PHOTO BY NICK ROMANENKO, RUTGERS UNIVERSITY

10 QUESTIONS WITH

THOMAS NOSKER

INVENTOR OF RECYCLED PLASTIC LUMBER'S LATEST ACCOMPLISHMENT: NAI FELLOW

BY EDITH G. TOLCHIN

MY HUSBAND, Ken, is a Rutgers University alumnus, both undergrad and grad. So is every member of his family for the past few generations, so it's only natural that we are current on all things Rutgers.

Most recently, we saw an interview with Professor Thomas Nosker, the inventor of recycled plastic lumber, on the Rutgers.edu website (for which Ken is the application developer). He connected me with "The Plastics Guy"—so named because he is "the most plastic-centered professor in the Department of Materials Science and Engineering at Rutgers University"—who was recently named a National Academy of Inventors Fellow.

Made from recycled plastic bottles, coffee cups and other plastics, recycled plastic lumber has a major role in creating environmentally friendly and safe playground equipment; in designing raised garden beds; in sustainable fencing, and in large-scale construction, among other uses. Nosker helped build New Jersey's first structural recycled plastic bridge in 2002.

You can reach him at tjnosker@gmail.com.

"The Plastics Guy," a professor in the Department of Materials Science and Engineering at Rutgers University-New Brunswick, is a prolific inventor with more than 80 patents or patents pending in the United States.

Give us a little background on you and how long you have been teaching at Rutgers.

I grew up in Georgia and went from first grade through college (Georgia Tech) there. I came from a family where the boys were all taught about working on cars by our father, who did that as a hobby. I was also taught a little about watchmaking.

"I was an early pioneer in plastic recycling technologies, and about all the main technologies to recycle plastics were developed in our labs."

Above: Crushed polymer granules can be turned into new reused material. Thomas Nosker got his Ph.D. at Rutgers University in 1987 and has been a faculty member ever since.

My father passed away maybe six months after my college graduation, and I moved myself and my mother to New Jersey, where I had three siblings. I was hoping the grandchildren would keep her interested, and that worked.

I went to grad school at Rutgers and met my wife there. I got my Ph.D. in 1987 and have been working as a faculty member ever since. My undergraduate degree was in Mechanical Engineering, and my master's and Ph.D. degrees were in Materials Science and Engineering, specializing in Polymer Science.

Which courses do you teach?

I have taught classes in materials science and plastics processing, oriented toward packaging engineers as well as plastics recycling.

I was an early pioneer in plastic recycling technologies, and about all the main technologies to recycle plastics were developed in our labs. These include collection, sorting, resin recovery processes and recycled plastic lumber (including composites) technologies. Mechanical properties were a special focus in my classes.

How did this lead to your inventing recycled plastic lumber, and can you describe the many applications of this invention?

After our work on resin recovery processes—at first, Polyethylene Terephthalate or PET bottles, but adaptable to other plastics—which require separation from other plastics, we found that there were a lot of plastics in the recycling stream that were not worth the resin recovery process being employed. Yet the public kept feeding plastics that we weren't asking for into the recycling system.

The mixture of plastics was primarily high-density polyethylene, so I gambled that we might be able to process the mixture in large, lumber-shaped molds at first—and make items of good utility. This worked. However, we found that reinforcing the material made it much more useful, and more load bearing.

Where is the recycled plastic lumber manufactured? Did you oversee the first production run?

Recycled plastic lumber without reinforcement was developed in the 1988-89 timeframe, at Rutgers University, in our labs. I went ahead and published how we did it and did not apply for a patent, so that it could be freely done by as many as possible.

I began working more secretly on low-cost, novel ways of reinforcing these materials, and that went through several generations of technology development.

The structural recycled plastics composites technologies licensing has been through more than one company's hands and is now exclusively licensed worldwide to Sicut, Ltd. of the UK. They recently sold $88 million in product annually and have factories operating in the UK, and in Kansas. They have four new factories in several other countries, each at various stages of construction.

Initial focus has been on railway ties, but bridge components are being added, as well as other end uses.

Ultimately, we assisted in building train and railway bridges made of these materials on Army bases and road bridges in several states that are standing the test of time very well.

Were there any obstacles initially in product development, production, safety testing, importing or government regulations?

