



CTO OF THE YEAR 2015

THE CTO OF THE YEAR AWARD HIGHLIGHTS LEADERS IN INDUSTRY WHO HAVE CONTRIBUTED TO THE SUCCESSFUL PERFORMANCE OR DEVELOPMENT OF A COMPANY THROUGH PIONEERING EXPERTISE IN TECHNOLOGY R&D. AS A MEDIA PARTNER, *INTERNATIONAL INNOVATION* PROVIDES AN INSIDE LOOK INTO THE EVENT AND SPEAKS WITH THE WINNERS ABOUT THEIR MOTIVATIONS AND ACCOMPLISHMENTS

Innovation is a core component of European competitiveness, and central to this year's CTO (Chief Technology Officer) of the Year awards were sustainability and the creation of strong and broad technology-based communities. Organised by Spinverse, the Nordic leader in innovation consulting, and the European Industrial Research Management Association (EIRMA), the event was held on 15 October in Utrecht in the Netherlands.

"The European CTO of the Year award is a unique way to recognise outstanding individuals whose vision and passion have made a big difference in keeping their companies at the forefront of innovation," outlines Dr Carlos Härtel, jury member and Managing Director for Europe at GE Global Research. "All the winners have shown exemplary leadership as technology managers; we're happy and proud to recognise them for their impressive accomplishments."

The joint winners of the large corporation category were Professor Martin Curley, Vice President of Intel Labs and Director and Senior Principal Engineer of Intel Labs Europe, and Dr Marcel Wubbolts, CTO at DSM.

"Martin Curley has provided inspired technical leadership for Intel in Europe. He has been so successful that Europe – not the US – is now the leader for several product lines," says Professor Richard Parker, Director of Research and Technology at Rolls-Royce, jury member, and CTO of the Year 2014 winner. Data storage and processing are at the

heart of innovation in the technology field today, and through his leadership, Curley has successfully built a European ecosystem consisting of over 600 partners.

Wubbolts has played a pivotal role in transforming DSM from a petrochemical company into a global science-based company active in health, nutrition and materials, and a leading biotech player. "The frontrunner development and commercialisation of lignocellulosic ethanol technology is only one very relevant example of many in which Dr Wubbolts is intimately involved. His enthusiasm and drive for science and sustainable innovation for society is an inspiration for many," comments CTO of Avantium, jury member and CTO of the Year 2014 winner, Dr Gert-Jan Gruter.

Jonathan O'Halloran, Co-Founder and Chief Scientific Officer at QuantuMDx, was selected as the winner of the SME category for his revolutionary handheld diagnostics technology, Q-POC™. "O'Halloran has unlocked a robust and affordable solution for medical diagnostics with massive application potential," outlines Léopold Demiddeleer, jury member and Founder and Administrator at TechBridgeOne. "Small seeds pave the way to the future and shake giants' certitudes."

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To read the CTO of the Year 2014 event report, visit:

INTERNATIONALINNOVATION.COM/CTO-OF-THE-YEAR-2014

AS AN ORGANISER OF THE CTO OF THE YEAR
EVENTS, PEKKA KOPONEN, FOUNDER AND CEO OF
SPINVERSE, SHARES HIS THOUGHTS ON LEADERSHIP
IN THE TECHNOLOGY FIELD AND THE RELEVANCE OF
INTERNATIONAL ECOSYSTEMS



How can CTOs (or equivalent) boost a company's performance through technology? What are the important criteria to consider?

As this was the second European CTO of the Year award, we have spent a lot of time with leading and former CTOs to define the criteria; what does it take to win? It's quite a challenging combination because a good CTO has to, first and foremost, be a good leader – and not only with regard to R&D but also the management team around him. That person must be able to communicate with marketing, sales, CFOs, CEOs and, if necessary, the Board of Directors – but also all external partners, including other companies, research institutes and so on.

Second, a good CTO needs to take into account, in addition to the traditional, commercial benefits of technical functionalities, the competitiveness of the technology with technically measurable outcomes. It has to be commercially competitive and sustainable.

Third, we are looking for an individual who is a good citizen in industry, and is able to contribute and give back to society what he or she has gained.

