

MODERN SCIENCE

ANCIENT WINES

Archaeologist Patrick McGovern is searching for the oldest wines in the world—and he's finding them BY LYNN ALLEY

Since the inception of archaeology as a discipline in the late 19th century, scientists have been digging up the bones of the past. They can analyze stone monuments, skilled metalwork, fine jewelry and pottery, all materials that are often able to withstand the ravages of time and the elements. But when it comes to the essentials of daily living, to what our ancestors ate and drank, archaeologists have little hard science to go on. • Patrick McGovern is filling in some gaps. McGovern, a senior research scientist at Museum Applied Science Center for Archaeology at the University of Pennsylvania, specializes in analyzing food and wine residues from the ancient past. The professor of anthropology has written four books and edited three, with titles such as *Organic Contents of Ancient Vessels* and *The Origins and Ancient History of*

Wine. A popular account of his scientific research entitled *Ancient Wine: Elixir of the Ages* is scheduled to be published by Princeton University Press in spring 2003.

Over the past two decades, McGovern has applied cutting-edge techniques from analytical chemistry and molecular biology to analyses of archaic residues of food and drink. He has, in fact, almost single-handedly fathered the new and rapidly developing discipline of molecular archaeology as it applies to ancient food and beverages.

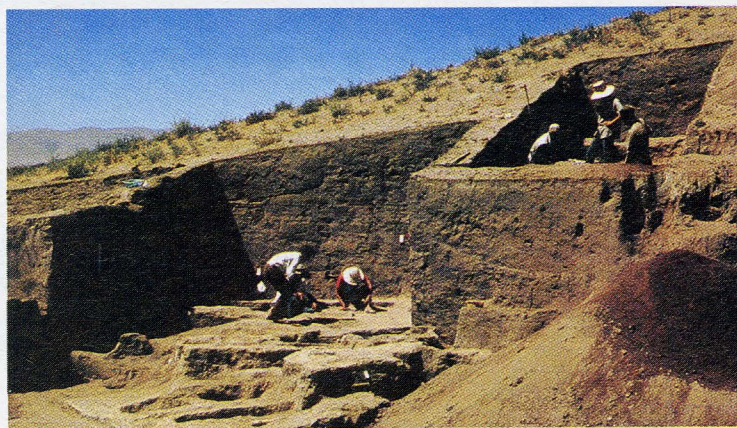
Today, at 57, McGovern, a tall man with a salt-and-pepper beard, says that his lab has become a kind of repository of ancient wine samples and that ancient wine has become his consuming passion.

McGovern is a man of wide interests. He graduated from Cornell University in 1966 with a bachelor's degree in chemistry and a minor in English, and was well into a Ph.D.-M.D. program in neurochemistry at the University of Rochester when he again switched gears. Returning to his love of science and the humanities, he completed a doctorate in Middle Eastern archaeology and literature at the University of Pennsylvania.

The idea of combining his love of chemistry and archaeology emerged while he was working as a graduate student in the Penn Museum's radiocarbon dating lab in the early '70s. Could the more precise and sophisticated techniques used in analytical chemistry and biochemistry be applied to solving some of history's unresolved mysteries?

Throughout the '70s and '80s, McGovern applied techniques such as neutron activation analysis, xeroradiography and electron microscopy to his archaeological investigations of ancient pottery and glass colorants. Then he made a discovery that would once again change the course of his life.

In 1988, McGovern was approached by Virginia Badler, a graduate student in Near Eastern archaeology at the University of Toronto. She wondered if a vessel excavated at a 5,000-year-old site in the Zagros Mountains of western Iran might at one time have contained wine. McGovern, an expert in the technology and identification of Middle Eastern pottery, recalls: "Although the sherds from the jar had a deep burgundy deposit on their inner surfaces, I thought the deposit was prob-



In 1988, Patrick McGovern analyzed artifacts from sites at Hajji Firuz Tepe (center), in Iran, where Neolithic wine vessels, such as the one above, were found with residues of ancient wine. He has also visited towns on the Swedish island of Gotland (top) to gain insight into centuries-old winemaking techniques.

ably an inorganic pigment, rich in iron or manganese."

But his tests proved Badler's hunch. "In a standard Feigl spot test, the residues emitted a green fluorescence—a sign that they contained tartaric acid, a compound specific to grapes," said McGovern. "Other, more sophisticated analyses were equally compelling."

Grape residue in a jar used for storing liquids, in a climate where juice would easily turn to wine: This was the world's earliest known chemical evidence of wine. According to McGovern, the finding pushed the known origins of winemaking back several hundred years, to a time predating the earliest written evidence of the practice, from Egypt and Mesopotamia. It seemed that even before the rise of the great Near Eastern civilizations, wine had been an important commodity.

In 1991, Robert Mondavi hosted an interdisciplinary conference on the origins and ancient history of winemaking at his Napa Valley winery. McGovern organized the conference. He invited experts from nearly a dozen disciplines including anthropologists, archaeobotanists, archaeologists, linguists and geneticists.

