

CERAMIC TECH CHAT

Episode 23

Title – “The Glass of Wine: Jim and Penelope Shackelford (E23)”

INTRO

De Guire: “I’m Eileen De Guire, and this is Ceramic Tech Chat.

While European countries such as France, Italy, Germany, and Spain are well-known for their wines today, historians say the first wines that were produced in antiquity come from a region slightly farther to the east.”

P. Shackelford: “Patrick McGovern, who’s written quite a bit about antiquity, found that apparently the first wines were produced in Georgia. And wine drinking goes back 7,000 years in our history.”

J. Shackelford: “That’s the country of Georgia, by the way.”

P. Shackelford: “The country of Georgia, yes.”

De Guire: “Today we’re talking to Jim and Penelope Shackelford, authors of the book ‘The Glass of Wine: The science, technology, and art of glassware for transporting and enjoying wine.’ We’ve invited the Shackelfords on Ceramic Tech Chat to talk about their appreciation of wine and to share with us the many intersections between winemaking and wine enjoyment that involve glass. And we’ll ask them how ceramics play a role in winemaking as well.”

(music)

SECTION 1

De Guire: “In the book, you mentioned that your mutual interest in wine and winemaking goes back to your first date.”

P. Shackelford: “We were invited on a blind date by a friend, and he had leased a twin-engine Cessna with a group of friends. And he told me they were going to fly up to the Italian–Swiss colony winery and go wine tasting. So, Jim and I were the two, you know, wine daters, and we got in the back of that Cessna and we, for the first time in a small plane, and we flew up there and spent the afternoon tasting wine. Now the Italian–Swiss colony winery was really important to the history of winemaking in California. It was founded, I think, in 1891. It was a way to give immigrants from Italy and Switzerland jobs. So, we appreciated that part of the trip as well, but I think maybe the scariness of our first flight or whatever, it was an indelible memory.

And it was also at the time when the wine production in Napa was truly beginning to take off. And we were just taken there, you might say, to taste wine. That journey with wine has continued for 50 years. We happen to go somewhere and there is a winery, or we're on the edge of a wine region. It's like bumping into a friend that you never make a plan to see, and it has happened to us consistently all of our married life. And over that time and with the experiences we've had, we've truly come to appreciate, you know, what goes into winemaking, the aspects of it, and it is truly the nectar of the goddess."

J. Shackelford: "And we'd like to thank The American Ceramic Society for being so thoughtful in arranging so many conferences near great wine growing areas."

De Guire: "Alright. So, Jim, at present you are professor emeritus of material science and engineering at the University of California, Davis, and much of your research career focused on glass and glass science. So, what was it that intrigued you about glass and pursuing a career in understanding glass better?"

J. Shackelford: "That's a good question. Actually, there was one of those singular events that tend to shape our lives much beyond what we might expect at the time. When I was an undergraduate at the University of Washington, majoring in ceramic engineering—major that is not so common these days in the age of materials science and engineering—but I was a ceramic engineering major. And, of course, that included some focus on glass making as well. We had a seminar, as I recall, I was in the senior year. I don't remember the gentleman's name, but he was a scientist from Corning. And he came and gave a talk like the various seminar speakers did, but what was unique about that was that he had a number of slides of glass products from Corning. And they're absolutely gorgeous. Just beautiful examples of technical glassware that were in themselves works of art, and it just intrigued me.

And then simultaneous with that, I did a senior thesis with Bill Scott, wonderful colleague and mentor there. He was at that time a young professor, had come up from UC Berkeley, and had a large part in the fact that I then moved on to UC Berkeley for graduate work. But Bill supervised my senior thesis, and that happened to be a project of interest to him, and that was looking at the crystallization of some sodium silicate glass. So again, I got my feet wet, so to speak, working on glass. And then when I came to Berkeley, I worked with Dick Fulrath. And he had just spent a sabbatical I suppose at the Sandia National Laboratories down in Albuquerque, and he came back with this interesting problem—interesting to the Sandia people—and provided some funding to look at the issue of gas transport through glass materials. And so that became the focus of my thesis, and my good friend at the time and still friend Joe Masaryk, he and I worked on that problem. Joe focused on the diffusion of gases to glass, looking at a picture silica as a model system—but an important material in its own right—and I worked on solubility. So, the Ph.D. thesis was on glass and then that led to really a career-long interest in those topics."