Can you explain the relationship between sustainable development and responsible innovation in the context of technology?

Good question! They go hand in hand. You can no longer develop an innovative business without considering its sustainability. There are no shortcuts, and if you do take one, it is very likely you will be caught out sooner or later – and later can be very expensive!

What are the core benefits of open innovation ecosystems? How does Spinverse contribute to their creation and development?

Open innovation is the only way to innovate radically and grow a company's capabilities. The traditional difference between closed and open innovation is that there are

companies who build everything using their own R&D and people, which is based on the belief that both the business and its employees know everything. But, in order to be truly competitive, you have to work with external connections.

If you consider Spinverse, there are two ways in which we have been developing this way of working. First, we have looked at our EU projects and focused on developing multi-party collaborations. We want to create an effective consortium with the right players in it.

Second, we are examining how to write a winning bid and coordinate a project with effective results; the end goal is commercialisation. This is where we believe we have the best practice in Europe.

It's important to start with the industrial targets in mind. As the CTO of the Year award also honours SMEs, we analyse how a small company can play a role in the ecosystem, and how large corporations can benefit from them. We have worked on a number of projects to scout SME partners for large companies, built incubation programmes inside companies and created corporate venture capital funds to invest into SMEs.

Are there any emerging technologies that you are particularly excited about?

I am still very much interested in biofuels, and especially biodiesels. It's an area Europe should look at very carefully. Last year's SME winner Avantium and this year's large corporation winner DSM are both working in this field. Soon, we will be facing a decision to stop drilling oil; this will be discussed heavily at the 2015 UN Conference on Climate Change in Paris.

We may find that we need to leave 80 per cent of the oil we've already found in the ground. Unfortunately, there are no easy solutions for replacing that. Electric cars, while they have made good progress in the last couple of years, are far away from being able to replace combustion engines. Therefore, creating fuels that are compatible with existing engines and using renewable materials is important.



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JOINT WINNER OF THE EUROPEAN CTO OF THE YEAR 2015 AWARD, LARGE COMPANY CATEGORY

**PROFESSOR MARTIN CURLEY,
VICE PRESIDENT OF INTEL
LABS; DIRECTOR AND SENIOR
PRINCIPAL ENGINEER OF INTEL
LABS EUROPE**

**PROFESSOR MARTIN CURLEY'S VISION AND
EXPERTISE HAS LED TO THE GROWTH OF INTEL LABS
EUROPE. IN DISCUSSING THE MULTIFACETED WAYS
IN WHICH TECHNOLOGY IS CHANGING OUR LIVES, HE
REVEALS HOW INNOVATION ECOSYSTEMS FOSTER
GREATER RESEARCH OUTPUTS**



What does this award mean to you?

I'm thrilled to have received the accolade of CTO of the Year 2015 in Europe; it's fantastic recognition. But innovation is a team sport, and I'm privileged to be the captain of the Intel Labs Europe team, so I accept the award on behalf of the incredible researchers that we have in Europe who do an outstanding job.

Why did you choose this career and what fascinates you about the work you do?

I was actually inspired by a past pupil of the secondary school I was attending, who had chosen an engineering career and came in to talk to us about it. He described engineering as 'interesting, lots of hard work and a passport to travel', and that certainly got me excited. I chose to do an electronic engineering degree and was lucky enough to get an opportunity to work with Philips Labs in the Netherlands within the systems field.

Systems have always fascinated me. How can we use technology to transform the way a city operates or its air quality? How can we apply technology to cars and motorways so that, in the future, nobody will ever get injured? How can we transform our energy grids to take advantage of renewables and make our energy systems as efficient as possible? While a key consideration is creating financial value for the shareholders, the core value of technology is its capacity to improve people's lives.

Since the founding of Intel Labs Europe, you have heavily contributed to the increase of researchers from 800 to over 4500 and the doubling of European labs to more than 45.

Can you outline the motivations behind and effects of this substantial growth?

We established Intel Labs Europe in 2009 as a central means and mechanism for coordinating our vision and activities across the diverse research presences we had throughout Europe. A core motivation was to significantly improve the impact and reputation of Intel's research in Europe. We had to work with different audiences, external collaborators, large European companies, universities and the European Commission. But we also worked with internal stakeholders at corporate headquarters to change their perception of Europe as a place where research is not only expensive to conduct but also not of the highest quality.

