ONE

SIMPLE SUGARS

I like to start with the simplest of ferments—sweet simple sugars that yeast and bacteria can effortlessly access and metabolize into alcohol and acids. With sugary fruits, plant saps, and diluted honey or sugar, fermentation is a spontaneous phenomenon: utterly unstoppable. Anyone who has ever harvested an abundance of any kind of fruit has discovered that some of it, inevitably, is already fermenting. Squeeze the juice out and it will all start to ferment, quickly. Plant saps readily ferment as well, once you extract them from the plant. Honey does not ferment so long as it remains free of water, but the addition of even small amounts of water enables the yeasts that are always present in raw honey to ferment its sugars and turn it into mead. Even if you are working with honey that has been heated or refined sugar that has surely been cooked, yeasts are everywhere around us and will find their way to any available sugars. The sources of the sugars that people ferment into alcohol and more lightly fermented beverages vary around the world.

As mentioned previously, before I was specifically interested in fermentation, I enjoyed palm wine in West Africa. Many years later, when I was better informed about how it is made, I encountered palm wine again, in a couple of different forms, in Southeast Asia. In Mexico, I learned about the importance of the dryland succulent plant maguey (or agave) and the elaborate cultural traditions around its processing into pulque and mezcal. I've witnessed different methods of fermenting pineapples—into *tepache* and *guarapo de piña*—in Mexico and Colombia. In Italy, I harvested grapes to make wine, and I have encountered passionate winemakers around the world. I have learned about persimmon vinegar (and pickles made from the residue!), mauby, and fruit enzyme drinks. And, of course, I'm still making mead. Wherever there is an abundant carbohydrate source, people likely have a method for fermenting it. In this chapter, I share what I have learned about this realm of fermentation.

Palm Wine

Palm wine, fermented from the sap of palm trees, is a delicious, cloudy white beverage that has always been served to me in simple open vessels, never bottles. Its strength, sweetness, and sourness are quite variable from batch to batch, and these shift over a relatively short timeframe. It is the first fermented beverage I encountered that was not made in a factory (in Niger); I loved it, though I wasn't yet thinking about fermentation and didn't inquire about how it was made.

I have since learned that palm wines and liquors are enjoyed in tropical regions all around the world. In Bagan, Burma (also known as Myanmar), I happened across a toddy drinking hole, recognizing *toddy* as a widespread name for palm wine. I was biking around by myself in the afternoon, meandering and exploring as I made my way toward the hotel where I was staying, when I spotted a simple sign with the word "Toddy," some words written in the beautiful Burmese alphabet, and an arrow. I followed the arrow to a small outdoor café where two young men who were already quite drunk helped me navigate the purchase of a bowl of palm wine. I was glad to have drinking partners, because the bowl was huge and the toddy was strong and already beginning to sour. Toddy, like all palm wines, is highly dynamic; it ferments into alcohol quickly and then passes into vinegar in rapid succession.

Toddy in Burma. Quite a large amount was served in the black ceramic vessel, along with coconut shell cups to drink from.

Owing to this dynamism, the toddy is frequently distilled into a beverage sometimes known as arak, to concentrate the alcohol enough that it is no longer vulnerable to vinegar-producing organisms and is therefore shelf-stable. (The name *arak* is also used in the Middle East and elsewhere to describe other distilled spirits.) As you will see throughout the book, people all around the world use distillation for this purpose.

My drinking buddies in Burma.

I visited a small, rural arak distillery in Bali, and I was struck by the simplicity of the still. It was hand built in place, primarily from earth, with a chamber to hold the fermented toddy above a simple fire chamber. The chamber holding the toddy was plugged tightly, with a tube to carry the vapors into and through a barrel

The arak still we visited in Bali.

Arak dripping out of the still.

Coconut sap fermenting into toddy prior to distillation.

filled with cold water, causing the vapor to condense and liquefy. The arak then dripped out of a tube on the opposite side of the barrel.

The improvisational nature of this still was especially striking to me at the time because my friend Billy had recently opened the Short Mountain Distillery down the road from my home, and I knew that the gorgeous copper stills he had purchased required a heavy investment. The moonshiners whom Billy originally learned from created improvisational stills not altogether different from what I was seeing in Bali. It's always good to bear in mind that before they were ever elaborated on by industry and engineering, all the basic, transformational processes that turn the products of nature and agriculture into the foods and drinks we love have long traditions of being done with whatever tools and methods that are available.

In addition to the still, I saw the trees whose sap was being tapped. Boys climbed the trees and pinched off just-developing buds, and they attached coconut shells to catch the sap dripping from where the buds were. The boys climbed up the trees every morning and afternoon to collect the sap. Coconut trees produced the sap; coconut shells were used to collect it; and coconut husk fibers (coir) fueled the fire to vaporize the ethanol in the toddy. I tasted the fermenting coconut sap and it was wonderful, though in Bali the tradition is to distill it.

Pulque

In the arid mountains of Mexico, maguey (*Agave americana*), known in English as agave or century plant, thrives. Spiny and slow growing, it flowers only once in its lifetime. Different varieties of maguey take 7 years to more than 20 years to develop; after flowering once, the plant dies. Clever inhabitants of ancient Mexico developed elaborate techniques for harvesting the sap, called aguamiel (honey water), which is extremely delicious and sweet when fresh. Each plant produces hundreds of quarts/liters of it. But aguamiel doesn't stay fresh for long, and it rapidly ferments into the legendary beverage pulque.

Pulque is milky white, slightly viscous, tart, effervescent, and alcoholic. It can be even more wonderful than the fresh aguamiel, though I have discovered that the flavor varies quite a bit from batch to batch and is dynamic over a short timeframe. In addition to being enjoyed as a beverage, pulque is used as a leavening agent for a very special sweet, light bread called *pan de pulque*.

