THE AGE

Good Weekend

# The artificial heart set to transform medicine – and the Aussie who invented it

Biomedical engineer Daniel Timms lost his father to heart disease. By then, thanks in part to the pair's kitchen-bench experiments, the unassuming Queenslander was well on his way to inventing a permanent, total artificial heart.

By Amanda Hooton

APRIL 20, 2024

This story is part of the April 20 edition of Good Weekend. See all 13 stories.

Listen to this article
31 min

One day this may be one of those eureka stories everybody knows, like Newton and his apple; Fleming and his Petri dish; the Wright brothers and their aeroplane. Daniel and his dad's plumbing. Because that's where Daniel Timms' BiVacor total artificial heart began: in a backyard in Ferny Hills, Brisbane, filled with ponds and water fountains, built on the weekends by a small blond-haired boy and his dad, a plumber.

There's a picture of the pair from this time: one of those old, amber-toned images that is, somehow, intensely moving. Timms is two years old, sitting beside what appears to be an irrigation trench, his little body intently focused on the tall figure of his father. Gary Timms is crouching in front of his son, long fingers screwing something together. *Look at this, mate. Can you see? This is how you do it.*

Twenty years later, in 2001, Gary Timms, at just 50, had a heart attack. He survived, but in the aftermath, his son realised two things. One: his father's heart was irrevocably damaged. Heart failure can take years to kill a person, but eventually Gary's labouring, leaking heart would stop, and he would die. And two: perhaps he, Daniel Timms, by then a PhD student in biomedical engineering, could build a new heart to save him.

Almost every day since, Daniel Timms has been working on this heart. In the early years, Gary helped him. Together they made a model of the human circulatory system out of pipes from Bunnings. As Timms has explained it, they'd go to the store on weekends, sit on the floor in the

plumbing aisle, and connect bits and pieces while interested bystanders stopped to ask questions, which the duo answered by saying they were building a fish tank. (If they told the truth, people got too interested, and Daniel Timms – an intensely non-attention-seeking sort of person – found it too, well, attention-creating.) Then they'd take their selected pipes and valves and U-bends home and add them to the rig they'd set up on the kitchen bench. Timms' mum Karen, a high-school science assistant, had to manoeuvre around it to get to the oven.

That was more than 20 years ago. Today, a burnished titanium device that carries the visible DNA of those kitchen-bench days is about to be implanted in a human. It may have already happened by the time you read this story. And if it works as many of the world's foremost experts believe it will, the plumber's son will have rewritten medical history.

Daniel Timms, aged two, watching his plumber dad Gary in their suburban Brisbane backyard. COURTESY OF DANIEL TIMMS

**Heart disease** is the biggest killer on earth. And heart failure, in which the heart doesn't pump enough blood to supply the body's needs, affects more than 64 million people globally, including as many as 500,000 Australians. About 60,000 Australians are newly diagnosed with heart failure each year, and more than 1500 people are hospitalised every day. In this country, according to the Heart Foundation, on average, one person dies of heart failure every three hours.

In the US, it's estimated that 100,000 patients are in immediate need of either a VAD (a ventricular assist device, useful if only one side of the heart needs help) or a total heart transplant. In Australia, the numbers are much smaller – in the hundreds – but wherever you are, the outlook for severe heart failure is bleak. Drug therapy is limited, and though heart

transplant is the gold-standard treatment, donor hearts are few and far between: only about 5000 become available globally each year.

