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Reverse-Engineering a Genius (Has a Vermeer Mystery Been Solved?)

David Hockney and others have speculated—controversially—that a camera obscura could have helped the Dutch painter Vermeer achieve his photo-realistic effects in the 1600s. But no one understood exactly how such a device might actually have been used to paint masterpieces. An inventor in Texas—the subject of a new documentary by the magicians Penn & Teller—may have solved the riddle.

By Kurt Andersen



LEFT, COURTESY OF TIM JENISON.

Left, Tim Jenison, with part of the optical apparatus he created above him, at work in his San Antonio studio. *Right*, Vermeer's *The Music Lesson*, the painting Jenison chose to re-create.

In the history of art, Johannes Vermeer is almost as mysterious and unfathomable as Shakespeare in literature, like a character in a novel. Accepted into his local Dutch painters' guild in 1653, at age 21, with no recorded training as an apprentice, he promptly begins painting masterful, singular, uncannily realistic pictures of light-filled rooms and ethereal young women. After his death, at 43, he and his minuscule oeuvre slip into obscurity for two centuries. Then, just as photography is making highly realistic painting

seem pointless, the photo-realistic *Sphinx of Delft* is rediscovered and his pictures are suddenly deemed valuable. By the time of the first big American show of Vermeer paintings—at the Metropolitan Museum of Art, in 1909—their value has increased another hundred times, by the 1920s ten times that.

Despite occasional speculation over the years that an optical device somehow enabled Vermeer to paint his pictures, the art-history establishment has remained adamant in its romantic conviction: maybe he was *inspired* somehow by lens-projected images, but his only exceptional tool for making art was his astounding eye, his otherworldly genius.



COURTESY OF TIM JENISON.

Jenison's finished painting, the product of years' worth of work. (Click image to enlarge.)

At the beginning of this century, however, two experts of high standing begged to differ. Why, for instance, did Vermeer paint things in the foreground and shiny highlights on objects slightly out of focus? Because, they say, he was looking at them through a lens. By itself, *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces*, by a London architecture professor named Philip Steadman, might have stirred a minor academic fuss. But a mainstream controversy was provoked—conferences, headlines, outrage, name-calling—because a second, more sweeping and provocative argument was made by one of the most famous living painters, David Hockney. Hockney argued in *Secret Knowledge: Rediscovering the Lost Techniques of Old Masters* that not only Vermeer but many great painters from the 15th century onward must have secretly used lens-and-mirror contraptions to achieve their photo-realistic effects.

Leading art historians were unpersuaded. Hockney, people said, was just jealous because he lacks the old masters' skills. "I don't oppose the notion that Vermeer in some way responded to the camera obscura,"

said Walter Liedtke, then as now the Met's curator of European paintings (including its five Vermeers), "but I do oppose drastic devaluations of the role of art."

Meanwhile, in San Antonio, Texas, Tim Jenison knew nothing of the brouhaha. Jenison, now 58, is the founder of NewTek, where he has made a fortune inventing hardware and software for video production and post-production. He is a nonstop tinkerer in the rest of his life as well, building giant model airplanes and battle robots, and learning to fly helicopters. Curious, careful, soft-spoken, and comfortably schlumpy, he comes across more as a neighborhood professor you might see at Home Depot than as a guy who owns his own jet.

But in 2002, one of his daughters, then a student at the Rhode Island School of Design, recommended he read *Secret Knowledge*. "And Steadman," Jenison says, "really got me thinking hard." As a guy who has spent his whole career reproducing and manipulating visual images, and contemplating the deep nuts and bolts of how our eyes see differently than cameras do, Jenison had a strong hunch that Hockney and Steadman were right.

However, the Hockney-Steadman theories were just that—theories, experimentally undemonstrated. As the nay-saying historian James Elkins (of the School of the Art Institute of Chicago) observed in 2001, "the optical procedures posited in Hockney's book are all radically undertested," and "no one, including myself, knows what it is really like to get inside a camera obscura"—a lens projecting a perfect image of one side of a room onto a surface equidistant on the other side—"and make a painting." Jenison decided to construct a version of a device that Vermeer himself could have built and used. And since he had no training or experience as an artist whatsoever, he figured he was the ideal beta user of whatever he rigged up.

He was in no rush. His R&D period lasted five years. He went to the Rijksmuseum in Amsterdam. "Looking at their Vermeers," he says, "I had an epiphany"—the first of several. "The photographic *tone* is what jumped out at me. Why was Vermeer so realistic? Because he got the *values* right," meaning the color values. "Vermeer got it right in ways that the eye couldn't see. It looked to me like Vermeer was painting in a way that was impossible. I jumped into studying art."

