Sue Nelson

Hello, I'm Sue Nelson and thanks for joining me on Create the Future, a podcast brought to you by the Queen Elizabeth Prize for Engineering. We're bringing a touch of Hollywood glamour to the podcast this time with two engineers whose companies have between them won Oscar nominations for visual effects on the Lion King, Gladiator, Life of Pi, the most recent Jungle Book, and won an Oscar for the hugely successful World War One movie, 1917. They are Roy Trosh, Vice President Global Systems Architecture at Technicolour, and David Spilsbury, Chief Technology Officer for advertising at the Moving Picture Company (MPC) in Soho London, which is where we are now. Let's start with you, David – what goes on here and give us a scale of the building, because you're split up into two buildings, aren't you?

David Spilsbury

Yeah, there's about 800 people in Soho working on visual effects for both TV, commercials, and feature film VFX. We also have offices around the world. London is where we started and where most of the global architecture sits. But that supports offices in New York, LA, Chicago, Bangalore, and Shanghai. And we have a satellite office in Amsterdam, so we really have a global presence.

Sue Nelson

Roy, I gave that long list – and that's just a short one, really, a short highlight – of some of the films that have been nominated for or won Oscars. I think we have to start with what's the difference between visual effects and special effects.

Roy Trosh

Some people like to differentiate it by saying that special effects are what's on set – the explosions and all the real physical effects actually happened on set. VFX is what happens after, it's the post-production. So think of it as special effects being production and VFX being post-production, that's is how I like to think of it.

Sue Nelson

So give me an example, then, of a visual effect with a particular film that we know of.

David Spilsbury

So, a visual effect would be a set extension or in, say, 1917, where you've got explosions going off with special effects, you might add more explosions as a visual effect. Matching the two makes it seem real. So, a lot of lot of the time, you won't recognise a visual effect if it's done well.

Sue Nelson

Now, this company, MPC, you've been involved with things that... well, for me as a Sci-Fi fan, you know, I just loved X Men, Blade Runner (the 2049 one) Jumanji, Ghost Busters – give me an example where visual effects has been used in one of those films where perhaps people hadn't realised it was there.

David Spilsbury

Well, so Sci-Fi is actually an interesting category because it is science fiction. So, you have to create the set and then extend it out into space or a different planet. There's a lot of set building that goes on so that the actors can feel like they're in the environment that they're supposedly in. One of the projects we worked on was Sunshine from Danny Boyle, and we had all of the science feeding into the visual effects. Obviously, you can't go that close to the sun, but you have to recreate it as accurately as you can from the science, but also make it look visually appealing.

Sue Nelson

But in Harry Potter, for instance, people would physically have a wand in their hand, for instance, but the visual effects would add something extra?

David Spilsbury
Add the sparkle and the magic to Harry Potter's wand. So actors wave it and, I mean the classic one is the lightsaber in Star Wars where it's a broomstick and they actually do hit each other, but then it glows and makes that sound and that's how you add those visual effects, to enhance what's already going on. MPC worked on the whole Harry Potter series and added lots of magic to the scenes.

Sue Nelson
Now Roy, Technicolour is actually just five minutes away from where we are now and there's a connection between Technicolour and MPC.

Roy Trosh
Technicolour is actually the company that owns multiple companies around the world now, including the Moving Picture Company and The Mill and Mr. X, [unclear], so yes Technicolour owns a lot of VFX companies around the world now.

Sue Nelson
Actually and I've seen that you've done the latest Avenue 5 series with Hugh Laurie (that's on Sky I believe), and Vikings, and Messiah which I just watched on Netflix. For you, where does the engineering come in all this?

Roy Trosh
The Technicolour companies not only work on these, you know, blockbuster Hollywood movies, but also there's a lot of what's called episodic work. That's being worked on at the moment. And we've noticed that with Netflix, for instance, and the Apple channel, there's now a demand for a lot of these long-form episodic series which we work on and add the VFX. So, the fact as David was saying earlier, the fact that we have multiple offices now around the world working on these productions means that we actually spend a lot of time just moving data around the world. Part of what we're doing at the moment is we call 'follow the sun'. So as various parts of the world light up in the morning, they work on shots, and when they go to bed at night, they then synchronise them to the next time zone and then the people in the next timezone start to work on them. So David and I are involved quite heavily in efficient and clever ways of moving data around the world, such that we don't duplicate data because obviously you don't be working on the wrong versions. Also using the cloud a lot and, more and more, to do a lot of the computer intensive rendering and production of frames that we have to do.

