David Stork Adds New Dimension to Old Masters

STORK, *From Page E1*

Saint Matthew" from 1600, and find out that the daylight that seems to shine into its tavern isn't natural at all: It could only have come from some kind of artificial source in Caravaggio's studio.

Most recently, the scientist has taken on "Las Meninas" by Velázquez, possibly the greatest picture ever made, and one of the most befuddling. By translating Velázquez's 1657 painting into a virtual world, Stork's been able to untangle some of its knots: He's figured out what kind of space the picture shows and exactly who is doing what in it.

Stork, who grew up in Chevy Chase, Maryland,turns 55 tomorrow. He is tall, handsome and fit (he's an advanced scuba diver). In a lecture hall, his energy is endearing and infectious, and he knows how to dumb down his subject when it's called for. His PhD in physics is from the University of Maryland, he has 37 patents (know what an "N-bit neural network encoder" is?)and a Silicon Valley job directing research on digital imaging for Ricoh Innovations, as well as a teaching position at Stanford. The day before his talk at the gallery, Stork will be at DARPA, the Defense Department research group in Arlington, briefing the military's eggheads on "securely outsourcing audio and video analytics."

None of which has helped him break into the world of art history.

Over a Sunday lunch a few months ago at the Phillips Collection — a favorite spot — Stork was frustrated that only a handful of art historians seemed to care or even know about his work on pictures.

That work started when Stork encountered a radical claim by celebrity painter David Hockney that had received huge media attention. In his 2001 book "Secret Knowledge," Hockney asserted that the great masters of Renaissance art had set up their subjects in front of curved mirrors, which then projected images that the artists traced their pictures from. That, Hockney claimed, is what accounts for the huge increase in realism that hits Western art in the years after 1400.

Stork says he received a last-minute invitation to a conference on Hockney's theory, which he'd barely heard of, as one of the few people who could debate the science involved. He had started out thinking the claims looked interesting, but then watched as the evidence collapsed "like a house of cards" under his physicist's touch. Which, he says, is when his work on art "really took off" — for him, if not for most art experts.

Although scholars have been happy to see Stork use science to bring about the demise of Hockney's theory, they've tended to view his work as confirmationof something they'd always insisted on, for all sorts of cogent historical reasons.

As for Stork's non-Hockney discoveries, the problem is that, as fascinating as they are, it hasn't always been clear what kind of profound insights they can bring to art. Stork's microscope analogy is all very well, but even the most powerful microscope isn't any good unless you're pointing it at the right things, to solve the right problems, and letting the right people look through it.

Take Stork's paper on the light in "Girl With a Pearl Earring," published, liked many of his findings, in an esoteric scientific journal. It proves that the highlights on her pearl, the cast shadow of her nose and the soft shading on her jaw each gives quite independent, cross-verifiable confirmation of the picture's light. But, reading that paper, even the most brilliant art historian might need some extra coffee to follow Stork and his team as they "let Si be the i^{th} source of information, such as from a single cast shadow, or a single occluding contour, and $p(x|S_1, \ldots, S_k)$ the probability density the illuminant is in position x given such information."

Even without the language problem, it doesn't get us very far just to confirm that (or even why) the light in Vermeer's painting seems astoundingly real: That's a cliche about the picture. As far as the art world is concerned, the real insight in Stork's paper is buried in a throwaway line in the thick of a discussion of computer modeling: "We assume Vermeer executed the portrait from a live model and sought to render reasonably faithfully what he saw." Actually, that assumption isn't obvious at all. Art historians know surprisingly little about how the Old Masters really worked: how much was drawn or painted on the spot in front of a live model, how much was freely altered afterward and how much in a picture was entirely made up.

The most important thing about Stork's virtual-world version of the "Girl With a Pearl Earring" is that it can exist at all: that Vermeer's picture is so perfectly consistent in its every detail that a computer can use it as the basis for building an equally consistent 3-D world, complete with lighting. That seems pretty good evidence that there was more observation than imagination in the making of the picture.

John Marciari, a Yale-trained art historian who is now curator of Italian and Spanish painting at the San Diego Museum of Art, remains skeptical of the idea that paintings would often have been closely based on scenes fully staged in the studio. "My feeling is that the majority of paintings show imaginary scenes," says Marciari.

