

## THE BIONIC MAN

While Blade Runner's modern-day remake depicts bioengineered humans in the year 2049, in 2017, a bionic human is being created in Auckland, New Zealand. **Elly Strang** talks to two-time gold medallist Liam Malone about failure, ambition, the future of technology and his quest to become the fastest man in the world.

Since the beginning of time, technology has attempted to make up for the fragility of the human body. Unlike other species, humans haven't been able to rely on features such as claws, fangs, venom, fur, or the ability to hit significant running speeds like that of a cheetah. Essentially, the long line of naked apes we're descended from wouldn't have survived at all if it wasn't for the resourcefulness of the human brain.

But with the dawn of new technology, society is on the brink of an overhaul of the basic human condition. Developments in neuroscience, robotics and artificial intelligence mean that biology can be manipulated at will, with different parts of the human anatomy strengthened, upgraded and potentially even phased out.

There might not be a person in New Zealand more comfortable with this revolutionary idea than athlete Liam Malone. After all, he's had 21 years to adapt to having a foreign piece of technology intrinsically linked to his body after he was born with defective legs.

But in Malone's view, it's all technology: his mind is a biological computing system and just as much as a piece of tech as the prosthetic legs he wears to get him from A to B.

"The question I ask myself is, 'Am I less of a man because I have less of a body than a normal person?'" he says. "The answer's no – well at least, I hope to think so. I don't see the body as being a part of who you are, so in the future it seems obvious we'd forgo our earthling bodies because they're so fragile in response to different environmental pressures."

It goes further: At some point, he believes humans will be able to download their consciousness into a body that's designed on a day-to-day basis to adapt to different environments.

If humans want to evolve in intelligence and inhabit other planets, we need to get comfortable with the idea of tech being imbedded into our body or brains, he says.

"That seems obvious to me from a survival standpoint, but also because it's an ongoing trend on an exponential curve," he says. "People get artificial breasts, they lengthen their bones, they take steroids to increase muscularity – it's going to happen at some point, seeing as people are already customising their body at such a rapid rate."

It's this fascination with technology that has led Malone to boldly declare his latest endeavour: To push the limits of human

potential and design a pair of blades that will allow him to become the fastest man in the world. He hasn't made much of a secret of his goal either, tweeting in July, "The Paralympics will make the Olympics look like the antiques road show in 50 years. Paralympians will be the most advanced humans on the planet."

To take the title of fastest man, it means beating current able-bodied world record holder Usain Bolt, who clocked in at 9.58 seconds in the 100-metre race in Berlin in 2009. But Malone doesn't consider it too unrealistic a goal.

"Look at how far I've already come in the three years I've been running – I've dropped two seconds in that period of time without any innovation whatsoever," he says. "My goal now is to run 100 metres in 9.4 seconds."

### TO ERR IS HUMAN

Though he's entered an exclusive club through his Paralympic accolades, by his account, he has failed his whole life.

Malone was born with fibular hemimelia, an extremely rare condition that left him missing the fibula bone in both of his legs. Early home videos show him getting around by shuffling on the outside of his ankles.

At 18-months-old, his parents decided that he would have his feet amputated and his heels grafted onto the end of legs, with technology – prosthetic limbs – becoming integral to his anatomy.

Malone understood his reliance on them, but says he was frustrated that the prosthetics' design was "primitive" and still made the way the Egyptians made them 3,000 years ago.

Despite this, he threw himself into various outdoor pursuits like snowboarding, rugby and cross country. As kids can be cruel, bullying and discrimination about his prosthetic legs ran rife through Malone's childhood. When he felt the sting of defeat against more able-bodied competitors, his Dad Murray assured him, "One day they will create a product that will allow you to run faster than your friends."

"I was lucky to have two very good parents who always encouraged me to participate despite having two artificial legs, and to play and try my best even in the face of failure," Malone says.

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But Malone also had a different battle brewing in his mind. He grew increasingly self-conscious of his body image, particularly as puberty rolled around. Anxious about what the opposite sex might think of his prosthetic legs, he started wearing pants everyday – even in summer – to hide the fact they weren't real.

Then came the news that would turn Malone's world upside down: his mother Trudi was diagnosed with stage three bowel cancer. From there, he spent his teenage years watching her and others fight off death, often stricken with grief about what they hadn't accomplished – a factor that would stick with him until later in life.

“When I was 12 through to 18, I was going in and out of hospitals and hospices

and I saw a lot of people dying,” he says. “When you see someone die and they have a lot of regrets, it's not a very pretty sight and they'll often tell you about it. I witnessed that for so long and realised you don't really want to die with regrets. You want to have the minimal amount of regrets.”