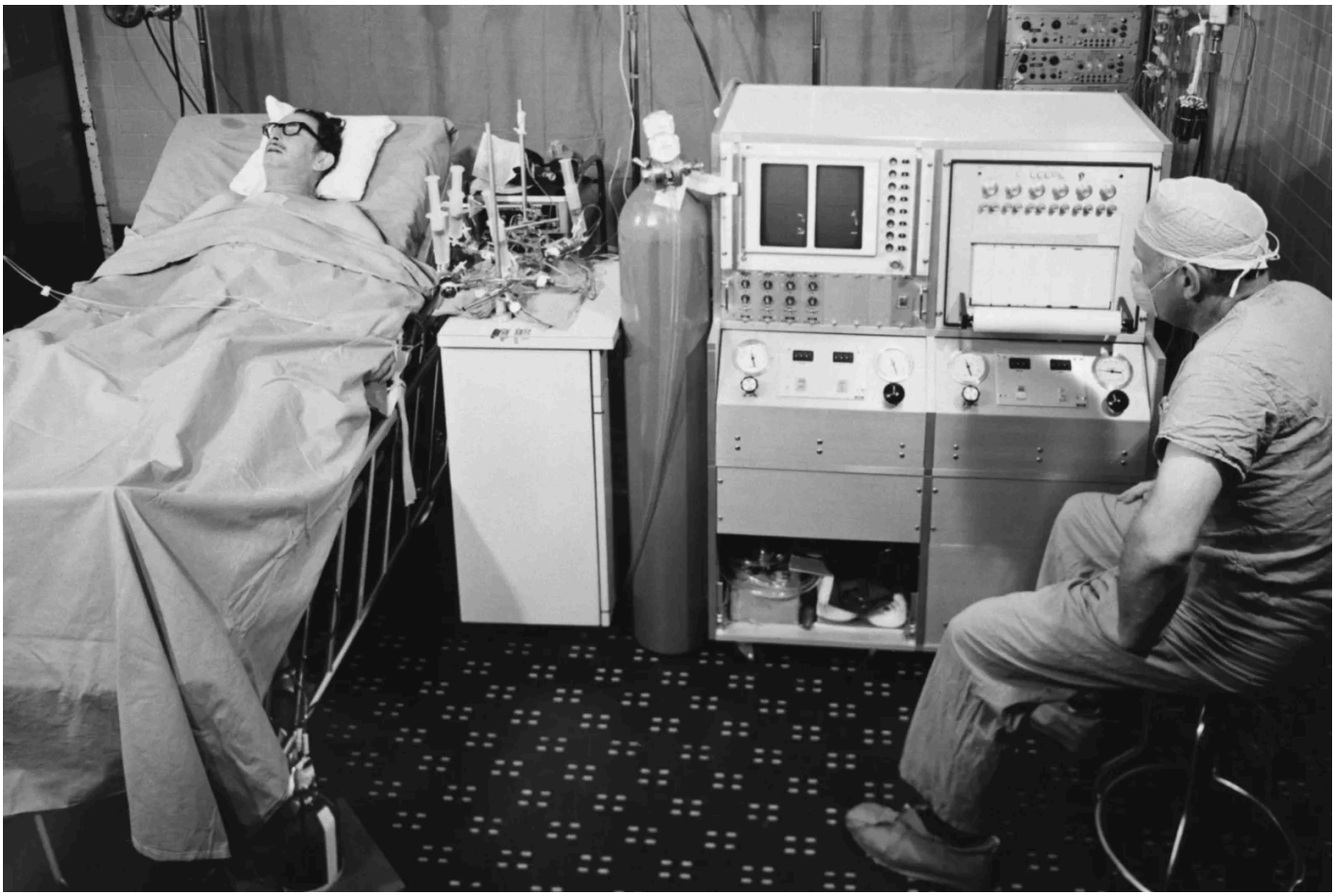
Even if you're lucky enough to get one, heart transplant itself is no picnic. Recipients must take a daily cocktail of drugs, including powerful immunosuppressants, which are toxic. They make you vulnerable to infection, they can contribute to illnesses including cancer, and they are a significant part of the reason that heart transplant has only a 50 per cent survival rate after 10 years. You can have a second transplant, but then the odds are even worse.

"That's why doctors are very cautious about doing a transplant in young patients," Daniel Timms will tell me. "As one doctor said to me, 'I know that if I do a transplant on a young kid, I'm consigning them to an early death.' But at this point, there's nothing else you can do."

This, in a nutshell, is the point of a total artificial heart. To develop something that doesn't set up a storm of defensive reactions in the body that ends only with death; to offer patients something other than a life dependent on drugs, vigilance and luck.

Timms himself sometimes likens the artificial heart dream to the race to put a man on the moon. In the heady optimism of John F. Kennedy's 1960s America, both dreams seemed well within the grasp of science. And indeed, the moon landing – on the face of it the more complex undertaking, filled with potential catastrophe – occurred, relatively speaking, both swiftly and with little loss of life. It was the heart that remained recalcitrant, as hearts so often do. More than 50 years after Neil Armstrong first walked on the moon, humans have yet to build a successful artificial heart.

