

# He Builds Robots with His Mind

Remember I told you this book ends with Jimmy standing backstage about to make his big debut? Well, when I sent this picture of him to my wife she replied back quickly, “That’s the ROBOT YOU MADE WITH YOUR MIND!!!”



**Figure 1-1.** Jimmy backstage (photo: Brian David Johnson)

Ten years ago I began to imagine what it would feel like for people to act and interact with robots in the twenty-first century. But these robots weren’t like the robots we’d seen in movies, on factory floors, or in university labs. These would be a totally new kind of robot. Something no one had seen before.

I used an unconventional tool to imagine what it might be like to live with these robots: science fiction! I’m a science fiction author, but more importantly, I’m a science fiction fan. Science fiction gives us a language to talk about the future. Most good science fiction stories are about people. So a science fiction story based on my research would allow me to explore how people would act and interact with my robots. The tool is called science fiction prototyping, and I’ve been using it my entire career to help me explore different visions of tomorrow.

The 21<sup>st</sup> Century Robots were first born in science fiction about a decade ago.

## A Robot Who Sees Angels

It was late afternoon in the spring of 2004. I was in my study, lying on the couch. The window was open and I could hear the afternoon traffic rolling down the street, and the sound of kids getting out of school for the day.

Lying there, I thought about what it would be like if a robot's intelligence was born and developed online. What if a robot's artificial intelligence wasn't created by a single person or a group working together in a government or university lab? What if the robot's mind and experience were put together on the Internet? I imagined what it would be like if people all over the world could work together to create the robot. Maybe some of those people might not even know they were working on a robot at all.

A robot's brain can take many forms. It can be everything from a small self-contained computer with limited functions, to a massive room-sized machine capable of incredible mathematical skill. But in all cases, a robot's brain should have intelligence and the ability to make decisions on its own. This artificial intelligence, known as AI, used to be created by teams of scientists, and was complicated and expensive. But if a robot's brain was developed online, then the AI wouldn't be expensive at all. Because it was created for free on the Internet, it would be more like a free app you could download for your smartphone or tablet. If this was true, then maybe there would be a lot of different robot brains out there. People could pick the one that suited them. They could modify the brain for the kind of robot they were building, or the tasks they wanted their robot to do for them.

That was it! My mind started racing.

Imagine the diversity of robot brains and software that could be born from people all over the world collaborating on the brain! Sometimes they'd be created for important things, but, like the Internet, most of the time it would be for fun.

Lying there on the couch I started working on a science fiction short story to play out what it might actually be like to act and interact with a robot that was born and raised this way. The name of the story was "A Robot Who Sees Angels," because this robot had spent a good part of his youth looking at ancient art and the walls of cathedrals. And because he was a robot, he could pull up that art and see it whenever he wanted. He could overlay the art of his youth to help him understand any new situation he might be confronted with. Or he might even do it to calm himself down if he was scared, remembering something that made him happy from his past.

Now that would be an interesting robot!

As I was writing the story, I started sketching out what the real-world software and operating system for this kind of robot might be like. The possible diversity

and funny things that people all over the world might come up with fascinated me. It wasn't just a robot that could see angels that was interesting, but also the potential diversity of all the other kinds of robots.

## **“I’m Making Irrational Robots”**

For the next few years I continued to experiment with this new kind of robot, but everything changed when I met Dr. Simon Egerton.

Back in 2008, I went to Seattle to attend the annual Conference on Intelligent Environments at the University of Washington. Typically, the conference is held outside the United States, and I was usually one of the few Americans who attended. For my work as a futurist, it provided a fresh and different perspective on how computers and intelligence might make our lives better.

At the end of the conference there was a big party. The room was filled with people, discussing and arguing new ideas and concepts for the future. This is where I met Dr. Simon Egerton.

“I’m doing work on nondeterministic robots!” Simon yelled above the music and chatter of the collected scientists, engineers, researchers, and university students. Dr. Simon Egerton was tall and broad. He towered over me at the crowded social event.

“What?” I yelled back. I had no idea what he had said.

“I’m doing work on nondeterministic robots,” he repeated. “I’m making robots that make both good decisions and bad decisions.”

“You’re making robots that make bad decisions?” I asked, puzzled, not sure I had heard what I had just heard.

“Yep.” He smiled and adjusted his glasses. “I’m making irrational robots.”