Sue Nelson
And how did you start yourself? How did your career begin?

Roy Trosh
Oh, well, I got a degree in electronic engineering many, many years ago now, back in the –

Sue Nelson
The dark ages? Well, sorry, that's really rude.

Roy Trosh
Ha, yeah thanks for that... So yeah, it was electronic engineering in those days, and I was lucky enough to be sponsored through there by a company, so I was like a student apprentice going through university. And I was lucky enough to just pick up one day, at the end of my degree, a magazine offering an opportunity for a job

working on computer graphics and computer animation in Soho. I jumped at this because I thought that just sounded exciting because I was young and impressionable at the time, and I got on in the very early days of computer animation. That was sort of when your TV title sequences – the Six O'Clock news, Nine O'Clock news – all wanted computer animated title sequences. So I got into it then and, you know, from those days of green grids and tumbling logos, we've now got to a point where we can do fully synthetic dinosaurs and people, people can age through synthetic ageing of actors, and that sort of thing. So in the last 20 years, things have come on a very long way. But I have to say: having that engineering background really was the only reason I got into this industry, because I had that engineering background.

Sue Nelson
And David, there was a mention there of TV and news programmes. You also have a sort of a background that involves broadcasting.

David Spilsbury
Yeah, so I took a slightly different route – I did a higher national diploma (HND) in communications engineering for radio and television, and then was lucky enough to join the BBC as a direct entry engineer and worked in news and current affairs. Working on live TV programmes with cameras and video tape recorders was very hardware-based technology. All of the equipment that you would engineer and connect together to build a system were all separate boxes and the engineering side of it was connecting them with the right cabling, with the right power, and hosting them in the right environment. Over the years, I've moved into post-production in Soho and we've seen several evolutions of technology that we have to carry on engineering, to put all of these pieces together. The current systems are on-premise compute, network, storage, and render. But we are, as Roy said, moving to more cloud-based and remote data centres, and remote working for people is a key part of it. The infrastructure of the internet, that's allowed people to not actually all have to come to the same place to collaborate on creative projects. A lot of the engineering that we do is enabling people to collaborate on creative projects without having to be in the same physical location.

Sue Nelson
So the role of an engineer has really changed over the years as a result of the changing technology, effectively.

David Spilsbury
I think the technology that we support as engineers and that we install and maintain has changed. But the role of an engineer is really as a problem solver. It's actually taking that technology and finding an application for it – whether that's a creative application, or purely a business application – it's solving a workflow or a problem that a creative team has and then producing a solution. And the technology will change over the years, but the problem and the workflow is still the same.

Sue Nelson
Where did you get the love of engineering from both of you?

David Spilsbury
I got my love of engineering from my Father and from sitting at home in my bedroom, taking things apart. Just being curious about how they work, what makes them tick, and then putting them back together and trying to work out why I've got one piece left over.

Roy Trosh
Yeah, similarly, my dad was a mechanical engineer. I was always the person in the family who would fix the radio, who would help my Mum if anything broke in the house, and it just evolved from there. I was very much

into music – in my early days already wanted to get into radio. But then, when I had the opportunity to do things on TV or in movies, I absolutely jumped at it. I wanted to be doing technical things in a creative environment, and I think I'm lucky to be doing that today.

Sue Nelson
So how did you actually end up where you are now?

Roy Trosh
Well, as I said, I was lucky enough to get this job in working in computer graphics and then computer graphics just developed. I guess I'm lucky. I mean, I could've decided to specialise in something which didn't go anywhere, but I was lucky enough to get in on the early steps of the ladder in computer graphics and computer animation and that has absolutely totally exploded over the last 20 years.

Sue Nelson
So what makes a good visual effect? I know you said it's if you don't notice it, but the sort of technicality in terms of nowadays you can see hair on people's head and individual strands blowing in the wind – it's much more detailed now.

Roy Trosh
When you're creating the frames for your computer animation, these used to be done by a few computers in the machine room of a company like MPC. But now, in order to work on the single frames required for a Feature Animation such as, let's say the Lion King, you're talking 10s of hours per frame to render and that's just not possible to do internally with a few computers on a shelf. We have to use the cloud. So being able to burst out into the cloud is a game changer for companies similar to those that are run by Technicolour. We've now got this infinite compute resource, and we can gear up and crank up the quality to produce these photo real images.

