Sue Nelson

Hello, I'm Sue Nelson and welcome to the first episode of Create the Future, a new podcast brought to you by the Queen Elizabeth Prize for Engineering. Throughout the series we'll be showcasing the incredible breadth, skill and creativity of engineers. It seemed appropriate to start us off with John Browne, aka Lord Browne of Madingley, an engineer, businessman, writer and member of the House of Lords. When he was chief executive officer of BP Lord Browne was praised for bringing in more environmentally friendly production and instigated a plan introducing solar power to 200 of its retail outlets. He's currently the chairman of L1 energy and chairman of the Queen Elizabeth Prize for Engineering Foundation. I began by asking how he would describe the life of an engineer.

Lord Browne

An engineer sits in the middle between discovery - what happens in the labs and people's heads - and on the other side, the market and humanity. I like to think engineers are like Janus as they've got two faces looking in two different directions. They make ideas possible. They make things. Whatever they do, in the end they make something - that's important for Humanity.

Sue Nelson

It's creative as well, there's this 'making'. You always associate 'making' something with being creative. It's not always a word that is associated with engineering even though it should be.

Lord Browne

It's all about creating things, there's nothing non-creative about engineering. Actually, there's almost nothing non-creative about almost any pursuit involved in taking an idea and making it as something which is useful for people. That's an act of creation and they happen in millions of ways every single day. People just need to think of themselves as creative people because they are.

Sue Nelson

For you what would you say was the act of creativity with Engineering that you are most proud of?

Lord Browne

For myself, the things I've done I was very proud of being able to work on developing some of the greatest oil fields in the world. This was a long time ago, but I remember being involved in the development of the Alaskan fields in Prudhoe Bay which were deemed to be impossible to develop. They were underground obviously, with 2,000 feet of permafrost on top of them, we were very worried about melting the permafrost during the activities - we didn't.

Sue Nelson

Thank goodness.

Lord Browne

Absolutely, forbidden! No one wants to do that sort of thing, no one wants unintended consequences to overwhelm the good that's being done. So it was a great endeavour and what I liked about it for me is, I became an engineer because I wanted to solve problems that nobody else had solved before, for the benefit of humanity, which is what I think I've done and I continue to do in my career, whether it's in oil and gas or renewables, or in the many other things I do today.

Sue Nelson

That must give you a great sense of pride then in terms of knowing that you were a part of something like that?

Lord Browne

It does and the word is 'part' because most engineering is done in teams and part of the act of Engineering is leading teams of people to show them that they can do far more as a team than they could do by themselves and to show people that they have greater strengths than they think themselves, therefore creating something which is unusual and different.

Sue Nelson

Now I've noticed the word humanity come up several times already and you've written several books about business and engineering and your latest one 'Make, Think, Imagine: Engineering the Future of Civilisation', the sort of humanity and civilization aspect is obviously quite important to you in terms of making people appreciate the role that engineering has had in the way that we live today?

Lord Browne

Engineering pervades almost everything that we do today and is the foundation of civilization. Without engineering, without engineered products from the very beginning - a prehistoric hand axe through to the most complicated thing we're building today, probably the James Webb telescope which will go to the second Lagrangian point and probably look closer to the beginning of time than we've ever seen before and probably show us more exoplanets than we've ever seen. These two things straddle extraordinary activities which really found civilization. So it's not enough because on top of this you need the pursuit that tell us about the human condition and excite and expand our minds and also tell us, very importantly, not the mere fact that in engineering you can do something and therefore you should do it - it asks the question: you can do something should I do it. That's what understanding the human condition gives you, but all of this is about creating something greater for Humanity - that's why entitle the book 'Make, Think, Imagine'. Everyone says it's the other way around and I say well probably not. Engineering is about making things, it's about thinking about how to use them and then it's imagining for the next step. One of the great things about humans as opposed to machines is that they can imagine - they can be in places they've never been doing things they've never thought of with people that never existed yet - that is imagination.

Sue Nelson

When engineers have so many skills, creative, imaginative, technical, why are we in such a mess, it feels like, in terms of the world today? People are worried about whether it's climate change or sustainability, it feels like engineers have the solutions, but the will isn't always there politically perhaps to put those ideas into practice. Do you think this could be solved by having more engineers within politics perhaps, or is there another answer?