Simon is one of the nicest and most thoughtful people you could ever meet. He’s a big guy with a big heart to match. He works weekends saving stray dogs and cats in Kuala Lumpur, where he is a professor of robotics at Monash University. He made quite an impression.

“Illogical robots!” I yelled back. “What?”

“Humans make both good decisions and bad decisions; that’s why we are so good at adapting to complex environments. I want my robots to be that good, so why wouldn’t I let my robots make both good decisions and bad decisions? They will learn faster.” He took a sip of his drink and peered down at me through his glasses.

“Good point!” I smiled. I was hooked! “What’s the name of your research?”

“Using Multiple Personas in Service Robots to Improve Exploration Strategies When Mapping New Environments” (Egerton et al., IET, 2008).

“Now *that’s* a title,” I said, smiling. “Can you tell me more?”

“For sure,” he replied.

And that was it. My life changed forever.

## The Creative Science Foundation Is Born

Working with Simon and a group of researchers and professors, we pulled together a collection of people called the Creative Science Foundation. Over the next four years, we would collaborate on this new kind of robot (see more details about this in [Chapter 5](#)). At the center of this research was science fiction, which we used to explore the possible realities of these robots. The stories were, in fact, prototypes that allowed us to understand what it might be like to interact and live with these robots.

As an homage to Simon and his research, we named the main character of the stories Dr. Simon Egerton. We never thought that the adventures of Dr. Simon Egerton and his strange little robots would ever become as popular as they did. Simon has always been a good sport about us using his name, saying, “I do wonder what it would be like if *my* life was as exciting as your Dr. Egerton’s.”

To bring the robots closer to reality, we convinced illustrator Sandy Winkelman to be a part of our team. With each new robot, he’d come up with a drawing of what the bot might look like. This would help us refine the functionality of the robot even more. Over the last 10 years, we’ve created all kinds of robots, all of them a little strange, but each one unique.

At the Creative Science Foundation, we used the stories to move our research forward and help us envision this new kind of robot. The stories allowed us to come up with new approaches to software and artificial intelligence. Each story led to a new breakthrough and more research. In turn, that new research led to another story, each building on the other. That’s why this book is a mix of science fiction stories and nonfiction chapters, of thought experiments and help files!

## He Fixes Radios by Thinking!

Richard P. Feynman is a personal hero of mine. He was an American theoretical physicist and Nobel Prize winner. In 1985, Feynman published a book that changed my life. *Surely You’re Joking, Mr. Feynman!* (W. W. Norton) chronicles the adventures of Feynman as he moves through a truly amazing life. Reading the book as a kid taught me to be curious about the world, to be intellectually courageous, and

that there wasn't just one kind of scientist. It not only launched me on a lifelong love of physics, but it also showed me that imagination was an important part of being a scientist or engineer.

The book opens with a section called "He Fixes Radios by Thinking!" in which Feynman relates a story from his childhood in Far Rockaway, New York. To make money, young Feynman repaired radios. Always good with mechanics and figuring things out, he would start each job by thinking through why the radio might be broken, based on the symptoms of the failure. He would picture how the electronics worked, imagine what might have gone wrong, and figure out what he could do to fix it.

This process meant that Feynman spent a good amount of time pacing back and forth in front of the radios, leading one customer to ask him, "What are you doing? You came to fix the radio, but you're only walking back and forth!"

To which Feynman replied, "I'm thinking!"

Then when he found the problem and fixed it, the customer proclaimed, "He fixes radios by thinking!" The idea that a person could think through a problem first, imagining different scenarios, seemed impossible to the customer. But that's just what Feynman did.

Little did young Feynman know that this activity would become an integral part of his profession.

"Thought experiments are at the foundation of theoretical physics and science," physicist Dr. Paul Davies explained to me once when we were talking about Feynman and using imagination in science. "Being able to imagine possible futures and then figure out if you can make them a reality is incredibly important."

Paul is the director of BEYOND: Center for Fundamental Concepts in Science and a frequent collaborator of mine. He's written books like *How to Build a Time Machine* (Viking). Each of his books and lectures explores real-world physics with fun and interesting topics. These were part of the inspiration for the science fiction stories in this book. We have to be able to imagine the future so we can then build it.

## Next: The Loneliness of the Long-Distance Robot

Our journey into the world of the 21<sup>st</sup> Century Robots begins with Dr. Simon Eger-ton as he investigates a strange occurrence at a distant technology factory. We learn that there are many different kinds of robots, and we meet a funny little robot named Jimmy...