

The impact of western science on today's society

Prof Fiona Wood

Thank you so much for your kind introduction and for giving me the opportunity today to speak with you about the role of science in Western Civilisation. I'm an absolute sucker for doing anything I've never done before. So, when this invitation landed on my, in my inbox. I was going to say on my desk, but that doesn't happen these days, does it? It pings in the inbox. I thought, oh, I'll have a go at that. And, as we were just speaking, I have a personal thanks because I recently had bilateral knee replacements at the Hollywood Hospital, a Ramsay hospital. I chose that hospital because it had the best infection control record. And if anybody's going for joint replacements that's the first thing to ask because you don't want an infection.

And so, here I am this evening and I am thinking how can I put into context my feelings around how I believe that we are in an extraordinarily exciting space?

Science and technology is interwoven in our lives in a way we couldn't begin to unravel. We get up in the morning, what we wear, we turn the light on, what we eat and many of our jobs, our communication, it is ubiquitous. It's everywhere. And so I want to put that into context with respect to the Civilisation.

I was brought up by a storyteller, my father, and so I'd like to tell you a few stories because I think that will give you the context in which I'm operating the best way I can. Maybe some of you might even want to close your eyes and just imagine you're in the middle of the Midlands in England, cold and damp it was the late 1800's The coal mines are very muddy. The coal in that region is peat, like peat bog, it's not like the coal in Yorkshire, which is hard as nails as my dad used to tell me. There's a landslide. You've got six children. The oldest is 11 and he's in bed. He's not down the pit that day, but your husband dies. You get a knock on the door, you realize you have nothing. This woman gets the wheelbarrow, steals the wheel barrow she can find, puts the small children in and sets off walking. She's got an 11 year old boy he can earn, she's got nine year old boy he can earn as well. They walk to Yorkshire.

The 9 year old and the 11 year old find work. They would be my great, great grandfather, one of them. They start working in the coal mines and that's their lineage. Their sons and daughter of that particular line spend time in northern France. They're fortunate they come home but their sister doesn't. She's a nurse and dies with Spanish flu. You fast forward a little, my grandfather made it home but his brother was so badly damaged from that experience that they sell him into indentured labour. He works on a farm on the coal pit so that the family have enough money to pay for Harry's treatment, that's my grandfather.

My father goes down the mine when he's 14. There's a knock on the door, his school teacher comes with a pair of soccer boots and a letter. He's got a scholarship to the grammar school and he's a gifted

sportsman. His mother takes the studs out of the soccer boots. They're the only shoes he has and he goes down the mine because the family needed the money.

Is that Civilisation? I think it's fascinating because it's actually not that long ago. I can't attest to the absolute accuracy of my father's stories because I'm sure he embellished here and there. In fact, I did a project at school on Florence Nightingale because I was convinced she treated one of my family members in the charge of the light brigade, courtesy of my father's stories. I realized sometime later that the numbers just didn't fit. I do know that as a 14 year old, he and his brother were down in the mine. There were pony drivers.

As a 13 year old, I got a choice of an opportunity of a lifetime which I will come back to. As a 13 year old, I saw in the fields, again the farm where my grandfather worked to earn money for his brother's treatment, I saw the fields where they brought the pony's out of the mines for the last time. Ponies with blinkers on because they've lived their life down the coal mine and so I know some of it is true and I also know that when my father, and my mother for that matter, were very focused on our education, they were so because it would give us an opportunity to get up in the morning and enjoy what we did.

I think education is fundamental to our Civilisation. It is actually extraordinary that in that very short span of time, in the scheme of things, when you look at the Stephen Hawking sort of timeframe and the big bang to now, we're talking 150 years. Those changes have been rapid, they're disruptive and they've only just begun. Having an education is fundamental, I think it's fundamental for everyone. There are many things I think we need to work on when we come to looking at this whole Civilisation issue. It is to have access to education and access to an education that broadens the mind rather than narrows it, that engages in diversity and an understanding that collectively we can do so much more than as individuals.

As I go forward then in my story, I went to medical school. As you have heard I had an opportunity of a lifetime based on a group of people that I came to know well and that was the Society of Friends, the Quakers. In the adjoining village to me in England, there was a school, it was the Act with Friends school. I think the emphasis was on friends. They were established, it had previously been a foundling hospital looking after those Victorian children and the earlier who were neglected and left and often sent to work. It's interesting that when my children were working on our farms, fast forward a very many decades later, they did go on strike and the placards said that child labour had been outlawed in the Victorian era. What, as parents, did we think we were doing? We were teaching them the value of work, the value of a job well done.