Lord Browne

I'd like to step back and be realistic, I think every engineered product and every engineering activity also has a down side, but sometimes it's unintended. I really don't think anyone imagined when we started burning fossil fuels, which created great progress, no one actually thought that they were going to damage the climate of the world, they only understood that later. What engineers do is they create things that come with the good and the bad. We have to bias them strongly towards the good and getting rid of the bad requires us to create another engineered product or system. We have all the technologies we need to solve climate change, we can do this now, what we have not got is the policy instruments, your point about politicians, we don't have the policy instruments to make it really possible. I think most people would think that we should - one of the biggest things to do would be to have a carbon tax of sufficient scale to force people to reduce carbon - a big tax which could then be used to redistribute to the population and so that the taxation doesn't become regressive. In order to do things you do have to understand some substance, you can't go around skimming lightly on the top, so I do think politics needs to be advised very strongly by engineers and probably scientists

but probably a lot of engineers because it's very practical and it should be probably by people who listen - not necessarily engineers, I would hope so, I'm a member of the House of Lords and I think there are only three fellows the Royal Academy of Engineering in the House of Lords. I think we'd like to see more people pursue different careers, not just engineering, but engineering into politics, engineering into business, business into politics, but that's not the will of the time, it's not the drift of what people do today, I hope it will change but more importantly I hope people will listen to the substance of solutions because there are solutions to so many things and also listen to what's real and not real, for example today we're very focused on AI and AI is lifted in a sea of hype - a lot of hype behind this and so people get worried about of course the hype leading to conclusions that may not be real, that robots will eat us all or we will all be extinct because machines will take over - this is far from the truth, machines, AI in particular, which of course is founded on 50 years' worth of hardware development that people forget, you know what's powering AI is a huge amount of hard stuff. AI is very important and will be developed I'm sure for many applications which are specific. The idea of general intelligence being artificial will require us I think to first define what we mean by general intelligence, no one's got there yet. We've got a long time to go, maybe infinity! I like to think that a lot of these scares need to be put in place by people who understand a little bit more of the context.

Sue Nelson
I was quite surprised that so few members of the Royal Academy of Engineering are in the House of Lords. Sometimes do you ever think that it's scientists that who gain the credit for a lot of engineering success? You mentioned the James Webb Space Telescope earlier, as you said, that couldn't happen without engineers - the Hubble Space Telescope couldn't have happened without engineers, but often when people celebrate its successes they're looking at the images or the science that comes down from it, perhaps we do take engineer's a little bit for granted?

Lord Browne
We do! I like to tell people that engineers have saved far more lives than any clinician or physician over time. It's absolutely true. Advances in medicine have been based on engineering breakthroughs and if you doubt it, look at sewers, look at clean water, look at what happens in an intensive care unit, look at what happens in an operating theatre. Engineers I think have been taken for granted, they take discoveries every day, you hear them on the radio, some of these discoveries are maybe 20 to 30 years off application and people are talking about them as if they're today. What happens between that and getting something you can use is the very hard work and thoughtfulness of engineers. Engineers have to create things, but in the end they have to be created so there's no doubt in their utility. Mind that Canadian Professional Engineers still wear a ring on their little finger which is made from a bridge that collapsed, it reminds people that whatever you do, it's got to be done so that it cannot be doubted - that's what engineer's have to do. that may sound dull to people but actually the creation of things that work - take a car, we expect to get into a car and we expect it to work. If it doesn't work we get very angry, it doesn't expect us to be fully qualified to use it, it's not as if we've got a pilot's licence for each particular model we drive, we can abuse it we can do all sorts of things to it and we expect it to work - that's an amazing idea and we will expect them to work better and better with batteries, with autonomous systems, still to be made safe, but we expect all these things and we don't actually think about who did this. I believe that that should be changed because people need to understand what society what civilization is built on which is it's built on the fundamental application of discoveries into things that make a difference to people.

