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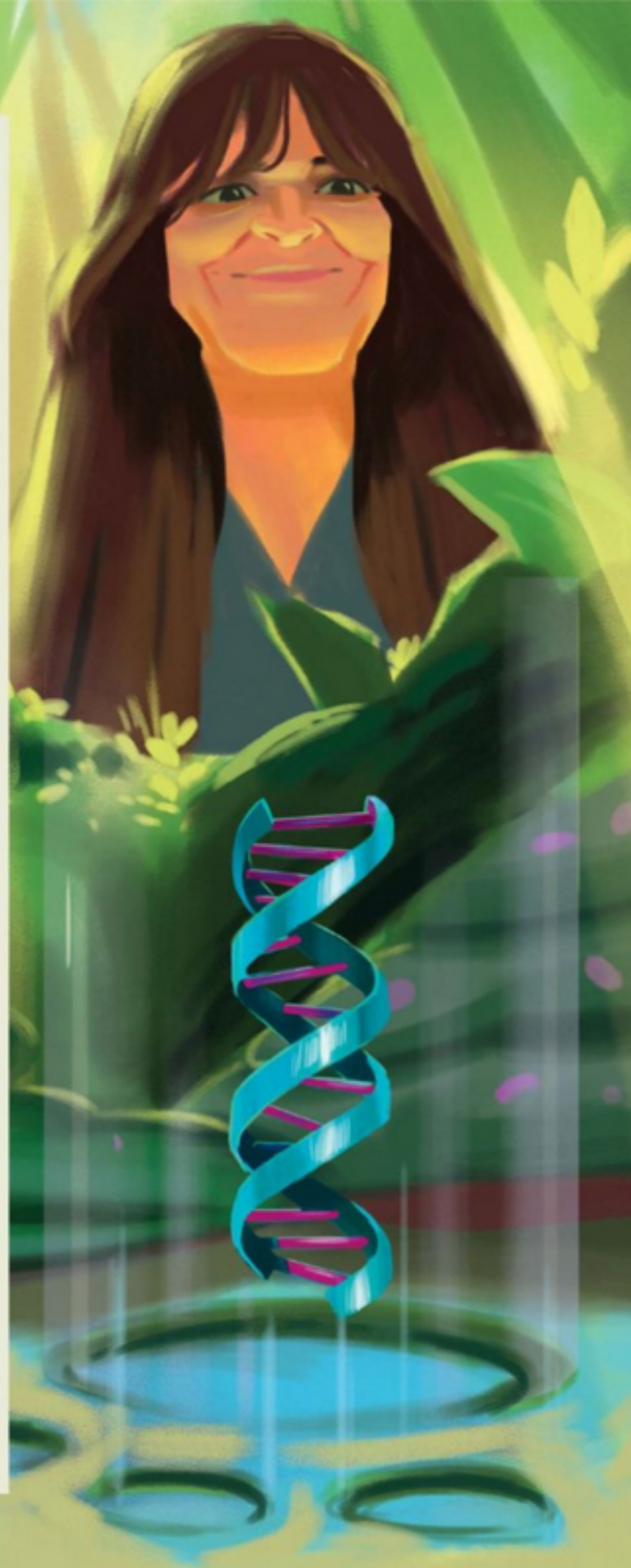
A Poster on Arachnid Architecture

DNA HUNTING IN THE JUNGLE WITH

MRINALINI ERKENSWICK WATSA

Mrinalini is a DNA hunter. She prowls the Amazon jungle and African grasslands, following monkeys, jaguars, elephants and leopards, collecting the DNA they leave behind in footprints, fur, and poop. Mrinalini is not just a geneticist, she's a wildlife biologist working hard to save endangered animals. She's built high-tech laboratories in remote places far from access to electricity. And she teaches genetics in the jungle. All that, and she's also a mom.

If you connect the dots in Mrinalini's life, it's more like a squiggle than a line. "You grow up thinking that to be something, you have to do ABCDE to get there," she says. "And if you get off that path—like you choose to be a mom or try something new—it's considered a terrible waste and you must get back on track. The truth is, there is no one right path. You don't have to choose; you can be everything."



Mrinalini's circuitous path led to big changes in wildlife research. She's created new ways to study endangered animals. "We don't really know how many animals of any one rare species are left," she says. Until recently, our best way of counting wildlife was using hidden cameras. That works if you can tell the animals apart, like leopards and cheetahs with individual spot patterns. But cameras have problems—like when giraffes walk by, the camera only sees their legs! So, Mrinalini is identifying animals by their unique DNA, shed from their bodies wherever they go. And that same DNA tells more—who's related, who's sick, who's having babies. But DNA is analyzed in expensive labs in cities and universities, often outside the countries where animals are most endangered. It can take weeks, piles of paperworks and lots of money to send out DNA samples and get results back. To solve that, Mrinalini's brought the labs to the animals, building portable (sometimes in

a tent!) and permanent labs in the wild, and proving that low-cost, cutting-edge genetics can be done anywhere, by anybody. "If you can cook, you can do genetics," she avows. She teaches lab techniques to residents and to students who come to her labs from all over the world.