De Guire: “Great. And, Penelope, your background is quite a bit different. Can you tell us a little bit about your professional background and how it intersects with your and Jim’s interest in wine?”

P. Shackelford: “Well, my initial interest in wine was, of course, the more playful aspects of wine. But then when I became a journalist, I was covering art and creativity and I moved into wine as well and I began to write about it. So, I would say professionally that was where I eventually went with it. I was also very interested, I had an art gallery and I was interested in glass art, so I’ve always found all of the glass used in wine is just draws me, you know, into it. To look at it, to observe it, to see what it does for the wine. So that too contributed to my professional working with wine.”

De Guire: “Great. So, you really, as a couple, kind of approach it from, you can cover the art side, the science side, and cultural intersection between all.”

P. Shackelford: “Yes.”

J. Shackelford: “And I have to add, as I’ve said publicly more than once, that Penelope is a primary reason that the book is readable and doesn’t sound too much like one of my textbooks. So, she gets all the credit for that.”

De Guire: “Very good.”

(music)

SECTION 2

De Guire: “So, how did glass come to be the preferred bottling container, and are there some challenges that the bottlers would still like to overcome?”

J. Shackelford: “That’s a great question, and it’s very true. The glass bottles are wonderfully impermeable to oxygen, so it can be safely stored for a long period of time. And, of course, some of the red wines, very high-end collectible wines, are stored for decades. So, that’s very important. The coloring is often used as a protective device because UV radiation can interact with the wine as an organic material and can decay with time. So, that’s a very important consideration. So, some of the coloring is not just decorative but also protective.

But I say the biggest issue right now with the bottle industry is that bottles kind of need to go on a weight loss program because the big competitors, of course, if you think of the beer industry for comparison. Beer from long ago, when we were very young, would have been primarily coming in glass bottles. Now it comes in aluminum cans. Soft drinks come in aluminum cans and plastic bottles. And, of course, those are dramatically lighter in weight. So, even though culture and tradition continue to make the glass bottles the preferred medium—it’s unimaginable going into a restaurant, ordering a bottle of wine, and having an aluminum can show up on the table. But at the same time, we’re very

conscious about energy consumption, and we tend to enjoy wines from Europe, South America, South Africa, and so on. And so transportation costs as well as various expenses are a big issue.

And so, there's a very high-profile weight loss campaign in the Champagne region of France about a decade ago. They systematically experimented with thinner and thinner bottles. Of course, they're under high pressure, so there's a practical limit to that. But they were successful in reducing the thickness enough so that they were able to reduce their carbon footprint somewhat. But it's a big challenge, and it's another reason why we're seeing a bit more—not a large amount, it's not a big share of the market—but we're seeing a bit more of alternate containers. Plastic is not practical because it's just too permeable to oxygen, but aluminum cans and also boxed wines, which have a plastic bladder in them, are also increasingly widely used. But again, if you go to the store, even entry level wines are still predominantly in glass bottles.”

P. Shackelford: “Just a footnote here. We were staying in a cave hotel in Cappadocia, Turkey, and on the wall were two little spigots. And you turned it on and out came the red or the white wine. Later we discovered that it was a big box in back of the wall that was holding the wine.”

J. Shackelford: “Exactly.”

De Guire: “Wonderful. So, Jim, just a follow up question to that weight loss reduction program. Is there anything glass science can offer to contribute to maybe new formulations or to that process?”