But again, I'll come back to that. As a 13 year old, I was destined to go to the comprehensive school in the local village where at that time the standard was to leave at the equivalent of the end of year 10. My mother wrote to the then Minister for Education who wrote back and said, she's not university material, don't worry about it. My eldest brother had left school, my next brother was at grammar school. My eldest brother did end up with a Cambridge law degree and was a criminal

defence lawyer before he unfortunately died as a 33 year old. My next brother is a professor of orthopaedics in Perth and has been for a while. And then I came along and so my mother saw this school, the Society of Friends, it seemed welcoming. All the old buildings had been there since the very early 1700's. She went along for an interview as a house mother. She figured that she was a mother, she lived in a house, it can't be that hard! She got a job, but she got a job as a physical education instructor. She'd been a PTI and a wife, she had no qualifications, but it meant I could go to that school, which changed my life.

I understand Civilisation because I understand kindness. I was taught kindness in that place. I was taught the value of doing something for someone else without personal gain. The school motto was "Non sibi sed omnibus". I think in the context of Western Civilisation where is the kindness and we must strive to maintain the kindness. I think it is fundamental for us all to understand the value of doing something for someone in need. Someone that we may never know, someone that actually will be better off because you're on this planet. That is what Civilisation is to me. And that's what I learned as a very impressionable young girl in those cold Yorkshire mornings as we were running around the fields and I learned also that I wasn't ever going to be a runner and so I better stick to the academic side of things.

When I start to think about science, I recall one of the earliest experiences I had of a scientist with passion was my teachers. My chemistry teacher, my physics teacher, my maths teacher were just extraordinary men. I had the great fortune of sitting down, at my father's funeral six years ago, with my physics teacher who was still alive, he was 96 and unfortunately has passed since. He asked me, "What is new Fiona? What is new in your world?" We discussed my interest in neurophysiology and my interest in the brain and interest in things since I was at school and in his physics class, the electricity along the nerve.

How do we interpret pain when it's just electricity and chemistry? There's something to ponder and I can tell you if you are burnt here, your nerves will change here and your brain will change here and maybe one day we will use that information to think ourselves whole. That is the power of science based in physics, based in chemistry, based in imagination, based in our Civilisation where we give the support to those who dream. So back in those days, I got the opportunity to go to this school as I've said, and it changed my life.

From there I got the opportunity to go to medical school where I saw science on a daily basis up front and personal. There is nothing like a medical school to show the vast array of science and technology that we had achieved to this point.

I'd like to take you again on a bit of a journey with me, a journey into an operating theatre. I'm sure there's a number of you that will have been there, but I hope that you don't remember it. You will be pleased to know that I do because I'm there on the other side of the fence. I remember the first operating theatre I walked into in St Thomas' Hospital Medical School. The environment was electric, walking into this environment you notice straight off the bat that what's on the walls links into the

floor such that there's no nooks and crannies from an infection control perspective. And looking at the equipment, the microscope. It was a micro-surgical case and I was researching with the plastic surgeons.

So there's the lighting system with the Zeiss lenses and the microscope with a robotic arm, they have hinged arms so that they could come over and actually focus in and sew together blood vessels that are two or three millimetres with sutures with the needles bonded to the plastic suture so that when you push that through the blood vessel, it doesn't tear, but it leaves a small hole that closes around the suture behind it so you could tie a knot. And the knot is not just straightforward. You are tying the knot in something that has to lose its memory so that the knot doesn't untie itself. We talk about memory in some certain sutures and certain chemistry because it wants to untie itself but we've had to overcome that so that the knots stay tight and withstand the blood pressure that's pumping, pumping, pumping with the oxygen, keeping the person alive with blood flow going around. I clearly was overwhelmed and I clearly am still because that environment that advances to this point and that keeps us going down this road, this juggernaut that we call science that keeps us moving has changed lives. It changes lives, on the macro level, it changes lives on the individual level. It gives us an opportunity for quality of life that is unprecedented.

