30 something science

What's being female got to do with anything, ask the scientists who are starting labs and having kids.

DANA SMITH

KAY TYE: POWER MOVER

The neuroscientist break-dancing down the tenure track.

BY HEIDI LEDFORD

Being five months pregnant comes with a series of concessions: no booze, no sushi, no double-shot espressos. Less appreciated, perhaps, is the havoc it can wreak on a break-dancer's moves. "My dancing is definitely limited now," says Kay Tye, neurobiologist, award-winning b-girl and assistant professor at the Picower Institute for Learning and Memory at the Massachusetts Institute of Technology (MIT) in Cambridge. "I can't do windmills — I can't do anything that might cause me to fall. Which is, like, everything."

It is one of the few limitations that Tye, 31, has been willing to accept. Striving to make her mark in optogenetics, one of the hottest fields in neuroscience, Tye thought nothing of working past midnight, getting by on four or five hours sleep a night and maintaining a constant, transcontinental travel schedule. She has had to dial back a little in recent weeks, and she knows that life may change further once her daughter is born. But she is ready. "I've been preparing for this my entire life," she says. "I chose a career path that's family friendly."

An assistant professorship at MIT, where the tenure rate hovers at around 50% and the faculty is still about 80% male, may not strike many as particularly family friendly. But Tye, the daughter of a theoretical-physicist father and a biochemist mother, grew up in her mother's lab, where she was paid 25 cents per box to rack pipette tips. With her mother as a role model, Tye says that she was in her teens before it occurred to her that her gender could hold back her career. "And by then, my brain was already fully formed," she says with a smile.

Even so, Tye wasn't sure that science was for her. After graduating from MIT, where she first took up break-dancing, she travelled to

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Australia to live on a cattle farm, in a yoga ashram and finally in a beach tent in an art commune. Her goal was to live moment-to-moment and write a novel based on her experiences. But Tye found her new lifestyle unfulfilling — and, she adds, the novel wasn't very good. She flew back home and started graduate school at the University of California, San Francisco. After rotating through the usual three labs without finding a suitable home, she begged neurobiologist Patricia Janak for the chance to do one last placement in her lab. "If you don't let me rotate, I'm going to drop out," Tye tearfully told her.

Tye got the place and a new mentor: Janak, a successful female scientist with two children. And Janak watched Tye bloom. "Her insecurities rapidly disappeared," she says. "She started to get amazing results." In Janak's lab, Tye published her first *Nature* paper after finding that in rats learning to associate a cue with a reward, there was a boost in the activity and synaptic strength of neurons in the amygdala, a brain region that in humans is associated with processing emotions (K. M. Tye *et al. Nature* **453,** 1253–1257; 2008). But Tye wasn't satisfied: she wanted to be able to switch neurons on or off directly. That led her to optogenetics, a way to activate or inhibit specific neurons in rodent brains using light.

After a two-year postdoc learning the technique in Karl Deisseroth's lab at Stanford University in California, Tye landed at the Picower. She plans to use the approach to map the neural circuits that govern whether an animal forms a positive or a negative association with a given environmental cue. Ultimately, she hopes that her studies can be used to devise ways to treat disorders such as anxiety, depression and addiction.

Over the past five years, the Picower has recruited a number of young female faculty members, several of whom have since started families. (MIT opened a day-care facility across the street from Tye's office in 2004 and uses it as a recruitment tool.) It definitely helps to know they have paved the way, says Tye.

Since her return to MIT a year ago, Tye has recruited four graduate students and four postdocs, applied for 13 grants, extended her list of top-tier papers and begun to prepare herself for the impact of motherhood. Some decisions are easy: the exercise bike in her office will be replaced with "a crib, or playpen, or whatever" for the times that her daughter accompanies her to work. Some are more difficult, like a trip to Tokyo to speak at a conference a month after the baby is due. Tye can't say no, not yet.

And tenure remains near the top of her list. "I never thought that my life had to be limited to anything," she says. "And I want to set that example for my daughter." ■

JOHNNY TANG

"I NEVER THOUGHT THAT MY LIFE HAD TO BE LIMITED TO ANYTHING, AND I WANT TO SET THAT EXAMPLE FOR MY DAUGHTER."

KARINE MARAFIGO DE AMICIS

KEITY SOUZA SANTOS: VENOM DETECTIVE

An immunologist who studies allergic shock receives a shock of her own.

BY ANNA PETHERICK

What should have been an ordinary Thursday for Keity Souza Santos turned out to be anything but. It was 4 a.m. when she woke up on 22 November 2012, tired but alert. She had been meaning to take a pregnancy test for days; now she decided she couldn't put it off any longer, and headed to the bathroom. Later, at work at the University of São Paulo Medical School's allergy and immunology department in Brazil, Santos, 33, told none of her colleagues why she had felt like screaming for joy hours earlier. She kept her secret even when one of them called to tell Santos that she had won the prestigious Young Investigator Award from the São Paulo Research Foundation. That meant that she would be starting her own lab at about the same time as her baby was due. Only it will not be just one baby; Santos is expecting twins.

