SECTION OF A CARDIAC ORGANOID STAINED TO SHOW DIFFERENT CELL TYPES

Degenerative diseases are, as a general rule, cruel. They take their time robbing us of some of the most fundamental aspects of what it is to be ‘us’.

To be diagnosed with Friedreich ataxia as a teenager is to be told that your future holds the slow loss of your muscle co-ordination, your vision, hearing, and speech. You will also likely develop a serious heart condition.

Affecting one in 30,000 Australians, Friedreich ataxia is most commonly diagnosed between the ages of five and eighteen years old and there is currently no cure.

Thankfully, Dr Jarmon Lees is one of a dedicated and talented group of researchers who refuse to accept that conditions like Friedreich ataxia are just a fact of life for an unlucky few.

“The main cause of premature death in people with the condition is heart failure but it is unclear exactly what the disease does to the heart. Up until now there has been no way to mimic the heart of someone with the disorder using animals or cell models in the lab to allow us to really understand how damage occurs,” says Jarmon.

Understanding how and why something occurs is the first step to stopping or limiting it which is why Jarmon and his team did something unique.

“We developed a way to ‘grow’ a diseased heart in the lab, using stem cells that have been reprogrammed from adult cells donated by Friedreich ataxia patients. We have, essentially, grown a beating ‘heart in a dish’ to understand exactly why people with the disorder develop heart problems.”

This now means that the team can begin testing a range of drugs that are already approved for other conditions and see if they can be repurposed into effective treatments for heart disease in people with Friedreich ataxia.

Growing a ‘heart in a dish’ is exactly as hard as it sounds. It’s also as cool as it sounds since Jarmon’s team are doing it from cells that didn’t start out as stem cells.

“We develop in the womb from a stem cell. We now have ways to ‘wind the clock back’ by turning other cells from an adult back into stem cells. We can then apply different conditions to coax these newly created stem cells to form all the different cells which make up the heart.”

After making the different cell types, the researchers combine the cells together in a dish in the incubator in the lab. In just a few short days the cells form an organoid that beats rhythmically.

Jarmon is using these organoids to provide hope to young people diagnosed with Friedreich ataxia.

THEME: REGENERATIVE MEDICINE
DISEASE: LIVER DISEASE

MORE THAN CHOPPED LIVER

It is generally accepted that researchers are busy. In addition to the actual science, they have students to supervise, papers to prepare, a never-ending stream of grant applications to write. To an outsider, their buckets seem full to overflowing.

Then you meet Dr Kiryu Yap. Not only is Kiryu trained as a surgeon, he also has a PhD and has just completed an MBA while also working together with Associate Professor Geraldine Mitchell on transforming care for patients with liver disease.

Asked if he hates sleep, Kiryu smiles ruefully, "Sometimes it feels like that but what I'm trying to do is bring together as many pieces of an overall picture to really make a difference in the clinical care of people with liver disease."

Liver disease is an encompassing term, it can mean a wide range of diseases from cancer to hepatitis and non-alcoholic fatty liver. A lot of conditions with one thing in common – they all make you extremely sick.

"In most liver disease cases, it isn't detected until quite late, which means that the only option left is a liver transplant but even then, because liver disease makes you so sick, most people aren't well enough to get the transplant," he explains.

Chronic liver disease affects more than six million Australians. For people with end-stage disease who are well enough for a transplant there comes the life-long risk of complications caused by immunosuppression as well as organ rejection.

This is why Kiryu is focused on finding new ways to treat liver disease.

As part of a multidisciplinary team, Kiryu is creating liver organoids – "mini-livers" grown from cells that replicate the structure and function of human liver. The aim is to be able to use the liver organoids as replacement liver tissue in conditions of liver disease.

"I guess as a surgeon my approach is less "can we do this" and more "how do we do this". How do we take cells from the patient, use advanced techniques to address the underlying problem and then put them back into the patient?"

It's a question Kiryu is dedicated to answering.

"I don't think we're that far off when it comes to new treatments. There is a critical need for them and the field of regenerative medicine is advancing quickly. The work we're doing is just the start of what could transform the care of people with liver disease."

"The work we're doing is just the start of what could transform the care of people with liver disease."

FINANCIAL SNAPSHOT

INCOME

Competitive research grants	**32%**	10,691,202
Australian Government infrastructure support	**5%**	1,800,105
Victorian Government infrastructure support	**5%**	1,720,167
Philanthropy (legacies, bequests, donations)	**13%**	4,149,204
Contracts and other income	**42%**	13,998,708
Investment income	**3%**	775,955
Total Income ($)		**33,135,341**

EXPENDITURE

Research	**51%**	18,051,168
Contract services	**22%**	7,785,795
Transfers to collaborators	**4%**	1,282,214
Building operations	**4%**	1,503,649
Administration	**15%**	5,423,736
Foundation	**3%**	1,121,496
Commercial development	**1%**	440,482
Total Expenditure ($)		**35,608,540**