David Spilsbury
Now for me, what makes a good visual effect is something that adds to the story that the creatives are trying to tell. It was a time when you would be wowed by a visual effect because it would be something that you'd never seen or that you couldn't see, and it'd be quite obvious that it was it was a statement piece.

Sue Nelson
Like Terminator two when it first came out, for instance, with the liquid metal Terminator?

David Spilsbury
Yeah, that is so obviously an effect and a very key part of the story as well. That would be an amazing visual effect, but the VFX that really amaze me are the ones where you can't see it, where you get the lighting right to match the camera move. One of the key things about 1917 is it's one long camera move, and we're able to put computer generated elements and environments into that camera move without noticing where it happens. We actually do break down videos of all of the parts that go into a visual effect just so people can understand them. If you're interested, you can search on YouTube and you can find those breakdowns and see all of the layers that go into it. I'm still amazed when you actually go back and look at what was shot on set and what it looks like when you see it in the movie theatre.

Sue Nelson

1917 is a pretty amazing film. Maybe not everyone perhaps has got around to seeing it just yet but I'm sure it's on their list. Gladiator, though, that's something that's been out a long time now and it's often on TV. What sort of visual effects were there that we might not have noticed at the time?

David Spilsbury
Extending sets like the Colosseum. Obviously, we know a lot about what's left but for the time of Gladiator you have to replicate the whole Coliseum. So building the CG model and then putting the actors within that set and making it look real.

Sue Nelson
Because there is a difference because sometimes when you watch Star Wars scenes, for instance, I think sometimes it's pretty obvious that a crowd has been duplicated, even though you might not see the join. Whereas it felt like, when watching Gladiator, maybe it was there was a massive crowd. But that's where the extension is, is to give the sense of fullness without you noticing it.

David Spilsbury
I think that's a really good example as those two systems will have changed over the years. In Gladiator, it was a real crowd that were assembled as extras. And then as the Star Wars series evolved, it used crowd replication systems. You can now start use gaming technology, where you have automatons as the crowd and, if they're far enough away, you don't realise that they are a digital crowd. Rather than just replicating the crowd, one of the classic things to do is to fill a stadium with a crowd. You can't get 10,000 people to fill a stadium, but you get 100 people to sit in a set of seats, and then film them in every set of seats and replicate it around the stadium. Now we can have computer-generated humans sitting in those seats, all waving, all animated, all following algorithms that make them look like a crowd.

Sue Nelson
Now we mentioned lighting earlier and how important lighting is. It's interesting, your father was a lighting designer, wasn't he? Has that sort come in useful in terms of your career?

David Spilsbury
Not directly in my engineering, but I think as Roy was saying, it's that link between the creative process and providing the technology and the engineering behind that. I've always felt that when people see the list of credits, there's hundreds of people that work on movies. When you go to the theatre, you see the people on the stage but there are a lot of people backstage who are making it happen and making everything look seamless. It's that being part of a team, working on a creative project, but not necessarily in front of the camera.

Sue Nelson
Do you do you mind being effectively backstage doing the stuff that people take for granted? Because if it's good then they do take it for granted?

Roy Trosh
I remember my mom used to always complain, saying: "Oh, why isn't one your name on the credits? Why aren't you up there with the director?" But in fact, to tell you the truth: I don't mind. What I do enjoy is just doing a technical job in a creative environment.

Sue Nelson
When you're younger, you were involved in flight simulators as well what do I know you didn't mention it, but I do know.

Roy Trosh

Well, the company that sponsored me through university used to do flight simulation and were based down in Crawley. As part of my apprenticeship, I worked on the computer-generated visuals to train pilots. So even though again, in a in a very, very small way, the fact that I had that on my CV really helped get me into this industry as you could talk it up a bit in the interview.

Sue Nelson

So how would you describe your day job now?

Roy Trosh

Oh, my day job now is talking a lot. And you know, there was enough time years ago I used to pick up a soldering iron and things but that's long, long gone. Now I spend a lot of time talking globally across all the Technicolour companies looking after the infrastructure for all of them. I'll be tempering some people's enthusiasm, but also finding crazy ways of doing things that somebody miles away might have suggested and then bringing it back to the group and saying: "this is an amazing idea, we should do this".