He traveled to Delft again and again, scouting the places where Vermeer had painted. He learned to read Dutch. He paid for translations of old Latin texts on optics and art. Much later, he did a computer analysis of a high-resolution scan of a Vermeer interior, and discovered "an exponential relationship in the light on the white wall." The brightness of any surface becomes exponentially less bright the farther it is from a light source—but the unaided human eye doesn't register that. According to Jenison, the painting he digitally deconstructed shows just such a diminution from light to dark.

But still, exactly how did Vermeer do it? One day, in the bathtub, Jenison had a eureka moment: a *mirror*. If the lens focused its image onto a small, angled mirror, and the mirror was placed just between the painter's eye and the canvas, by glancing back and forth he could copy that bit of image until the color and tone precisely matched the reflected bit of reality. Five years ago, Jenison tried it out on the kitchen table. He took a black-and-white photograph and mounted it upside down, since a lens would project an image upside down. He put a round two-inch mirror on a stand between the photo and his painting surface. He immediately found that "when the color is the same, the mirror edge disappears," and you're through with that bit. Five hours later, he had painted a perfect duplicate of the photo, an astounding proof of concept by someone who can't draw and had never painted a thing. Then he used his mirror trick to copy a color

photo. Again, perfect. "I couldn't believe my eyes," he says. But while that was all well and good, it wasn't remotely Vermeerian.

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Jenison with the harpsichord he built. Piece by piece, the tech inventor constructed a life-size reproduction of Vermeer's room.

COURTESY OF TIM JENISON.

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The Vermeer he decided to reproduce is *The Music Lesson*, 29 inches by 25: a girl at a harpsichord, her male teacher standing at her side, the Delft north light flooding the room through leaded-glass windows. "My whole experiment was about getting the colors right. Colors are all determined by the lighting in the

room. And *The Music Lesson* shows you the exact position of the windows." But the challenge was immense, because in order to reproduce the painting with the help of a camera obscura, Jenison would first have to build an exact reproduction of the room in the original painting, and of everything in it. Around that time Jenison happened to get a call from his old friend Penn Jillette, the larger, voluble half of Penn & Teller, in Las Vegas. "I hadn't had an adult conversation outside of work in a year," Jillette says. "I needed to talk to somebody who has nothing to do with work and is not a child." Jenison flew to Vegas that day. Jillette recalls, "I said, 'Talk to me about something that isn't showbiz.' Tim said, 'How about Vermeer? I'm working on this project...'" First Penn and then Teller immediately got it. "I was so sucked in," Jillette says. "Because I want everything to be a magic trick! The idea of an amateur coming in and understanding things experts can't see—that's a very American kind of plotline. I said, 'Don't do anything else. Stop everything. You've got to make a movie out of this.'" A movie, like ... a little thing on YouTube? No, Jillette insisted, a real documentary. In Los Angeles the next day they had half a dozen pitch meetings with TV executives. According to Jillette, "Some of them thought they were being punked. And Tim said, 'I'm really not liking these meetings.'" So instead they enlisted Teller as director and decided to finance and make the documentary themselves. "We didn't know the outcome," says Teller, whose father was a commercial artist and mother an amateur painter. "The question did seriously arise: Is this going to work or not? I asked Tim, 'What if this doesn't succeed?' He said, 'Then there won't be a movie.' I said, 'Yes, there will be—it'll just be a different one.'" Penn and Teller installed cameras in Jenison's studio to record everything. In the end, they would have 2,400 hours of video to turn into an 80-minute movie, now called *Tim's Vermeer*, which Sony is releasing nationally in February. David Stork, an imaging scientist and former Stanford professor with a side career in computer-aided art analysis, was the major scientific critic of Hockney and Steadman a decade ago. One of his main counterarguments was that, using only a camera obscura, Vermeer would have had to paint upside down and the projected image would be too dim to be useful. Jenison figured out that using a *second* mirror solves both problems. So in his apparatus, the image is projected through the 4-inch lens onto a 7-inch concave mirror on the opposite wall, and then onto the 2-inch-by-4-inch mirror he'd have right in front of his face as he painted. A second mirror makes the image right-side up and not backward. And it has the added advantage of making the image reflected in the little second mirror, the bit he's actually copying, vastly brighter and clearer.

For his experimental purposes—using a device that Vermeer himself could have made—Jenison decided that modern lenses are too fine. So he learned how to make lenses himself, to melt and polish glass using 17th-century techniques. Jenison painted only with pigments available in the late 1600s and learned to mix them himself, including grinding lapis lazuli stones ("they're kind of poisonous," he points out) to make ultramarine blue.