We set about organising our existing labs as a network and started to participate in the development of mechanisms for collaborative research in Europe and triple helix innovation – the alignment of the interests of government, industry and academia to drive structural change far beyond the scope of what any one organisation can do on its own.

Since then, we've participated heavily in the EU Seventh Framework Programme (FP7) with more than 70 programmes, and have taken a strong industrial approach to undertaking research. We have been able to grow the network mostly organically, and today, Intel does quite a lot of its exascale research and Internet of Things (IoT) work in Europe. We also have a leading automotive R&D centre in Germany. Intel has largely achieved its goal of getting very good value for research and money in Europe, especially through our triple helix innovation collaborations; this has amplified the output of our research.

Intel is part of an innovation ecosystem comprising more than 600 European research partners. How is this collaboration fostering more effective technology R&D?

A central principle behind this is recognition that innovation is moving out of the lab and into the ecosystem. Competition has changed; it's no longer how good a particular company or university is, but how strong and vibrant its ecosystem is. We talk about the 4As:

We have a customer relationship management system to keep track of those relationships. Intel has a well-articulated vision of Europe, and how can we use technology to transform different sectors of European society – be it



transportation, energy or healthcare. All of this means we have stronger and quicker impact.

There is a strong focus on technology for education and accessing new experiences at Intel. What are some of the biggest projects at present?

There is general recognition that we have moved into the 'experience economy', where people are less interested in buying products or services and more interested in buying experiences. As a company, on the one hand, we have to focus on enabling new experiences in the world of PCs and laptops, and on the other hand, driving new technological developments like the IoT platform we've recently announced that can create all sorts of new and exciting opportunities.

One of the key enabling technologies that Intel has released recently is RealSense, which is a platform for implementing basic human-computer interactions. It has traditional cameras, infrared lasers and a microphone, which creates the opportunity for an array of experiences. One education-focused example can be seen in our open lab in Istanbul, where we have an adaptive learning research project using RealSense to measure the engagement state of learners who are using eLearning solutions, so that we can detect whether they're engaged, bored or tired. We can then suggest specific interactions or interventions to make the learning experience better. In January, we are going to conduct RealSense trials with Turkish schools. Intel as a company is invested from a philanthropic as well as a technological standpoint to transforming education.

A less obvious but equally valuable use of the RealSense technology can be seen in a company in the UK called GPC, who are using RealSense technology for wound management. Public health nurses out in the field use the RealSense camera to take a 3D picture of a wound so that we can track how fast it's healing. Then back at the hospital or surgery, they can discuss potential interventions with the doctor or consultant. This kind of technology wasn't available four or five years ago, but now it serves purposes ranging from entertainment to education and healthcare.

ALIGNMENT is the ability to combine the interests of different players with a shared vision to create shared value

AMPLIFICATION is the act of combining resources together to amplify the capacity of an individual company or university

ATTENUATION is the lowered risk associated with partnering with different players

ACCELERATION is the ability to speed up research because of a higher volume of collective resources available

“While a key consideration is creating financial value for the shareholders, the core value of technology is its capacity to improve people's lives”

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JOINT WINNER OF THE EUROPEAN CTO OF THE YEAR AWARD 2015, LARGE CORPORATION CATEGORY



Mercedes Benz A-Class engine cover made from 70 per cent bio-based EcoPaXX.

DR MARCEL WUBBOLTS,
CHIEF TECHNOLOGY OFFICER, DSM

USING RENEWABLE RESOURCES AND DEVELOPING EFFICIENT SOLUTIONS TO FEED THE WORLD ARE AT THE CORE OF CREATING A SUSTAINABLE FUTURE. DR MARCEL WUBBOLTS PROVIDES AN INSIGHT INTO DSM'S PIONEERING ACTIVITIES WITH TWIN FOCI ON ECOLOGICAL PERFORMANCE AND BENEFITS TO SOCIETY



In your role as CTO, you have channelled DSM's scientific expertise into finding solutions to combat climate change and ensure food and nutrition security. In brief, how did you come to work in this field and decide upon these objectives?