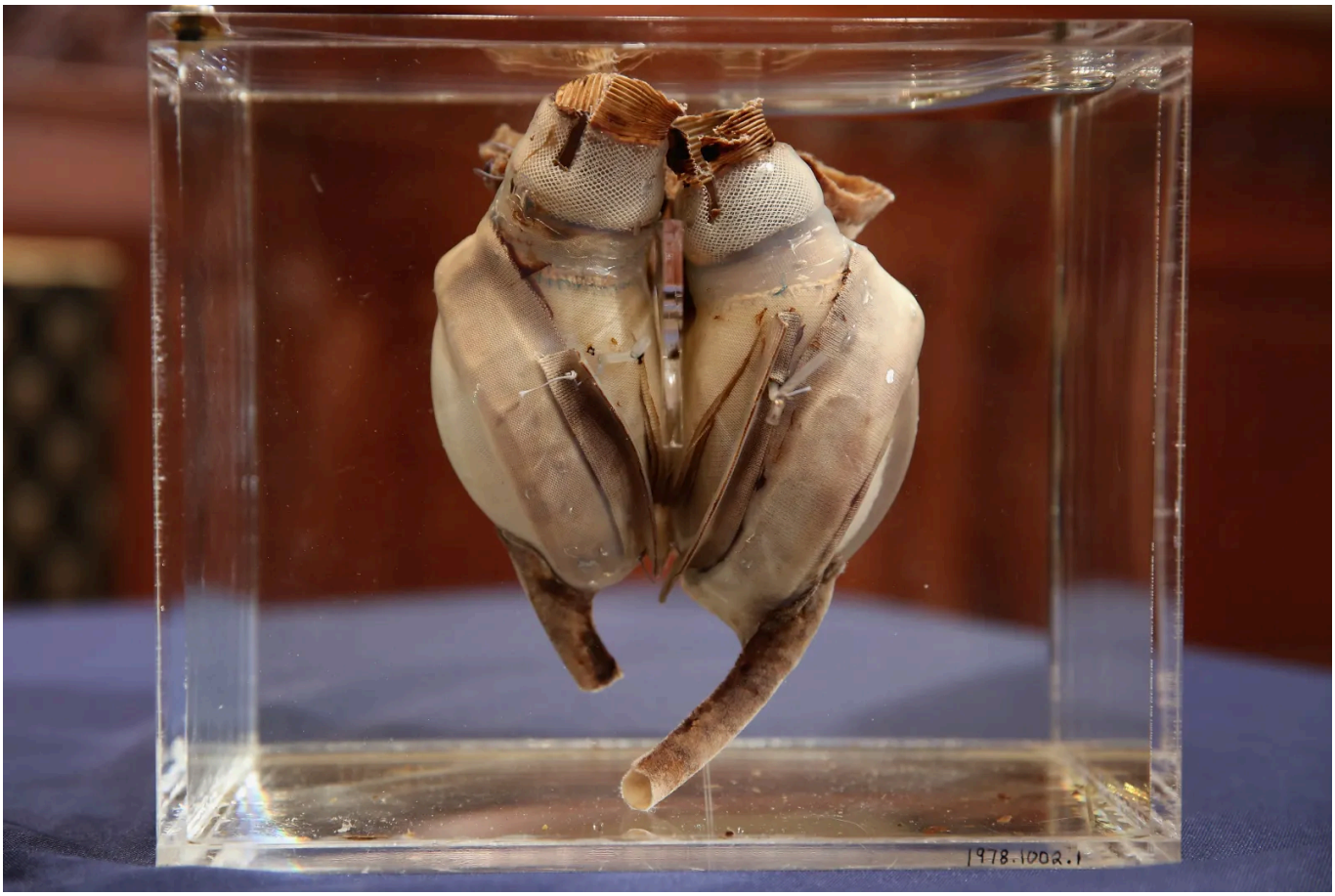
The first attempt was made (like the moon landing) in 1969, in the unlikely city of Houston, Texas. For the previous decade, two American cardiac specialists, Dr Denton Cooley and his boss Dr Michael DeBakey, had been frontrunners in the artificial-heart race. One Friday in early April 1969, when DeBakey was out of town for the weekend, Cooley persuaded one of DeBakey's young surgeons, Domingo Liotta, to use the artificial heart Liotta had been developing under DeBakey's supervision. Using an operating theatre at the Texas Heart Institute (now one of the world's leading cardiac treatment and research centres), they implanted it into a 47-year-old man called Haskell Karp.



Haskell Karp, recipient of the first artificial heart implant, the Liotta-Cooley heart, recovering from surgery in 1969. Previously, the device had only been tested on seven animals. Karp survived 64 hours until a human heart transplant became available, but died 32 hours later. GETTY IMAGES

This heart was air-powered, connected by plastic hoses to a controller the size of a chest freezer, and made of two small chambers of rubbery plastic. It looked like a pair of very small bellows: the kind of thing you'd use to stir up a goblin campfire. As a device, it was virtually untested: it had only been trialled in seven animals, and four of them had died on the operating table. Haskell Karp survived for 64 hours, long enough to receive a human heart transplant. He died 32 hours later of kidney failure and pneumonia.

Dr William (Billy) Cohn is an internationally renowned heart surgeon, device-deviser and present-day artificial-heart-Daniel-Timms-evangelist at The Texas Heart Institute. After that first operation, Cohn explained during a presentation in Texas recently, "For the next 40 years [DeBakey and Cooley] didn't speak. They were in hospitals separated by a car park, and they became the two busiest heart surgeons in the world – in the 1980s, their combined programs performed more heart surgery than was done in all of Europe. And they didn't speak."




The Liotta-Cooley heart was the first completely artificial heart implanted into a human being. GETTY IMAGES

In the world of artificial hearts, the practical and ethical issues that caused this feud still exist today. Is such surgery outrageously hubristic or a valiant attempt to preserve life? None of the devices designed since 1969 – including the SynCardia, the AbioCor, the Carmat – have proven that life with an artificial heart is viable long-term. Some patients have survived for months, and in very rare cases, years. But all artificial hearts to date have been used temporarily, as bridge-to-transplant devices. And sometimes – often – their recipients have died before reaching this goal.