He says his own research has looked at gorgeous pastel faces by Federico Barocci, an older contemporary of Caravaggio's, which have been praised for centuries as having been done direct from life. And that research has shown that they almost certainly were not.

"I understand the constructed nature of art — that artists are not photographers," responds Stork. "All that our techniques can do is point out when the artists were consistent and realistic, or not." But what's not clear — or has yet to be proven, at least — is whether computer analysis could ever tell the difference between a picture that science registers as completely realistic because it's done from life, and one that a computer reads as realistic just because a painter's got the skills to simulate it perfectly.

Stork admits that his lab can't give all the answers — "but we do better than pure connoisseurship." He can, for instance, tell when the simulation's not as perfect as it seems — when a picture does *not* reflect the real-world situation that expert eyes might think they see in it.

In the case of the "Calling of Saint Matthew," even a connoisseur would say there's sunlight pouring through the window in Caravaggio's tavern. Yet Stork's analysis shows that the bright light on the rear wall could only have been cast by a source much nearer than the sun, like a lamp or a candle. (Why? Because the light on the wall gets dimmer with each inch that it gets farther from its source — which wouldn't happen if that source were 90 million miles off.) Stork's finding proves that a plausibly realistic *look*, such as we also admire in Vermeer, isn't by itself enough to tell us if a scene is completely natural, or faked and posed in the studio, or perfectly imaginary.

In what he refers to as "the chink in the dam," Stork was invited to present his latest findings on the "Calling" at the meeting of the august Renaissance Society of America, held in Los Angeles in March. "There wasn't a negative word said," recalls Stork of the reaction to his talk. "I was happy as a clam." (Stork has now lectured on art more than 150 times, everywhere from Milan to Helsinki to Tokyo.)

David Stone, an art historian from the University of Delaware helped organize the society's session on Caravaggio. He gave Stork one of its coveted slots after attending a lecture the scientist had given to conservators. Stork, Stone says, pushes art history to "think more deeply about the degree to which artists observed the world and respected it. . . . He gets us to think again about issues we thought were settled, or issues that we thought could never be settled." Stork is "evidently not an art historian," Stone says, and doesn't always focus on the "compelling issues" of art history. (Although a love of art and culture runs deep in Stork's family: One great-grandfather was painter to Crown Prince Rudolf of Austria. The physicist's father, a technical writer for the federal government, was an art lover and his sister was chief calligrapher at the White House. David Stork himself has had a sideline as an orchestral percussionist, with 18 recordings to his credit.) So Stone has agreed to work with the scientist on a paper that will set out the full art-historical potential — as well, perhaps, as the limitations — of the computer analysis of art. The pair hope to see it published in one of art history's most prestigious journals.

"I'm just at the beginning of understanding the implications of Stork's work," says Stone. It's about "getting at the decisions that artists make" — by finding new ways to look at the pictures they painted.

Take Stork's work on "Las Meninas." Velázquez's great puzzle-picture from 1657 famously shows the artist himself painting a portrait of the king and queen of Spain, whom we glimpse only through their reflection in a mirror on the back wall of the scene. (We can't see the royals themselves, because Velázquez seems to render the whole setting as though it's being viewed through their eyes.)

What has never been clear is whether we're supposed to imagine that the mirror is reflecting the actual royals, or whether what we're seeing in it is a reflection of the picture Velázquez is painting of them. Stork has resolved the issue by building a computer model of the painting that lets us view its scene from any angle. What we discover is that the only way the layout of the painting works is if it's the royal portrait, rather than the royal couple, that's been caught in that reflection.

