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Cultural Connections: The Relationship Between Art and Science

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The history of science is by its very nature interdisciplinary. Most of us in the field have for the past quarter century emphasized the "external" approach. That is, we have investigated those events in society as a whole that influenced scientific and technological development as well as the effects of such development on society. Most of these studies have involved political, economic, religious, and social history.

One familiar example is the effect that the Newtonian concept of "natural laws" had on eighteenth century behavioralists. Do human beings follow natural laws? The search for the answer gave birth to the social sciences in the Age of Enlightenment. More recently a few hardy pioneers have attempted to study the relationship between art and science in terms of the direct or indirect impact of scientific knowledge upon a painter's choice of subject matter and style of presentation. I do not refer to the technical aspects of the painting (the use of oil-based paints or acrylics, for example as many researchers have done) but rather to its reflection of the artist's intellectual environment and the attitude he or she adopts toward science and technology.

This sort of approach leads to some fascinating areas in both teaching and scholarly research. In my general education classes I am able to connect the history of science with course material familiar to many students from Art 101, a general education course in a totally different category. They enjoy seeing how material presented to them in an art appreciation course can be utilized in a different but supportive way in a very different context. Students without an art history course in their curriculum still can appreciate seeing that both art and science contribute to human intellectual development. This brief essay will explore several examples of this connection.

Many well-known paintings can be used to illustrate significant points in the history of science. Masaccio's "Holy Trinity" (fig. 1) of about 1428 is an admirable example of mathematical perspective that appeared nearly a century before the more commonly used example of Leonardo's "Last Supper". In the "Trinity" we see an archaic Roman barrel arch with an elaborately columned post-and-lintel opening in the foreground. Because of the unusually low viewpoint—the observer must look upward toward the image—all of the perspective lines converge in a descending pyramid to a point

behind the dirt mound at the foot of the cross, exactly at eye-level. Ascending and descending pyramidal lines of composition intersect in Christ's body. This concern for geometric rigor later (around 1500) characterized the Italian high Renaissance style of Leonardo, Michelangelo, and Raphael. A high level of mathematical knowledge and sophistication is necessary for a successful masterpiece of this sort. Thus even before the scholarly architect Leonbattista Alberti published the first major western treatise on perspective in 1435, the new technique was being rigorously applied to a small number of paintings.

Virtually any work by the Delft painter Jan Vermeer illustrates the interest in optics held by seventeenth-century Dutch artists and scientists. His consistent use of a left-side window allowing natural light to enter his interior scenes and the way that light is reflected off surfaces as from the bread in "The Milkmaid" (fig. 2) of about 1658 led most scholars to conclude that he used a crude image-making instrument, the *camera obscura*, which was also utilized by the scientific community (Alpers, 26-33).

Rembrandt's "Anatomy Lesson of Dr. Tulp" and Hans Holbein's "The Ambassadors" provide obvious connections to discussions on the state of the medical and astronomical sciences, respectively. The former picture of 1632 (fig. 3) shocked and offended when it was publicly exhibited because it realistically portrayed a dissection of an

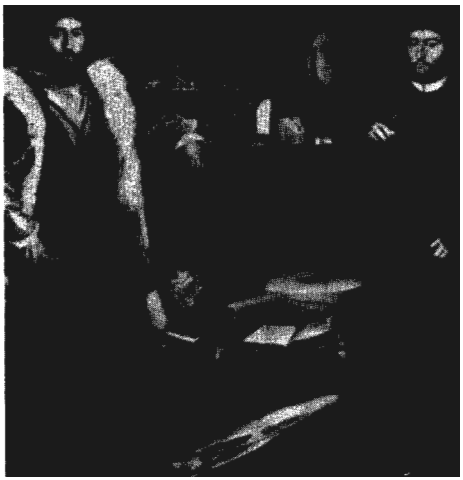
Masaccio, *Holy Trinity*,
Florence, Santa Maria Novella.

Vermeer, *The Milkmaid*,
Amsterdam, Rijksmuseum.

executed criminal by the head of Amsterdam's guild of surgeons in the presence of other guild members. The shedding of blood and the relatively accurate depiction of the anatomy of the arm resulted in the picture's being promptly placed in the guild hall—out of sight of the squeamish Dutch *burghers*. Holbein represents in 1533 a magnificent still-life of scientific instruments on a two-shelved cabinet, the upper shelf containing apparatus devoted to observation of the heavens and the lower shelf involving earthly interest (including music) (fig. 4). Even more intriguing is the unusual elliptical-shaped object in the center foreground. The painting was designed to be hung at the top of a steep staircase. From below at a certain oblique angle this "amorphous" object turns out to be a skull—the universally used symbol of human vanity and mortality.

Most challenging are those artworks that present the viewer with an ambiguity about the artist's attitude toward scientific "progress". A discussion of Albrecht Durer's famous

Rembrandt, *Anatomy Lesson of Dr. Tulp*, The Hague, Mauritshaus.



Holbein, *The Ambassadors*,
London, National Gallery.

Durer, *Melancholia I*,
Cambridge, Fogg Museum of Art.

print "Melancholia I" of 1514 (fig. 5) and J.M.W. Turner's oil painting "Rain, Steam, and Speed" of 1844 (fig. 6) can launch fascinating class discussions about the state of scientific knowledge of those periods, and more importantly, the public's perception or even awareness of that knowledge. Is Durer's main figure lamenting the over-dependence on secular knowledge of the High-Renaissance world or conversely depressed that even scientific knowledge cannot save the unity of Christianity on the eve of the Reformation? Does Turner support Britain's "railroad mania" of the 1840's or does he regret the passing of a time when a swift rabbit represented the notion of speed to a plowman or leisurely boaters?