Why have these devices failed? Let us count the ways. Traditionally, artificial hearts have been based on Mother Nature's version, with its chambers and valves – which means they've had multiple moving parts. They've been pulsatile – pumping blood in pulses, just as the heart does. They've been large: too big for most women, and all children. All of them (bar the AbioCor, which was abandoned after $US250 million of investment when all 14 of its trial patients died) have had permanent drivelines, powering and controlling the heart from an external box – the controller – that must be worn 24/7.

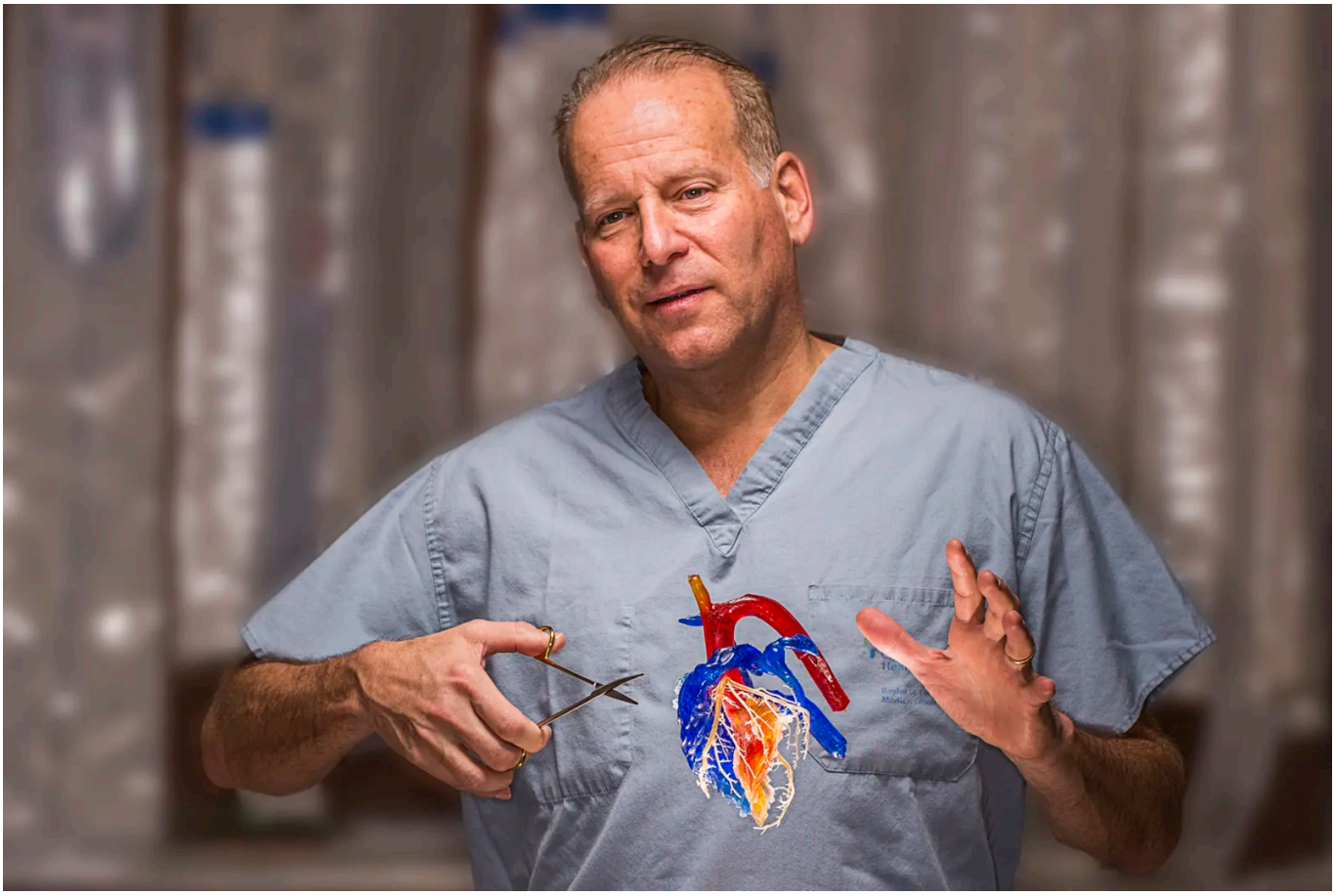
Perhaps unsurprisingly, all have had basically the same set of problems. Every artificial heart so far has caused blood clots, which kill patients. All have made their recipients vulnerable to infections, especially through the drivelines, which kill patients. Their size has rendered them essentially useless to more than half the world's population. And most fundamentally of all, they've ultimately failed to do the one apparently simple – in fact, profoundly difficult – thing a heart is designed to do: keep pumping.