Sue Nelson

And David, what about you, you work particularly in the advertising section. Some adverts now are mini short films and there is a great tradition, like with Ridley Scott, of directors who started in advertising.

David Spilsbury

Advertising is very fast paced; there's a much shorter timescale. Three months is a long project to make a 30 second commercial, but we have worked on longer formats. Ridley Scott did the Hennessy commercial recently and that's a long piece of work. Looks visually stunning. They are mini films. We work on the John Lewis series of commercials, and they're always people always keen to see what they're going to be.

Sue Nelson

The Christmas ones?

David Spilsbury

The Christmas ones. Yeah. Buster the dog, and the hedgehog and the fox on the trampoline. Obviously, we didn't train a fox and a hedgehog to bounce on the trampoline

Sue Nelson

What a shame.

David Spilsbury

What a shame. I don't want to dispel the illusion, but those are the sorts of things that, as technology evolves, the engineering challenges evolve as well. So particularly for that one, John Lewis wanted to have a VR experience in store. So being based in near Oxford Street in London, we worked with John Lewis to install a visual VR experience where you could put on a pair of gloves and it would sense where your hands were. You could actually train the animals on a trampoline to do backward flips if you did the right hand movement. And we have to try and match the real time interactive technology of producing a VR experience to the visual quality that you can see in a non-real time render for the John Lewis commercial.

Sue Nelson

And how has the engineering changed as well in terms of your work, because the way we view ads, films, short films, has totally changed.

David Spilsbury
The number of platforms that we deliver to has changed, so being able to ensure the colour consistency and the quality. We had standard definition and high definition and we're now all moving to 4k, and high dynamic range and TVs are going OLED. It's a constantly evolving target and that's one of the things that I love about it. It's not 'static' engineering where you just get better and better at the same thing. It's really that always chasing the technology evolution.

Sue Nelson
And when ads are sold all over the world, how do how do you use visual effects to ensure that the ads are compliant? Say, both in Europe versus the Middle East versus, say, China, because sensibilities can be quite different in each place.

David Spilsbury
Yeah, there's a there's a whole piece of versioning that goes on to make sure that you meet local compliance. Different regions have different ways of approving commercials, and the internet is obviously a lot less regulated than some of the other platforms. So you have to be really careful that what you put into the final delivery is broadcastable.

Roy Trosh
Yeah, I mean, it is quite a big a big part of studying in advertising, in as much as the versioning and adaptation for multiple versions that go around the world. You might produce a single, say Nike commercial, but then make 150 or so different versions that go around the world. Obviously, different regions have different acceptances of what's decent and what's not. A bikini in a commercial might be fine for Europe wouldn't work for the Middle East, for instance. A lot of commercials then get adapted – you change number plates on cars, you have to change the weather conditions to be more suitable for that region, and so on. You just have to be aware of the fact that something that might be accepted in one region wouldn't be accepted in a different region.

Sue Nelson
And this is done with visual effects? So if a woman's showing a shoulder which might not be acceptable in the Middle East, you would cover it with visual effects.

Roy Trosh
Yes, absolutely. Various techniques are used using a lot of different software. If people know what Photoshop is, the VFX software that's used by film and advertising is like that, plus more.

Sue Nelson
Both MPC and Technicolour have been around a long time now, seeing tremendous changes in the industry in terms of format and how film and adverts are actually produced. What would you say has been one of the biggest changes most recently in the way that you do your work?

David Spilsbury
I think the Internet has had the biggest change, the way that you deliver to multiple distribution and multiple platforms. There's still a 30 second TV commercial, but advertising has broadened out and, as you know, has become more direct, more targeted, more algorithm based. It's also gotten shorter, so if you're watching YouTube and you can skip after three seconds.

Sue Nelson

I do. You don't want to hear that, though.

David Spilsbury

It's about engaging. Advertising is about giving a message – normally it's a message to sell, but those messages are changing. Visual effects and the work that post-production companies can do can actually help tell that story and get a message across. That's how things have changed. The clients that we have are changing from working through agencies; we work directly with big brands, who want to get messages out; we work with public information; and we show images to tell a story and get a message across that you couldn't do by going and doing a shoot.

Roy Trosh

Well things have moved on, haven't they? Technicolour years and years and years ago got its name from the three-strip film camera. Wizard of Oz, for instance was technicolour, wasn't it? Now we're talking about how to use the cloud or we're now talking about the convergence with gaming engines and what they are doing compared to computer animation. And we're doing things in real time playback of animation, which is getting better and better and better. That's going to be a very, very significant way that we produce VFX in the future, I'm sure. The convergence of gaming and what people see at the cinema.