Santos studies life-threatening allergens in foods and insects, a serious threat in Brazil. Well known for its stunning biodiversity, the country ▶

has more than 400 species of wasp compared with the Northern Hemisphere's 30-odd. One species, *Polybia paulista*, causes hundreds of hospitalizations in Brazil every year. But doctors often have trouble pinpointing the cause of the allergic reactions. "Sometimes patients even bring the wasp to the hospital, but even then we cannot treat them properly because we don't know what allergens are in the sting," Santos says.

During a PhD at the University of São Paulo, Santos worked on an antivenom against the sting of the Africanized honeybee or 'killer bee' (*Apis mellifera* L.). As a postdoc, she studied the proteins responsible for anaphylactic reactions to cassava (*Manihot esculenta*), a staple food in north Brazil, and to the sting of several wasps. From *P. Paulista* alone, she and her colleagues separated out and identified 84 venom proteins — including some that had previously been found only in snake venom — and showed how they can trigger devastating tissue damage (L. D. dos Santos *et al. J. Proteome Res.* **9,** 3867–3877; 2010). Now she is trying to identify the offending proteins in other insect venoms.

To learn the mass spectrometry and other molecular techniques required for the task, Santos spent months in labs in the United States and Austria. While abroad, she heard tales of sexism, something she says she did not encounter when growing up in Brazil. Santos says that her family was shocked when she announced (after reading about the cloning of Dolly the sheep) that she wanted to become a biologist, but not because of her gender. No one in her family was a scientist, and such a career was different from the world they knew.

Now working largely independently, Santos's goal is to create kits that will help doctors to quickly identify the allergens to which a person has been exposed and how to detoxify them. But first she is focused on the challenges that this summer will bring. "My boss is a little bit worried," she says. "But I already have a PhD student and a technician. We can Skype a lot [during my maternity leave]."

"I think she will manage," says immunologist Jorge Kalil, Santos's head of department, before adding after a pause, "but they are twins". Santos has no such qualms. "I want to increase my group of students and collaborators," she says. "Why would I give up my scientific career now?" ■

MÓNICA BETTENCOURT-DIAS: CELL MECHANIC

A biologist who explores and shares the intricacies of the cell.

BY ALISON ABBOTT

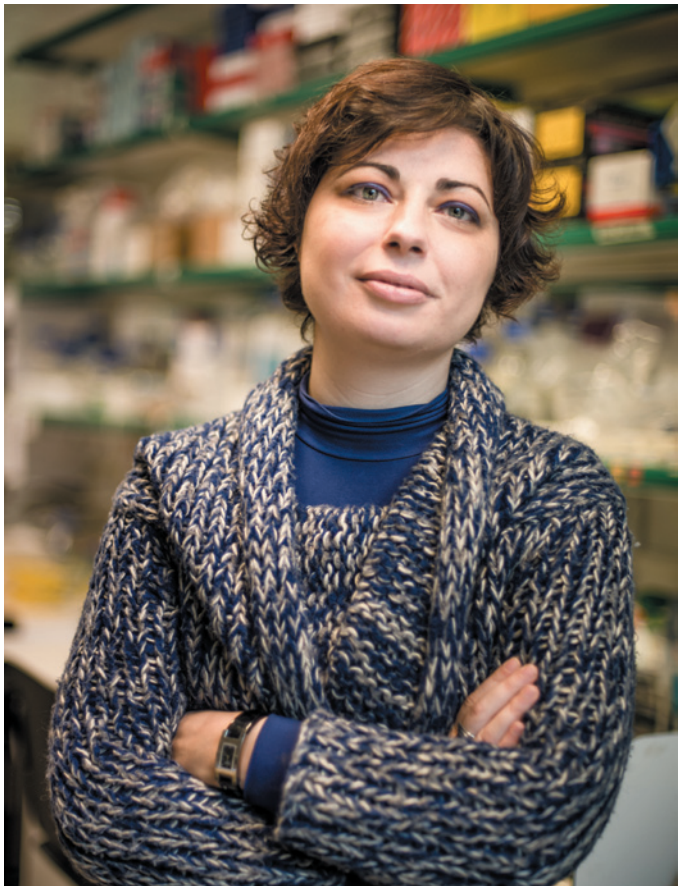
Mónica Bettencourt-Dias grew up surrounded by role models. Despite being relatively poor, Portugal has an excellent record within Europe for appointing women to top positions in academia and other professions. Some think that the situation traces back to the 1960s and 1970s, when educated young men were sent to fight in Angola and Mozambique, leaving room to promote women and spawning a gender blindness in academia. On top of that, Bettencourt-Dias was raised by a supportive mathematician father and social-scientist mother, and she came of scientific age just as her country was introducing an innovative, government-paid doctoral programme, for which she was selected in 1996. "We had some of the world's best scientists teaching us," she recalls, "and I was able to learn that my destiny was cell biology and development."