SVI BOARD

Mr Tony Reeves, Chair
The Honourable Chris Pearce, Deputy Chair
Mr Michael Burn
Ms Melanie Eagle
Ms Karen Inge
Professor Thomas Kay
Professor Erwin Loh
Mr Simon Marton
Professor Mike McGuckin
Ms Fiona Rowland
Professor Ian Smith
Dr Marcus Tierney
Mr Michael Wachtel
The Honourable Kathy Williams

SVI FOUNDATION BOARD

Ms Karen Inge, Chair
Ms Christine Tarascio, Vice Chair
Ms Rhonda Barro
Ms Kallie Blauhorn
Ms Caroline Daniell
Ms Bernadette Dennis OAM
Professor Thomas Kay
Ms Margaret Lodge
Ms Claire O'Callaghan OAM
Mr Tony Reeves
Ms Yan Li Wang

WITH THANKS – RECENT PAST BOARD MEMBERS

Ms Jennifer Coutts
Mr Phillip Huzzard
Mr Stephen Marks
Dr Megan Robertson

SVI FOUNDATION
SUPPORTER STORY

JOAN OF HEARTS

Joan has always had a big heart. Over a period of 50 years, along with her late husband Brian, she fostered more than 300 children from diverse backgrounds.

Joan was drawn to helping those facing challenges but she sadly faced her own when one of her twin daughters, Michelle, was diagnosed with terminal breast cancer.

As well as being a much loved daughter, Michelle was the devoted wife of Greg and a loving mother to Glen, Kate and Emma.

After struggling for several years to come to terms with Michelle's death, Joan found herself in a financial position where she could support the people and causes she cared most about.

When she was introduced to research being undertaken by Associate Professor Andrew Deans and his team at SVI, Joan felt that here was an opportunity to create a wonderful legacy in honour of Michelle.

Joan and her family established a grant to directly support Andrew and PhD candidate, Lara Abbouche, to better understand inherited breast cancer.

On a recent visit to SVI, the family met with Andrew and Lara to learn more about their research.

THEME: CANCER
DISEASE: BREAST CANCER

LARA OF GENES

Breast cancer is the second most common cause of cancer-related death in Australian women. The disease occurs when cells in the breast begin to grow abnormally and uncontrollably.

While much work remains to be done to determine what causes breast cancer, it is known that about 10% of cases arise from an inherited predisposition due to the actions of a faulty gene.

Associate Professor Andrew Deans' team recently identified a gene called 'FANCM' as strongly linked to breast cancer predisposition.

Ground-breaking research like this is usually a team effort and that was very much the case for the FANCM discovery.

"One of our students, Lara Abbouche, was instrumental in this research. She started working on it as an undergraduate and is still working on it as a PhD," Andrew said.

"She is quickly on her way to becoming a leading expert in FANCM and breast cancer."

Lara's work helped provide the first ever evidence that faulty versions of FANCM can directly cause inherited breast cancer.

“I am honouring a beloved member of our family and in so doing I am giving the great hope of a better tomorrow to the generations to come.”

Andrew and Lara are exploring the role of a gene called FANCM in breast cancer, with the aim of developing targeted therapies for its treatment.

Joan and her family were delighted to hear first-hand about the impact of their grant and how their relationship with SVI is honouring their beloved Michelle.

Through her Private Ancillary Fund Joan is planning to continue with an annual grant of $40,000 to support the research as well as establishing an endowment that will fund a research fellowship in honour of Michelle.

To be known as ‘Michelle’s Dragonfly Fellowship’, the funding will ensure that Michelle’s legacy will endure and will continue to involve Joan’s family for many generations to come.

Losing her beloved daughter led Joan to putting appropriate arrangements in place during her lifetime to ensure her daughter’s memory will endure forever.

Another way of doing this is by a gift in your Will, which can establish a legacy to support the ground-breaking work at SVI.

Joan says, “The way I look at it, I am not taking anything away from my family or my kids. I am honouring a beloved member of our family and in so doing I am giving the great hope of a better tomorrow to the generations to come”.

To ensure your generous gift gets to where it is intended it is important to include the correct wording and legal details in your will.

To discuss further, please contact Jo Hastings at jhastings@svi.edu.au or 03 9231 3265

“We were able to show that certain inherited versions of FANCM do not work properly in a process that is normally required for the prevention of cancer,” Lara said.

“From that work I was able to invent a series of assays that can now be used to test FANCM.”

This now means that when women have genetic tests for FANCM mutations, it can be determined whether that particular mutation puts them at risk.

These results represent an exciting leap forward in our ability to diagnose inherited breast cancer.

With generous funding from Joan of Hearts, Lara will continue this important work.

“I’m currently focusing on what the normal function of FANCM looks like and how it prevents breast cancer,” Lara said.

“I am also working on ways to develop new therapies that specifically target FANCM for prevention or treatment of breast cancer.”

Lara is part of a highly specialised team who are recognised internationally as the world experts in FANCM and its function in cancer.

Lara’s work helped provide the first ever evidence that faulty versions of FANCM can directly cause inherited breast cancer.