I absolutely, fundamentally understand the inequalities across the world with respect to nutrition and we've got some serious challenges. Why have we got the indulgent overweight and we've got the starving? That's a challenge for us all because there's certainly enough food on the planet to feed us all. So how do we melt that Civilisation, that acknowledgement that it's the right thing to do and actually put that into practice. And I'm sure if you think for probably a half a second you know somebody who's volunteering in some way, shape or form or maybe you are yourself or helping save the children or whoever it may be to make a difference again to somebody you may never know, but knowing that their life is better because of yours. This juggernaut that we keep driving forward, this science and technology, engineering, maths, we all talk about stem these days. I make a real plug for talking about steam because I think we have to put it into context. We have to put it in the context of our whole society, our communities. And we can't do that without bringing us all along with it. And that's not science in isolation. It's science as part of Civilisation. And as I go forward in my own personal journey, I see that I absolutely focused on how we can do better.

I see suffering every day and it's my privilege to do something about it, one of the most extreme times of my life you've heard about. But it wasn't just my life that changed those around that period of time, it was many lives, many lives change and were never the same again. But I certainly came forward and through that, knowing that the only way we can respect those who suffer and those who may not survive is by ensuring that we aggressively engaged in learning so that tomorrow is better. And those learnings can be in the sphere of science and technology and data analytics. But they can be in the appreciation of beauty. They can be in the appreciation of understanding how we can integrate and work forwards together. When I look at the changes, I start to think, well, where to next and how can we pay the respect to those whose shoulders we stand on, the giants who've gone before us.

You think of how science started. Did it start in the Renaissance and the Royal Society in England? Think of the changes and the arguments of these learned men about whether the world was flat or round and then going forward to the Luddites concerned about their livelihood and having the capacity to feed their children. I think now let's stand back and let's look, we're in kind of an interesting situation. We've got an acceleration of technology as science in such a way right here, right now that can we integrate it in a fair and equitable way. And are we in a space that may look back and think we were in a round world - flat world scenario or are we in a Luddite type scenario? When we look at artificial intelligence, how are we going to engage with the capacity that we have at our fingertips without ensuring that we drive down an artificial stupidity path. Taking the opportunities that we have and making sure that we don't imprint upon it our intrinsic bias, but we let our imaginations really roam free so that we imagine what tomorrow can be for the better of us all. 25 years ago, as you heard, we started on a path in the burns service where I know that when you have a significant amount of the burns surface damaged, I need to repair it. We've moved way beyond what we could with respect to burn injuries over the years. The intensive care teams can keep our patients alive, but we need then to repair the skin because without that skin repair all they're doing is buying us time. Healing that skin wound early has become the absolute focus of my life. It illustrates, I think many things I want to really share with you today. Those young people amongst you, in 1990 I was a good deal younger, there was a patient that did change my life. I wasn't even working in the hospital where she was in intensive care at the time, but I could see her massive burn injury was such that the infection, waves of infection kept crashing over her and she was weakening. As the weeks went by and I went into that hospital for our training, our teaching rounds, I could see her fading, falling between our fingers like sand and then I heard on a radio station that Joanne Paddle-Ledinek and Professor John Masterton from Monash University had been to Boston and they had learned how to grow skin cells into skin cell sheets. I went to the consultant who was in charge of the case. I said, "I think we could take her skin, we could send it to Melbourne and I think we may be able to save her life".

He said, "Well, if you could find the money, you can do it". I went to the administrator of the hospital, it was Royal Perth Hospital, at the time, who became a great friend and an extraordinary supporter. I said, "Mr Berrisford, you don't know me. I don't really work at your hospital. I am one of the young doctors. There's a patient in your hospital whose life I think we can save if we send some skin to Melbourne. We'll grow it there and they will bring it back. It's her skin and that's the best thing. Your skin is so precious to you, it has to be you."

And then he said, "Well, if you get the money you can do it." So I placed a cold call to the Ansett CEO. In those days they put me through. I just said I'm a doctor. I am Dr Wood, it seemed to work.

"I'm Dr. Wood and you don't know me, but I'm one of the young doctors at the hospital and I am a plastics and reconstructive surgeon and we treat the burn patients. There's a lady dying, but I think she might be able to survive if you can fund sending a specimen to Melbourne, just a specimen, it won't take up a seat, it's just a small box. But if you could bring it back with a person, with a scientist, it would be really appreciated." They flew the specimen to Melbourne, they flew the Prof Masterton

and Joanne back and enough skin in sheets to cover the patient. We worked away in the bone marrow laboratory, which is a very, again, amazing environment, but let's just stop there for a moment. Bone Marrow Laboratory. I would hazard a guess that there are a few of you in the audience that know of someone who lives as a result of a bone marrow transplant.