Sue Nelson

So what sort of engineers now do you tend to want within this business?

Roy Trosh

Well, there's a sort of a new breed of technical people coming along these days. We're calling like creative technologists. This is a person that can not only go home and sit in his garage and build something with a soldering iron, but also come in and be able to sort of hold his head up and be influential in a meeting with agency creatives or brands for instance – coming up with crazy ideas to get their brand and their name across. There's absolutely definitely a need for technical people who enjoy and also have a something to say in the creative process.

Sue Nelson

Now, I couldn't help noticing that you said 'he' there, but I hope 'he' equally applies to women in this industry?

Roy Trosh

Absolutely, we have loads of women working at the company and that absolutely helps.

David Spilsbury

Same at MPC, we have a diverse group of people, and that helps with the creativity and the problem solving. You need lots of different approaches in order to create the best workflows.

Sue Nelson

Does this mean that science subjects – the traditional you know, maths, physics, chemistry – but also maybe an art subject like product design that mixes the two, or going left of field? Does something completely different work for this industry?

Roy Trosh

Absolutely. Yeah. If there's anyone out there who has all those skills you just mentioned, you just have a word with us!

David Spilsbury
Yeah, I think as Roy said, engineers are problem solvers – people with an interest and curiosity to see how things work and how they can be put together differently to achieve a different outcome. Software has become a big part of it as well, so people with coding skills. But you don't have to be a computer programmer, per se, you can learn enough to do it so people have experimented with Arduino and those home kits where you just get something to do something.

Sue Nelson
It's what my son's currently doing actually and I'd never heard of Arduino until he got one.

David Spilsbury
Yeah, it's that experimentation – putting things together. What we're seeing is there's a lot of information and data streams that you can tap into, and you can use those data streams to influence visual effects.

Sue Nelson
What's the visual effect then that you're both most proud of that you were, directly or indirectly, involved with that you just thought "wow"? Whether it's a wand in Harry Potter… in fact I didn't you put the steam on some of the trains sometimes?

David Spilsbury
Yeah, so there's lots of moments where you just think: "without that visual effect, it wouldn't be believable". My personal favourite – I like the Sci-Fi genre as well – was when we worked on Passengers, on the scene with the swimming pool in zero gravity. The water comes out of the swimming pool and floats in space. You know, I just think that is inspired and you couldn't really do it. It's obviously a visual effect, but it involves fluid dynamics and rendering particles to look real in zero gravity.

Roy Trosh
The thing I'm most proud of, like the most – and I mean I had a tiny, tiny, tiny part to play in it – is just the Lion King. Anyone who's seen the Lion King. How many people watch it and think those creatures are real? I'm very happy with that. Engineering-wise we did a bit in terms of rendering it all in the cloud, but the artistry and the creativity is all down to the incredible people that work at Technicolour.

Sue Nelson
And it's easy to forget that the Lion King is purely digital.

Roy Trosh
Oh, absolutely. Absolutely.

Sue Nelson
So it's all in a computer effectively.

Roy Trosh
Oh, of course. Absolutely. Yeah. And even the pre-production, that was done in order to work out all the shots. They were all done using gaming engines. Again, that shows the how the two are converging.

Sue Nelson

And you've given some advice in terms of engineers who are interested in going into this industry. Do you think people could ever get here through the conventional roles that you came through, or is it now it's sort of like gamers, as much as creative technologists now? Where engineering in this industry has moved on to create a sort of new breed of engineering.

David Spilsbury

I think you could still follow that path. I think there are lots of paths into what we do. It's a collection of like-minded people who want to work with creativity and technology. So, a broad interest and curiosity, and a desire to work in this industry will get you far.

Roy Trosh

Yes, absolutely. I was just thinking that there's people at The Mill, for instance, who just program hair shaders. Their speciality is working out how pieces of hair fall over other pieces of hair and how light refracts through it. There's a hell of a lot of physics involved in that and science, but they work on it because they know that what they do, will ultimately end up being something that contributes towards a visual effect.

Sue Nelson

Roy Trosh from Technicolour London and David Spilsbury from the Moving Picture Company. Thank you both for sharing your fascinating engineering careers on the Create the Future podcast.