Vermeer painted *The Music Lesson* in a first-floor room in his mother-in-law's house. "We know, historically, everything about that room in Delft. And this building"—Jenison was now referring to his little one-story warehouse in Texas—"has the same north-northwest angle to the sun." Because the buildings across the Oude Langendijk canal would have blocked some of the light, Jenison erected false Dutch façades outside on the San Antonio pavement. Inside, piece by piece, he constructed a life-size reproduction of Vermeer's room—wooden beams, checkerboard floor, plastered walls. He had the porcelain platter made, and the pitcher on it, by a potter in Delft. He made the chair himself, copying one in a Delft museum. He also built the prop harpsichord. "I started off going as authentic as possible," Jenison says. "I realized I could commission or learn to make stained glass. But I decided I didn't need

another major hobby at that point in time. I cheated on the glass." The stained-glass windows are in fact stained Plexiglas. All the physical preparations took about eight months.

When I first talked with Jenison, three years ago, in his fully completed fake Delft music room, he was six weeks into the painting, working every afternoon for a couple of hours. He had just completed the checkerboard floor. He thought the technique *seemed* to be working. But he had another eight months of almost daily work ahead of him. He was proceeding through trial and error, millimeter by millimeter, fiddling with the paint until the edge he saw between the tiny piece of image in his mirror and on his painted picture dissolved and disappeared.

He was rigorous about painting only what he saw in his mirror, rather than referring to a reproduction of the Vermeer. Or to his gobsmacking memory of examining the real thing for 30 minutes on a wall in Buckingham Palace, wearing a surgeon's binocular magnifiers. "We talked the Queen into showing it to us. I was, 'Oh my God.' It's totally different from the reproductions. It's more muted and bluish." The biggest differences were the crazily meticulous details—the silver thread at the bottom of the woman's skirt, the key ring on the teacher. In terms of detail, "It was goofy what he did on the harpsichord. It was eye-opening, astounding to see. I had no idea. My biggest takeaway was that I was an idiot. There's so much in it."

When I talked to him again recently, long after the painting and Teller's documentary were done, I asked about his learning curve over the 220 hours he spent with brush in hand. "I started with the ceiling beams. They look horrible. I hadn't thinned the paint. I was worried about how you make a smooth gradient, so my daughter showed me that. My brushstroke did get better. By the time I got to the rug, I knew how to handle the brush. Not that I could sit down and paint anything today without the apparatus. It'd be a piece of shit."

Jenison still sounds a little surprised at how he has spent so much of the past decade. He believes he fully succeeded in his mission, but being who he is, he's not exactly doing an end-zone dance. "It's probably kind of important" is as far as he'll go. When we first met, he told me he was 80 percent sure Vermeer used an optical apparatus and a procedure something like his own. After he finished his picture, his confidence was up to 90 percent. Lately, after examining a high-resolution scan of the painting provided by Buckingham Palace, he's 95 percent sure. The most doubt-inducing part of the mystery for him remains how Vermeer kept the trade secret secret. "That's the killer argument. That's the best one there is. I've got a file of counterarguments to my own theory."

But his collaborators aren't fazed at all by the conspiracy-of-silence issue. "How much of history is lost!" Teller says. "We're not talking about an age where people put things up on the Internet. There are magic tricks whose descriptions don't exist." And Jillette is emphatic, as he tends to be: "Tim's device is Vermeer's device! I have *no* doubt. Tim can give you all the doubt you want, but I have none. It's not the kind of thing you write down! The photo-realistic painters of our time, none of them share their techniques. The *Spider-Man* people aren't talking to the *Avatar* people. When [David] Copperfield and I have lunch, we aren't giving away absolutely everything."

The crux of the resistance to the idea that Vermeer invented and used an optical device, beyond technical and historiographic issues, is that it diminishes our sense of Vermeer's genius. But great artists in every age use clever new tools and technologies. You could give all the digital contraptions Alfonso Cuarón used on *Gravity* to a hack director and he'd make a crappy movie. Pro Tools software doesn't turn a mediocre musician into a great one, but great ones depend on it. Chuck Close bases paintings on photographs and

uses a mechanical lift to move his enormous canvases around as he works on them. As Jenison says of the history of art, “*perspective* is an algorithm, a ‘device’” invented in the 15th century to paint more realistic illusions.

“One of the things I learned about the world of art,” Teller says, “is there are people who really want to believe in magic, that artists are supernatural beings—there was some guy who could walk up and do that. But art is work like anything else—concentration, physical pain. Part of the subject of this movie is that a great work of art should seem to have magically sprung like a miracle on the wall. But to *get* that miracle is an enormous, aggravating pain.” To see Vermeer as “a god” makes him “a discouraging bore,” Teller goes on. But if you think of him as a genius artist *and* an inventor, he becomes a hero: “Now he can inspire.”

And Tim Jenison—definitely not a great artist, but certainly a great artificer—is inspiring too, whether or not Vermeer used a device like the one Jenison used in Texas. When I ask what new quest he’s on, Jenison says, “I don’t have a current obsession. I’m between obsessions.”