When his mum eventually passed, Malone was 18-years-old, on the cusp of adulthood and distraught. Depressed and anxious, he failed to find a job out of school and ended up on social welfare. He then fell through the social welfare system because his condition meant he couldn't work an eight-hour day at an orchard.

He eventually found his way into a commerce degree, but his mental state remained on edge. It wasn't until a year later when he crashed his truck drunk that he realised something had to change.

“I had all these negative events happen and how I was reacting to them was leading me to have bad outcomes in my life,” Malone says. “All the outcomes were the result of a system – my mind. I set out to change it. I conducted a situation analysis of what I could do and measured them against different metrics and blade running was the obvious choice.”

At age 19, he decided that whatever he did, he was going to put himself into an environment that incentivised him to be the best. Blade running made sense in the way it challenged him: In order to succeed, he'd have to run for the first time in six years, as well as overcome his body-image anxiety by shedding the pants he'd been covering up his prosthetics with every day.

To add to the pressure, he crowdfunded \$20,000 from the New Zealand public to buy a pair of carbon-fibre blade prosthetics called the Flex-Foot, made by Össur, the same manufacturer used by Oscar Pistorius.

And after just three years of hitting the track, it paid off: At the 2016 Rio Paralympics, Malone won silver in the T44 100 metre final and two gold medals in the 200-metre and T44 400 metre final.

But ask what Malone's secret weapon was, and he'll say it wasn't the technology – it was mindfulness. It's a therapeutic technique that achieves a calm, focused mental state by focusing one's awareness on the present moment, while not becoming overwhelmed by feelings, thoughts and sensations.

It's a practice that has helped him through anxiety and depression and a concept that's now common in both elite

athletic and business circles.

“If you go into a hyper-competitive environment like the Olympics and your internal dialogue is going out of control because you have all these people looking at you and you've had some early experience where you get really anxious, then you're going to crumble. It's very important to be very centred, very observant and very focused in those situations.”

But often people laugh when he tells them that, he says, thinking it's “hippy bullshit”.

“Every single person I meet says ‘sport is just the top two inches,’ and then I ask if they practice mindfulness and they say ‘no.’ They know it's good for them to go out for a run but they don't know what mindfulness is. So few people on a daily basis practice being mindful. It's crazy. It's crazy we don't teach it to kids, it's crazy we don't practice it with people who are battling anxiety and depression, it's crazy it's not talked about way more.”

Even after all he's achieved, Malone still feels anxious and fearful all the time, he says, but his mindfulness helps him overcome it and focus on what he's doing constructively.

“Damn right I'm always anxious, because I'm always striving to be put in an environment that stretches me.”

#### A NEW BREED OF ATHLETE

After his Paralympics win, it would've been understandable for Malone to rest on his laurels and bask in the victory. He'd come, he'd conquered – shaving crucial milliseconds off Oscar Pistorius' previously held records in the 200 and 400 metre races.

But instead, Malone set his sights beyond competitions. It was never the running aspect he was passionate about, he says. It was the idea that he's as able as anyone – or even hyper-abled – which is where the idea for becoming the fastest man in the world sprung from.

While humans have steadily increased their athletic abilities over time, researchers now speculate that due to the slowing pace at which sporting records are being broken, humanity might have hit its physiological limit.

To Usain Bolt's disappointment, at the 2016 Rio Olympics, the world's fastest man couldn't beat either record he set in the 100 and 200 metres at the Berlin World Championships in 2009. Women's track speeds have also plateaued off – the

current women's 100 metre record holder is Florence Griffith-Joyner, who clocked in at 10.49 seconds back in 1988.

Assuming Malone is nearing his physiological peak, body-wise, the focus is now on what technology can do to push him forward beyond the limits of the human body.

He's currently in the initial stages of collaborating with a team of researchers, coaches and carbon manufacturing and tech companies in New Zealand to design a brand-new pair of blades that solve the pain points in his previous pair.

His findings could spearhead a revolution in athletics through a new breed of athletes that combine the peak human form with cutting-edge technology.

“Technology is really at the very beginning because we've had one development in prosthetics, and that was carbon fibre,” Malone says. “Now para-athletes like myself are running as fast as able-bodied athletes, it seems obvious that I'll do it [become the fastest person] or make a significant step towards it and it will be within 10 years.”