The human heart beats, on average, just over once a second. That's about 70 beats a minute, 100,000 times a day, 37 million beats a year. No man-made device on earth has ever come close to matching that.

Until now.

Maybe.

Today, in the offices of Daniel Timms' company, BiVacor, in Huntington Beach, California, several artificial hearts are pumping. (Timms has been based largely in the US for more than a decade.) These BiVacor hearts are nothing like the human heart. They do not have chambers. In their base mode, they are not pulsatile – which means a person implanted with one would have no pulse. They have no valves and only a single moving part. They are heavy (about 650 grams) but small – small enough for some children and virtually all women. In animals, they cause far fewer blood clots than any previous artificial heart; so few that several animals implanted with them have not required blood-thinning medication. They intrinsically adjust to changes in blood flow, exertion and position when they are inside a living body. They do have drivelines and a controller, both of which Timms hates. But they also have something else. So far at least, they have an unblemished ability to keep on pumping.



Renowned heart surgeon Billy Cohn, now BiVacor's chief medical officer: "This thing will pump until the Earth spirals into the sun!" GOOGLE IMAGE

"We've got eight of these, two years on, without a failure," Billy Cohn, now chief medical officer of BiVacor, explained during his presentation, his drawl even more pronounced than usual in his excitement. "We have one pump that's been pumping for five years. This thing will pump until the Earth spirals into the sun!"

---

**Australians,** it seems fair to say, are slightly more understated than Americans – and Daniel Timms is understated even for an Australian. Indeed, he's so quietly self-effacing

that when I interview him, I spend our entire conversation in an agony of apprehension that my tape recorder won't pick up a word he says.

It's also true that, historically, this understatement has not always served us well when it comes to world-changing technology. The phrase "punching above our weight" comes up several times during my research for this story, and it's used, each time, to describe our national ability to come up with cool stuff in the fields of science and medicine: the CPAP machine to treat sleep apnea; Wi-Fi; the human papillomavirus vaccine; the solar cell. But then, when it comes to manufacturing, selling and profiting from our innovations, another phrase appears: some variant of "now made and sold overseas".

According to conventional wisdom, Australia simply doesn't have the cash to fund the massive costs of bringing biotech "off the bench", as University of NSW biomedical engineer Dr Michael Stevens puts it, through development and trials. Nor do we have the specialised manufacturing infrastructure to actually make things here. Instead, we export our intellect the way we do our mining and agricultural products – as a primary product, to be refined, manufactured, marketed and profited from overseas.

---

## *'There's a "gulp" moment where out comes the heart and in goes a device that you hope's going to work.'*

St Vincent Hospital Sydney's Dr Paul Jansz

But recently, the federal government has taken steps which might disrupt that story. In February (a month before its announcement about investment in domestic solar cell manufacturing, as it happens), the Medical Research Future Fund awarded $50 million to a single, multifaceted Australian biotech initiative: the Artificial Heart Frontiers Program (AHFP) for the development of devices to assist failing hearts. A multidisciplinary consortium led by Melbourne's Monash University but based all around the country, the program's remit is partly to do research, but there's also an explicit goal to "seed an entirely new Australian specialised industry", as the website puts it. In other words, to patent, manufacture and market locally invented, globally relevant heart-device technologies. "It's a whole ecosystem," says cardiologist Professor David Kaye from Monash, who is one of the co-leads on the program. "If you look around the world, I can't think of another program like this – engineers and clinicians working together, with proper funding, governance, structure."

Carolyn Stone, the program's chief of operations, hopes it addresses the often siloed nature of research. "Everyone's incredibly good at their thing," she explains. "The key to getting something to market is that you've got to bring all the pieces together. It's not just having brilliant people in the lab, you've then got to have experts to take it to clinical trials; people for development; people to get it into production and to the market. That's the big challenge."

To solve it, the AHFP has gathered what it hopes is an Avengers-style team of experts. As well as nationally recognised cardiologists David Kaye and Professor Christopher Hayward from St Vincent's Hospital Sydney, there are people such as Griffith University associate professor Michael Simmonds, an expert on the way blood responds when it flows through man-made materials instead of living tissue. And University of Queensland professor Cara Wrigley, who understands that patients living with external controllers still need to take showers and get through airport security without their electronics shorting out or setting off a bomb alarm. And

authorities like UNSW professor Nigel Lovell, who creates remote patient-monitoring platforms, and Dr Michael Stevens, who researches physiological control systems for cardiac devices; and Monash professor David McGiffin, who's investigating driveline infections and mini-pumps. There's even Daniel Timms: BiVacor is one of the program's flagship devices – it will receive $17.5 million of the $50 million total. This money will support the clinical studies of Timms' heart; a ventricular assist device BiVacor also has in development; and various technologies that will support both. It's hoped, for instance, that some components of the BiVacor heart will be made in Australia.