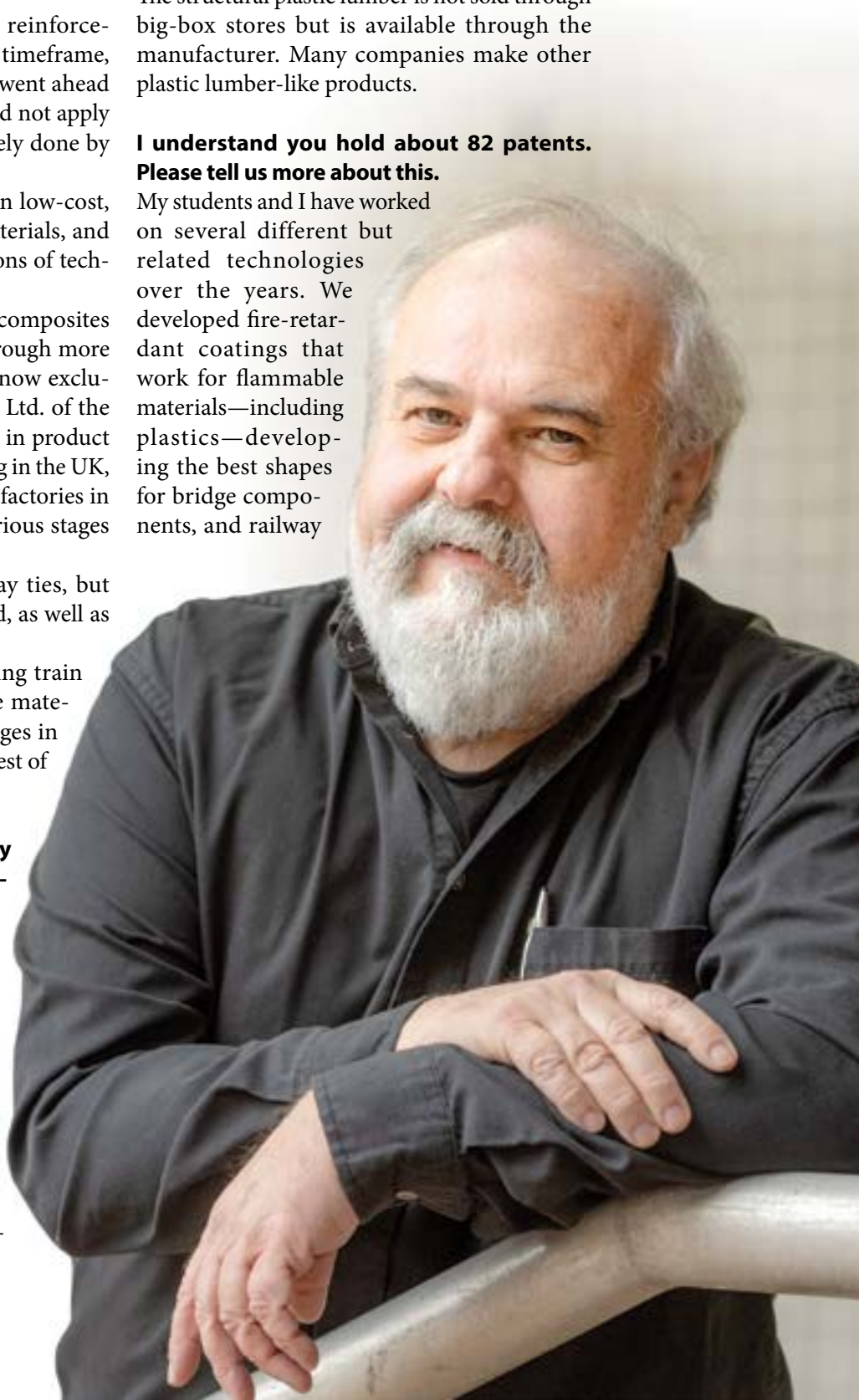
There were several types of obstacles, including wood-based construction materials companies trying to slow down standards development, and less-expensive composites technologies trying to block us as well. The Army Corps of Engineers helped us win those battles. The ASTM plastic lumber standards and test methods were basically developed in our labs.

Is this recycled plastic lumber sold for commercial use, such as at Home Depot?

The structural plastic lumber is not sold through big-box stores but is available through the manufacturer. Many companies make other plastic lumber-like products.

I understand you hold about 82 patents. Please tell us more about this.

My students and I have worked on several different but related technologies over the years. We developed fire-retardant coatings that work for flammable materials—including plastics—developing the best shapes for bridge components, and railway



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"The mixture of plastics (in the recycling stream) was primarily high-density polyethylene, so I gambled that we might be able to process the mixture in large, lumber-shaped molds at first—and make items of good utility. This worked."

ties that interact with the ballast, and most recently, layered materials that can be mined like graphite and mica, being exfoliated in-situ in molten polymers, and as reinforcing agents for those materials.

This latest group of technologies yields the most amazing mechanical and electrical properties.

Notably, most of the work required me to build or adapt machines in order to make them work. I usually get composition of matter patents and don't divulge the machines exactly. Compositions of matter are very hard to get around. But without those machines, we could never make the materials with the properties we need.

Please share with us the honor of being named a 2024 National Academy of Inventors (NAI) Fellow.

It's a huge honor to be named a Fellow of any National Academy. Universities use the number of members as a measure of success. The award was given in Atlanta, the week of June 23-27 this year. Ironically, it's kind of where I started.

What was your first invention?

Probably regular recycled plastic lumber. My first patent was reinforced recycled plastic lumber, made stiffer and stronger by adding polystyrene to the mostly HDPE (high-density polyethylene) materials available. This is an Immiscible Polymer Blend, and it was thought that mixing these plastics would not yield any advantage by people that had tried, and published.

What are your hobbies?

I've always loved machines and have worked on watches and clocks, cars, and now professionally on plastic processing machines.

Machines are much less complicated than people are. Because I am really focused on machines, that is probably the key to success for me as a materials scientist.

I modify or build machines to suit my ideas. Most materials scientists don't have that background. Most machine designers don't know materials science well enough to know what to build. The advantage of being cross-disciplinary is an important point for young people to understand.

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