J. Shackelford: “Well, my friend and colleague Arun Varshneya at Alfred University did some very serious study along that line and has certainly contributed specifically to that area. He did that some years ago, issues around mechanical strength, improving the surface resistance to cracking and abrasion that can lead to failures, are all things that can help, along with the simplest approaches, which is to simply make the walls thinner. But again, that can only be reduced so much. So again, there really is quite a bit of potential work that glass scientists can do. Surface studies, fracture mechanics, and so on, and that's ongoing. But ultimately the density is what it is. And so it's something that can be improved to some degree, but it ultimately is always going to be a bit of a handicap in terms of the carbon footprint.”

De Guire: “Alright. So, starting with that moment of experiencing wine, there are many styles of glassware for drinking wine. They're often presented to consumers as providing the optimal design for a particular varietal. What can you tell us about glassware and how it contributes to the drinking experience?”

P. Shackelford: “Well, on a very everyday practical level, well I have two thoughts. One is, ‘Just give me my basic Bordeaux glass. It'll pretty much handle it all.’ On the other hand, and I was rather skeptical for a while also about the different wine glasses—do we really need to go, you know, into a wine glass for every varietal? I was at a tasting several years ago

with a friend and we were tasting pinots. And I was using my basic Bordeaux glass and she had a Pinot glass. And at one point she said to me, ‘Taste the wine from my glass,’ which I did, and I felt like I had a new wine in my hand. This wasn’t the wine I was drinking. I was really shocked.

So, I think that there is truth to the fact that the shape of that glass, whatever it is, does something that aids the type of wine, the varietal that you’re drinking, that it needs to open in a way that it needs to open. Whether or not we can all afford to have a dozen types of wine glasses to go with every bottle of wine is another story. But I do think that, with some of those glasses, it helps and it gives that wine what it needs, you know, it gives you that full experience.

Maybe you would like to say anything?”

J. Shackelford: “The only thing I would like to add, Penelope, is that we had the privilege of meeting George Riedel at UC Davis a few years ago, just before the book was published, in fact. And he’s the patriarch of the Riedel family that is really synonymous with wine glasses, glassware for drinking wine. And the company goes back 250 years. I’m giving them a shout-out for one thing because they’re so generous. They provided photographs of all of their glassware, and also the beautiful cover of the book is a photograph provided by the Riedel company of a very elaborate and exotic decanter pouring into a glass with a glass bottle nearby. The glassware that Riedel has made is important for a number of reasons. One, that classic tulip-shaped glass—Penelope referred to the Bordeaux glass—that’s sort of the typical size. Fairly large but not too large. And sort of the one-size-fits-all for most wine drinkers. That was designed by George’s father, Claus. And they make a big issue of the heritage of the Riedel family. So, Claus was the ninth-generation patriarch of the family and George is the tenth-generation patriarch. And Claus’s design really revolutionized the way we enjoy glass. Now it’s the common look. They’re not all made by Riedel, but you go into a restaurant and that’s the way they look. And it’s actually in the Museum of Modern Art as a classic example of modern design. It’s very functional, it’s clean, it allows you to see the wine, there’s not a lot of ornate carvings and colors on the glass, which used to be common to show how elegant the glass was. It was highly decorated, and you couldn’t see the wine. So, it really has revolutionized the industry and it’s also, they’ve been extremely generous in producing our book.”

(music)

BREAK

De Guire: “Are you an engineer, scientist, or student looking to increase your materials science knowledge? Under a partnership agreement, ACerS and Wiley co-publish books and proceedings on the science and industry of ceramic and glass materials and composites. Learn more about ACerS-Wiley publications at www.ceramics.org/books.”

SECTION 3

De Guire: “So the glassware and the bottles that we’ve talked about are the two uses of glass that the wine consumer can see and experience. But how is glass used behind the scenes in the winemaking process?”

J. Shackelford: “That’s basically the business of chapter six in the book. We try to systematically go through how wine is made. And that involves largely materials other than ceramics and glasses. Wooden castes—oak wood, ordinarily—and stainless steel vats that are very large, 25,000-gallon stainless steel containers, that allow wines to be made with excellent temperature control and so on.

But ceramics and glass do play a role in glassware and winemaking. But glass is not, as a practical matter, one of the container materials for the fermentation process. What it does provide, though, is a substantial amount of the laboratory glassware that’s used in virtually every winery, from the most humble little boutique winery to the largest facility, the Gallo Winery-type operations. Those are all requiring wet chemical laboratories.”