Dr Paul Jansz is set to perform St Vincent's Hospital Sydney's first BiVacor implant, which he describes as "the Mars expedition". KATE GERAGHTY

Nothing like the AHFP existed when Timms started out, of course. But ironically, many of the people who are now part of it – professionals with distinguished careers and international reputations – have worked on BiVacor over the years, often as students, drawn in by Timms' ability to attract other people as crazily committed as he is.

Professor Shaun Gregory, for example, met Timms when he was a teenage undergraduate in Queensland; Timms was his PhD supervisor. Today, he's co-director of the AHFP and director of the Centre for Biomedical Technologies at Queensland University of Technology, as well as the president-elect of the International Society for Mechanical Circulatory Support. "If you want to call us 'The Avengers fighting the common enemy of heart failure'," he says, "that's OK."

Professor Shaun Gregory, director of the Centre for Biomedical Technologies at Queensland University of Technology: "If you want to call us 'The Avengers fighting the common enemy of heart failure' … that's OK."
GOOGLE IMAGE

John Fraser, one suspects, would don a superhero suit in a heartbeat. He is now, among other things, the director of ICU at St Andrew's War Memorial Hospital in Brisbane, but he first encountered Daniel Timms two decades ago at Brisbane's The Prince Charles Hospital as a young intensive-care doctor. Sitting in his research office one day, he suddenly noticed an annoying *plip-plop, plip-plop* coming from next door.

"Eventually I went to have it out with the weirdo making the noise, and there was Daniel with his Bunnings pipes all over the bench," Fraser recalls. "I said, 'What's this?' And he said, 'It's how a heart works.' And I said, 'Umm, not really.' "

Before long, however, Fraser was a convert to what Billy Cohn in Texas has called "the cult of Daniel Timms". Today, he points out that he hasn't had anything to do with BiVacor (which he and Timms co-founded in 2008) for "years and years". But back in the day, Fraser helped Timms – who'd been given a stipend and a single room for research at Prince Charles while still a PhD student – with access to the institutions and networks of medicine. Today, those early years sound like a cross between a *Boy's Own* adventure story and *Spinal Tap*: all Brisvegas barbecues and devices wrapped in protective underpants and surgeons banging tables and telling our heroes that pulseless hearts will never work.

***'I went to have it out with the weirdo making the noise, and there was Daniel with his Bunnings pipes all over the bench.'***

John Fraser, now a Brisbane ICU director

The heart Timms was working on was closely based on the one he'd first conceived as a student: a single spinning disc inside a metal casing that pushed blood through the body not in pulses, like a natural heart, but in a single continuous flow, like a plumbing pump. He and his dad had built a rough prototype (Gary Timms had machined the central disc on a mini lathe he'd set up next to the TV) and tested it on their kitchen bench circulatory system. And it had worked, pushing water filled with tiny beads (representing red blood cells) around the system.

But as Timms told *The New Yorker* in 2021, they also noticed beads getting stuck in an eddy under the disc. In the real world, this was a danger signal. Points of slow flow, in blood, are points where clots might develop. And clots can lead to strokes – the great bane of all artificial hearts.

Professor John Fraser first encountered Daniel Timms two decades ago at Brisbane's The Prince Charles Hospital.

Timms reached out to a Japanese researcher working in magnetic levitation – the process by which Maglev trains work. He had no money to pay for advice, so he went to Japan and worked on the researcher's own project in exchange for help. He would do this again and again in the coming years, travelling to Germany, Taiwan, the US, wherever the experts he needed were based. And slowly, over years and years, he built a heart.

Today, the BiVacor total artificial heart consists of a single titanium chamber with one moving part: a spinning disc (called the impeller) floating inside the casing. Because it's suspended by Maglev technology (thank you, Japanese researchers), wear and tear is eliminated. This impeller simultaneously pumps blood to both the lungs and the body, because it has vanes poking out

on both sides – high on one side, like prongs on a barbecue fork, low on the other, like the blades of a fan. These prongs drive the blood first gently into the lungs, then powerfully into the body.

Thanks to this design, the BiVacor has much larger spaces for the blood to flow than other artificial hearts – which means there's fewer places for clots to form, and less likelihood of blood cells being "smashed up" (the technical term) by the mechanism itself. Some blood does leak around the edges of the floating disc but this, according to key engineers on the project, is "a design feature, not a bug. The wash of blood around the disk [sic] cleans out the casing and ensures there are no areas where stagnant blood can form into dangerous clots."