LIVING WITH WILDLIFE

Mrinalini grew up in southern India. Her love of animals came early when—at age nine—her family moved out of the city into the country where they could afford a house. She and her sister explored, discovering all sorts of creatures, even cobras. Jackals howled outside her window at night. She started an Animal Lovers Club at school, with friends who had sleepovers at her home. "We once tried to hatch lizard eggs, and cooked them accidentally because they were too close to the light." The memory still makes her sad.



FINDING HER OWN PATH

In India every year, millions of 10th grade students compete in national exams which shape their future. The enormous pressure takes a huge toll on teenagers. Although Mrinalini did well, her parents encouraged her to escape the stress. She found an all-expenses-paid scholarship in Singapore, a tiny nation off Malaysia near where she now

studies the rare Sumatran tiger. Being far from home at fifteen and being taught in a language she didn't speak was a struggle (although she spoke four other languages fluently, including English). Her grades suffered. Fortunately, she aced a U.S. college admissions test she discovered, called the SAT, and was invited to attend Grinnell College in the United States.

DNA AND JUGAAD

DNA fascinated Mrinalini. She was amazed at these molecules in every living cell that contain instructions—like a biological recipe—to make a particular plant or animal. She devoured everything in college related to molecular biology. Her favorite course offered independent projects. She could ask any question that interested her, but she had to design the experiment herself, do the work, and write up the results in six weeks. She did five of those, and learned how to do research. In graduate school at Washington University, Mrinalini combined her love of DNA and wild animals. Plus, they gave her a stipend, much-needed money to pay off college loans. Her early projects were in the Peru jungle with tamarins, squirrel-sized monkeys. The amount

of field work was staggering—following, capturing, and releasing animals—but she didn't let it deter her.

*There's a Hindi term, **Jugaad**, It's like a 'hack' and means 'creating new things without many resources.' It's how I approach everything.*

In the spirit of jugaad, she invited students to Peru from all over the world to assist her and learn field research in one of the most biodiverse and threatened biomes on earth. This blossomed into Field Projects International, today a thriving research and education program.

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She has since trained over 300 conservationists, 70% are women. “They help multiply everything I do by 20 or 30,” she says.



GENOMICS IN THE JUNGLE

What led her to bring cutting-edge gene technology to the jungle? “I’ve learned that being brown in America is not an asset,” she says. “So now, when I walk into a room, I represent a group of people for whom it has been an effort to get there. And because I’m in that room, I can actually refocus a conversation, and redirect money towards things the rest of them just don’t think about. And I can give other people the same opportunity I had.”

In Peru, every other scientist collecting DNA complained about how hard and expensive it was to export DNA samples. But nobody ever questioned why they exported them. It was Mrinalini who thought of bringing the lab and its technology to the animals. With her inexpensive, but high-tech DNA labs in place, Mrinalini has brought genetics education to people in some of the remotest reaches of the planet.

DNA HUNTING

A particular day of DNA hunting in the Peruvian jungle sticks in Mrinalini’s mind. She was on a riverboat with her students, as well as her twin six-year-olds, testing a new idea. Could footprints be swabbed for DNA to identify animals? They stopped at one muddy riverbank where lines of animal tracks came out of the dense jungle to the water’s edge. Her boys thought it was the best playground ever, and ran around in circles in the mud. Mrinalini and her students protected one clear set of footprints they hoped might be a jaguar, but could have been almost anything. They swabbed them and took the samples back to the field lab, wondering ‘Would

footprint-swabbing even work?’ Students did the entire analysis, learning everything from pipetting to sequencing. The mood was somber. They were full of doubt, knowing it was a long shot. Then, the data came up on the computer and everyone cheered. The DNA was clearly jaguar! After that, the students swabbed over a hundred different footprints, identifying DNA from animals like caiman, capybara, and puma. But what made it most exciting for Mrinalini was the people doing the lab analysis were not geneticists with PhDs. They’d learned to do genetics there, in her lab. And it all started with her boys playing in the mud.

Credit: San Diego Zoo Wildlife Alliance

WHAT GENETIC QUESTIONS WILL YOU ASK?

Mrinalini is excited about kids doing DNA analysis, as genomics becomes more and more accessible. Low-cost DNA sequencers can be found in schools and community bio-hacker maker spaces. Remember, she says, “If you can cook, you can do genomics, because you follow a recipe in both.” She urges kids to get their hands on a pipette, do some sequencing, and explore questions that interest them. Make mistakes. Discover what happens if you accidentally double an ingredient. Volunteer in a lab, she suggests. They can’t pay you most of the time, but they will be happy to show you how something works.



WHEN MRINALINI'S NOT WORKING...

What are you having for dinner tonight?

I have no idea! I know I said, ‘If you can cook, you can do genomics because you follow a recipe.’ But it doesn’t work the other way around. I tend to throw things together, so I will probably decide just before dinner.



What favorite game do you play with your kids?

The Iron Snake! It’s an African version of Chutes and Ladders, but the path you’re following is the railway track from Mombasa to Kampala and along the way you get eaten by lions and gored by hippos. And black mambas send you back to the Start.

What’s your dream vacation place?

The beach. Any beach.