SVI FOUNDATION
CATALYST CIRCLE

CHANGE MAKERS DREAM BIG

SVI's Catalyst Circle provides a vehicle for donors who are motivated to enable impactful discoveries, quickly.

Like all scientists, researchers at SVI need access to the best tools and the latest technology, to do their work accurately and quickly and progress their research to the next step – whether it be clinical trials for new therapies, or further studies to build on and extend the knowledge they've gained.

That is where SVI's Catalyst Circle comes in.

Led by SVI Foundation Board members Rhonda Barro and Margaret Lodge, the Catalyst Circle provides a vehicle for donors who are motivated to enable impactful discoveries, quickly.

Catalyst Circle members donate towards the purchase of equipment, with the understanding that their gift will be used to purchase equipment or technology within that year.

"Due to the expense of new research technologies, the Catalyst Circle has increased our fundraising goal from $150,000 in 2022 to $1 million in 2023," says Rhonda. "It's a big goal, but we have great supporters who dream big. I am optimistic we will reach that goal."

Rhonda recently invited a friend, Frank Nagle – Managing Director of B&S Land, to join the Catalyst Circle.

"When Rhonda approached me to join SVI's Catalyst Circle, she didn't have to ask twice," Frank says.

"I had both personal and benevolent reasons to accept Rhonda's invitation. The Institute works closely with some of the clinicians at St Vincent's Hospital in Melbourne, where both of my parents spent a part of their careers. My father was a surgeon and my mother a nurse, and we spent some of our Christmas holidays going on visits to the hospital with Dad, mainly to see Santa Claus!

"When I saw what SVI's Catalyst Circle was doing, and then met with Tom Kay and some of SVI's researchers, I could see first-hand the important level of their work, and just how much it costs to buy a high-quality and precision microscope for research.

"Very soon thereafter, my wife and I agreed to invest in SVI's research, and to donate $50,000 to the Catalyst Circle," Frank says.

Rhonda and Margaret share Frank's enthusiasm and are determined to keep the SVI tool shed full.

"The Catalyst Circle gives SVI the flexibility to respond quickly to promising opportunities to invest in new technology and equipment, where the need is greatest," says Margaret. "We want to continuously 'build' the Catalyst Circle, so that we can raise funds for the purchase of vital equipment and technology to support their cutting-edge medical research."

To become a part of SVI's Catalyst Circle, or to learn more, contact SVI Foundation CEO David Drysdale on 9231 2480 or via email at foundation@svi.edu.au

CATALYST CIRCLE IMPACT

The Osteomeasure software program, made possible by the Catalyst Circle last year, has enabled Dr Natalie Wee's bone research to progress.

Natalie's research focus is on understanding the signals that stimulate bone formation in the hard outer shell of our bone, called the periosteum. This is an important step forward in supporting the design of new drugs, for instance to specifically strengthen the wrist and hip, sites where current osteoporosis treatments are much less effective.

We are inspired by discovery and driven by purpose.

We seek new knowledge to improve health outcomes, reducing the burden of ill-health on individuals and their loved ones.

We are dedicated, committing all our skills and energy to the pursuit of research excellence.

We bring the best minds to solve critical health challenges, and we provide them with the tools that allow them to push the boundaries of medical research.

We build relationships – with clinicians, philanthropists, fellow researchers, industry, and the community – to meet the need, head-on.

We will stay the course, because we believe that for every question there is an answer.

We just need to find it.

DONATING TO SVI

Please mail this slip in the reply-paid envelope to: 9 Princes Street, Fitzroy, Victoria 3065
To give online: **svi.edu.au/support/donate**

I would like to support SVI and allocate my gift to:

☐ SVI Discovery Fund (research support)
☐ SVI Rising Stars (young scientists)
☐ SVI Catalyst Fund (equipment)
☐ SVI's Highest Priorities
☐ PhD Student Scholarships

Please make my monthly* recurring gift:

☐ $42 ☐ $63 ☐ $85
☐ Other $ _____

**gift is ongoing unless you notify us otherwise*

Please accept my one-off gift of:

☐ $500 ☐ $750 ☐ $1,000
☐ Other $ _____

Please make my receipt out to:

Title First Name

Surname

Address

Suburb

P/code State

Email

Tel

Date of birth / /

To make my gift:

☐ Cheque
(please make payable to St Vincent's Institute)

☐ Credit card
(please tick one of the following cards and complete details)

Card type (please tick)
☐ Visa ☐ Mastercard ☐ Amex

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expiry date

Donation amount

Name on card

Signature

Have you considered making a gift in your Will to SVI?

☐ I have already included SVI in my Will
☐ I am intending/considering leaving a gift to SVI in my Will
☐ I would like more information

SVI

St Vincent's Institute
MEDICAL RESEARCH

St Vincent's Institute of Medical Research
t +613 9231 2480 w svi.edu.au
address 9 Princes Street, Fitzroy, Victoria 3065, Australia
f +613 9416 2676 e enquiries@svi.edu.au