

Podcast interview: Patrick McGovern

PNAS: Welcome to Science Sessions. I'm Paul Gabrielsen.

Wine plays a large role in Western civilization. It's been used as a medicine, a social lubricant, and a valuable agriculture product. It has factored into social life, religions, cuisines, and economies since its beginnings. The early Neolithic period, between around 10,000 and 4,500 years ago, saw the beginnings of plant and animal domestication, agriculture, pottery, year-round settlements – and wine. In a recent PNAS paper, Patrick McGovern of the University of Pennsylvania Museum of Archaeology and Anthropology, along with his colleagues from Georgia, Italy, France, Denmark, Israel, and Canada, presented evidence of winemaking in the South Caucasus region dating to between 6,000 and 5,800 BC. Residues of wine made from the Eurasian grape, *Vitis vinifera*, on pottery jar sherds found in the country of Georgia, fill in more of the story of both the origins of wine and the origins of civilization.

Around 1998, McGovern first examined sherds from Georgian *qvevris*, or “large jars,” that were thought to have contained wine. Those sherds, unfortunately, had been cleaned with hydrochloric acid, which can destroy organic material such as tartaric acid. Tartaric acid is the principle biomarker for any product made from Eurasian grapes, and that includes wine. Two of the sherds were promising enough for tartaric acid that, although compromised by acid treatment and using less precise chemical methods than today, McGovern proposed in his 2003 book *Ancient Wine* that the contents of their jars might have been grape wine.

McGovern: And so we went on to this more international project, opened up the excavations of the old sites again in the last three years and started getting out material that we could analyze. Well, the first two groups of material we analyzed were all negative for tartaric acid, but then just as we were about ready to give up hope, the third group came in.

PNAS: That third group had six samples positive for tartaric acid, adding to two borderline positive samples from the 1998 group. Comparing the chemical composition of the samples with background tartaric acid levels in the soil confirmed a positive detection. The result was backed up by other organic acids -- malic, citric, and succinic—associated with tartaric acid in grape and wine; also by evidence of abundant grape pollen in the Neolithic soils at the sites, and paleoclimate evidence of an ideal grape-growing climate in Georgia 8,000 years ago. And that age – about 8,000 years old – makes these samples the oldest known evidence of winemaking using the Eurasian grape to date.

McGovern: These results push it back, of course, 600 to 1,000 years earlier than our previous oldest chemically confirmed wine jars from Iran. This grape, the Eurasian grape, spread out over the Mediterranean, up into Europe, and subsequently all over the world so that it produces 99.9% of the wine that we drink today.

PNAS: Over time, 8,000 to 10,000 varieties of the Eurasian grape have emerged, including famous cultivars such as Sangiovese, Cabernet Sauvignon, and Riesling.

McGovern: So we're still not sure if Georgia is where the domestication occurred. Well, Iran still hasn't been thoroughly examined. We can't get back in there to collect grapevines. It's very difficult to do excavations there. And there's other regions of the Near East besides the South Caucasus that still haven't been explored either. We did some exploration collecting wild grapes in eastern Turkey. Lebanon, where humans first saw the grapevine when we came out of Africa 100,000 years ago has not been explored very well. So, you know, it's a question of "Let's get back to where it all started."

PNAS: McGovern says that winemakers today could learn from the Georgians.

McGovern: You have many other varieties, and we mainly make our wine today from the French ones that developed much later. And so you can get varieties from Turkey, from Georgia, from Galilee, Lebanon, and so on that are different in flavor, aroma and so on. Humans tend to want to not have just the same thing all the time. Well this is a way to do it. Take a variety that could go back 3,000 years rather than 200 years like Cabernet Sauvignon, and really see what the difference is. And also if you use techniques like fermenting in pottery underground, like the Georgians do in their *qvevris*, you get all different chemical reactions occurring between the pottery and the grape must liquid that produces all sorts of interesting different aromas and tastes. So why not try that, and be a little bit more like the beer makers, be very experimental? Craft brewers of sorts.

PNAS: McGovern says the public is eager to learn how these drinks originated.

McGovern: If you really give a substantive lecture with a tasting of what could be a possible interpretation of the ancient beverage afterwards, people are enthralled by it. And when they've done surveys of wine aficionados or drinkers, at whatever level and ask them what they'd like to know more about, it's the history of wine. It's understandable because people are aging their wines, they're familiar with the whole concept of *terroir*, a specific place, a specific time, and what we're really doing is taking this back thousands of years to when it all started.

PNAS: Thank you for listening. Find more Science Sessions podcasts at pnas.org/multimedia.