I have been fascinated by nature's chemical reactions ever since I started working in science. I began my academic training as an organic chemist and, later on, studied biochemistry because I wanted to understand how things work, from diseases to nature.

What is so great and fascinating about nature is that it always operates without generating waste so, in principle, it is always cyclical – everything that is built is then degraded and becomes a new source for the next process. We only have one globe, so we have to think of processes in a circular way. Already in my early years at DSM, I was using enzymes to make new drugs and fermentation processes to look at new building blocks for making materials. Another focus was examining how we can produce food in a more efficient way – taking inspiration from nature.

At DSM, sustainability is our core value and everything we do in our product portfolio development is geared towards that. We have sustainability criteria, where we look at whether a process or product is better than the current incumbent in terms of ecological performance (Eco+) and benefits to society (People+). We only proceed with their development if they are Eco+ or People+.

Can you describe a few of DSM's innovative projects on renewable energy sources?

There are quite a few! We are active, for instance, in the area of making antireflective coatings for solar panels, where our coating ensures the energy is better captured as it no longer reflects sunlight. With this smart coating applied to the front

"By working on the basis of open innovation and collaborating with external parties in industry and academia, we have been able to boost R&D, especially in the area of sustainability"

MOTIVATION TO ACT NOW

SCIENCE CAN CHANGE THE WORLD

The sciencecanchangetheworld.org website launched by DSM to show just how science is making a difference to our everyday lives by creating and showcasing a poignant film. And it's not just the Nobel Prize winners, it is also the unsung heroes of science, people who are finding solutions to eradicate disease, support the disabled and reduce environmental damage. Every small effort to make our lives better counts. Often scientists face barriers, they struggle with funding, bureaucracy or doubt, but perseverance is paying off.

THE TRUTH ABOUT CLIMATE CHANGE

People are coming to realise that the time to act is now. Climate change is actually happening, despite scepticism

by non-believers; we are seeing flooding in places where we wouldn't expect it. Even the Pope and the Dalai Lama are making statements about climate change, and governments are committing to unprecedented targets. The UN Conference on Climate Change in Paris (30 November-11 December 2015) will be an ideal forum in which to discuss matters such as carbon taxing. We need to speak to the highest level decision makers and call upon leaders internationally to take action, so that we can face our children and their children.

Those are two things that motivate me every day to do what I do, and I think they also motivate a lot of scientists who develop solutions to improve the world.

glass of a solar module the overall energy efficiency will increase up to about 4 per cent.

The challenge was developing a material that was also sturdy and robust, because these panels have to last for 20 years – the typical lifetime prescribed by the industry. We have managed to do that, which has put us in a very strong position in this area.

Another example is that we are developing technologies to reuse agricultural surplus like corn crop residue to create bioethanol so we can move away from petrochemical feed stocks like crude oil. For example, with corn, the stems and leaves are leftovers that are ploughed through the soil, which feeds it and prevents erosion. However, approximately 30 per cent of those materials can be taken off the land without causing any damage. We've developed a technology inspired by nature to turn that feedstock into biomass; there are fungi that degrade biomass into CO₂ via sugar. We've taken enzymes from the fungi and developed a special yeast that can then turn this corn crop residue into bioethanol. We recently began project LIBERTY, the first commercial-scale cellulosic bio-ethanol plant in the US established together with our partner POET.

My third example refers to reducing the consumption of energy. For instance, we are working on lightweight materials for automotives. We are reducing the weight of a car such that it emits less CO₂ by replacing metal parts of the car with high-performance polymers, which are able to resist very high temperatures and ensure the engine works more efficiently. We also have a material that we use for engine covers in, for example, the Mercedes Benz A-Class, which is 70 per cent bio-based and reduces up to 40 per cent of the CO₂ emissions of the car in comparison to conventional polyamides.

By what means is DSM bolstering food and nutrition security and reducing waste?

We produce an antifungal component and fermentation product called natamycin that is derived from nature and works effectively against fungi. It was developed for cheese coatings. The outer layer of cheese typically has a waxy layer and coating that prevents fungus growth; if that layer weren't included, everything would look like French cheese! This product has been on the market for many decades.

