

I TOOK A BREAK FROM PHYSICS TO RUN ACROSS A CONTINENT

In 2023, Jenny Hoffman traversed the United States in 47 days, smashing a world record. But she still found time to lead a research team. **By Sara Reardon**

Jenny Hoffman made a last-minute decision to launch a new attempt to run across the United States, coast to coast, in pursuit of a world record. A physicist at Harvard University who studies the properties of insulators and conductive materials, she turned to the time-honoured method of recruiting willing students to help. In just two weeks, she pulled together an enthusiastic team to accompany her along the route, supplying her with food, water and emotional support.

Hoffman took a sabbatical, left her laboratory in the care of a senior research scientist and set off from San Francisco on 16 September 2023. Her 4,888-kilometre route took her through California, Nevada, Utah, Colorado, Nebraska, Iowa, Illinois, Indiana, Ohio, Pennsylvania, New Jersey and New York. Sleeping in a camper-van that followed her along the way, she averaged more than 100 kilometres per day while navigating narrow-shouldered highways, thunderstorms, dogs and even large pieces of farm equipment that nearly ran her off the road.

A mere 47 days, 12 hours and 35 minutes later, Hoffman arrived at the New York City Hall. For the final few kilometres, she was accompanied by dozens of friends, family members and fans. Her time smashed the previous women's record by more than a week. She returned to Harvard's physics department in Cambridge, Massachusetts, victorious. Less than a month later, she flew to Taiwan to compete in the 24H World Championship, an international 24-hour run, in which she was placed 23rd in the world.

Double duty

Now, Hoffman is back in the lab, writing grant proposals in an office her colleagues had decorated with balloons, and trying to readjust her metabolism after consuming 8,000 calories a day while racing. She's also trying to decide on her next big goal, which might not be an athletic one. "You can have a scientific impact, but you can also have an impact by being a good mentor or giving somebody the confidence they need to do a hard thing," she says. "The people impacts are maybe more accessible to me right now."

Many scientists would worry that the intensive training needed to achieve an extreme



Physicist Jenny Hoffman in Utah during her record-setting run across the United States.

athletic goal would affect their research output. But Hoffman is no slouch. Her lab has published dozens of papers, including one in *Science* last March about quantum oscillation in a type of insulator material (H. Pirie *et al. Science* **379**, 1214–1218; 2023). She mentors students in her lab and others, and attends numerous conferences. "I don't think there's

"You can have a scientific impact, but you can also have an impact by being a good mentor."

any compromise in any dimension of her life," says Daniel Lieberman, an anthropologist at Harvard who studies the evolution of human athleticism and runs with Hoffman every Tuesday morning. "I don't think she sleeps."

Hoffman insists that she does sleep – for around seven hours a night – but says that, for her, running is a necessary life function. "It's just part of the self-care that I that I do every day," she says. "Even if you have a grant due tomorrow, you're gonna brush your teeth, right?" Tracking her time and looking for ways

to make things more efficient helps, although she concedes that she has no time for a social life beyond her husband and three children.

She does frequently worry that she is neglecting either her career or her athletic pursuits. "There's this myth of having it all or doing it all and you can't," she says. "I'm definitely not as good a physicist as I would be if I were not running, and I'm not as good a runner as if I were full-time. But you only get one life, and I don't want to throw away either of those activities."

Running has been a part of Hoffman's life for more than 30 years, although she only started pursuing it seriously in 2014, after her third child was born. She never expected to be successful. But she soon found herself winning ultramarathons – races that are 50 km, 100 km and longer – and her objectives became more and more difficult. Her 2023 run across the United States was her third try, following a particularly heartbreaking attempt in 2019, when she injured her knee with only 800 kilometres left to go.

The latest run couldn't have happened without a lot of teamwork, Hoffman says. During the most intensive two weeks of training, the amount of time she spent in the lab

halved, but she trusted her group, comprising around 30 people, to keep the science going. “I’m really lucky that I have a great group of students who work together as a team really well and they’re able to turn to each other for questions and advice,” she says. The team, she says, was used to working without her being physically present as a result of the COVID-19 pandemic, and her senior scientist was able to deputize for her, handling problems.

The training and run itself needed a team, too, which included Hoffman’s husband, as well as massage therapists and a professional logistics coordinator, along with a support team cobbled together from students and old friends. Among them was Yanting Teng, a physics student at Harvard who signed up to drive Hoffman’s support van in Iowa and Illinois. Teng was particularly impressed with Hoffman’s drive to get to her next stopping point each day, and her willingness to push further if she was unhappy with her progress that day. “If she wants to do something and feels good about it, she will go for it,” Teng says. “I’ve never seen anyone so determined.”

