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Ahead of Her Time

Elisabeth Pain
Greece
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When she was a child, Katerina Aifantis wanted to understand the work of her father, Elias, who today is a professor of mechanics at [Aristotle University of Thessaloniki](#) in Greece and at [Michigan Technological University](#) (MTU) in the United States. "I really wanted to find out what he was doing, and he wasn't telling me," she says today. All he would say was, "You will find out when you grow up," she recalls.

Katerina Aifantis

"The key is to take advantage of whatever assets you have in your life. Get everything you possibly can out of your opportunities," says Aifantis's former high school principal, Kass Simila.

It's hardly rare for a child to want to follow in a parent's footsteps, but few carry through to the extent Aifantis has. She couldn't wait to grow up, so she raced ahead with her education, stepping into her father's research field at 17 and obtaining a doctorate at 21. Earlier this year, at just 24, Aifantis became the youngest researcher to receive a [Starting Independent Researcher Grant](#) from the [European Research Council](#) (ERC), which she will use to establish herself as a principal investigator at one of her father's universities, Aristotle University of Thessaloniki.

SWEET 16

Aifantis spent her childhood years in Greece and the United States, returning to the U.S. in time for her last 2 years of high school. At 16, she started taking courses in math and chemistry at MTU in Houghton. She did better than the college students, so she was given the opportunity to skip her last year of high school and attend MTU full-time "to study mathematical sciences to figure out what [my dad] was doing."

Aifantis was 17 when she approached Stephen Hackney, a colleague of her father's, and asked him if she could work with him on applied elasticity, which her father had developed as a mathematical theory the year she was born. "I ... found it would be very romantic to study that," she says. Hackney "was hesitant" to take on so young a researcher, he writes in an e-mail, but he gave her a project on the micromechanics of lithium battery design when he recognized that her mathematical skills far exceeded those of many graduate students.

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Aifantis earned a B.Sc. in engineering at 19, summa cum laude, with a minor in mathematics. She started taking graduate courses at MTU but left 7 months later for [Cambridge University](#) in the United Kingdom, supported by a 3-year [Graduate Research Fellowship](#) from the U.S. National Science Foundation. At Cambridge, she worked with John Willis at the [Department of Applied Mathematics and Theoretical Physics](#) in the Centre for Mathematical Sciences.

Most students at Cambridge only start research when they've obtained their M.Sc., but Willis "allowed me to start right away," Aifantis says. "His trust in me and belief is what made me work extra-hard." Within a year, she got her master's degree in engineering and cracked Willis's problem in theoretical solid mechanics.

That was enough for a Ph.D., but Cambridge requires at least 3 years of research for a student to obtain the degree. So with Willis's blessing, Aifantis set off for the [University of Groningen](#), the Netherlands. She worked with applied physicist Jeff De Hosson, who was interested in doing experiments to test the theoretical work she had been doing in Cambridge. De Hosson allowed her "to enter the experimental world and most importantly arranged for my Ph.D. defense to take place." Five months after arriving at Groningen, just before her 22nd birthday, she became the youngest person ever to receive a Ph.D. in the Netherlands.

Aifantis then spent a couple of years doing research with other established scientists in New York, Hong Kong, St. Petersburg in Russia, and Sheffield in the U.K. while interacting with her father's group at Aristotle University. In 2007, she became a postdoc at the [Materials Science Centre](#) of the École des Mines de Paris in France. Finally, she says she started another postdoc in the [Division of Engineering and Applied Sciences](#) at Harvard University as a safety valve "because I thought I wasn't going to get the grant" from ERC. She needn't have worried.

A VOTE OF CONFIDENCE

When she first heard about the ERC grant, Aifantis realized it was exactly what she wanted. "If you become an assistant professor, there are many constraints; you can't give your research 100%. But with the ERC, they give you money and freedom to do what you want." On the evidence of her track record, her research proposal's quality, and her ambition, Aifantis's jury saw her as having "a very high potential to become an independent research leader in spite of her limited experience," according to the ERC evaluation report.

ERC gave her more than €1 million to pursue her research in understanding how material properties change between the micro- and the nanoscale--work that's close to her father's early research. "It is really interesting to build upon something that my father has started. That's what really makes me enthusiastic," she says. She plans to do theoretical as well as applied research and steer her research toward energy, electronic, and biomedical applications, combining materials science, applied physics, and engineering with biomedicine.

She expects such a multidisciplinary approach to pay off in the form of applications such as lithium batteries for stronger and more comfortable pacemakers and better metal implants for damaged bones. That's a lot of unfamiliar territory, she admits, but the ERC grant allows her to assemble her own advisory committee of "senior and younger researchers around the world [who] have expertise in different fields."

INNATE BRILLIANCE AND OTHER CAREER SKILLS

As inspiring as Aifantis's story is, its most striking aspect isn't that helpful for the average science trainee, who isn't likely to share her natural gifts. "Katerina is brilliant and you can't emulate that. ... You either have it or you don't," writes Kass Simila, her former high school principal, in an e-mail to *Science Careers*. "Still, you could have all that and waste it. The key is to take advantage of whatever assets you have in your life."

That's easy when you enjoy what you do, and "the attribute exhibited by Katerina that has been the most important to her success is that she loves what she is doing," Hackney says. "This type of idealism is required to put in long hours to develop the requisite analytical skills and familiarity with several decades of literature."

Not all her good qualities are innate; she also learned some good career skills at her parents'

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side. From her mother, an artist, she learned to identify potential mentors. From her father she learned about networking. "I also wanted to be part of that scientific community," she says. So she got to know people and, a very few years later, turned many of her father's peers into supervisors, collaborators, and co-authors. "Collaboration is really important for young people because they always need the advice of mentors," she says. "Try and go a step further than your Ph.D. work and try to interact with other people and try to see how it can apply to different areas."

BACK TO GREECE

As a faculty member, years ago Elias Aifantis started the work of establishing Aristotle University as an international center for theoretical material mechanics. His daughter plans to use her ERC starting grant to extend his efforts to nanomechanics and its applications. She expects her work to be more challenging than it would be at a research university in a country with a richer scientific tradition, but the environment suits her. She is eager to return to her roots and to enjoy the Byzantine culture and Greek Orthodox tradition offered by the city. Plus, "I wanted to be the first person doing this," she says. "I think it's a better environment where I will be able to prosper."

Elisabeth Pain is contributing editor for South and West Europe.	Comments, suggestions? Please send your feedback to our editor .
Photo (top): courtesy of Katerina Aifantis	DOI: 10.1126/science.caredit.a080004
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