# CAREERS

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TED/JAMES DUNCAN DAVIDSON


**Stuart Firestein worked in the theatre industry before turning his hand to neuroscience.**

CAREER CHANGE

# It's never too late to switch

*With willpower and suitable financial means, you can start a science career at any age.*

**BY AMBER DANCE**

Julie Dunne was perfectly happy as an accountant, yet she always felt as if there were some other type of work that she would adore. "I just didn't know what it was," she says. Then, in the early 2000s, Dunne participated in field expeditions run by the worldwide environmental organization Earthwatch — and discovered that scientific research enthralled her. The 57-year-old is now a post-doctoral researcher at the University of Bristol, UK, studying the chemistry of ancient pottery to determine early eating habits.

The decision to start science later in life comes with challenges: a mature student may have to go back to secondary- or undergraduate-level classes to pick up necessary qualifications. They might have to rejig their financial or living situations to support a science career. They have less time to build up a CV and research programme, and they may have to combat ageism when it comes to securing a job.

But older students have advantages, too, such as maturity, drive and unique experiences and networks. The best way to explore a new career, say many, is to try out an evening science class or two, maybe a master's programme, before diving full-time into a PhD. Those who have trod this path say that although it might have been daunting and involved sacrifices, it was worth doing. "I love what I do," says Dunne.

Dunne is far from alone in her late-life scientific endeavour. Some people don't discover their passion for science until they've already settled into a different career. Others love science, but aren't ready for a PhD when they finish university. Still others cherish the goal of a tenured academic position but, owing to stiff competition, take decades to get there.

## DOCTOR IN WAITING

Most doctoral students are in their 20s or 30s, according to data from the US National Science Foundation (NSF), the European Council of Doctoral Candidates and Junior Researchers and the European University Institute. But there are plenty of older students, too. According to the NSF, 5.3% of PhD recipients are between 41 and 45, and 8% are older than 45 (see 'Doctoral data'). And the European University Institute data indicate that in many countries, it's rare for students to complete a PhD before hitting 30, and not uncommon to be older than 50 ▶

before becoming a senior professor.

Dunne dipped her toe into science more formally in 2005, at the age of 45, when she began evening and weekend classes in the sciences that qualified her to apply for an undergraduate degree. From there, she carried on through her bachelor's and PhD programmes at Bristol. "I was terrified at first," she says. But although her fellow university students had come straight from undergraduate programmes, Dunne had drive. At the beginning of every term, she and her peers received a guidance booklet for each class that listed reading and course criteria. She devoured them from cover to cover — and was surprised when her younger counterparts did not do the same. That sense of determination is the key to success, she advises. "You've just got to be committed."

Stuart Firestein, a neuroscientist at Columbia University in New York City, has noticed similar traits among his older post-baccalaureate students, who take courses at the university after earning a bachelor's degree. At Columbia, they pay for each class individually, rather than for blanket tuition as do undergraduates, and they want the most value for their investment. They're more focused, he says, and often treat the class as if it were a job.

Firestein came to science relatively late, too. He had always been interested in science and had considered a career in astronomy as a child, but in high school, he developed a love of theatre and worked in that industry for nearly 15 years.

When he was 30, he was stage-managing and doing lighting for a successful production in San Francisco, California. During the day, when he was free, he began to study animal behaviour at San Francisco State University. He earned a biology degree, then left the theatre to pursue a PhD in his late 30s, followed by a postdoc.

Firestein says that his theatre background turned out to be an advantage in some situations. For example, his skill at learning scripts helped him to memorize organic-chemistry reactions. And after the failure inherent in the theatre business — a poor performance one night, for example — a botched experiment was no big deal. (He even wrote a book on the topic called *Failure: Why Science is So Successful*, Oxford University Press, 2015.)

## A SLOW START

Later-stage students may find it helpful to ease into the process slowly, says Robert Hevey, 63, who is studying plant biology and conservation at Northwestern University in Evanston, Illinois, and the Chicago Botanic Garden in Glencoe, Illinois. He took time to work up to his doctoral studies during his former career in business and finance. In the early 2000s, he enrolled in a plant conservation and biology certificate programme at the garden. Then he studied for a master's degree at night school, taking one course per quarter over six years. Only then did he leave his job to pursue a PhD. Hevey says that in the United States, community-college and non-degree courses can help an older student to decide whether a doctoral-degree programme is the right choice.

But there's one crucial question to ask even if those classes go well, Hevey adds: "Can you afford it?" Hevey could embark on the PhD — for which he sought no stipend — only because he was in shape to support himself for the rest of his life.