P. Shackelford: “And I’d like to add something here. Those wine laboratories were really the foundation of our book. Because we would go, either private or on a tour of a winery, and Jim would always end up in the laboratory observing the chemical, you know, to me it was like a chemical laboratory, and observing the instruments and how they work. And one day I had this thought. I thought, ‘You should write a book about this.’ That was the initial genesis. Look at the way he’s so interested in glass and this wine laboratory.”

J. Shackelford: “And actually the subtitle for that chapter six is ‘From the barrel to the lab.’ And so in the winery, one of the things that often will happen in a tour, if you’re lucky enough to be toured through one of these modern wineries, is that the winemakers are fond of giving you a sample of the wine before it’s bottled, and actually pulling a sample out of a barrel during the fermentation processes. It’s something called barrel tasting. And to do that, they invariably use a large glass pipette. Dip it down into the wine, bring it out, and fill your glass. So, that’s all part of the ritual of wine touring these days. And so, it really begins at the barrel and ends up in the laboratory.”

De Guire: “So I’m going to put my ignorance on display here, but is there much difference in the taste between a barrel sample and the mature wine that it turns into?”

J. Shackelford: “It is quite different. It really takes some experience to project what that liquid experiences at the barrel to how it’s going to turn out down the road. But the experienced winemaker can get a sense of just what the chances are after another year or so in the bottle perhaps. And also, depending on what point in the fermentation process they’re sampling, how much more time it’s going to have in the barrel, where it picks up various organic chemicals from the barrel, and so on, as well as just the natural aging process. And there can be substantial changes. But it is an increasingly popular way to get a sense early on of what that vintage is going to produce.”

P. Shackelford: “I don’t know if you’ve had a wine, I’m thinking like maybe an Italian Barolo, that needs to be opened quite a while before you drink it. Some people say depending, it might even need a 24-hour decanting before you drink it. And what you taste the first time when you open it and what you taste after it’s decanted, it’s almost like this isn’t the same wine. It can be a little bit like that, you know, when you taste a barrel. I mean, you kind of know, ‘Oh yeah, that’s, you know, that’s a cabernet,’ or whatever, but it’s just different. And then after it’s gone through its process, it’s like, ‘Oh yeah.’”

De Guire: “Well, thank you for clarifying that. I know more now than I did when we started. Are you aware of any of future uses of glass, either in the wine drinking or in the winemaking, that are maybe under consideration or in the works?”

J. Shackelford: “There are a couple of interesting developments, one of which we talk about in the book and the other one has come out in the last year or so since the book was published. Chapter 14 contains some of the ideas that Penelope was just talking about, the complex relationship of wine to oxygen. It’s interesting. Even though I was talking about the virtues of glass bottles keeping oxygen away from the wine, Penelope is exactly right that some of these very tannic wines—very strong red wines like Barolo from Italy; Cabernet Sauvignon, which is, course, very popular in America these days—these big powerful wines can be a little bit too powerful when you first open them, and it does require a little bit of oxygenation in order to soften it, that’s the usual term. So, there is something to be said for providing oxygen.

So, there was a product from Germany a few years ago, again, that we do talk about in that chapter 14, and that was a so-called breathable glass. And it was criticized by the Riedel people as perhaps overstating the case. The suggestion was that the glass wall was actually permeable to oxygen, so that while you were enjoying the wine, it wasn’t just exposed to oxygen from the air but also from the walls of the glass. So it was a proprietary technique, and I suggest in the book how they might have pull that off with some sort of nanoscale porosity. We got to sort of geek out and talk about that. But it turned out that Riedel successfully sued them for talking about that, and they backed off and changed the name of the glass and didn’t make quite such a bold claim.

