



Where I work Tammy Hsu

Photographed for *Nature*
by Helynn Ospina.

My work focuses on creating clean colour. Many conventional fabric dyes are made using unsustainable processes. Indigo dye, for example, is usually made from petroleum-derived aniline in a high-temperature process that involves formaldehyde and cyanide. Globally, around 20% of industrial water pollution comes from fabric dyeing.

I want to make dyes using microbial fermentation instead. At Huue, the early-stage start-up I co-founded in Berkeley, California, we look at how dye molecules are made in nature. We study the biochemical pathways, then program *Escherichia coli* bacteria to make our dye in the same way. Instead of using toxic chemicals, we feed the microbes and they make the dye.

We chose indigo to work on, because it is so iconic. The way indigo bonds with the cotton in denim, building up on the outside of the fibre, is special. When the dye wears down, the white core of the fibres is revealed, which is how denim gets its faded look.

At the University of California, Berkeley, I

worked on inserting the indigo biochemical pathway into microbes. Commercial denim brands became interested; so, just before I graduated, my business partner Michelle Zhu and I set up Huue. We went through a start-up accelerator to get seed funding, and then we were off to the races.

This photo was taken just after we moved into our own laboratory space. I'm standing in front of the fermentation station.

The tanks of dark liquid are growing our microbes. All the instrumentation is used to fine-tune the growing conditions, which we are experimenting with to find out how to produce the most dye.

We have demonstrated that we can make a high-quality product, and are now working with dye mills to see what quality of fabric we can obtain. Depending on the launch schedule of the denim brands, we hope to see products dyed with our indigo on the market within a year.

Tammy Hsu is chief scientific officer and co-founder of Huue in Berkeley, California.
Interview by James Mitchell Crow.