OUT OF THE SHADOW

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Jake Dyson has created what many said was impossible – an LED light that 'lasts a lifetime'. The designer and engineer talks to us about his light-bulb moment…

Jake Dyson, 42, knows a thing or two about the highs and lows of invention. As the son of famous British inventor Sir James Dyson (founder of the Dyson Company), he has been brought up in an environment where innovation is second nature and making mistakes is praised (a chance to learn something new and improve).

Although he decided to go it alone in the world of business, it's clear that the Dyson desire for perfection is in his DNA. After many tireless nights trying to produce an environmentally friendly light that lasts for life, Jake has finally done it – using light-emitting diode (LED) technology.

His new overhead light, the Ariel™ suspended light, is the latest addition to his high-end lighting units and is designed to save energy by slimming the number of lights required in buildings (homes and offices). Just one Ariel™ light can illuminate an entire kitchen and will last for 40 years before anything needs replacing – even the bulb. It took Jake four years to get his innovation performing to the standard he wanted and he led the entire process – from concept, testing and manufacturing to creating the supply chain. He tells *QW* his story…

What is your definition of quality?
Jake: Quality is a product that performs. It does what it says it does. It lasts for a very long time, is robust against human interaction and completely flawless in its appearance. Also, quality is a tactile thing – when you touch something you know if it's good quality or not.

Where does your drive for perfection come from?
I'm quite minimal and I've been brought up in an artistic design environment. Ironically, my father loved designer lights so there were lots of them around the house. I'm just not happy unless everything is in order and if there is something unfinished, I can't rest. A problem doesn't leave my head until it's solved. As a designer you become more and more fastidious about making sure things are perfect.

What was the inspiration behind creating a long-lasting LED light?
Frustration. I was frustrated with uplighting because there wasn't enough thought regarding how the light was emitted or the technology inside it. I felt the lighting industry was ignoring a technology – LED – that could be incredibly environmental and give lifelong performance.

It just wasn't in the interest of businesses because if companies such as Philips made lights that last for life, then they wouldn't sell any in the future. But I had a different approach to it: as an engineer I wanted to make a suspension light that could illuminate a whole bank of office desks

Image:
Engineer, Jake Dyson
London, 2015

– an investment purchase. People disagreed with me, saying: "Why are you going to do that? It's not what anyone does in light." And I thought: "I don't care, I think it will be good."

It has taken you four years to get your lights to the standard you wanted. What problems did you encounter?

LED is an indestructible light source that has the potential to last for life but at the time (2007) every single LED product on the market only had a life span of 25,000 hours, and I couldn't understand why.

I didn't know much about LEDs so I flew to Malaysia to see Dr David Lacey, Head of Research and Development for lighting manufacturer Osram – a company that has the ability to manufacture around eight to 10 million LEDs a week. I asked him: "If LED lights are supposed to last for life how come they don't?" His reply was: "Because you need to cool them."

The challenge was clear. An LED could be run as hard as it possibly could and last forever, but only if it's run at -200C, the equivalent of being in the shade in space. And this overheating issue was the reason why lights on the market kept popping.

The Phosphor that covers LEDs was degrading at a high temperature, and quickly reducing and altering the colour of the light coming out. I needed to create a cooling system for the LEDs if I wanted to make a light that 'lasts for life'. LEDs are essentially semiconductors and computers are full of them, so I ripped apart a selection of old laptops to see how they stayed cool.

I found that most computers have a hot semiconductor driver. The heat shoots down a pipe into the heat sink, where a fan blows air to keep the component cool.

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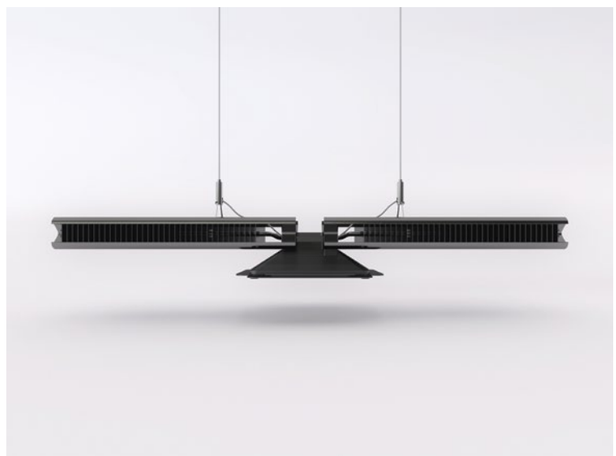
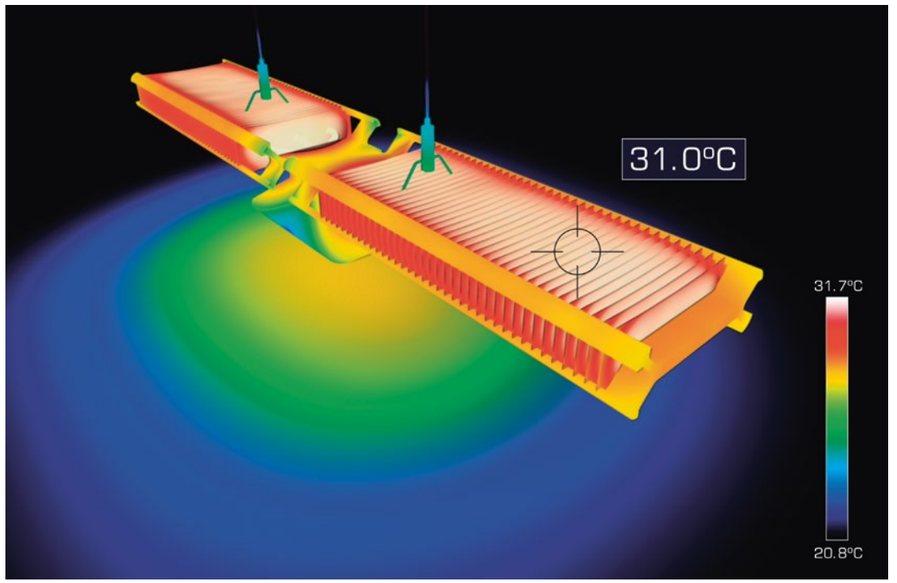


