

Intoxicating science

Jamie Goode drinks in two views of that most venerable and destructive drug — alcohol.

“Booze is civilization in a glass,” states Adam Rogers in *Proof*. This science-steeped tale of humanity’s 10,000-year love affair with alcohol is an engaging trawl through fermentation, distillation, perception of taste and smell, and the biological responses of humans to booze. Robert Dudley’s *The Drunken Monkey*, by contrast, focuses on the single question of why we drink — in many cases, to excess.

Of the two, *Proof* is the easier read. Rogers, a senior editor at *Wired* magazine, reveals how alcohol is a spin-off from a form of warfare: yeasts use it as a chemical weapon in their competition with other microbes. The sugar-rich environment of ripe fruits is a tantalizing food source for organisms ranging from bacteria to primates. So much so that yeasts use the relatively inefficient process of fermentation to metabolize the sugar, because it produces the waste product ethanol, which poisons competitors.

Humans first consciously exploited this around ten millennia ago: the oldest archaeological evidence of alcohol production is a pot shard dated to that time, from Jiahu in China. For some 9,850 of these years, fermentation must have seemed a mysterious, even mystical transformation — until, in 1857, French microbiologist Louis Pasteur revealed that yeasts are responsible. Even now, many aspects of booze — such as the link between soil characteristics and noticeable local flavours in wine — are yet to be fully explained. Exploring some of these unanswered questions is where Rogers has his fun.

Along with yeast, Rogers looks at the varied sugar sources that fuel booze production: rice, grapes and barley. The latter is generally malted, a process in which it is allowed to germinate a little to initiate the conversion of starch to sugar. Here we meet the remarkable Jokichi Takamine, a Japanese chemist who worked intermittently in the United States, and who in the late nineteenth century devised a way to break down starch without malting. His technique could have revolutionized whisky production, but it was never developed commercially because it threatened the livelihoods of maltmen. Rogers then takes us through fermentation and examines distillation, first invented some

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Proof: The Science of Booze

ADAM ROGERS
Houghton Mifflin Harcourt: 2014.

The Drunken Monkey: Why We Drink and Abuse Alcohol

ROBERT DUDLEY
University of California Press: 2014.



Fermenting fruit has held allure for millennia.

2,000 years ago. Steam distillation — the process of heating and cooling through which alcohol and water, which have different boiling points, are separated — was probably invented in China, as evidenced by Han Dynasty bronze stills (a detail noted in *The Drunken Monkey*). Today most stills are copper, Rogers shows in *Proof*, because reactions with the metal get rid of the smelly volatile sulphur compounds produced by fermenting yeasts. As a result, the still’s walls gradually thin, giving the vessel a lifespan of just 25 years or so.

In discussing how alcoholic drinks are aged, Rogers pays particular attention to the role of barrels in producing whisky, bourbon and wine. Slow but steady exposure to low levels of oxygen, and the leaching from the oak of flavour compounds such as lactones and vanillin — which give notes of coconut and vanilla, respectively — are both important in shaping the flavour of these drinks.

Proof is an entertaining, well researched piece of popular-science writing. Rogers

scrutinizes the role of smell and taste in wine tasting; this has proved a fertile ground for scientists interested in sensory perception, partly because of wine professionals’ highly detailed descriptions of how they perceive taste. There is some interesting discussion about the connection between flavour perception, the words we use to describe the flavours and the chemical composition of the drink. Sensory scientists use statistical techniques to link aromas perceived by tasters with chemical analysis of wines, but it can be a daunting task. Rogers also dips into the downside: how alcohol affects our physiology, and hangovers — perhaps caused in part by the accumulation of the breakdown product of alcohol, the fairly toxic molecule acetaldehyde.

That downside is amply explored by Dudley in *The Drunken Monkey*. He, too, gives plenty of background on the history of drinking, the effects of alcohol on health and alcoholism. But the thrust of the book is an attempt to explore human alcohol use through the lens of evolution. He puts the roots of overindulgence in ancient primate tendencies to seek out ripe, sugar-rich fruits, which would often have some alcohol content because of yeast activity. Dudley, an evolutionary biologist, hypothesizes that alcohol activates neural pathways that were once nutritionally useful, but now falsely signal reward after excess consumption. This is a well constructed, clearly written book, but the overall impression is that Dudley’s hypothesis, interesting as it is, needs more data points. Information on the blood alcohol levels of animals that have fed on fermenting fruit would be particularly welcome.

It is remarkable that, where not disallowed by religious beliefs, alcohol consumption has remained prevalent in so many human cultures, as both these books show. And what of the future? Most alcoholic drinks are still concocted using ancient techniques. Decades hence, will burgeoning scientific knowledge lead to new methodologies and novel forms of booze? Or will our descendants still be quaffing versions of the same old elixirs, magicked out of grain and grape by the time-honoured processes of fermentation and distillation? ■

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