Extraordinary science, extraordinarily powerful. I met Marie Stoner there and we were working away on the skin and we went into the operating theatre and we put the skin cell sheets on and she survived. I had rotated back through the hospital. She was in rehabilitation when she had a sudden cardiac arrest from which we could not salvage. She didn't survive. Imagine how wretched I felt at that point in time, standing by the bed resuscitating the patient. But this felt self-indulgent. It was a fraction compared to how her family felt and that was my next job to go and explain what had happened. I learned a lot about myself that day and I learned a coping strategy that has taken me through from there to now. To honour that I had to learn something, I had to learn so that others would survive because of the learnings around her as an individual.

The science and technology that we applied to that individual in that context was the very best we could worldwide at that point in time. I had scoured the literature. I had left no stone unturned and I say to those youngsters in the audience, if you have an idea, never let it go. As my Mum used to say, "grasp the nettle with both hands and don't let it go". You'll always find somebody to help you. You just keep having to ask, ask and ask and don't be put off with people saying no. Just keep asking, you will find them. There's a lot of good people out there, far many more good people than not, actually. Can I tell you that people have survived because of the learnings on that day? Absolutely, yes.

The time to healing is a huge focus. Can we grow and can we cover the skin, this burn surface in less than five months, which is what we waited? Had I heard that radio station earlier, would it have made a difference? Possibly. But her life has made a difference to many others. In Western Australia today, 50% of our patients with burns to around 80% of the body surface area will survive.

As I go forward, I think that the life of an individual that has been the recipient of so much over her life, living in Western Civilisation, but whose life was cut short, has contributed to that science and technology, not by being a scientist, but by being part of the society, part of our community, by being human. I think it's fascinating, as I've already told you, that maybe one day we'll be able to think ourselves whole. Given the right building blocks.

Every one of you self-organises to a shape that's recognizable through life. We may get bigger and smaller, as I've already kind of whinged about a bit. If we're recognizable, what drives self-organisation, what drives us to repair our surface? Certainly we age, we don't really understand. We've started exploring genetics again in an unprecedented way. But then how does that genetics link to the cells? How do the cells within our structure express themselves? The epigenetics, the punctuation that we see in the genetics and we started working there and I can tell you that in a scar, the cells look exactly the same down the microscope as the cells in your normal skin, but they're behaving differently. We have now technology that can single cell sequence. I can tell within a scar

whether there's one cell population or many, and understanding that can I unscar the scar? Can we turn that around by understanding, and this scar isn't just about burn injury in the skin and the aesthetics, it's about function. It's about the scar in your heart after the heart attack. It's about the scar in your brain after your stroke. It's about the scar in your liver. It's about the scar around the excision of your cancer. Understanding this, again, opens up doors such that for each and every one of us living in this Civilisation that we call western can benefit with an improvement in the quality of our life.

But as I've said, it's just the beginning. This isn't the end of the road. It's the beginning of the road and the acceleration is extraordinary. We know that there's more information out there than there is knowledge and I will clarify that. We have so much information in health and medicine that isn't applied.

We have tried so hard to understand the barriers to translation into clinical practice. It's a whole movement in of itself. And then understanding how to change that information into knowledge, into experience so that we can learn from the experience of feedback and generate more information. And how can one brain think of that? Well, those "one brain's" only come through, probably once in a lifetime, but less than that. How many Einstein's have we got now? How many Hawkings, Newtons? We know them. Absolute giants.

Someone asked me recently, as a child, who inspired me and I'll have to make a confession here. The first person I said as a child, that had inspired me. I said there were two, two women, Dorothy Hymen and Valerie Wild or Valerie Peach, she became as she married, they were runners, they were coal miners daughters who went to the Olympic Games.

They went out of the village. They went across the world and they ran and they felt the air in their face in Mexico and Tokyo. They were coaches I had as a kid. The fact that they had spread their wings, opened my eyes to the big wide world out there. But I followed that up very closely by saying that then there was this kind of Russian cosmonaut chick because I really wanted to be an astronaut but I wanted to be the first. And she was the first in space. But bottom line is when I went to medical school, there was a woman in St Mary's Hospital who was a surgeon and she was a surgeon and almost ready to retire in the 70s. To be a surgeon in those days, now that was inspirational. When you start to think about the Einsteins and the Newtons of our world beyond that, there's a whole lot of people there that need our support and that we can harness their inspiration and their imagination and jump on the coattails and stand on those shoulders as we go forward. Because in fact, what we will be able to do, I think if we start to imagine 10 and 50 years down the track is going to be extraordinary.