Going the distance

Determination might be the key to being a good ultrarunner – and a good scientist, Hoffman says. “You need to be okay with repetition to be successful in the lab and sometimes you need to repeat a task many times to get it right,” she says. “I think that same kind of mentality applies to running long distances.”

Science itself supports that assessment. Although little research has been done on ultrarunners, Lieberman says that mental stamina and pain tolerance are the most necessary traits, on top of good form and endurance. The human body evolved to run long distances rather than short sprints, he says, but land mammals didn’t evolve to run Hoffman’s average of 101 kilometres a day. “No horse can do what Jenny did,” he says. “You’d kill the horse.”

To Hoffman, running long distances is not only a personal challenge, but also a necessary escape. Many people with demanding careers find that they think most clearly while running or working out, describing it as a chance to clear the mind and think about problems in a new way. But Hoffman says she never thinks about physics while running. Instead, she listens to audiobooks (see ‘Quick-fire Q&A’).

In fact, Hoffman says, the objective nature of the sport puts her day job in perspective. “Human judgement plays a huge role in science and much less of a role in running, so I really appreciate being able to do something where somebody else’s opinion doesn’t matter,” she says. “There’s no anonymous peer reviewer. I just run the time I run.”

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Quick-fire Q&A

What was the best thing you saw on your run across the United States?

The Eccles Canyon pass in Utah. The Sun was rising just as the full moon was setting on the other side, and the autumn foliage was perfect. It was just gorgeous. But there’s a lot of beauty in this country. Even the cornfields are beautiful, entering them on a sunny day and seeing the waves of golden grain.

What gear did you need?

I went through 11 pairs of running shoes, changing them every 2–5 days, depending on road conditions. I also wore two watches — one on each wrist — so that I had back-up data for tracking for the world record. Here’s something I’m proud of: I made it all the way across the country on US\$7 worth of socks. I bought a 16-pack of socks at Walmart, and we did laundry, so that got me across the country.

What do you listen to while running?

I usually listen to books. I like history and memoirs. Right now, I’m listening to elite runner Lauren Fleshman’s memoir, *Good for a Girl* (2023), which talks about sports science for women and how most sports science is actually measured on men.

What do you like to eat while running?

I don’t have very specific nutritional plans; that’s a weak point for me. When I was running across the country, I was eating

eight eggs a day and salad, but also a tonne of junk food. Of the 8,000 calories I ate each day, maybe half of that was junk food.

What’s your go-to junk food?

I don’t like buying food at convenience stores because the quantities are too small. I like buying junk food at the grocery store, where you can get a huge bag of M&Ms. Chocolate is my weak point. I eat a lot of baked goods, too, just anything to get the calories.

What’s your best mentoring hack?

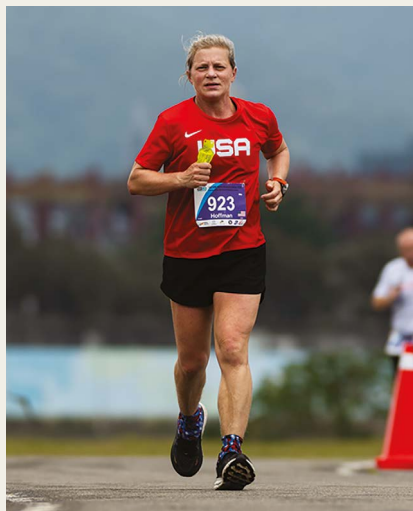
I think people do their best work when they are happy and confident. I try to speak positively about my team members’ work in direct conversation with them — and I also try to speak positively about each of my students ‘behind their back’ when I am talking to other students. It’s super-important that my students value each other so they can work together to solve problems even when I’m not immediately available. To preserve this teamwork, I take their input very seriously each time I consider bringing a new student onto the team.

I also try to provide enough resources for students to operate independently and to minimize e-mails. This includes guidelines for everything from keeping a good lab notebook to navigating international visas. And I have a ‘getting started’ guide for communication that can help to head off frustrations. For example, I tell new students to be ‘squeaky wheels’ if it helps get their questions answered efficiently.

What’s your favourite scientific finding?

I’m most proud of a *Physics Review Letters* cover article (H. Pirie *et al.* *Phys. Rev. Lett.* **128**, 015501; 2022) that actually appeared on my birthday — the best birthday present ever! We invented the first topological acoustic transistor, which can efficiently switch the transmission of sound on or off. It’s part of our broader work using acoustic metamaterials to simulate quantum materials and devices. The transistors could lead to improvements in areas such as one-way sound transmission, ultrasound imaging and echolocation.

This interview has been edited for length and clarity.



Jenny Hoffman competing in Taiwan.