Bettencourt-Dias travelled to University College London to study the regenerative properties of salamanders as part of her PhD. Later, as a postdoc at the University of Cambridge, UK, she discovered a master regulator of the centrosome, an organelle that organizes some of the key structures and machinery involved in the cell cycle, bagging her first *Nature* paper (M. Bettencourt-Dias *et al. Nature* **432,** 980–987; 2004). She returned to Portugal in 2006 to start her own laboratory at the Gulbenkian Institute of Science in Oeiras and the money has flowed generously ever since — including a prestigious €1.5-million (US$2-million) Starting Grant from the European Research Council.

Now 39, Bettencourt-Dias's life changed a few months ago with the long-awaited arrival of her adopted one-year-old daughter. But Portugal has abundant professional child-care places, and family members tend to be close by to help out. Bettencourt-Dias's husband, also a scientist, does his share of the child-raising, and the couple has hired help for their domestic chores.

In the lab, Bettencourt-Dias still focuses on the tight communication and organization imposed by cellular-signalling pathways and centrosomes. There are parallels in her own life. Being well-organized has been essential to her career, she says, and she developed a drive for communicating science to the public that has led to regular participation in workshops in Portugal's former colonies. Last year, she organized a molecular biology workshop in the west African island nation of Cape Verde, which in 2008 became the first country in Africa to have a government comprising a majority of women. The workshop had a similar number of men and women, Bettencourt-Dias says, and the attendees "told me they wanted to learn science to help their country — you don't hear this in Western countries".

Sharing is a life philosophy for Bettencourt-Dias; her discoveries are recalled in those terms. One of her first such moments came in Cambridge when she and her first PhD student showed that an enzyme called PLK4 is important for the structure of fly centrosomes (M. Bettencourt-Dias *et al. Curr. Biol.* **15,** 2199–2207; 2005). Together, they watched scores of tiny centrosomes forming under the microscope. "It is beautiful to share that moment with someone you are teaching," she says. ■



ROBERTO KELLER-PÉREZ

TONY MARKS

AMANDA WELTMAN: DRIVING FORCE

A cosmologist who probes dark energy and ignores stereotypes.

BY LINDA NORDLING

When Amanda Weltman discovered physics as an undergraduate at the University of Cape Town in South Africa, she thought that "understanding the way the Universe worked was just about the coolest job anyone could have".

Weltman was just 24 when she shot to fame with a proposal about how the Universe works at the grandest scales. Her breakthrough paper, '*Chameleon Cosmology*' (J. Khoury and A. Weltman *Phys. Rev. D* **69,** 044026; 2004), published when she was graduate student at Columbia University in New York, gave rise to a popular theory to explain the phenomenon of dark energy — the mysterious force that is hypothesized to be speeding up the expansion of the Universe.

Weltman and her colleague Justin Khoury suggested that a new force that changes according to its environment could explain many observations about the Universe's expansion. This 'chameleon' force would be weak when particles are packed together, such as on Earth or in the early Universe. But as galaxies fly apart the force would grow, and accelerate the growth. What makes their theory popular is its testability: it predicts that a photon will sometimes decay into a chameleon 'particle' when travelling through a strong magnetic field. Experimental physicists have begun looking for this effect, but haven't yet found anything conclusive (see *Nature* http://doi.org/b96z3f; 2009).

In 2009, after finishing her PhD at Columbia and a postdoc at the University of Cambridge, UK, Weltman moved back to South Africa. This enabled her to start a life with her husband, string theorist Jeff Murugan, whom she had met a decade earlier. Until that point, their courtship had been a typical case of academia's 'two-body problem' — mostly conducted at great distances. Their return to South Africa was also driven by idealism. After years learning from the best in their disciplines, they wanted to bring that expertise home. "We thought we could be better put to use here to grow the country's science and knowledge," Weltman says.

Back at the University of Cape Town, she is part of a large research group, but is also building her own — she has one student and one postdoc so far — to extend and test the chameleon theory. Last year she received a 'P' rating from the country's National Research Foundation, a distinction given to a handful of young researchers who are on their way to becoming international leaders in their field.

Weltman thinks that early barriers for women — the expectations that girls are better at soft sciences than hard ones, or that mathematics is more for boys than girls — are the most harmful. She was raised in a family in which such stereotypes did not exist, she says, and is grateful to have had role models, many of whom were men. "I don't think girls necessarily need girl role models, but I think they need good role models," she says.

> "I DON'T THINK GIRLS NECESSARILY NEED GIRL ROLE MODELS, BUT I THINK THEY NEED GOOD ROLE MODELS."

Having her husband down the hall was handy after the arrival of their two children, now 2 years old and 8 months old. Weltman, who is now 33, kept her research going through her four-month bouts of maternity leave, which in practice were only a leave from teaching. She admits that it was tough at times. Her husband, she says, "looked after the children as much as possible, so I could work. Together we make it work by finding the cracks in the day". They go to conferences as a family and take turns looking after the children.

Academia offers flexibility, but it can still be a daunting place to start a family, Weltman says. "When I was pregnant, I felt a little bit defensive and guilty, like I was admitting that my personal life was important to me by having a child," she says. "In physics, you are supposed to be life, blood, flesh, dedicated 100% to your research." ■