I've told you how my life was changed by one individual, one individual patient and the time to heal him became fundamentally important and as a result of that, Marie Stoner and myself worked away understanding that the layer between your surface waterproof layer of your skin and the deeper tough layer of your skin is called the dermis and the epidermis. That junction is the engine room of

the skin. We worked out how harvesting that not to just grow into sheets but to spray on as individual cells onto a wound could change the healing paradigm and we could change that technology from about three weeks to grow sheets, Maria was extraordinary, she could grow sheets in 10 days. We could spray the suspension on in five days and then we put it all together in a point of care kit. We put the first stages of the tissue engineering process, took it out of the laboratory and took it into the operating theatre and in 20 minutes we can harvest cells from that individual's dermal epidermal junction and spray directly onto the wound to seed the cells of that person to close down the wound.

Yesterday I was operating at the children's hospital. I did two such cases, two small children within a week of their burn injury they have the operation, the dressings will be changed in a week and 80% of our children will have no visible scar as a result of this technology. This works best in our kids.

But we've moved the paradigms of scarring in the adults as well. So we were able to take the current state of the technology 25 years ago and change it and move it, manipulate it and invent and put that in a box again by asking and asking for help and asking for help with people with electronics, CSL with the enzyme, Go Medical with the electronics, the company that helped us near the airport in plastic moulding because it's in a plastic box, it's all self-contained. That mould that we manufactured in the late 1990s in Welshpool in Perth is still used in Ventrex in California to make the kit now. The kit got FDA approval last year in association working with the American military and Avita Medical.

I was in an operation 18 months ago and I want to use this as an example of how there is never going to be the end, we're never going to get to the top of the Everest. In science and technology you will never get to put your flag on the top of Everest. It's all about the journey and every achievement. Certainly, every step back is the day you really learn the hard lessons. It's an opportunity, every day is an opportunity, to think about how we can do better tomorrow. We can never stop thinking and stop understanding who can have parts of your jigsaw. Who can we work with? 18 months ago we were in an operation, a young boy who was four years old, he had flame burn to 50% of his body down to his muscle. We resuscitated him, kept him alive for 48 hours, stabilized him, took him to the operating room, removed all the burn. We put him in a massive dressing like a giant sponge to remove all the swelling. The science and technology to get to that point, extraordinary!

The next day, which was a Sunday morning, we took him back again into the operating room where we controlled the swelling and we put on a framework, a Collagen and glycosaminoglycans framework with a plastic layer on the top, a silicon layer on the top. And we tailored it all around his body, around his neck, under his arms and I was teaching the team how to tailor so that we held this again with a giant sponge dressing with the machines to keep it all firm and tight so that the blood supply could grow into this - Tissue Guided Regeneration. We know that when we have that close apposition between them, the blood vessels can grow in, the cells migrate into this framework and express themselves as skin. Tissue Guided Regeneration. It will look, down the microscope, like the deeper layer of skin, no hair follicles, no sweat glands.

But when it goes well, it goes very well. It replaces dermis. Then three weeks and two days later we peeled off the silicon outside and we use skin grafts, traditional skin grafts, stretched them right out like a string vest. And then made our skin spray with our kit and sprayed the cells all over him. And at six weeks he was healed and home. That's state of the art in 2017 and still state of the art in 2019. Everybody was very happy with the result. This boy had survived. We are set on a trajectory, certainly we will have to consider his growth and his movement. With laser therapy we will be trying to unscar the scar and will be driving the releases to allow him to grow. As we stood around and we debriefed after what was a significant and extraordinary case, it was very reminiscent of my youth where we used to get burns in from nightdresses catching light from open fires. It was very similar, a sort of blast from the past. I said, "well 25 years ago this team changed the paradigm".