Pulque, like many of the world's indigenous fermented beverages, has been much maligned. Profitable and politically powerful breweries, working with corrupt public officials, orchestrated government campaigns against pulque in the early twentieth century, characterizing it as unhygienic. There were even rumors that pulque was fermented with feces. Factory production of Western beer and Coca-Cola was touted as safer than traditional small-scale pulque production. I heard a similar story in Colombia, where indigenous, ancient *chicha* made by small producers (see "*Chicha*," page 116) was disparaged as unhygienic, and the suggested replacement was modern, hygienic, factory-produced beer and sodas. In spite of the fearmongering, the fact is that fermentation is a strategy that ensures safety, whether for aguamiel, corn, barley, or any other ingredient. In the realm of sweet, carbohydrate-rich substrates, there is no danger beyond the final product becoming too vinegary for most people to find palatable. But the alcohol and acidity from fermentation only make it safer from potential pathogens.

Pouring a glass of bubbly, fresh pulque.

In a field of maguey on his farm, Emilio Arizpe shares pulque with students during a fermentation workshop.

Tlachiquero Don Teo pouring freshly harvested aguamiel into a barrel full of already fermenting pulque.

Pulque is one of the most wonderful ferments that I have had the good fortune to experience in its context: where maguey thrives and little else will grow; where aguamiel is collected twice every day and the pulque fermented. Indeed, pulque is not really available beyond where it is produced. No one has figured out how to completely stop the fermentation without destroying the qualities of the beverage.

I first tasted pulque, and witnessed how the aguamiel is collected, at Villa de Patos, a beautiful, diversified farm in General Cepeda, in the mountains outside of Monterrey in the north of Mexico. Emilio and Sofia Arizpe own the farm, and it is home to huge fields of maguey from which *tlachiquero* Don Teo harvests aguamiel. Tlachiquero means "the one who scrapes" in the Nahuatl language. Don Teo, like the other tlachiqueros I have met in Mexico, learned the harvesting techniques by helping elder family members with the ancient practice.

Fermenting pulque is simple enough. Aguamiel ferments spontaneously very easily. Because fresh sap is harvested twice a day, there is generally some form of backslopping. This involves adding new sap to the already

Don Teo cutting la puerta into a maturing maguey plant in preparation for harvesting aguamiel.

fermenting batch, stirring, and continuing to ferment. The duration of the fermentation varies with the pulque maker and the temperature: from less than 24 hours to several days. At some point, based upon subjective evaluation of smell and flavor, some pulque is harvested, more sap is added, and so on. The harvested portion might be either further fermented or blended with the previous day's harvest.

Beyond evaluating when it is ready to drink, the major skill involved in making pulque is harvesting the sap from the maguey. The tlachiquero's work starts with identifying mature plants that are beginning to develop stalks. Then, to access the center of the plant so they can cut down the developing stalk, they must remove the sharp, spiny edges from some of the outer leaves of the plant, which then allows these leaves to be arched down and secured, thereby creating *la puerta* (the door) to the center. The maguey spines are strong and can pierce deeply, and the sap can be a toxic irritant. Care must be taken to create safe and easy access to the heart of the maguey where all the sap will eventually be collected twice a day for months.

At Villa de Patos, tlachiquero Don Teo had a very specific process that he followed, and the architecture of his cuts was highly stylized. At the very center of

El capazón, or "the castration" of the maguey: Don Teo cuts through the developing stalk (1); pries it off (2); digs a well (3); and covers it with a piece of the removed stalk (4).

the maturing plant is the developing flower bud, but it is shrouded and protected by tight layers of succulent leaves. Don Teo confidently cut through those leaves and removed them. The very lightest (not yet photosynthesizing) central leaves he impaled on the biggest remaining leaves to make it easy to locate this plant for harvesting in the huge field of magueys. Once the growing center of the plant was revealed, Don Teo took firm hold of it in his hand and pulled it downward to the base, where he removed the developing flower bud in a process known as *el capazón*, or castration. He then cut a depression into the base of the maguey—from which the sap would later be collected—covered it with a portion of the removed stalk, and scattered some of the chips left over from creating the well right around it, perhaps ritualistically.

The castrated plant is then left for a few months, during which the wound heals and the bud continues to swell with sap, but the flower cannot develop. When the tlachiquero deems it time, the scabbed-over wound is reinjured—poked, punctured, and mashed—then left for another week or so, after which the fermenting debris is easily removed by scraping the cavity. The cavity (*cajete*) becomes a well from which to collect the aguamiel, and the twice-daily harvesting begins!

Daily aguamiel harvesting involves two main tools. The first is a long, thin gourd called an *acocote*, with a hole at each end that is used to transfer aguamiel from the cajete into a bucket. One end of the gourd goes into the cajete full of aguamiel. The tlachiquero sucks on the hole at the other end like a drinking straw, drawing the liquid (which can vary with the size of the plant and over the course of the harvest, from a cup/250 ml to more than 1 quart/1 liter per plant) into the gourd. A finger is used to cover the hole and keep the sweet sap in the gourd while it is moved to the waiting collection bucket. The finger is removed and the aguamiel flows into the bucket. Finally, the tlachiquero uses a tool to scrape the edges of the cajete and remove any debris, which is collected in a separate bucket to feed to livestock.

Uriel Arellano, another tlachiquero I met, lives in a village called Otumba, overlooking the pyramids of Teotihuacán outside of Mexico City. He does things a little differently. Whereas Don Teo's plants are essentially untouched until he prepares to extract the aguamiel,