Today's BiVacor heart also has a pulse. It's still not really understood what, if any, advantages there are to pulsatile blood flow in the body; and Timms the engineer seems sceptical about its necessity. But nonetheless, a few years ago it became clear they could create a BiVacor pulse simply by rapidly alternating the disc between high and low speeds. Was it done just to, well, placate doctors? "Precisely." Timms smiles. "There may be some advantages, there may not. But we can do it, so we thought, 'Why not? We can always turn it off.' "

The BiVacor heart can also do something else. It continuously adapts its output to match a patient's daily life. Our biological hearts are constantly adjusting as our bodies sit, stand, go to the loo, climb the stairs, jog. The BiVacor's spinning disc can do a version of the same thing, moving along its central axis from left to right. This movement changes the efficiencies of the two sides of the disc, pumping more blood through the lungs and out to the body as we exercise, less as we sit reading a weekend magazine. No other artificial heart has ever been able to adjust to the living human body in this way.

So. Could this heart be the Holy Grail of cardiac medicine: a permanent artificial heart? Titanium is biologically inert: no immunosuppressants required. One moving part: no wear and tear. A pulse – if required. The potential to intrinsically adjust blood flow to daily life. In Timms' heart of hearts (ahem) there seems little doubt. This, he believes, is the heart that will revolutionise current transplant survival rates. This is the heart that will work – forever.

"I was talking to a doctor at the paediatric hospital in Texas," he explains. "He wanted to do a study with us. And I was like, 'But it's not a paediatric device: it's too big for a toddler.' And he goes, 'Daniel, I don't want it for a four-year-old. I want to put the transplant heart in a kid at four and I want them to grow up to be 12. And then I want to give them the BiVacor for the rest of their life."

---

**Speaking of** life. Back in 2004, a year or two after Daniel Timms talked to the Japanese, his dad Gary needed a heart valve replaced at The Prince Charles Hospital. By this point, Timms had his stipend and his research room at the same hospital, and he'd go and visit Gary on his breaks. John Fraser remembers Timms being at the hospital night and day, no holidays, no weekends; eating two-minute noodles and sleeping on the couch Fraser had bought him.

All the while, time was running out. Timms has subsequently said that he knew, realistically, that his artificial heart would never be ready in time to save his dad. But faced with the prospect of losing him, he couldn't help but try; couldn't help but hope. The heart has its reasons which reason knows not, after all.

In 2006, Timms implanted his device into a sheep, showing it was workable. Soon afterwards, Gary became very ill. Timms was about to go to Europe to talk to pump engineers in Germany. As he told *Forbes* magazine, he asked his dad if he should go. "You've got to get there," said Gary Timms. "This is what we've been working for."

John Fraser, the intensive care specialist, still remembers the next two weeks. "I brought Gary from the wards to ICU so I could look after him personally, and I was phoning Dan on a daily basis." Gary grew worse and worse. When the end was close, Timms flew home, but by the time he arrived his dad had a tracheotomy tube and was heavily medicated. And so there were no last words between father and son about hearts, mechanical or otherwise.

After Gary Timms' death in 2006, aged just 55, his son kept working. And working. And working. "Daniel is someone who is brilliant, and someone who is incredibly stubborn and pigheaded," says Fraser. "I mean that as a compliment. There are people with good ideas who have come and gone, and Daniel has had one vision and he's kept going."

Stubborn pigheadedness has no doubt driven him. But so has love.

---

**In November** last year, BiVacor received approval from the US Food and Drug Administration (FDA) to implant its artificial heart into three patients. Today, in March, sitting in the cafe at St Vincent's Hospital Sydney in jeans and trainers, Daniel Timms reckons the first implantation is "probably three weeks away – maybe a month". This means that by the time you're reading this story, it will either have already happened, or be just about to. The first implant will be at the Texas Heart Institute, the same place the world's first artificial-heart operation was performed 55 years ago, and where Timms, now 45, seems to be regarded as a kind of beloved, albeit slightly odd, Aussie wunderkind.

Still, when we meet, Timms doesn't seem like a man crazed with excitement at the achievement of his lifelong dream. Despite his terrifyingly quiet voice, he's articulate and funny – but he's also self-contained, unusually focused and intent. Somewhere, not terribly far away, is still that small boy, watching and learning in a Brisbane backyard.

Rather prosaically, he's back in Australia because he has to renew his US visa. American optimism, capital and appetite for risk has allowed him to refine BiVacor's design in the past decade; to test it in live animals (an emotionally challenging part of cardiac device development); and to work towards the moment it can finally be placed in a person. This moment, in other words. As he told *The New Yorker*, this project has consumed his life. He hasn't married or had children: "I've been stuck on this."

---

## *'If it works, it works. You can't hide with this sort of thing.'*

Daniel Timms

And of course, the work isn't over yet. Unless there's some catastrophe in the US trial, and pending Australian ethics approval, the BiVacor heart will not only be implanted into Americans this year, but also a handful of Australians. In both countries, the operations will be part of a "first-in-human" early feasibility study, and the BiVacor hearts will only be used until

human donor hearts become available for transplant. Status as a permanent replacement heart is still an unknown distance away – perhaps until the BiVacor device simply functions so well that there's no need to replace it.