We took growing skin in the laboratory and we took it to the bedside and we sprayed the skin cells on for the first time in 1994. How about we spray all skin on the skin construct? How about we take these 3D printers that everybody's talking about that are our future and that are our opportunities for the future. How about we take these 3D printers and we take it to the bedside and we print skin. In these last 18 months I've been in negotiations and collaborations with a number of groups here in Sydney, obviously in Perth, in Queensland, in the US and in the UK. And I'd like you to imagine a system where you come into the operating room, currently, I will take a sharp knife and I will remove the burn and I remove the burn until I see pinpoint bleeding because then I know the tissue in the base of that wound is alive. I'm sure you'd all agree that's not desperately subtle.

There is an I-knife. There are eight of them in the world and this I-knife, intelligent knife, captures the plume. It's a laser knife, it captures the smoke coming from the laser and does real time chemistry analysis so we can tell the condition of the cell that it is cutting through. I want one in my Christmas stocking. In a few weeks I am traveling to the UK to get one of these I-knives in Perth linked to our National Metabolomics Centre that is opening up. Because the eight I-knives around the world, the vast majority are being used in trials to cut around a cancer and they can tell whether the cell being cut through is a cancer cell or not, so that the margins of the tumour, the margins of that cancer can be told real time.

That is the power of linking science and technology. You don't have to come back for further excision of your cancer yet you don't have to suffer a broader tissue loss, people, having to take more of you away than is necessary. I want to drive this technology into a trauma scenario, salvaging what is survivable, removing what is not, not just in burns but in all trauma because we know that surviving a trauma changes your life, so the more accurate I can be, we can be, at that time the better. With our NH and MRC, where we have been successful with a group of folks from Queensland and New South Wales to build the library of understanding around the chemistry that we need in trauma. This is distinct from malignancy and to see where it overlaps and where it doesn't.

Then the second phase of that, you can imagine a car wash, right? The first part of the car wash. I want to remove all what's wrong, whether it's a cancer or the burn or the bad tissue that's not got a blood supply. The second part of the car wash, I need to understand what it is that I'm dealing with.

What is the extent of the deficit? We're working with the CRC in spatial imaging. They do an enormous amount with the oil and gas companies and they came to us and said would our 3D spatial imaging help you? Well, yes. We have linked with a group around the world, again, different sciences, a different group where we started scanning images of burns, images of wounds because we can feed that 3D information back into the next phase of the car wash. I would like us, one day, to give the building blocks the bio ink that will self-assemble the scaffold. Give the cells of you, from a non-injured space, whether it be your fat or your skin, and bio-print that into the wound so that you've got the building blocks and the mental imagery to think yourself whole.

And then I wake up.

But seriously, standing back from that, the progress we've made in 18 months is breathtaking. I can tell you another line of work we're involved in that takes us right down and into this artificial intelligence data analytic space. When I was with a group of people two weeks ago in Sydney talking about data in health an area that we've really got to understand the interface with our Civilisation, with our community, our society. That interface, privacy, ownership around data is something we could debate long and hard but the power of that data is extraordinary. I'd like to finish before you asked me the really difficult questions with a story around data and it starts with N=1. A little bit like I started as a young person in 1990. N=1, one person can change your life. An 8 year old boy who had an 80% body surface area burn in 2003 and again we thought we did the absolute sterling job, we removed the burn, we used our Integra, the tissue guided engineered template that I've discussed.

We put the split thickness skin grafts or traditional graft meshed way out and sprayed cells over and he healed and he sent us postcards from outdoor Ed camp. He died as an 11 year old with a rare cancer. N=1. My colleagues told me it was bad luck and a coincidence. Bad luck? Coincidence? That did not sit well with me.

I needed to investigate. I needed to satisfy my curiosity on one level, but on another level, I had to honour that debt. I had to look his parents in the eye and say we have done everything, not just while he was alive, but to reduce the suffering of those that come subsequent to him. And I know, in Western Australia at the time, was one of the world leaders in data linkage, Fiona Stanley, who has done extraordinary work. If you look up Telethon Institute and the Folate story, that's a story to make the hair stand up on the back of your neck, changing neural tube defects, neurological deficits in our children, not just here but across the world. Extraordinary work. I knew her because we were kind of part of a club. She had had been Australian of the Year two years before me. I knew her as an extraordinary woman. She helped me nag the team because I said, "no you won't see anything, the numbers aren't right. There's this, there's that" and I wouldn't go away Eventually in 2009 we had an NH and MRC grant and we linked the database with burns, with the cancer database, with the hospital database. All this de-identified data that we have in health in Western Australia, we linked it and I can tell you that 96% of the children in that database of 34000 and 84% of the adults were not major burns, but there is a change in your life trajectory after you have survived a burn injury. It appears to

unmask the diseases of aging, your cardiac diseases, cancers, neurological diseases all appear to be slightly increased as if your life trajectory has been shortened maybe by 7 or 10 years. That simplistic. I must apologize to my data linkage teams because that is, as I say, an enormous amount of work put in a breath.