More recently, we have used a similar antifungal compound called Zivion® in mushroom beds before and in between

harvests to prevent unwanted fungi growth, promoting the overall mushroom yield. We are also working with partners to develop an application for Zivion® in post-harvest activities, as the crop has to survive the journey between the farm and the retailer. It is difficult to prevent these products from deteriorating during this period; you either have to package it extremely well or use products derived from nature that inhibit the growth of the fungi to prevent as much food waste as possible. This works well in developed countries. It could also be an interesting option for developing countries where it's even more important that, if farmers produce more than they can consume themselves, they can get it to a market. We really have to work on solutions to help them do that; this could be one of those.

We are also very active in developing efficient food packaging to reduce waste by creating barriers, such as for water, oxygen or nitrogen. Packaging enables the determination of how long a specific type of product can last at the supermarket, where there is a lot of waste. It has been estimated that, worldwide, we throw away 30-40 per cent of food produced; this is unacceptable. In 2050, we will have 2 billion extra people to feed, so we need to find solutions now.

How has DSM's collaboration with industry enhanced sustainable R&D?

We are still a mid-sized company and we have come to the realisation that the tasks we see ahead of us related to climate change, circular economy and food and nutrition security are too big to tackle on our own. We need to produce bioethanol mass on a large scale instead of relying on oil and feeding the world by providing good-quality nutrition for generations today and those to come. You can only realise this by working with partners across the value chain. By working on the basis of open innovation and collaborating with external parties in industry and academia, we have been able to boost R&D, especially in the area of sustainability.



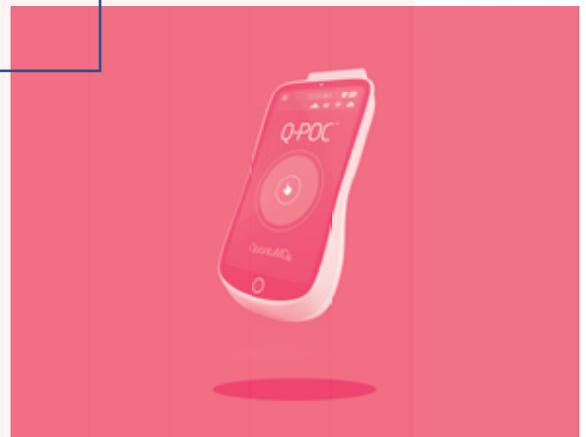
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WINNER OF THE EUROPEAN CTO OF THE YEAR 2015 AWARD, SME CATEGORY

**JONATHAN O'HALLORAN, CO-FOUNDER AND
CHIEF SCIENTIFIC OFFICER AT QUANTUMDX**

AS A PORTABLE LABORATORY, Q-POC™ IS
HELPING TO CHANGE THE FACE OF PERSONALISED
MEDICINE IN DEVELOPING NATIONS. HEALTHCARE
AMBASSADOR AND INVENTOR JONATHAN
O'HALLORAN EXPLAINS HOW THE HANDHELD
DEVICE ENABLES ACCURATE DISEASE DIAGNOSIS
AND ON-SITE DRUG PRESCRIPTION



Q-POC™



The CTO of the Year award recognises your dedication to humanitarian health challenges through your work at QuantuMDx. What led you to devote your research to this cause?

I've always been interested in science, especially genetics, and then more recently, molecular diagnostics. I am colour blind, tone deaf and dyslexic, so I was never going to go into the arts! Genetics seemed like the perfect career path for me; fortunately, I absolutely loved it. When I was 16, my biology teacher (Dr Bishop) gave us a series of experiments using

Drosophila melanogaster (fruit fly), which is a classic genetic model organism, and I was blown away. So thankfully – after my dream of being a professional footballer died – I got into genetics and that's really where it all started, as a 17-year-old A-level student doing *Drosophila* experiments.