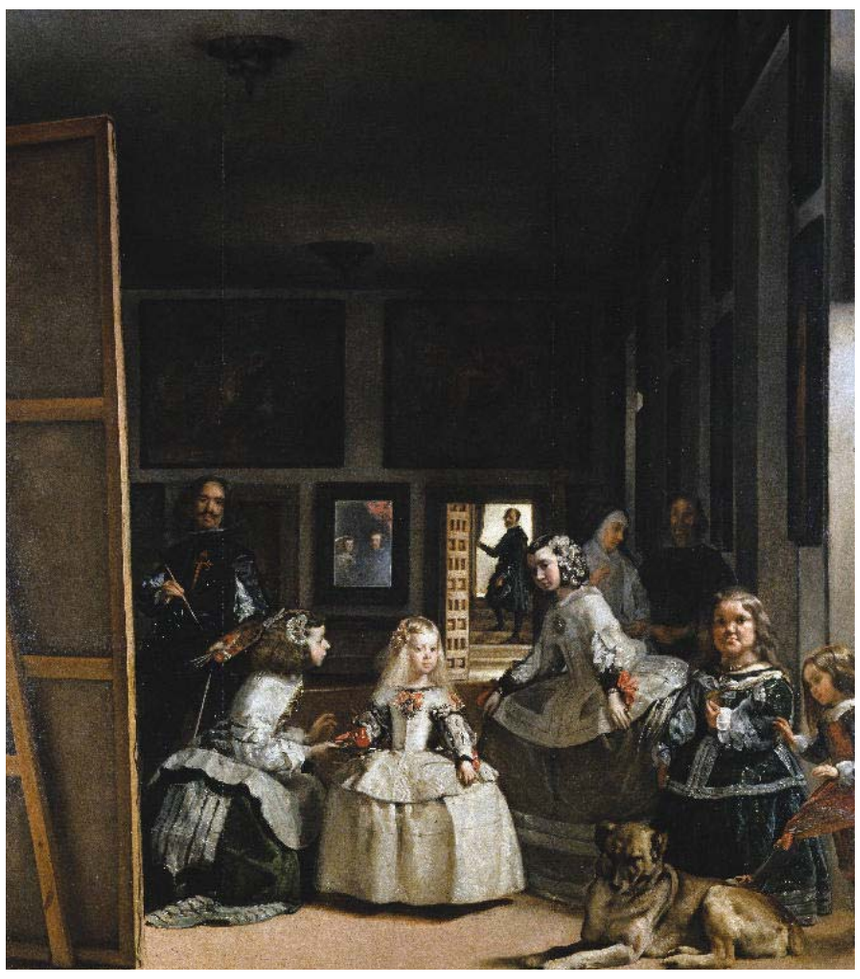
Stork has made a similar computer model of the "Calling of Saint Matthew." Lorenzo Pericolo, a scholar from the University of Montreal, hopes to use it to flesh out some work he's been doing on the gazes in the painting: Which characters could see Christ and which couldn't? And how does that make us think about the sacred import of the scene?

In his model, Stork can move an imaginary movie camera to the viewpoint of each figure, so we can look through their eyes, as it were, and see precisely what would have been in view for each of them in that dark tavern. Pericolo says that Stork, whom he describes as "humble and open-minded," seems to enjoy having art historians ask him to solve new problems. Even if that means that Stork finds out "that what he thought was primary in his work is in fact secondary, and vice versa."

In the end, knowing more about a painting's "real-life" scene, as well as its unreal peculiarities, may help us nail down our most complex reactions to the work of art — revealing even more, maybe, than Stork and his supporters have hoped. If, for instance, it turns out that the "Calling of Saint Matthew" is painted so that the tavern's back wall and the figures in front of it seem lighted by different kinds of light (that's where Stork's latest research is tending), that could help account for how the painting touches us. Though we don't even know it, our eyes tell us that the tavern is illuminated by artificial light: It represents a transient world of human artifice. And then they read the sacred figures in the scene as lighted by the sun: They stand for a moment of eternal, daylit truth that's entered the darkness. Couldn't that mean that Stork's findings have given us real, hard evidence for why the picture works so well as a depiction of Christ's impact on the human world?

"I'll leave it to others to take that interpretative step," says Stork, always one for the empirically provable. "We're just a tool that will help art historians."

But that doesn't mean he suffers from false modesty: "I really think we're making a difference, and will make an even greater difference in the future — especially now that Hockney's out of the way."



