

Seeing, Knowing, and Understanding: Intersecting Paths Between Art and Science

Eye of the Beholder: Johannes Vermeer, Antoni van Leeuwenhoek, and the Reinvention of Seeing

By Laura J. Snyder, New York, NY, W. W. Norton & Company, 2015, 448 pages,
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A well-known psychological study by Stanley Milgram—though not his most famous one on authoritarian behavior—assessed the degree to which two strangers could be linked by a chain of mutual friends (Travers & Milgram, 1969). In the study, a random sample of individuals from Nebraska were asked to locate a complete stranger living in Boston. They began by sending a letter to a friend and asking whether or not the friend knew the target person. If so, then the friend was to send a letter to the person directly; if not, the friend was to send a letter to someone else who might know the person and thus continue the search until someone down the chain of mutual friends actually knew the target person. About 20% of the searches were completed with an average of 5.7 intervening friends linking the starting subject to the target person. This value established the often heard notion that there are “six degrees of separation” between any two strangers.

Laura Snyder’s book, *Eye of the Beholder: Johannes Vermeer, Antoni van Leeuwenhoek, and the Reinvention of Seeing* moves much like the Milgram study as she searches for social connections between two prominent Dutch figures of the 17th century—Johannes Vermeer and Antoni van Leeuwenhoek (*lay-wen-hook*). Vermeer

stands as one of the premier painters in the history of art and is known for his exquisite, almost photographic, scenes of Dutch life. Most extraordinary is his ability to paint objects and reflected light in near-perfect detail and tonality. In 2012, many were awed by his *Girl with a Pearl Earring* as it went from city to city on its international tour while its permanent exhibition site, the Mauritshuis in The Hague, Netherlands, was being remodeled. Its popularity was enhanced by a novel and film about the painting and artist, though even without that commercial hoopla, this and other of Vermeer's paintings are wonders to behold as they embody an intimate quietude that is unique to Vermeer's artistry.

Leeuwenhoek was also a master of objects and light, though his expertise was in science and the burgeoning field of microscopy. A cloth merchant and city bureaucrat by profession, Leeuwenhoek invented his own microscopes by creating bead lenses from molten glass and attaching particularly goods ones onto a metal rod. With a specimen placed close to the lens, such as a drop of water, Leeuwenhoek pointed the apparatus to the sun, peered through the lens, and saw a tiny world magnified 250 to 500 times. He sent letters to the newly formed Royal Society of London describing such things as tiny organisms, which he called "animalcules," swimming in a drop of canal water, the tails on sperm of many species, and most heroically the head of a louse as it sucked the blood from his own hand. Leeuwenhoek wrote about his miniscule universe, which included the discovery of bacteria, and as a result is considered by many to be the "father of microbiology."

The degrees of separation between Vermeer and Leeuwenhoek is very small. The two were born in the same town, Delft, were baptized in the same church only days apart,

and for much of their adult lives they lived across from each other along the borders of the Delft Market Square. As Snyder painstakingly points out, the two undoubtedly had many mutual friends. Vermeer in his role as both art dealer and painter would have interacted with many of Delft's socialites as would Leeuwenhoek in his capacity as cloth merchant and city official. There is, however, no documented proof that the two knew each other personally or were even acquainted with each other by reputation. Yet speculations abound. The person who posed as a model for Vermeer's two depictions of a scientist—*The Geographer* and *The Astronomer*—has a striking resemblance to Leeuwenhoek as depicted in the only existing portrait of him. Upon Vermeer's death, Leeuwenhoek acted as the executor of the artist's estate, which primarily involved parceling out Vermeer's paintings to settle his debts. Although this position may just have been a part of Leeuwenhoek's regular job as a city official, Snyder suggests in a somewhat convoluted argument that the executorship was based on Leeuwenhoek having known the Vermeer family.

Why would we be interested in a personal link between Vermeer and Leeuwenhoek? It has long been speculated that Vermeer used some kind of optical device in order to create his photographically precise depictions of rooms, objects, and lighting. Perhaps Leeuwenhoek himself was the one who taught Vermeer how to use optical devices to perfect his art. It is true that Vermeer's ability to portray nearly perfect spatial perspective and to render precise tonal qualities appear super human unless aided by optics. Steadman (2001) offered a demonstration of how the painter could have built a room-sized camera obscura—essentially a darkened closet at the rear of his studio with a lens placed at the front so that an image of his studio could be projected at the rear of this

closet exactly like being in a camera with the image displayed upside-down and mirror-reversed. Such a room-sized camera obscura as well as table versions were known and available at the time. In Steadman's demonstration, miniature 3-D models of scenes depicted in Vermeer's paintings were created with an actual camera placed where Vermeer presumably had placed a lens. The shot taken by the camera duplicated exactly the perspective used in Vermeer's painting. Moreover, given a room-sized camera obscura, the size of the image that would have been projected on the back wall matches the size of many of Vermeer's actual paintings.

There is, however, no evidence other than the painting themselves, that point to Vermeer having used optical devices. No such instruments were found among the painter's possessions upon his death and there is no documentation of witnesses describing how Vermeer actually painted. It has been suggested, most strongly by David Hockney, one of the most noted artists of our time, that many artists since the Renaissance secretly used optical devices (Hockney, 2001). Most art historians agree that Vermeer likely used an optical device to aid his work, though exactly how he used it is contentious. Snyder speculates that Vermeer used a table-sized camera obscura—essentially a box camera without a film cartridge—that the painter could peer into and observe an image projected onto a screen. This image would help him frame his paintings and note how objects and tonal qualities are exactly presented on a two-dimensional surface. She discounts Steadman and Hockney's conjecture that the painter actually traced or copied scenes with the aid of an optical device.

