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The science of Disney

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Disney animator and engineer Yasser Hamed is at the cutting-edge of film animation technology, blurring the lines between science and art.

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When Yasser Hamed wondered, 'Can I use engineering science in filmmaking?' in 2001, he didn't realise he was one of the first to ask that question.

The mechanical engineering student was then in the final stages of his degree at the University of Newcastle in New South Wales. Fast forward to 2017, and Hamed is a senior creative at Walt Disney Animation Studios in Los Angeles, having worked on major films including *Moana* (2016), *Big Hero 6* (2014), *Cloudy with a Chance of Meatballs* (2009) and *Happy Feet* (2006).

As Crowds Supervisor for Disney Animation, Hamed heads the department responsible for 'crowd animation' – that is, animating the background characters and elements in a film, such as crowds of people, flocks of birds, schools of fish and traffic systems.

"We basically use simulation and science to drive characters and animate them as a group," says Hamed. "For example if you've got a crowd of 100 people who all need to react to something, you're not going to hand animate each character. So you write software scripts to control characters so they look in certain directions

and do things.”

It's called procedural animation and it uses physics to create animation in real-time. Essentially, it gives characters a life of their own. And Hamed and his team at Disney are at the forefront of this technology.

Most recently, Hamed worked on *Moana*, an Academy Award-nominated film about a teenage girl in ancient Polynesia who sets sail on an adventure to fulfill her ancestors' unfinished quest.

Moana posed numerous creative challenges for Hamed and his Crowds team, one of which was animating fleets of boats and the 200-plus characters that sailed them.

“We wrote simulation software to animate each character on the boat relative to the motion of the boats themselves,” says Hamed.

The software took into account factors such as how fast the boats were moving and how big the waves were to automatically drive the movements of the people on top. In a way, the technology brought them to life.

Animator of extraordinary ability

It is Hamed's curiosity about science and technology and his relentless pursuit of finding better ways to do things that landed him in Hollywood, where he now lives.

Hamed's US visa labels him an 'Alien of Extraordinary Ability' – a high-priority category reserved for just 2 per cent of people in their field. This includes winners of Academy Awards and the Nobel Peace Prize.

The Egyptian-born Hamed moved with his family to Australia when he was 11, and settled in the coastal city of Newcastle when he was 14. He loved film growing up – *Aladdin*, created by the same directors as *Moana*, was one of his favourites – but never really considered a career in the industry until the last years of his Mechanical Engineering degree.

In his final project, Hamed brought together computer graphics and engineering science, writing a software tool that analysed machine ware using computer graphics. He scored the highest mark for the presentation of a project that year, but had no idea if there was a market for his interest.

“Getting that foundation and education, that was the stepping stone for my career. So I have a great appreciation for the university,” says Hamed.

In 2004, Hamed emailed the Head of Research & Development, Guy Griffiths, at Sydney visual effects studio Animal Logic, to ask about the potential of using engineering science and software in filmmaking. Griffiths, an electrical engineer himself, asked him to come in the next day. Hamed was offered a job as a software engineer and software technical director on the spot.

“The sheer fact I'd brought up this question was enough to win this job that I didn't even know existed,” he says.

Animal Logic was about to start work on *Happy Feet*, Australia's first animated feature film. The studio hired hundreds of people from around the world. When production finished, Hamed was offered a role at Sony Pictures Imageworks in Los Angeles.

An engineer in the city of angels

After hitting the ground in Hollywood in 2006, things moved quickly.

“Americans in general are very welcoming to Australians,” he says. “I think we have a reputation overseas of being very friendly and very creative and resourceful. I think in general Americans just love working with Australians.”

As Senior Technical Director at Sony Pictures Imageworks, Hamed worked on films, including *Beowulf* (2007), *Cloudy with a Chance of Meatballs* (2009) and *Alice in Wonderland* (2010).

He became well known in the industry for his role in introducing science into animation, and his skill in combining art and science.

“What I like about animation in general is that we’re creating these virtual worlds,” he says. “Something about the philosophical aspect of that really excites me. Like, wow, I’m essentially creating life in a way. For example, in *Big Hero 6*, the characters were programmed so they walk around doing their own thing. I don’t actually tell them exactly where to go, they just do their thing.”

2010 was a big year for Hamed. At 29, he became the youngest person to win the University of Newcastle Newton John Award, which recognises innovation or creativity in any field that has improved cultural life.

It was also the year Disney Animation offered him a job – a ‘pinch yourself’ moment for someone who grew up watching *The Little Mermaid* and *The Lion King*. The studio was in the production stage of *Tangled*, its first 3D princess movie.

“They needed my expertise because there were a lot of interesting challenges scientifically speaking,” says Hamed. “She has 70 feet of hair: how does that hair move, how’s it going to behave in a realistic fashion, how is it going to look?”

Animation innovation

Seven years later, with *Moana* having wrapped in October 2016, Hamed is between films. Last month it was announced he’ll be Crowds Supervisor on *Frozen 2*, due for release in November 2019.

“That’s a big one for me, and hopefully, a big one for Disney too,” says Hamed.

Hamed expects to start work on *Frozen 2* in early 2018. In the meantime, he’s researching potential tools to use, supporting his team of artists and exploring some new innovative technologies.

“We are at the leading edge and we push the technology in the industry,” he says. “Sometimes we learn from the work of others and we try to build upon that. And being a leader in an advancing field like this is something that I really appreciate.

“The great thing about Disney is they give us this time to research new ideas in between projects.”

A number of industries have been researching ways to incorporate machine learning and artificial intelligence. The games industry for example has been adapt at incorporating this technology, and Hamed has been keen to explore these new ideas in animation.

As well as experimenting with new ideas, time between films gives Hamed a chance to return to Australia to

visit his family and give back to his community.

“I wouldn’t be where I am if it wasn’t for the ideas I learned at university, which is why I always like to help out when I can and donate my time,” he says.

Most recently, this involved a visit to the University of Newcastle to share his story and inspire current students. For those interested in a career in animation, Hamed says it’s all about finding your passion.

“Somewhere like Disney is super interesting. We have individuals from all walks of life. That’s the beauty of animation – because you’re creating a world, you need a world of people.”

It’s a world that is changing rapidly, but it’s this constant sense of possibility that drives him.

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