Of course, there's no guarantee it will work. Human blood, for instance, is different to that of cows and sheep, the animals the heart has been tested in: perhaps the BiVacor heart will cause some unexpected haematological reaction or damage in humans. Perhaps there will be some unforeseen reaction in the body to the device's particular design, or its positioning, or the external controller. Perhaps it will, for some reason, just stop pumping. Nobody I speak to anticipates these things, but this is life – and heart design – after all. Unexpected things happen.

Timms is clearly not expecting disaster, though he is anxious. "For the core team, yes, it's an anxious period," he says. But he's also focused on the next step. "Once this study is done, all being well, we'll scale up the production, and we can do a clinical trial. And that might be 50 patients. And then we're on the market and ready to sell." He gives a half-laugh. "Because if it works, it works. You can't hide with this sort of thing."

"This is the Mars expedition," explains Dr Paul Jansz, head of the mechanical circulatory assist program at St Vincent's, who's set to perform the first BiVacor implant in Sydney. Melbourne's The Alfred hospital will also be part of the Australian BiVacor trial. "There's a quantum leap with this sort of technology, because you're cutting the heart out. So there's a 'gulp' moment where out comes the heart and in goes a device that you hope's going to work. Of course we cut hearts out all the time when we do transplants, but we know we've got another one to put in. So there'll be a certain leap of faith when we do one of these."

Jansz has performed a number of first implants of devices. "And there are always a lot of nervous engineers, a lot of people in the room. I'm sure Daniel will be there, going, 'Oh, can you check that stitch?' "

"I would never say that," grins Timms. Still, you can't help thinking he'll be more comfortable when this period is over, and he can start the next phase: making the device even better.

Getting rid of the drivelines is a particular priority. "We're going to take the electronics in the power box [controller], miniaturise them, and put them actually in on the [device]," he explains. "Then we can remove the driveline, and transfer power across the skin, like charging an iPhone." He sits back.

"And then the patient won't have a wire breaking the skin; then they can take off the power box and be more active and free."

Sydney heart transplant candidate Ray Meneses thinks he would take a perfected artificial model. WOLTER PEETERS

I think of the man I met yesterday, a 45-year-old father of three from Liverpool in western Sydney, Ray Meneses. Eight years ago, his heart suddenly began to fail: in 12 hours he went from the GP, where he'd gone to discuss feeling breathless, to St Vincent's emergency, where he was told he would need a heart transplant. During the work-up to go on the list, doctors discovered he had cancer – lymphoma – under one arm. No one can receive a transplant while having chemotherapy; nor could Meneses be placed on the list until he'd been in remission for four years. He survived cancer; four years later, he went on the list. He waited almost another four years. In the meantime, he had an LVAD (left ventricular assistance device) implanted to help his heart pump – he sits with the controller on his lap while we talk.

This Australia Day, at last, St Vincent's called: they had a donor heart for him. The happy end to this long, harrowing story, one thinks. No. When they called, Meneses had COVID-19 and was taking antivirals. And so he wasn't eligible for the heart.

After he tells me his story, we sit in the uncomfortable hospital chairs for a while. I tell him about the BiVacor device. In a perfect world, if it was available – with no drivelines, no controller, just the man-made version of six million years of evolution – would he take it? Or would he keep holding on for a human heart? Meneses – who appears to be an extraordinarily sanguine, hopeful person – thinks about it for a long moment.

"I think I would take it," he says finally, seriously. "I would take the artificial heart. I have waited so long."

At the end of our interview, I ask Daniel Timms if his dad's heart condition makes him, Daniel, more likely to have problems with his own heart. "Probably," he smiles. "When we first got to

Texas Heart, Dr Cooley was still around – the guy who did the very first artificial heart transplant. And someone once asked him, 'So, Dr Cooley, you are the most prominent heart failure specialist in the world. What can each of us do, ourselves, to prevent heart failure?' And he said, 'Change your parents.' " Timms laughs, shaking his head. "That was his answer."

There is no doubt the tragedy of Gary Timms' early death changed the course of his son's life. But as Timms points out, there's nothing unusual in that. "It's like, Mum's incredibly proud of what we've done. But every time there's a news story or something, what she says is, 'Your dad must be really proud.' It always comes back to that. She's been by herself now for 20-odd years. And I imagine, a lot, what it would have been like if he'd been around for those years. It would have been a totally different life for me, my mum, my brother, everybody."

He pauses. "People think it's the patients that are benefiting the most from this technology. They're not. It's the family that's benefiting most." The toddler in the backyard, the PhD student, the history-making engineer – all of them potentially free, in another life, of this particular form of heartbreak.
Would the BiVacor heart have saved Gary Timms? "Once his valve started to fail?" asks Daniel Timms, with a crooked smile. "That would be a perfect application."

**To read more from *Good Weekend* magazine, visit our page at *The Sydney Morning Herald*, *The Age* and *Brisbane Times*.**

---

**Amanda Hooton** is a senior writer with Good Weekend. Connect via email.