Ariel™ images
© Jake Dyson Light

Images L–R: The Ariel™ suspended light will last for 40 years before anything needs replacing – even the bulb. It was named after the Ariel 1 satellite – the first British satellite in space, launched in 1962.



Computers have to use fans because they are an enclosed chamber but with suspension lights we have the luxury of cooling by natural convection of air. I visited Chaun Choung Technology Corp (CCI) in China, who produce five million of these microprocessing cooling units a month for Intel, Samsung, Hewlett Packard and more, and worked with them to engineer my 6mm heat pipe.

I clamped the LEDs to a copper block as a very thin wall, so the heat shoots out of the pipe and is released through the heat sink (a passive heat exchanger that cools a device by dissipating heat into the surrounding medium) as it travels down. Inside the heat pipe is a vacuum and it contains one drop of water. The water vaporises and boils

at a very low temperature. When it does, the vapour shoots to the cool end of the heat pipe, taking the heat with it and then when it gets to the cool end, it condenses and comes back down the inside wall of the pipe. Then it does it again.

That is the speed the heat is coming off the LED. As it shoots down the filters the air gets pulled up and through to cool it.

Was it difficult combining design with functionality?
As a designer I wanted the light to be utterly brutal. I didn't want any fancy styling because I needed a really aggressive heat sink – the engineering had to be left as it was. What's interesting is that the Ariel™ light turned out looking absolutely stunning and very architectural. By cooling the LEDs we've protected the brightness and colour for 40 years, at 12 hours a day, on full brightness. Osram have backed this life claim based on the low temperature we've achieved on the operating running temperature.

What are the other unique selling points of your light?
One of the big problems I faced with LEDs was glare. If you look directly at it, it can be very painful for the eyes. I wanted to find a way for users to only see the light that is lit up on the surface.

By using one single source of light we were able to light up a 4x2m area as well as being able to trim it with shutter blades. Customers can change the angles of light coming out anywhere between eight and 60 degrees, and can tune it to any degree between those two angles. It's perfect for offices because you don't get any light on your computer screen as the shadow falls underneath.

What quality processes are in place in your supply chain?
As close as I am to my contract manufacturers, I have to have people on the ground. When you fly out there the red carpet is rolled out and everything looks pristine, but as soon as you leave they take down the assembly line. I've also had experiences where I've been told there has been a delay on a component and they've given me an excuse.

It all boils down to the fact that if they don't order a component on time they won't admit it, so I have to have quality control managers to do spot checks on the quality of components, inventory of components and more.

I found that it doesn't matter how well you explain to a supplier that you expect quality, they'll do it to the level of quality they think is good. With the CSYS desk lamp (another product in the range) we had to train Malaysian manufacturing staff to get the wheels on the ball bearing absolutely perfect because we had hundreds delivered to the UK that were too loose. We had to teach them that it was about the feel of it and getting that accuracy on the assembly line was very difficult.

Once you've mastered the specification of the quality that you expect, then it's a lot easier for contract manufacturers to reject components from other suppliers when they don't meet the specification. It has been the most painful and important lesson in designing and manufacturing my own products, and I think that's probably why a lot of people don't do it. They design for a manufacturer and then wash their hands of the rest of it.

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Images L–R: Jake at his studio in London, and the Ariel™ light in the office environment

Did the power of the Dyson name help when you were building your supply chain?
It didn't in terms of setting up the supply chain as I was seeing suppliers that hadn't even heard of Dyson, visiting really remote towns. I spent a year flying around China, Taiwan and Malaysia to find suppliers to make components for my products. Seeing their processes, how they do things and negotiating with them taught me a huge amount. It was about seeing all those things and understanding both the limitations and the possibilities: what you can do, and the costs and speed you can do them at. It did help on the contract manufacturing assembly side though because companies there are excited about the Dyson brand.

Why did you go all the way to Asia when we have a fantastic manufacturing supply chain here in the UK?
I went to Asia because an injection moulding machine is half the price it is in the UK and they make it in six weeks rather than six months. The company I use is hugely experienced in injection moulding, and because my products are complicated and very high precision, I needed someone who could get it right the first time.

What are your plans for the rest of the year?
I will continue developing LED technology and educating consumers about lighting in order to make the world a better place. I'm also a Non-Executive Director on the Dyson board and will continue giving advice there.

How do you continue your professional development?
As a designer I'm always learning because there are new technologies coming out every single day. I've found that if you design based on market research then you will only make small improvements to what's already out there. I like to think completely out of the box. To me nothing is impossible.

Read it
Jake reveals five ways quality professionals can drive innovation in their organisation. Don't miss July's Knowledge email, direct to your inbox or available in My CQI:
members.thecqi.org