# Q&A: Henry Garcia built carbon nanotubes. Now he simulates big red curly hair

His work at Pixar on special effects and simulations blends physics and art.

**HENRY GARCIA** (Photo by Kris Campbell/Pixar.)

"If you are here because you want to work at Pixar, that's basically saying you want to be an NBA player. It's probably not going to happen." So said the teacher in a graphics course that Henry Garcia took as a sophomore at Sacramento State in California in 2001. Garcia decided to major in physics and computer science. He left graphics behind—at least for a while.

A few years later, when Garcia was a third-year PhD student, graphics—and Pixar—found him. He joined the company in 2008 and has worked in simulations and special effects ever since. *Toy Story 3* was the first movie he worked on, and he has been involved in *Toy Story 4* and *Toy Story 5* (scheduled to be released in 2026), *Brave*, *Elio*, *Luca*, *Dream Productions*, and more. These days, he works mostly as a simulation supervisor. His specialty is using motion to help tell a film's story.

"It's a work hard, play hard environment," says Garcia. "It's not uncommon during our busiest periods to work 50-hour weeks, several weeks in a row, or even in the 60s if it gets crazy. You've got to hit your deadlines."

Despite the pressures, says Garcia, he manages to balance work and life: "I have three kids. I have hobbies. I have a whole life outside of work. I am training as a meditation teacher in the Buddhist tradition."

**PT:** Describe your education path.

**GARCIA:** I come from humble beginnings. My neighborhood wasn't rough, but it was low socioeconomic status. I was the first in my family to graduate college. In high school, nobody was going to pick me as someone who was going somewhere. It wasn't until I got to college that I started to thrive.

I double majored in physics and computer science. Then I went to the University of California, Berkeley, for graduate school. Ironically, one of the reasons I pulled away from computer science and went into physics was that I didn't want to sit in front of a computer all day.

I originally wanted to get a PhD because I wanted to teach. I loved bringing my passion for math and science into the world, and I thought there was something I could offer people, especially at the high school and early college levels, where people get scared of those things.

At Berkeley, I worked in Alex Zettl's lab. I was working on constructing the most-robust, nicest-quality carbon nanotubes possible so that I could start playing around with shoving tiny diamonds into them for hydrogen storage. In the process, I created some wonderful nanotubes that others in the lab started using, and my name got on lots of publications.

I had just finished my coursework and was starting to get heavily involved in research when I left for Pixar.

**PT:** How did that happen?

**GARCIA:** I was enjoying my time in grad school, and I was succeeding. But I started to question whether I had the passion and drive for the next steps. I had about three years left on my PhD, then I'd have another two years in a postdoc, then I'd hopefully get started on a faculty position, and then, maybe, after six years I'd get tenure.

I felt I could be happy taking that path, but I asked myself, Is this really what I want to do? And what could I do now? Around that time, I got an email from DreamWorks Animation recruiting for internships. I could check off 8 of the 10 boxes of what they were looking for and thought, Maybe I could do this.

I swiped my laptop clean, put Linux on there with Windows, and started programming again. I hadn't really touched a computer in the three years since I started graduate school as an experimental physicist. I also audited a computer graphics course.

I applied to the residency program at Pixar Animation Studios. You get full salary, full benefits, and then after nine months, they either hire you or wrap you. The worst-case scenario was that I

could have worked on a movie for a year and then gone back to graduate school to do what I loved there. Luckily it worked out, and I've been at Pixar since 2008.

**PT:** In what sense were you an atypical hire?

**GARCIA:** I came in without film or computer graphics experience, but the timing was good. Pixar was expanding from making one movie a year to three movies every two years, so the company was expanding its workforce and was willing to take a risk on somebody like me.

When I was applying for the residency, they asked me if I painted or was artistic. My answer was that I used to draw a lot in elementary school but hadn't done it since then. I said that my mom was a painter and I knew there is an artistic side inside of me that hadn't been brought out yet.

I've kind of pieced together what happened: Half the room was saying, What are we doing hiring this guy who doesn't know anything about how to make a film? The other half was like, He's a smart guy, he works hard, he'll pick it up. Luckily, somebody on that side was in charge of *Toy Story 3*, and he said, "I am hiring him, and he's coming on my team."

**PT:** What do you do at Pixar?

**GARCIA:** I am a simulation supervisor. I lead teams of 10 to 30 people to create and use technology to bring our characters and environments to life. My department specializes in clothing, hair, and vegetation. I tend to focus on motion, such as walking through grass, or if characters interact with ropes, or things like that. I have spent 25–30% of my career in the effects department, which also uses simulations, but it tends to do things more like water, and smoke and fire, and large destruction.

I always prefer to carve out about 15% of my time to get into the trenches with my team and help make the film. I think it makes me a better supervisor because I'm in there with my team doing it, seeing the pain points. I can relate to everybody and give better advice to my team. Every film involves creating new technology, so working directly on the film helps keep my skills up to date.

As a supervisor, I'm in charge of the budget. I work with producers to figure out how to get the film done. I partner with directors and production designers. During the first half of the filmmaking process, I try to learn what they want and work with my team to build the technology and assets needed for the film.

**HENRY GARCIA TALKS WITH SIMULATION ARTISTS** about how he created the weightless feel of the movie character Elio's cape and hair. (Photo by Emron Grover/Pixar.)

As we start getting into the second half of production, we use the technology we've built to start making the movie. During this part of production, the deadlines come quickly and there are hundreds of people working on the film. Part of me loves that pressure cooker.

