

# Davos wowed by device that reads 'code of life' in hours

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It was the talk of Davos, grabbing the imagination of a forum otherwise shrouded in gloom: a miracle machine that cracks the code of life within hours and could revolutionise healthcare.

Patients will no longer have to wait weeks to know if they have cancer and their doctors will know immediately what kind of disease they have, allowing them to target therapies precisely and to avoid harmful delays or mistakes.

Health officials confronted by superbug outbreaks will be able to identify the bug's strain and begin planning treatment within hours rather

than days or weeks, potentially saving thousands of lives.

Soon, researchers in the developing world will take portable DNA sequencers into the field to identify new viruses and verify water quality.

And police investigators will be able to develop a suspect's [DNA profile](#) as quickly as their fictional counterparts do in glossy television dramas, while commandos on the battlefield will identify the bodies of friend and foe.

The man behind the revolution is Jonathan Rothberg, master biotechnician and CEO of Ion Torrent, owned by US firm Life Technologies, which produces the Ion Proton -- the world's first desktop semiconductor-based gene sequencer.

Business and political leaders at this year's Global Economic Forum were gripped by pessimism over the economy, but -- at a summit boycotted by Mick Jagger -- Rothberg was received in Davos like a rockstar of science.

"He's a genius. I want to buy his machines," Sami Sagol, a leading Israeli neuroscientist and research sponsor, told passengers on a minibus ferrying delegates through the snowbound streets of the Swiss resort.

"I was sat next to him at dinner. He's amazing," declared a young investment banker swigging beer in a nearby bar, admitting he had found Davos' scientific programme more uplifting than the headline economic debates.

The man himself, geekily excited in a woolly ski hat and loud striped shirt, bursts with enthusiasm for a machine that has brought the once laborious task of gene-sequencing to the era of the semi-conductor microchip.

With no false modesty, he compares the revolution to the transition from the era of room-sized computing machines to desktop microprocessors, and predicts that his technology will follow the computer into laptop and hand-held forms.

"It's the first machine that can do an entire human genome for less than 1,000 dollars. It's the first machine than can read the genome in two hours," he told AFP in an interview in Davos.

"Previously machines would cost more than half a million dollars and it would take weeks to get information on your genome," he said. A genome is the complete DNA code, unique to each individual, which shapes our organism.

"The Proton instrument is designed to do discovery -- find new genes that are involved in cancer, find new genes that are involved in autism, find new genes that are involved in diabetes," he said.

"But it's also designed to be used in a clinical practice to make sure that you give the person the right medicine or the right medicine to the right person. And to help diagnose new born children with ailments."

The Desktop Ion Proton was making its European debut, but the technology is not a pie in the sky dream. It is based on a larger predecessor that is already the world's best selling sequencer.

"Last year in Germany there was a terrible outbreak and a number of people died," he said, referring to a enterohaemorrhagic E.coli (EHEC) infection from contaminated food that killed 52 people and left more than 4,000 sick.

"It was the precursor to this machine and one of the first chips we made that decoded that E.coli outbreak and allowed us to understand that

superbug, track that superbug and have a diagnostic for that superbug."

Two factors make the Ion Proton unique. It is the only machine to use a semiconductor chip to sequence genes, previously researchers had to study DNA strands under what were effectively powerful microscopes.

Now, DNA samples can be dropped onto a microchip a couple of centimetres (one inch) across, slotted into the Proton like a SIM card into a mobile, and two hours later the entire six-billion-letter code of life is known.

The second factor is size. The current model squats on a desk like a photocopier and, as a scalable device, it will one day shrink, even to the size of a handheld like the science fiction Star Trek "tricorder".

"So investigators in Africa have asked me for machines that they can use to monitor wild game that's caught to see if there's any new viruses coming in that can interact with man for the first time," said Rothberg.

But, while its enthusiastic inventor foresees dozens of tasks for his machine, its inspiration and initial core use will be in healthcare.

"When my son was born, he was rushed to the newborn intensive care unit because he had difficulty breathing," said Rothberg, recounting the personal trauma that led directly to his breakthrough.

"At that moment I realised that I was less interested in the human genome as an abstract concept and I was completely interested in my son's genome.

"I realised two things: I cared about my son Noah's genome and I needed a technology that scales. And during the time he was in intensive care I had the idea to move sequencing to a massively parallel substrate, a chip."

Noah recovered, his disease was not genetic after all, but once the Ion Proton is common in world hospitals, other parents will have a shorter wait.

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