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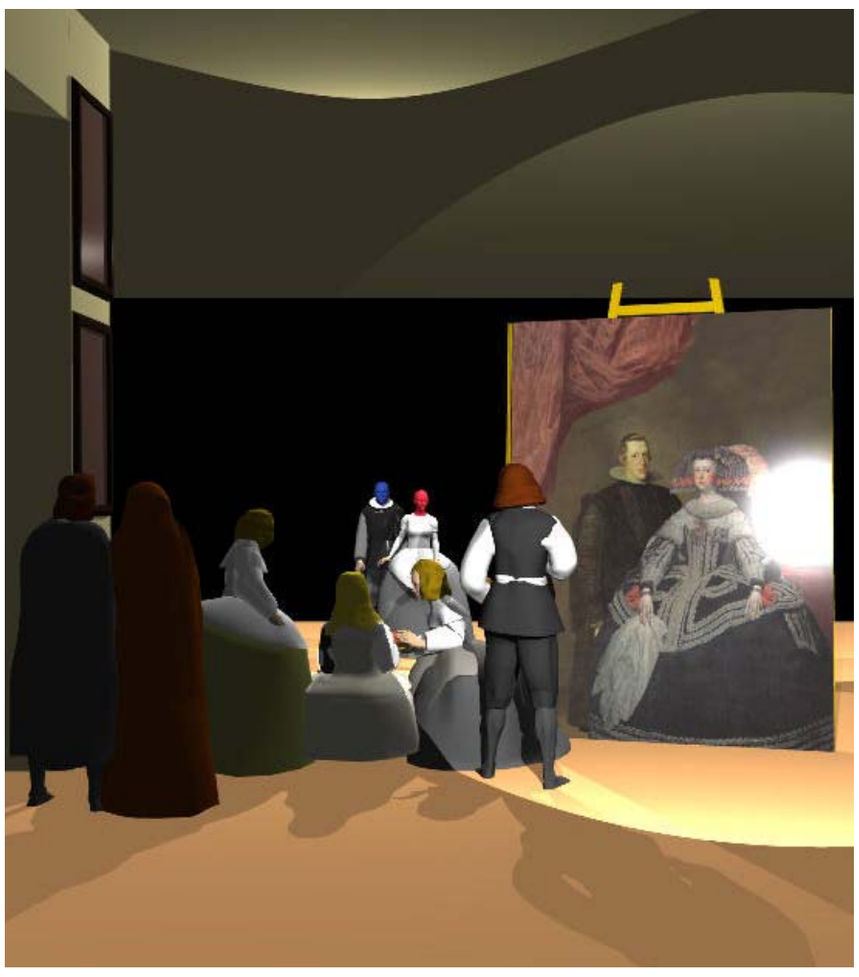
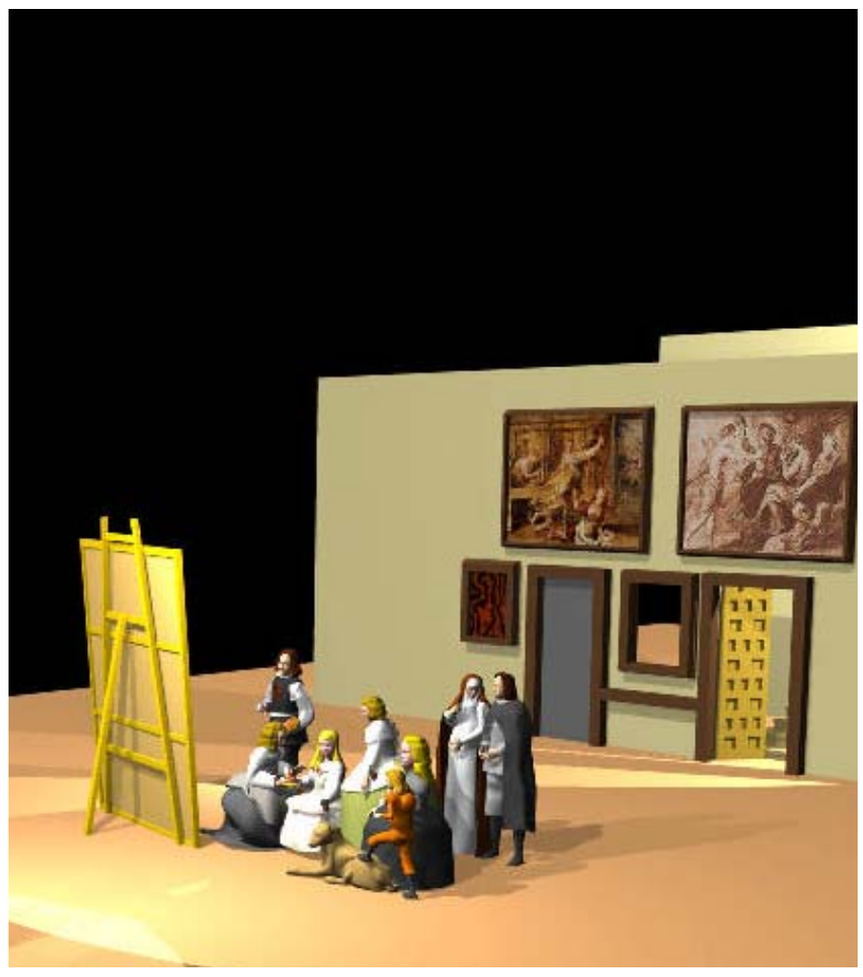
ABOVE AND BELOW: BY YASUO FURUICHI AND DAVID STORK (RICOH INNOVATIONS AND STANFORD UNIVERSITY)