But we understand that it has changed the life trajectory in mental illness as well. And so the N=1 led us right up to 34,000 patients with hospitalisation for burn injury in Western Australia. We compared it to 120,000 age, sex, geospatial, socio-economic, non-burn individuals in our community. We've found out all sorts of novel information that has changed the way we think about burns across the world. We then linked with IBM Watson Drug Discovery platform because that is a computer that could win a game show. And I said to the guys, (I'm good at cold calls). "you don't know me but are you IBM job discovery you? You won jeopardy." I said, "well if you could win a game show, can you do something really useful? Cause I hear you're doing some interesting cancer with the Sloan Kettering Hospital" and like yeah, yes, yes. "So can you, can I come and meet you?" And eventually we got them to Perth. There are 30 million medical abstracts in that database. There's patent data, there's all sorts of amazing data in that database and you can interrogate it. But it needs to learn and you've got to be very careful you don't imprint your intrinsic bias on it. They came for 6 week training course with us and when they walked in and saw the burns team they said "Is this the whole team?". And we go, "yeah, there is not many of us. But you know, we make up with enthusiasm for the lack of numbers, promise." And so we worked away and I said, "well, you know, we've got the power of this and we're asking it to binary question, cancer burns, let's go zen here. Let's really see if we can make this machine steam. Let's understand how we can interrogate this at many different levels." And that's work that we're involved in now and they at IBM have funded some of our research work so that we can then cross reference and check. We have genetic information from patients, a thousand of our patients that relate to their scar outcome and we've put that information into Watson Drug Discovery to see if we can find the linking pathways that have driven a change in the structure of your body remote from the burn, which may associate with an increase in cancer.

It's fascinating because we can learn from lots of different places. I work with data analytics. I work with neurophysiologists, I work with cardiologists, work with infectious disease people. I work with engineers. I could talk about the power of science and discovery until you all turn to dust. But I'd like to leave you with the thought that we're all in this together. I remember my life changing again January of 2005. I was asked a number of questions that day as I was walking up the stairs to receive a very nice glass trophy from Mr. Howard, that one of my children, Mr Nobody, has broken in my house. And as I was walking up the stairs, I was asked, "You are Australian aren't you" and I go, "No. Does it matter?" in my best Yorkshire accent and then, "I'm kidding. Yes, I am promise. I am Australian".

But what is it that you want to share with Australia? And it became something that I've thought a lot about since, I wanted to share with Australia that I had seen the power of basic science at the bedside. I've seen the change in suffering. I have seen the power of science and technology and I've seen it in the cultural context here and I've seen it across the world in less fortunate environments.

I work as part of the International Burns society where we have a mantra, one world, one standard of burn care. It's an aspirational goal when we strive towards, by sharing our knowledge and our energy and our time.

As a part of all that, I found myself and the very north of Western Australia where you could smell the dry. I'd travelled from Broome across the top end and I'd been in many communities. I'd seen things that had taken my breath away in our indigenous communities across that environment. And there I was on the beach having a barbecue at Kalumburu Mission and one of the ladies who'd taken me around, indigenous ladies my age, we were there with our kids and our grandkids. You are one of life's good women, you know, good people. And I go, wow, what motivates you? And she looked me straight in the eye and said to do the best for my children. What about you? And it stood me back on my heels and I went, yes, when we start to think of this science and technology, I'm a nerd, you know, I am a self-confessed nerd. Clearly, I don't get out much because as I said, I could talk and drive you to dust about the power of science, technology, data analytics, the opportunities of our future.

But I am a mother and a grandmother now and I am a believer in people. I'm a believer in the uniqueness of each and every one of us, and a believer in a society dependent upon the integrity of each and every one of us, not the intellect of a few, and certainly not driven by the negative. I believe in goodness in people, and I think that is what we need to harness. We need to harness the goodness. We need to harness the positive energy and we need to do so such that our science and technology of the future shines. And we leave a history behind us that we are proud of. Thank you very much.