**PT:** How does physics play into simulating characters?

**GARCIA:** My first lead role was on *Brave*. Merida is a character in the film who has big red curly hair. No one had done curly hair at the caliber we were trying to target. I worked with a team of engineers in the research department to develop a new simulator. My role was as a liaison between the artists making the film and the engineers developing the simulator. The engineers were talking about conservation of energy, damping and spring forces, and so on. I really got to see my physics side come out and become very useful.

**PT:** What were you trying to do with Merida's hair?

**GARCIA:** One of the issues was how her hair uncoiled as she moved. A lock of curly hair is like a spring. But when she would bounce or turn her head quickly, her hair would uncoil too much and stretch out really far. The director wanted a softness to her hair and to see S shapes in motion as she moved. How do we solve the problem of keeping the hair soft enough to create S shapes but not so soft that the locks could uncoil?

Sometimes the solution is very physics based, like changing damping in a spring model, and sometimes the fix is more of a hacky Band-Aid. For Merida's hair, we created nonlinear stiffness: If her hair was close to its default length, then the stiffness would be low enough to create the S shapes, and if the hair started to uncoil and lengthen, then the springs would strengthen automatically to reduce the uncoiling. It's not realistic, but it created the look the director wanted.

**PT:** What are some other examples of how physics comes into play for the characters you work on?

**GARCIA:** In the film *Luca*, which I was a supervisor on, the director and production designer wanted a stylized look for the shapes and motion of the clothing. The character Giulia had these baggy pants that create a triangle shape, and it was important that her silhouette was maintained. It had to be simple and clean. This required us to push the simulator in a nonphysical way.

There is a technical side of the job: understanding the existing technologies and the physics-based simulators that make things move. At the same time, the artistic side of my brain is challenged. I need to make sure that the physics we are applying is adding to the performance and overall storytelling, not subtracting or distracting from it.

Accuracy is not always the goal. We want fast, efficient, and beautiful, and it's not always physically based. A large percentage of my job is spent strong-arming the physics into doing what I want it to do, as opposed to what it naturally would do. That was the case for *Luca*.

But in the movie *Soul*, for example, the physicality of all the details, all the wrinkles in Joe's sweater, were celebrated. The physics sung in that movie.

**PT:** How else do you use physics in your work?

**GARCIA:** The other way my physics comes in is as a soft skill—the ability not to shy away from a complicated problem and to break it down into manageable pieces. I use that all the time to tackle complex problems.

**PT:** What do you like most about your work?

**GARCIA:** I love using physics to create something beautiful. That was something I had to learn. Sometimes it's an emotion or a tender moment. When I can use motion to convey emotion, it's very rewarding.

**Toni Feder**

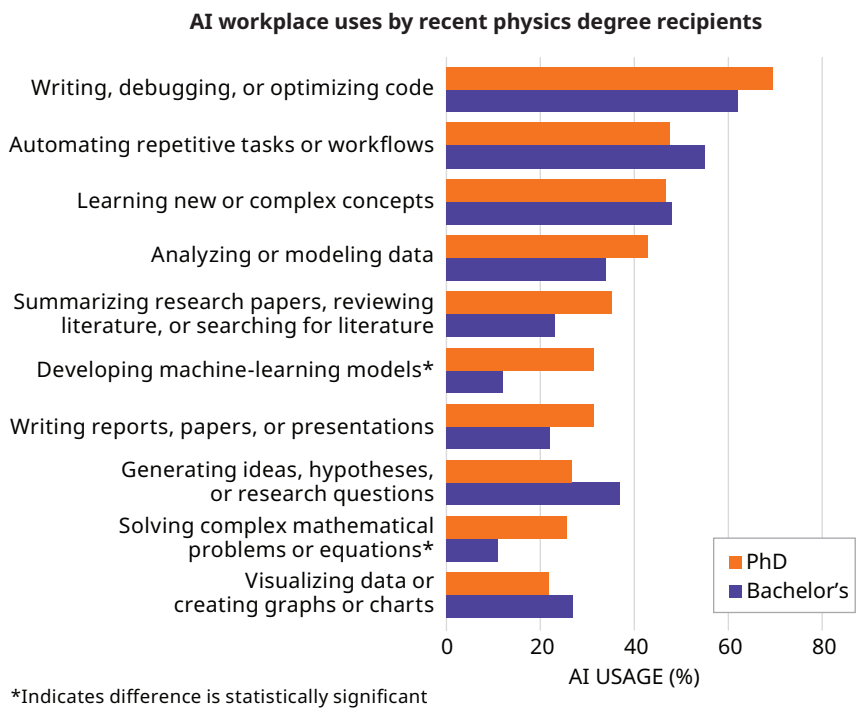
# Recent physics degree recipients use AI at work for coding, repetitive tasks, and more

Some 40% of newly minted physics PhDs who enter the workforce use AI tools routinely in their jobs, compared with about 23% of employed new physics bachelors. That's according to data gathered from a survey of people who received their physics degrees in the US in the 2023–24 academic year. The survey was conducted by the American Institute of Physics' (publisher of Physics Today) statistical research team, who for the first time included specific questions about AI usage in its annual degree-recipient follow-up survey.

The most common application of AI tools among the bachelor's and PhD recipients who reported using them routinely was writing, debugging, or optimizing code; other frequently reported uses of AI were automating repetitive tasks and learning new or complex concepts. The PhD respondents were more likely to report using AI tools for developing machine-learning models and solving complex mathematical problems or equations than the bachelor respondents were.

Those results and others regarding recent physics degree recipients' AI use at work can be found in the report at https://doi.org/10.1063/sr.f1815e968c. The report also breaks down data by STEM and non-STEM employment and includes specific responses from participants regarding their AI usage.

**Tonya Gary**




(Figure adapted from P. Mulvey, J. Pold, *AI use among physics degree recipients*, AIP Research, 2025.)