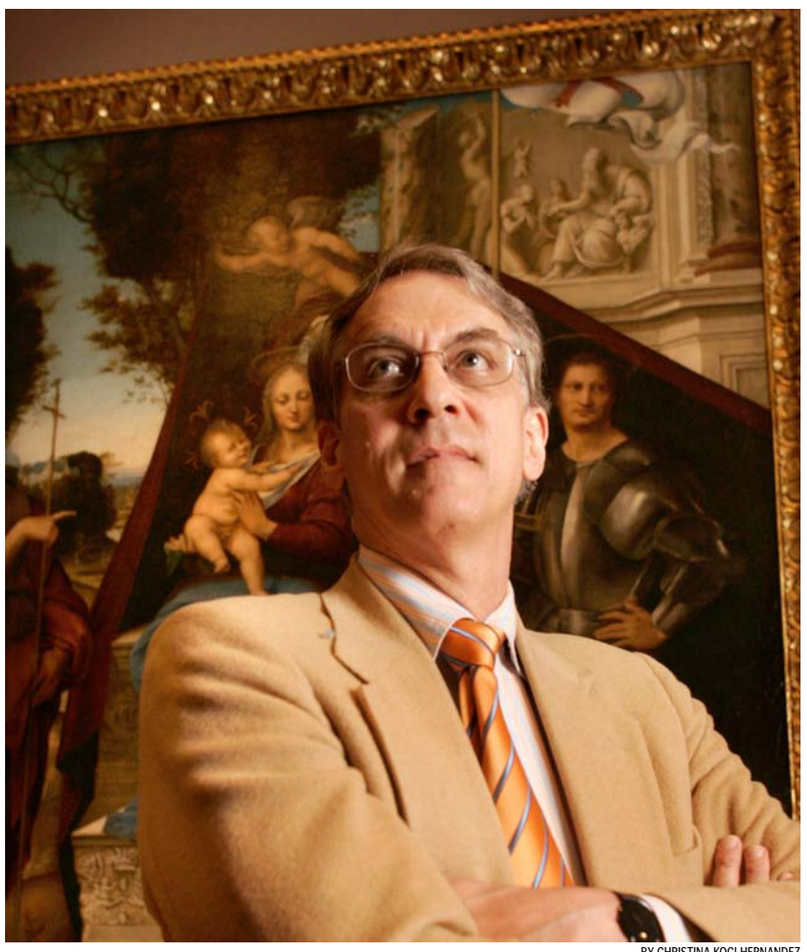




David Stork's computer model of Velázquez's "Las Meninas," top left, confirms that it's the royal portrait, not the royal couple themselves, that's been caught in the mirror's reflection.

SEE FOR YOURSELF

David Stork will be speaking on "Computer Image Analysis in the Study of Art" on Friday at 2 p.m. The talk takes place in the lecture hall on the ground floor of the West Building of the National Gallery of Art, on the north side of the Mall at Sixth Street NW. For more information call 202-737-4215 or visit *www.nga.gov*.



BY CHRISTINA KOCI HERNANDEZ

Stork, at the Legion of Honor in San Francisco, says his techniques, like a biologist's microscope, let art historians "reveal things in art that we didn't see before."

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A Fresh Perspective

ON THE WEB | For a 3-D look at "Las Meninas" with commentary by David Stork, visit *washingtonpost.com/museums*.