

## Angels' Share Assignment

The walls of distillery warehouses—where the casks of spirit are aged before bottling and sale—are almost always stained black. It's not dirt; the gunk is actually multiple species of fungus. That's been true for hundreds of years, but for all that time, no one knew what the stuff was, or how it grew in the peculiar environment of a booze warehouse.

When barrels of distilled spirit age, the porous wood lets some ethanol vapor diffuse outward. The hotter it is, the wider the pores in the wood open, and the more ethanol gas there is in the barrels. And warehouses can get quite hot, especially at the top. So every year a barrel of whisky, rum, brandy, or whatever loses one to three percent of its volume. It's called the "angels' share," and it's why distillery warehouses smell so good. It's also why older booze costs more—distilleries have to keep the stuff safe, which has a cost, and by the time a distiller bottles a spirit, there's less of it in the cask than when it came off the stills. In other words, that bottle of 21-year-old single malt had 20 percent less whisky in the barrel when it was bottled than when it was laid down. It's this kind of chemistry, combined with the wild biological nanotech of using yeast to excrete alcohol, and stills to concentrate booze, that for my money make distillation the first, best symbol of civilization. You can't have whisky without science.

But no one knew what was up with the black schmutz on the walls—so-called warehouse staining. Scientists had attempted to characterize the stuff but found themselves flummoxed by the multiplicity of fungi growing in it, and the relatively blunt-tipped nature of the tools used to distinguish species. The mycologist who named dozens of species of fungus in the 1820s basically assigned all the dark-colored ones to the genus *Torula*. The warehouse stain got the name *Torula compniacensis* (Latin for "cognac"). That turns out to have been an oversimplification.

So in 2007 a team of Canadian mycologists took the latest genotyping tools and scraped off some warehouse stain to see what was what. It wasn't easy—not because the tools were hard to use, but because distillers were leery of giving access. See, it turns out that the stains don't confine themselves to warehouse walls. They also show up anywhere beneath the plume of emissions from the warehouse—on lawn furniture, house exteriors, trees, and so on. Distillers weren't sure they wanted to get blamed for harmful pollution. But the researchers, lead by a University of Toronto prof named James Scott, prevailed. And what they found was astonishing. The black stuff was different enough to constitute an entirely new species, which Scott's group called *Baudoinia*, named after a French pharmacist and fungus enthusiast.

*Baudoinia* turned out to be totally weird. It lives, essentially, on ethanol fumes—pulling its carbon from the angels' share and providing a substrate for a bunch of other fungi to live on the walls with it. And it has specialized proteins that protect it from the high heat of distillery warehouses. It is, in short, a fungus specifically evolved to live next to spirit casks, one of the hallmarks of industrialized humanity. This'll be the story of how Scott's team solved a 150-year-old problem in science, and what it says about evolution and the place of distillation in human (and fungal) history.