The gathered experts included Vernon Singleton and Harold Olmo, from the department of viticulture and enology at the University of California, Davis; paleoethnobotanist Jane Renfrew, from Cambridge

University; Louis Grivetti, a food historian from UC Davis; and Daniel Zohary, an expert on plant evolution from Hebrew University, among others. This interdisciplinary approach allowed the participants to "lay out and debate the available evidence from different perspectives, as well as to set future research priorities," explained McGovern. Fine wine flowed freely and their discussions "took on the spirit of a Greek symposium," he recalled. "The study of ancient wine was in full ferment."

The Mondavi conference on the origins and ancient history of wine opened both personal and professional doors to McGovern, and thrust him full tilt into the pursuit of knowledge about what our ancestors ate and drank.

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As a result of the Mondavi conference, he had realized that the Neolithic period (8500–4000 B.C.), with its transition from

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nomadic life, to life in permanent villages, the domestication of plants and animals, and the appearance of pottery around 6000 B.C., contained many of the necessary preconditions for early winemaking. Following his hunch, McGovern went to the Penn Museum, with its rich collection of Neolithic materials, and asked archaeologist Mary M. Voigt if she had ever noticed any unusual residues inside the jars that she had excavated from a Neolithic site at Hajji Firuz Tepe in the northern Zagros Mountains. Voigt mentioned a yellowish residue that she theorized might have come from some ancient dairy product, but subsequent lab results turned up negative.

McGovern retrieved one of the pottery shards from Voigt and, using his battery of tests, once again found traces of tartaric acid, as well as terebinth tree resin, which was used as a preservative. Because the residues had a yellowish cast, McGovern and his colleagues speculated they had been left by a white wine. Then, in June 1996, while McGovern was holding another of the Hajji Firuz jars for a London photographer, he noticed that it contained a reddish, rather than a yellowish, residue. Lab analysis confirmed that the jar contained the earliest known red wine. This was evidence of both red and white wines from a Neolithic home dating as far back as 5400 B.C.

McGovern's work helped to broaden his own culinary horizons. Past and present mingled when the McGovern family spent time in France, researching the origins of ancient royal purple dye. "We lived at the base of the Pyrenees, among vineyards dating back to the Roman period," said his wife, Doris, "and traveled around France, making a point of enthusiastically sampling local food, wine and cheeses in every small village we encountered."

McGovern has also developed an appreciation for traditional methods of food preparation and winemaking. While on a Fulbright Fellowship in Sweden, for instance, he toured Gotland, an island in the Baltic Sea, and went from farm to farm, knocking on doors

hoping to get some idea of variations in taste, ingredients and techniques used to produce the local juniper-barley-and-honey mead. He speculated that they might shed some light on ancient production techniques dating back to the Viking period.

Past became present when McGovern examined food and beverage residues found at the King Midas funerary feast at Gordion in Central Turkey. He reconstructed the actual feast, including a spicy barbecued lamb and lentil stew and an unusual fermented beverage of wine, barley beer and mead. The re-created feast has since been served on several occasions in the United States and at the Midas tomb. The mixed fermented beverage has been carefully recreated by McGovern and master brewer Sam Calagione, owner of Dogfish Head Brewery in Delaware, and is now being marketed commercially as "Midas Touch."

McGovern is now seeking to push the known origins of wine even further into the past.

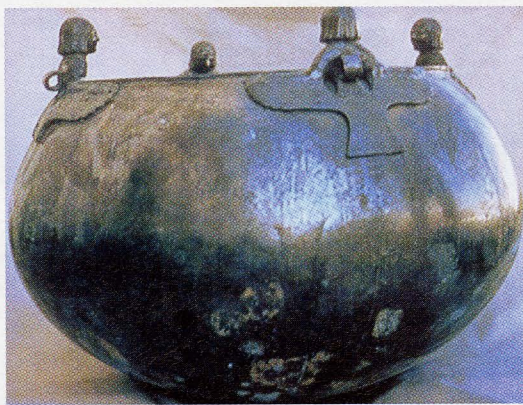
Grape wine has been traditionally considered a product of Western Asia and Europe, but the majority of the world's vine

species are native to China and North America. Few of these native species have been domesticated, however, or were historically used to produce wine. Were the resulting wines so poor that no one bothered to ferment these grapes? Or have we simply not yet discovered evidence of such wines?

In November 2001, McGovern traveled to China to research ancient Chinese wines. If his results from residues on 9,000-year-old pottery samples turn up positive for wine, then the world will have yet another set of mysteries to solve. Could ancient Chinese winemakers have been plying their craft at the same time—or even before—the earliest western winemakers in Iran? And if so, why did the art later give way to the popular sake industry?

Whatever the questions that arise, McGovern will be on the job, looking for answers, and bringing the tastes and aromas of the past into the present.

Lynn Alley is a freelance writer based in San Diego.



Wine residues found on artifacts from Hajji Firuz Tepe, in the northern Zagros mountains (above), led to McGovern's discovery of the world's oldest known red wine. Found at the "King Midas" tomb in Gordion, Turkey, this cauldron (top) once contained a beverage made of wine, beer and mead.