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CODE NAME GINGER

The Story Behind Segway and Dean Kamen's Quest To Invent a New World

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1. The Early Days

Dean Kamen was born in Rockville Center, Long Island in 1951. School bored him so by the middle of his high school years, he began playing around with electronics, semiconductors and solid state transistors. To demonstrate his prowess, he made a light box that plugged into a stereo which had lights that pulsed in synch with the music. Through sheer chutzpah, the 16-year old Dean Kamen actually managed to sell four of these light boxes to the Hayden Planetarium in New York, netting him $8,000 in sales for machines that cost about $320 to manufacture.

Inspired by this early success, Kamen began selling light boxes to local rock bands and other businesses near his parent's house. By the time he started college at Worcester Polytechnic Institute in Massachusetts, Kamen was earning $60,000 a year in his spare time working from his parent's basement. His brother Bart who was a medical student at Harvard suggested that Dean should try and develop a product which would monitor hospital IVs automatically rather than requiring nurses to constantly keep checking them. Dean Kamen came up with a device which was portable and cheap because it used off-the-shelf parts. When a medical journal did a story about the device, the National Institute of Health ordered 100 devices at $2,000 each – Dean Kamen's first big break in business at age 20. Dean hired his brother and friends as assemblers, with his mother keeping the books and his father doing illustrations for the users manual. Kamen incorporated AutoSyringe Inc. to sell the machines.

Despite his intentions to stay at school, AutoSyringe took off. Within a few years, he had developed a range of products, relocated from the basement to a building on Long Island and then to a larger building in New Hampshire. By the time AutoSyringe had 100 employees, Kamen realized he was going to have to move into large scale manufacturing or sell out to a bigger company. Manufacturing was of no interest, so he sold AutoSyringe Inc. to Baxter Healthcare for a reported $30 million. Dean Kamen was now 31 years old.

In addition to buying houses for himself and his parents and a few toys (a small plane, a helicopter and a 3-acre island in Long Island Sound), Dean Kamen purchased a 500,000 square-feet factory building in Manchester where he wanted to start his own R&D company named after himself: DEKA (DEan KAmen). This started a flurry of activities. He developed his own climate control system and patented it before starting a spin-off subsidiary, Teletrol, to develop and install large scale climate control systems. Kamen also purchased Enstrom Helicopter, and patented a number of technologies for helicopters. Dean and his engineers also developed an air driven kidney dialysis machine which was more portable and quieter than anything else on the market. This product was released in 1993 by Baxter Healthcare as the HomeChoice dialysis machine and was a huge commercial success, generating enough royalties to fund DEKA's research programs.

Dean Kamen's success and mind-set at this time was encapsulated in some of his favorite sayings:

- *"Don't solve the solution. Solve the problem."*
- *"You gotta kiss a lot of frogs before you find a prince."*
- *"I don't have to invent anything. It's out there somewhere if I can just find it and integrate it. Inventing is frustrating, it's dangerous, it's expensive, and inventors should avoid it wherever possible. Be a systems integrator."*
- *"Innovation is the art of concealing your sources."*
- *"History is a great teacher, but progress depends on disproving history."*

Around this time, Kamen also started a robotic competition called FIRST. This event teamed corporate engineers with high school students to build robots. It was designed to inspire kids to consider careers in science and engineering. The first year 42 teams competed, and by 2002, more than 20,000 kids on 16 teams would be competing in 17 regionals to win the right to go to the FIRST National Championships.

One day, Kamen was at the local mall when he noticed a man in a wheelchair struggling to get his wheelchair over a curb. Kamen thought to himself: *"We can put people on the moon and travel to the depths of the ocean, but we can't get a wheelchair over a curb?"* With characteristic confidence, Kamen decided he would do something about it. He analyzed all the wheelchair patents for the last 100-years, and was surprised by their ingenuity.

"He suspected that the solution would be a climbing mechanism. So had lots of people before him. They had tried movable legs, flexible arms, arms that grabbed. He admired the ideas and the elegant drawings, but studying them revealed their flaws. He kept chewing on the question. As always, he tried to see the problem afresh, as if it had never been addressed. First, he thought, identify the basic issues: If I'm disabled, I don't want to be stopped by obstacles, including stairs, and I want to move at eye level with everyone else. It had looked like quite a simple problem, but he couldn't think of a solution. The puzzle often kept him awake at night. He put a couple of engineers on it, but it stumped them too. Two years passed, two years of princeless frog-kissing."

– Steve Kemper

The solution came to Dean Kamen one day as he stepped out of his shower onto some wet tiles. As his legs started to slide out from under him, Kamen instinctively threw his arms back to recover his balance. Kamen suddenly realized maintaining balance was the solution to the problem. All of the wheelchair designs used previously had worked hard to create a platform which was always steady. Kamen realized a better approach was to develop a platform which (like humans) would work to recover its balance whenever it was in danger of falling down.

To prove this concept would work, Dean had a few engineers put together a table with a single leg. Using a few amps, surplus printer motors and a gyroscope tilt sensor, they put some small wheels on the bottom of the table's leg. By measuring the pitch angle (the amount of tilt), the pitch rate (changes in the pitch angle), the wheel position and the wheel speed (changes in the wheel position), the engineers could move the wheels in such a way as to always keep the table in balance. Of course, taking the crude model and making it safe enough for a disabled person to be able to sit on top of it or for it to be able to climb stairs and such like were formidable technical challenges of the future, but clearly the idea had merit.

Kamen threw a number of engineers onto the project, and started recruiting more people. They soon started analyzing the nuances of dynamic balance – the way people walk by getting off balance and then moving so as to prevent a fall. By the time they had developed five prototypes using this principle, they came up with a tripod arrangement – three legs with a small wheel at the end of each leg, along with a plywood seat and an aluminum frame.

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