I went on to study at the University of Sussex, and later, as a visiting student at Harvard University, where I spent four amazing years studying genomics. It was such an exciting time of discovery; the human genome was sequenced and Facebook was launched. During that period, I also developed a fascination for epidemiology after reading books like *The Hot Zone* and *Virus Hunters*, which described the efforts of Centers for Disease Control and Prevention epidemiologists

“We’re able to provide a diagnostic result while the patient waits, which is revolutionary”

in Uganda tackling the first Ebola outbreak. It was such an exciting time to be a genetic scientist and one that shaped my initial thoughts on what we are now doing at QuantuMDx.

QuantuMDx is developing Q-POC™ to provide molecular testing in minutes for those in poorer nations who require a rapid, inexpensive and accurate way of diagnosing disease and drug resistance. How did you come up with the idea for the lab, and how does it work?

It seemed simple to me to take a diagnostic product to the patient rather than the patient going in to see a doctor, and then having to send samples to the lab and the results back to the patient. Essentially, we’ve created a device that condenses these steps. We still need to take a sample in but we’re able to provide a diagnostic result while the patient waits, which is revolutionary.

How it works is relatively simple: the patient will provide a sample – a swab, a finger prick of blood or sputum, for example – which is put into a disease-specific cassette and inserted into Q-POC™. We then press ‘go’ and wait just 15-20 minutes for the results and drug resistance information. As all the magic happens automatically within the disposable cassette, we’ve spent the past eight years ensuring that the process is seamless.

By what means will you make sure that practitioners on the ground are trained to use your technology?

That’s the tricky part; we’re doing our bit by making sure it is very simple, so that it will slip into standard clinical practice. Health practitioners and workers on the front line in developing nations are used to running lateral flow tests, like pregnancy tests, so we are trying to make it so that our complex DNA testing is operated in a similar way. There will be minimum training required; we will ensure that the individuals on the front line get the knowledge and experience they require through our partnerships with NGOs, the Bill and Melinda Gates Foundation and the Clinton Foundation.

What are the greatest challenges to tackling global burdens such as antimicrobial resistance?

Cases of drug-resistant tuberculosis (MTB) have been reported for a long time now, but more recently, the

alarming rise in extensively-resistant TB (XDR) has emerged. We, the research and medical community, took our eye off the ball after drugs for TB were discovered over 50 years ago. We halted further development and the bug fought back by developing resistance. We are now in an arms race to create new drugs, new diagnostics to stratify patients into new drug regimens that utilise these pharmaceuticals, and surveillance tools to ensure we monitor our enemy to better steward these drugs and watch out for new pockets of resistance in populations.

TB is merely one example of a pathogen that develops drug resistance. HIV rapidly generates resistance to drugs and we are all familiar with MRSA, which is the Methicillin-resistant strain of *Staphylococcus aureus*. Alarmingly, we are seeing sexually transmitted infections such as gonorrhoea developing resistance as well, so the problem is fast running out of control. The O’Neill Review on Antimicrobial Resistance has been tasked to address this problem and has suggested that drug-resistant infections could kill an extra 10 million people across the world every year by 2050 if they are not tackled.

I spend a lot of time speaking with people at the O’Neill Review on Antimicrobial Resistance and trying to impact change via that route. They have recently released a paper on the need for rapid diagnostics and market changes needed to stimulate both innovation and adoption, and they have managed to get the antimicrobial resistance issue on the G7 agenda. It is great to think that we are able to contribute to such an important global issue and we think that technology like our Q-POC™ is well placed to make a significant impact.

How is the work being undertaken by QuantuMDx addressing the lack of healthcare infrastructure and services in developing nations?

We talk about this issue a lot – with anyone who will listen! Having spent time in Africa and seeing firsthand the issues facing health workers in providing quality ‘in-field’ diagnosis, we have worked hard to ensure our Q-POC™ addresses the lack of healthcare infrastructure, which ranges from no electricity to clinics being located hundreds of miles from patients. By providing battery operated devices that can perform an entire day’s shift from a single battery charge and by ensuring that it is portable, we change the access to diagnostics paradigm. By taking this further, and networking the devices and geo-stamping the data, we will not only improve the patient experience with near patient rapid diagnostics, but also address the significant issue of disease/resistance surveillance and monitoring, which will enable a rapid-threat response and better stewardship of antibiotics.

QuantuMDx

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