With respect to Vermeer's use of optics, it is surprising that Snyder does not mention Tim Jenison, whose five-year project to reproduce a Vermeer painting was

described in the 2013 documentary movie, *Tim's Vermeer* (Sony Pictures, see also Andersen, 2013). Jenison, a video tech inventor and entrepreneur, was fascinated by the photographic quality of Vermeer's paintings. With cash and time in hand, he set out to discover how an optical device could be used to create such paintings. He invented a lens and mirror setup that allowed him to see a scene in front of him reflected onto a sheet of paper placed on a table. By matching a dab of paint with the color that he saw projected through his device, he meticulously painted a scene depicted in one of Vermeer's painting, *The Music Lesson*, in a dot by dot fashion. To recreate the scene and its exact dimensions as accurately as possible, Jenison used vintage artifacts, exquisitely reproduced copies of furniture, and costumed models. After a year of painstaking labor, Jenison completed his painting, and the result is a rather stunning copy of a Vermeer. The demonstration is remarkable and takes away some of the criticisms Snyder and others have of Steadman's account, such as trying to paint in color in a darkened enclosure and transposing the orientation of objects, such as maps, projected in left-right mirror reversal.

Snyder's book is intended for a general audience and offers a worthy introduction to the accomplishments of Vermeer and Leeuwenhoek. It is well written and provides a window to the cultural and intellectual milieu in which these two men lived. She covers well the cultural riches of the Dutch Republic during the 17th century, a time in Dutch history which is referred to as *The Golden Age*, relates religious pressures between Protestants and the ostracized Catholics, and notes the various conflicts between the Dutch Republic and its neighbors Spain, England, and France. Snyder also characterizes in an interesting manner the proceedings—both formal and informal—of the Royal

Society and other scientific bodies of the time. As an introduction to the Dutch Golden Age and the application of science to art, Snyder's book offers a wonderful and interesting discourse of events and prominent figures. It provides a stepping stone to more detailed analyses on these topics, such as works by Alpers (1984) and Schama (1997) on 17th Century Dutch art and culture and Kemp's (1992) *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat*.

There are, however, some rough spots in the book that could have been improved by prudent editing. First, Snyder begins rather inauspiciously by falling prey to dramatic narration, similar to those staged reenactments often used in television history programs. She describes Vermeer hunched over, head covered by his robe so he can more clearly see the image projected on his table-sized camera obscura. As mentioned, there is no evidence that the painter used one or was even familiar with them. She could just as easily imagine Vermeer copying the scene in Tim Jenison fashion. Though well-written, there are passages in the book that could have been trimmed, such as the relentless attempts to connect Vermeer and Leeuwenhoek socially and detailed discussions of marginal players, such as Robert Hook, the British microbiologist, and Constantijn Huygens, the Dutch statesman. At times, the story of the two central characters becomes obscured by the peripheral information. It reminds me of the movie director who must decide to edit out his favorite shots for the purpose of driving the story in a purposeful manner. Snyder's story loses its punch on occasion as a result of including a few too many divergent offshoots of information.

The general theme of the book is *seeing*, which Snyder astutely suggests was reinvented by Vermeer and Leeuwenhoek. With the benefit of optical devices, these two

17th century luminaries saw beyond normal vision and demonstrated how one could use light in an entirely new way and present a previously unseen view of the world.

Leeuwenhoek was fortunate as he received recognition of his accomplishments during his lifetime. He was honored by induction into the Royal Society and many made a pilgrimage to Delft to meet the famous scientist. Vermeer, on the other hand, died with debts to be paid, ironically enough, executed by Leeuwenhoek. Vermeer's reputation as an artist for the ages was not fully recognized until the 19th century, some have argued as a result of his style being so close to what could be depicted through photography.

Vermeer and Leeuwenhoek represented advances in the way we see the world, though I would argue that their real contribution was developing new and remarkable ways of *understanding* the world. In my own analysis of the psychology of art (Shimamura, 2013), understanding plays a prominent role in our experience with a art. That is, when we behold an art work, our knowledge—including general facts about the world, cultural knowledge, and personal memories—drives our interest and appreciation of art as much as our sensations and emotions. Thus, Vermeer understood the optical effects of spatial perspective when a scene is viewed from a specific vantage point. He also understood the extremely subtle changes in colors and shadings created by reflected light, which is necessary to render on canvas a scene in a naturalistic manner. Dutch beholders did not understand what they were seeing and did not herald Vermeer as an artistic genius. They didn't appreciate how close Vermeer's paintings was to what a camera could capture, because they didn't have any photographs with which to compare!

Leeuwenhoek saw amazing things through his microscope, but more importantly he understood what he was seeing. He appreciated the odd movements seen through his

lens as microorganisms swimming about and understood he was looking at a new world in a drop of water, even though that world was invisible to the naked eye. The role of understanding in science is central to theory development as the collection of data is meaningless unless there is some overarching concept—a theoretical framework—that allows us to link and conceptualize empirical findings. As obvious as this notion sounds, it is still relevant today, as we often need reminding that it is not enough to simply make empirical statements, such as “brain area X lights up in my neuroimaging study when I present stimulus Y.” It is the psychological and biological mechanisms underlying such a finding that makes such statements meaningful (for further analysis of this issue, see Shimamura, 2010).

In both Vermeer and Leeuwenhoek’s work we see the ways in which genius is expressed with respect to seeing and understanding. Thus, it wasn’t just the eye of the beholder that needed to be reinvented, it was the brain of the beholder that required retuning. Seeing, knowing, and understanding are the mutual friends that allow us to link what some might view as two strangers—art and science.

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