Then more recently Riedel has come up with a new, if you will, ‘twist’ on glass design. George Riedel has been promoting a new glass that their people have developed working, I suppose, with fluid mechanics. Instead of the usual tulip shape, it has sort of ripples in the side, so that when you twirl the wine—you’ll see wine connoisseurs twirling the wineglass to oxygenate it at the beginning—this new wavy shaped glass apparently speeds up that process. And so, he’s promoting that scheme.”

De Guire: “In the book, you also mentioned the possibility of glass stoppers in the bottle.”

J. Shackelford: “Yeah, that’s interesting. It’s a small part of the market, but we thought that was a cute idea that you can almost have an all-glass container because, of course, for the last couple hundred years the standard wine bottle system is a glass bottle with a cork, usually

from Portugal. It's an excellent sealing system that is all part of the romance of winemaking, opening with an elegant corkscrew and enjoying the wine.

But there was a problem in the 1980s. The Portuguese cork industry got a little lax on their quality control, I have to say, and so there was a lot of wine spoilage in various countries. A lot of chardonnays were lost in Northern California, huge financial loss. So, people began to experiment with alternate closures. Synthetic corks that avoid some of the problems of contamination of natural cork. And also screw caps, which were taken from other beverage designs. So those are actually quite popular now and widely used.

And so, an enterprising fellow in Germany designed a glass stopper, which actually comes from some traditional designs in scientific laboratory. Those have become fairly popular, primarily in Europe. German Rieslings often now have that kind of closure. It's quite beautiful, it's a very different look. But truth in advertising. It does depend not like some of the old scientific glass stoppers, which are ground glass going into a ground glass opening. Very precise. But as anyone who has worked in a laboratory realizes, if they weren't nearly perfect, you might break them opening them up. They had a very bad reputation. And so, these wine bottle glass stoppers actually have a very small organic O-ring that are the secret to success. So, they're not quite 100% glass."

De Guire: "So, of course at The American Ceramic Society, we're just as interested in ceramics as we are in glass. So do you have any information you can share with our listeners about how ceramics are used in the winemaking industry today?"

P. Shackelford: "I'm going to defer to him on that for the most part, but the only, my knowledge is when we toured wineries and I saw the amphora on the ground. The first time, I think, was Frank Cornelissen's winery in Sicily, Italy, I walked in and here are these lids all over the floor. And so, for me that was my, but I'll let him..."

J. Shackelford: "Right, exactly. No, Penelope's exactly right. It's really quite fascinating and it is tied to a large part to a movement these days to return to, if you will, the good old days. Return to the so-called natural wines and making them in a traditional way before a lot of modern technology, let's say, intervened and made them perhaps a bit more polished than in the past but maybe losing some of the character. So, basically, we cover that in chapter five, as I said, we talk about glass around a winery, not in winemaking as much as in analyzing the wine. Most winemaking does involve wood—oak wood—and stainless steel containers, but ceramics also play a significant role in the fermentation process itself. Again, these amphorae that were the earliest winemaking vessels were basically red clay and generally in a very characteristic sort of urn shape, usually with a couple of handles on top, and often sealed in very inelegant ways, it was straw and so on. But they were the way wine was made and, again, a lot of people are going back to that. And modern winemakers in Georgia, in fact, celebrate their tradition by doing a lot of their winemaking in that kind of vessel.

The other thing that is an alternative to the large stainless steel vats are concrete vats. And especially touring wineries in South America, we had a chance to see quite a few people

using that. They have a light porosity—they're not unlike wood—but also very thick and provide excellent temperature control. So, concrete and clay are both widely used in in winemaking these days.”

(music)

CONCLUSION

De Guire: “The next time you pour yourself a glass of wine, pause and take moment to appreciate all the ways that glass and ceramics contribute to your wine tasting experience.

I’m Eileen De Guire, and this is Ceramic Tech Chat.”

(music)

“Visit our website at ceramics.org for this episode’s show notes and to learn more about the Shackelfords and where to purchase your own copy of ‘The Glass of Wine.’ Ceramic Tech Chat is produced by Lisa McDonald and copyrighted by The American Ceramic Society.

Until next time, I’m Eileen De Guire, and thank you for joining us.”