

# Electrifying Toyota's IP Engine

February 04, 2021

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In 2020, [Toyota led the automotive industry](#) with 2,819 patents granted from the U.S. Patent and Trademark Office.

To get a better understanding of how Toyota engineers are driving innovation, we spoke with Eric Dede, a Group Manager at the Electronics Research Department at Toyota Research Institute of North America (TRINA) in Ann Arbor, Michigan. Since joining Toyota in 2008, Eric has been granted over 100 patents and published more than 90 archival research papers. His work has also been recognized twice with an R&D 100 Award, a prestigious innovation award with recipients spanning industry, academia, and government labs. He has a master's degree and a PhD in Mechanical Engineering from Stanford University and the University of Michigan, respectively.

**You began your career working in the aeronautical field. How did that shape your experience working with Toyota?**

Much like spacecrafts, today's automobiles are also sophisticated electro-mechanical systems. I began my career working on the development of solar panels used on satellites to capture energy from the sun. That energy needs to be efficiently converted into electricity that can power the various components of the spacecraft. Although the energy in a passenger vehicle doesn't typically come from the sun, we rely on similar physical principles to design efficient ways to move power through electrical components embedded in our products.

**For the past decade, Toyota has consistently ranked first in patents granted to an automotive company in the United States. What factors do you attribute to this success?**

We've worked incredibly hard to cultivate a collaborative environment that taps into our collective expertise. Toyota's engineers and scientists come from a wide spectrum of backgrounds and have different perspectives and broad experiences. On my team alone, we have engineers with backgrounds in electrical engineering, computer science and optimization, semiconductors, and metamaterials – which is an important field of research that could have a huge impact on future mobility. Having all of these perspectives sitting around the table creates a unique synergy that helps us generate new ideas and concepts which ultimately form the building blocks of our intellectual property portfolio.

## 5 Things You Should Know About

Ercan "Eric" Dede

1. He is Turkish-American
2. He is married with two kids (boys)
3. He enjoys hiking and has hiked in Nepal
4. He enjoys climbing and has climbed the Grand Teton in Wyoming
5. He very much enjoys inventing as part of his job at Toyota R&D

**You've personally been granted more than 100 patents during your time at Toyota. How would you describe the intellectual property that makes your "personal portfolio"?**

A significant portion of my research focuses on electronics packaging and thermal management technology. This can range from making heat transfer more efficient in hybrid electric vehicles for improved fuel efficiency, to making sure the computer systems behind automated driving systems continue to work under harsh conditions. These electronic systems are very compact, and they need to be designed to work in parts of the vehicle that already get very hot, such as the engine compartment. It is no simple task.

**What's a project that you're most excited to work on moving forward?**

I'm really excited about our work with hydrogen fuel cell technology. Hydrogen is continuing to gain momentum as a critical sustainable energy source worldwide and Toyota is at the forefront of the technology. Our team is currently exploring methods to optimize the fuel cell stack and design it to be more efficient.