Sue Nelson
One of the aims of the Queen Elizabeth Prize 'Create the Future' podcast is to showcase a variety of Engineers from all sorts of areas that perhaps people wouldn't initially think "oh wow yeah that is engineering!" - whether it's AI, smart cities or healthcare. I know this is going to be a difficult question to answer unless you've been

asked it before, but what would you say has been the greatest contribution to society by an engineering invention that's changed the way we live our lives?

Lord Browne
This is a very big question, you have to look for very big impacts, so I think the biggest impacts are the delivery of energy to the world in its various forms which has allowed progress to happen everywhere and secondly the delivery of health care that made a difference. These two things, so whether that sewers right through to the most advanced immunotherapy today, these two big pillars have allowed society have allowed civilization to progress and everything else is built on top of it - enough energy to do things for today and for the future and enough healthcare to survive to do something with it. Everything else is in-between and when I was writing my book I talked to a lot of people who involved in these things and also in things like shelter and building, you know, how do you get people to live in these bigger and bigger cities and actually feel that they own a piece of the city you know not just give them a box to live in but maybe give them half a house and ask them to develop the other half of the house so that they can feel that they own it. That's an engineering idea, it's a systems engineering idea made by a great architect Alejandro Aravena from Chile, but there are plenty of others, Norman Foster again talking about how do you really use all the spaces in an in a city because more and more people will live in cities to do agriculture and make the environment different. There are plenty of ideas in in every field that will keep us going for the future. We should be proud of that because a large number of people in every generation believe that the end is nigh, from Malthus who believed that the ability for us to get the resources we need would use so much energy that it would reduce the population, through to lots of peak oil, peak gas, peak copper, peak agriculture, you name it, every time engineers have challenged that and have solved the problem to make it more possible for people to do more things in a better way and I think that's what engineering is about. Again and again it's challenged the boundaries and created something new and that's what everybody who is involved in engineering should believe that they are doing, they're changing the future of humanity.

Sue Nelson
July 2019 is the 50th anniversary of the first human beings on the Moon so our opening podcast that showcases engineers other than yourself focuses on an Apollo engineer. What would you say from those Moon landings were the key engineering innovations that helped make it happen?

Lord Browne
It showed that in peacetime you could build a great team and a great challenge to do something that's never been done before with safety. It's an outrageous idea to take a human and put them on in another world - that's the main point of it, it was a challenge which had not been met, with a finite time scale to get there, with the resources needed and attracted the best people from all walks of life because they said we can do something which is different, we need to do more of that. I think climate change is one of those things that if we get it right, because it's too big a problem to solve in one go, the components are great challenges for the future. Health Care is also another great challenge, the ability to use all the data we have available on every individual combined together to use in diagnosis and possibly even prognosis, these are great challenges that would be very important for us. So the Moon landing was one great peacetime challenge, there were plenty of others in wartime, the Manhattan Project of course, but this was the greatest peacetime challenge, we should remember what its purpose was, to galvanize action. Out of it we've got lots of things we still use, whether it's materials or rockets smaller than there were for the Saturn program, or the ability to make human environments that allow people to survive in very unusual circumstances. So lots of things have happened, but in the end it's setting that challenge and time.

Sue Nelson

If you were to relive your engineering career again given the enormous variety of areas now within engineering, would you still stay in energy or is there a new area that really fascinates you?

Lord Browne
I suppose the two areas that I've really spent my engineering career on, one is energy the other one is information technology - I've been on the board of Intel for a decade and before then I did a lot in this area. I think I'd probably still pick those two but these hypothetical questions, you never know what will happen. I'm intrigued with how medicine is being changed by engineering, by both information, big data, processing the data, learning from the data, AI based on that data and also medical devices - things that can be put into the body or used to inspect the body that give us much bigger insights to what we're doing and allow more people access to things. If you can get people off an operating table five times faster than you could in the past because of some device, then five times the number of people can get access to medicine. So what would I do? Probably the same things but I might veer in that area because I think it's intriguing and I think there's so much that we don't understand about us, our bodies, disease, that there's tremendous areas to go for.

Sue Nelson
Lord Browne. In our next episode to celebrate the 50th anniversary of the Moon landings, I'll be joined by former Apollo engineer David Baker and we'll be walking on the surface of Mars with Airbus ExoMars Rover engineer Abbie Hutty, do join me then.