For some, the move back to education may involve down-sizing. When Dunne moved from Newton Abbot, UK, to Bristol to begin her undergraduate degree, she bought a much smaller flat than she'd occupied before. "I had the oldest, smallest, cheapest car you can think of," she says. Although Dunne loves fashion, she cut back her spending on clothing.

"It's certainly not been a good move for me financially, really, because I would've been much more secure if I'd just stayed working," says Dunne. "I'm not motivated by the money — hopefully I will have enough to live on."

Starting late also means that one's career is likely to be foreshortened. Some may not make it to the tenure track; Hevey plans to spend six more years in graduate school before continuing his work by volunteering at the Botanic Garden.

Dunne is philosophical: "Realistically speaking, permanent positions are incredibly few and far between, so I don't necessarily have any expectations of getting a permanent post. I would be happy enough if I could postdoc until I come to the age that I retire."

An academic career path isn't necessarily out of the question for older students, says Firestein, but he notes that industry might offer a quicker route to success. He's seen his past students rise quickly in that world.

The skills acquired during an earlier career can also confer an unexpected advantage. Oné Pagán wasn't ready for his first attempt at a PhD in Puerto Rico in his 20s. He left the programme after a year and worked as a middle- and high-school teacher — acquiring instructional experience that would serve him well later — and then as a research technician at a medical school. He decided to return to his studies and earned a master's degree at the age of 33. This led to a position teaching medical students.

Pagán still wanted to earn his PhD, but by then he was well into his 30s, with a wife and child. "I had a family, I needed to work — period," he says.

He found the right opportunity, however, when a collaborator of one of his former mentors invited him to apply to Cornell University in Ithaca, New York, for a PhD in pharmacology. Pagán and his wife talked it over and decided it was too good an opportunity to pass up. He qualified for student loans and a US National Institutes of Health scholarship that was meant to support university professors who wanted PhDs. It paid him 75% of his previous salary — not a lot, but enough. He enrolled at the age of 35, and this time, he was ready. "I was a responsible adult," he says.

Still, he worried that as he climbed the academic ladder, his age might be a hindrance. He didn't want to do a postdoc and apply for tenure-track positions at 45. So he found five professor advertisements that didn't specifically seek postdoctoral experience. Only one, West Chester University in Pennsylvania, invited him to visit. After Pagán got the job, he asked his new colleagues what had made him stand out. It turned out to be the educational skills from his previous career, which shone in a teaching demonstration that was part of the interview process.

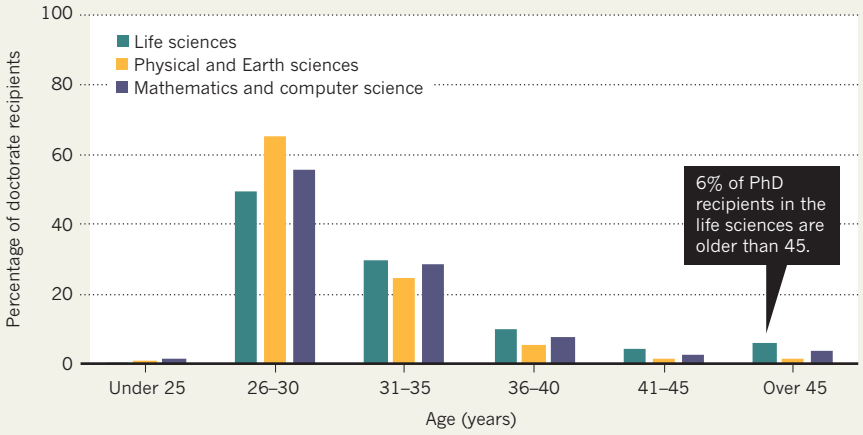
## FAMILY CONCERNS

Family can certainly make it harder for scientists to move around, as the job typically requires, notes Pagán. For example, he has a sabbatical coming up, and he would love to take it in a lab in Europe. But with two kids and a dog, he's looking for options closer to home.

Family obligations were also a concern in the early career of David Gurwitz, a genomicist at Tel Aviv University in Israel. Owing to

**DOCTORAL DATA**

In the United States, the median age for achieving a PhD in any field is 32 years. In the sciences, a high percentage of PhDs are awarded to people in their late 20s, but many recipients are older.




SOURCE: NSF

Israel's compulsory military service, and breaks between degrees that he spent earning money to support his growing family, Gurwitz finished his PhD at the age of 34 and his postdoc at 37, in 1989. He wanted his children to grow up in Israel near their grandparents, but faced a paucity of available academic positions. So he worked as a research associate instead, first at a government institute and then at Tel Aviv University.