This is already occurring in other sporting arenas. Scientist Hugh Herr lost both legs below the knee to frostbite in 1982 while rock climbing. He went on to ‘hack’ his prosthetics so he could climb again by designing prosthetic feet with a stiffness that it made it possible to stand on tiny rock edges no human foot could wedge into, while titanium spiked-feet helped him scale steep ice walls.

In his view, they were upgrades from his previous legs made of skin and bones. He wasn't disabled, “the technology was” – and now, he thinks people may want to trade in their fragile limbs for bionic ones like his company, Biomechantronics, is building.

“I believe in the near future, in a decade or two, when you walk down the streets of Boston, you'll routinely see people wearing bionic systems,” Herr told ABC News.

Malone is tight-lipped on which New Zealand companies are involved with creating his blades, but says the team recently conducted a “sanity test” on whether his goal is achievable and concluded that it's viable.

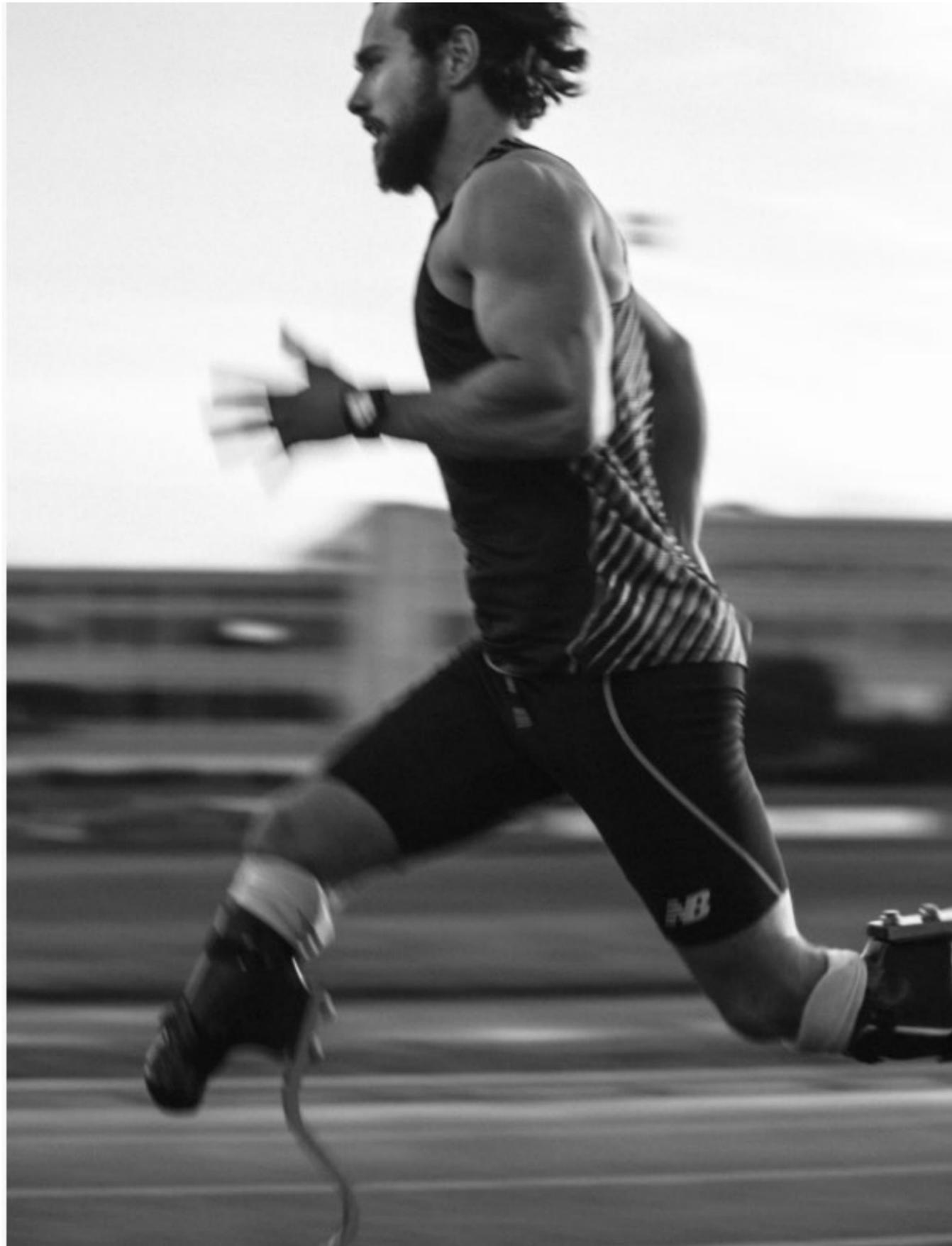
“We're going to go through and see where all the pain points are from 0 metres to 100 metres and how we solve these from a trial-and-error standpoint, as well as what the deeper level analysis we can do to make performance gains. That's the part that's going to be really expensive.”