Gurwitz organized collaborations and authored papers, and eventually was able to submit his own grant applications. He volunteered to teach courses, which attracted graduate students to his laboratory, although he had to co-mentor them with tenure-track professors. But a tenure-track post continued to elude him.

The tide turned in 2014 when Gurwitz won three major grants and his dean advised him to apply again for a tenure-track position. This year, at 65, he was hired as a tenured associate professor. "I believe this sets an Israeli record for age at first academic appointment," says Gurwitz, who encourages others not to give up. "Persistence should eventually pay off," he says, "even though it may take many years."

Paul Bédard, a geological engineer at the University of Quebec in Chicoutimi, Canada, also had to bide his time for years before landing an academic position at age 50. No such jobs were available when he first tried in 1995 after a postdoc. So he spent five years working as a consultant for companies, and another decade as a lab manager at the university.

***"Persistence should eventually pay off, even though it may take many years."***

When a faculty position suddenly opened, Bédard was there to jump in. But he knew there was no time to waste. "You cannot say, OK, I'll take five years slowly to build," says Bédard. "You get in on Monday, on Tuesday you have to be on a grant application, and on Friday have the money in." Industry experience helped him to start at a sprint, he says, as did selecting a tight focus for his research.

And although a science career can be slow to start, or require a scary transition, there's reason for scientists who begin late to hope for the best. A 2015 study by the American Institute for Economic Research reported that 82% of those who attempted to change careers after age 45 were able to do so (see go.nature.com/2wzckct). They were also happier in their new jobs.

"It doesn't matter if you're going to start at 20 or at 40 or at 60," says Pagán. "Just do it." ■

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ADAPTED FROM GETTY

# COLUMN

# Writing takes work

Professors and students alike can benefit from attending a writers' workshop, says **Eli Lazarus**.

This year, I've spent a lot of time working with graduate students on their writing. They were preparing manuscripts for peer-reviewed publication, and wanted to lead the writing process from first cut to submission. The result, in addition to a stack of drafts, has been an unexpected and welcome education for me — a raft of challenges in learning to write, in teaching writing and in the craft of writing.

Writing is hard work, even for people who enjoy it. In my most impatient moments, I think of what William Shawn, legendary editor of *The New Yorker* magazine, once said to writer John McPhee: "It takes as long as it takes."

But for anyone undecided about whether they like to write, 'as long as it takes' can be a tough sell. Engaging with the writing process requires unequivocal patience — with oneself, with iteration, with the open-endedness of simultaneously creating and solving a puzzle. Such dependence on patience makes writing tricky to learn and tricky to teach. Every adviser has a different way of guiding student writing. For each student, an adviser's default approach — usually some mix of trial, error, preference and habit — will either resonate or rankle. New graduate students arrive with formidable talents, but if they need to learn how to write, how do they start? What shape does that learning experience actually take?

Between starting secondary school and finishing college, I participated in at least eight writing programmes and workshops. Some were three-week intensives; others ran for three months. The first focused on personal essays. Several covered technical exposition. Two were for poetry. Cumulatively, they delivered essential lessons.

One is that even technical writing is a creative practice, which means that commenting on someone's technical material can evoke an emotional response. Another is that unpractised attempts are clumsy, and a clumsy critique of an unpractised attempt can feel excoriating. A third lesson is that most students — and advisers — with scientific training rarely encounter the formal rules of constructive criticism that are so embedded in artistic training. Art students quickly learn that their work is an object, and as such, can be treated objectively by themselves and others. Once they understand objectivity, they also understand that critical comments on their work are not personal criticisms. In terms of emotional effort, an objective perspective is less exhausting — but both the writer and the critic need to be on the same page.

There was a stretch when I was regularly pushing student co-authors to the point of frustration. I hacked around with an overly heavy editorial hand. Projecting myself back into the setting of a writers' workshop has helped me to readjust. I now reply to every draft with the same question: "What kind of comments would you like from me?" I regularly remind myself that if the structure needs work, I should not also make copy edits. A retired high-school English teacher once told me that he marked student papers with the thickest crayon he could find. "There's a limit to how detailed your comments can be when you're using a dull crayon," he said, "and that's for the best."

Everyone can benefit from a good writers' workshop. If a workshop can help students learn how to be objective readers of their own work, then a workshop can likewise help advisers to be better guides through the warrens of the writing process. Time in a writers' workshop is an investment in professional development, in fruitful collaboration, in the practice and improvement of a craft. I'll be encouraging any graduate students I work with to enrol in one — and I might check out a few myself. ■

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