The immediate design flaws can be easily identified from his own experience, he says. For example, it takes 50 metres for an able-bodied athlete to reach full speed, while it takes Malone 90 metres on his blades.

“He starts a little bit different even to other athletes he races,” Malone's coach James Mortimer says. “Single-blade athletes still can get into the blocks and push off their standard leg and get themselves going, but he's not able to push through the blade because the return is so fast. When he's up and running is when he comes into form and is faster than other athletes in the acceleration.”

To solve this, the team will look at what different shaped blades will do in terms of performance, weight distribution and how the blade moves.



Where the companies can also help is at a nano-technology level, such as how the carbon is constructed during the manufacturing process, while machine learning could also help in crunching data and making an analysis on what will increase speed and performance.

Malone initially wanted work with a tech giant like Google or Facebook on his endeavour, but after a recent visit to Silicon Valley, he says he wants it to be a home-grown success story.

“We’re just focused on the best we can find in New Zealand to tell a story by bringing in New Zealand tech companies and an individual who’s had to overcome adversity by creating new tech to solve a problem.”

#### **BREAKING THE RULES**

Of course, these technological developments pose a whole new set of problems for regulators, as it’s far harder to draw a line with augmented biology than it is with doping.

Pistorius, who has the same condition as Malone, was barred from competing in the 2008 Olympics after it was decided his blades posed an unfair advantage to able-bodied athletes.

He then appealed the decision for the 2012 games and went on to compete.

Following the games, two members of the scientific team that backed him published a paper that claimed his blades made him hyper-abled, not disabled.

“We conclude that the moment in athletic history when engineered limbs outperform biological limbs has already passed,” the report said.

Technology used by para-athletes is governed by International Paralympic Committee (IPC) rules, and changes were made in January that would outlaw the blades already used by Malone.

“While the Olympics battles with regulating the soles on shoes, the Paralympics now is figuring out how to regulate people who have artificial bodies that are taking designs from the hind leg of cheetahs and turning it into a prosthetic leg,” Malone says.

“We’ve got companies here like Rex Bionics, who build exoskeletons for people who suffer from paralysis. Soon you’ll have athletes running around in exoskeletons. They’re trying to figure out how they deal with that. It’s such a grey area in the rules around technology because previously there’s been so little, but now there’s so

much room to innovate.”

But Malone is unfazed by potential legislative problems.

“I’m trying to do it outside the rules because I don’t want to compete against anyone, I just want to see where technology takes me,” he says.

Mortimer, Malone’s coach, believes he will reach his goal of being the fastest man in the world, but it won’t be the addition of custom-designed blades that’ll set him apart – it’ll be the part of him that’s human.

“It’s amazing the way that technology is going, but he’s a natural athlete – it’s not like you’re putting an average joe on a fast set of blades,” Mortimer says. “You’ve still got to be an athlete and he’s got the motivation and the drive to do it. It’s going to be pretty cool what they come up with. I’ll keep training him the way I normally coach, and there might be a few changes we will have to make on the way. Hopefully his body can cope with the strain and speed he’s going to generate.”

Whatever findings Malone comes away with, his competitive nature is still strong.

He says he won’t be sharing the results of his efforts with fellow para-athletes, as they have their own monetary and technology resources – not unlike the Team New Zealand vs. Oracle and Larry Ellison advantage.

“At the end of the day I’m still in competition with them and I’m still holding my legs on with duct tape,” Malone says. “If you look at what the Germans and the Americans are running on, it’s a little bit more advanced than what I had to go to Rio.”

And if Malone does meet his goal, there’s no shortage of other endeavours he could pursue.

He’s keen to climb Mount Cook, he wants to play a key role in New Zealand’s tech industry, and he already has a side project underway with a New Zealand product accelerator to 3D print prosthetics for kids out of recycled plastic bottles.

Simply put, a normal life doesn’t appeal.

“I certainly don’t want to be in a job where I work 9 to 5 and I’m doing it to be safe and pay my mortgage, like that just seems fucking horrible to me,” he says. “That’s boring and you don’t have to do that now. I want to spend my life looking at these projects and being curious and testing them while contributing to humanity in some small way.”

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