The recent publication of the second edition of the complete catalogue of Turner's oil paintings as well as two major monographs dealing with his life and times provides the researcher as well as the teacher with an enormous amount of interesting material (Butlin and Joll; Gage; Wilton). The artist, while not himself a member of the Royal Society (Britain's major scientific "think tank") was on familiar terms with several of its most prominent fellows including Humphry Davy and Michael Faraday, scientists of international fame and major significance. He was also acquainted with a number of industrialists whose fortunes were being made in those years (the 1830's and 1840's) when the Industrial Revolution was at its height in Britain and when Turner was painting some extremely interesting works illustrating technological themes.

Turner, *Rain, Steam and Speed*, London, National Gallery.

Turner, *The Fighting Temeraire*, London, Tate Gallery.

Despite a short monograph investigating the question, John Gage—a major Turner scholar—is unable to tell us whether the artist is pro- or antirailroad, or if he is ambivalent (Gage, "Rain"). Less discussed, but not lacking a similar ambiguity, is Turner's earlier (1838) oil painting "The Fighting Temeraire Tugged to Her Last Berth to Be Broken Up" (fig. 7), picturing a magnificent British warship from the Battle of Trafalgar being hauled by a smoke-belching steel tugboat to the ship-breaking yard to be reduced to a pile of firewood.

Characterizing Turner's mature work, atmospheric effects play a major role in his style, and consequently, in the way one interprets the picture. The sky around the setting sun is bright crimson, "typifying," as a contemporary critic noted, "the departing glories of the old Temeraire." In addition a rising crescent moon provides symbolism of the new era of steamships overtaking the past. As another critic stated, "There is something in the contemplation of such a scene which affects us almost as deeply as the decay of a noble human being" (Butlin and Joll, I, 229-231).

Yet Turner was by no means akin to William Blake in opposition to technology. This painting could equally well be explained as a "portrayal of the more general theme of the decline of Britain's mercantile power," as Turner illustrated symbolically in other contemporary paintings (Butlin and Joll, I, 229-31). His interest and support of technology were so well known that in 1836 he was asked to review ideas for improving London's water supply. Perhaps Turner wished to keep his true feelings hidden, and art historians will never know how to interpret his pictures "correctly". They do, however, enliven a discussion in class of the introduction of railroads and steamships in industrializing Britain.

One of the most fascinating artists whose work shows an awareness of the Renaissance interest in science and learning is the Fleming Pieter Bruegel the Elder. Both in his oil paintings and his more numerous drawings and prints he used scientific symbols to illustrate moral principles. Consider his etching of "Temperance" in a series illustrating the vices and virtues created around 1560 (Klein, 245). Temperance is portrayed as a woman surrounded by a symbolic representation of the seven liberal arts. Among these, astronomy is shown by figures making measurements of the earth and between the earth and the moon.

Significantly, the globe of the earth appears to spin. Only seventeen years previously the great Polish astronomer Nicholas Copernicus published his heliocentric (sun-centered) model of the universe, that included an earth that not only revolved around the sun but also spun daily around its own axis. Was Bruegel aware of this development? At this stage we are uncertain; however, these sorts of questions provide fertile ground for further study.

This same print has other scientific symbolism. For example, the liberal art of geometry is shown by architects making measurements on a column. They appear to be determining that the column stands perfectly vertically—not like the famous bell tower of the cathedral at Pisa. Other practitioners are investigating cannon and cannonballs. The motion of projectiles was an area of great practical concern at this time and would only receive its definitive geometric solution in the work of Galileo Galilei (who was born four years after Bruegel's print was produced).

The paintings reveal a keen interest in subjects and themes that we can relate to science. Near the end of his life he was commissioned to paint a series representing the seasons (or perhaps the months since we do not know how many were completed) including for winter the well-known "Hunters in the Snow" (fig. 8). The accuracy of the lighting and the concern for tiny details in the peasants' activities and the landscape reveal Bruegel's interest and knowledge of the cycle of time and life in sixteenth century Flanders. His paintings follow a well-established tradition found in medieval illuminated manuscripts where prayer books often contained richly decorated calendars showing seasonal activities for each month. During the seventeenth century other artists, notably Nicholas Poussin, painted cycles of the seasons often including allegorical representations of time, dawn, dusk, and mortality.

Bruegel, *Hunters in the Snow*, Vienna, Kunsthistorisches Museum.

Finally, Bruegel's large landscape paintings are fascinating for their illustration of the rugged countryside not of his native Belgium, but rather the Alps, through which he traveled on a visit to Rome. An early biographer described Bruegel as having "swallowed all the mountains and rocks and spat them out again, after his return, on to his canvases and panels" (Gibson, 36). Numerous sketches were used as models for these larger oil paintings.

One particularly fascinating example, "The Suicide of Saul" (fig. 9), caught the eye of a seminar student, David Speas, who noticed how Bruegel carefully indicated the strata of the mountainous formations throughout the picture. The geographer Nicholas Steno, credited with the introduction of the principles of stratigraphy, did not publish his thoughts until a century after Bruegel's painting appeared. We plan to investigate the use of strata in Bruegel's work from two directions: the status of geologic thought in the early sixteenth century and Bruegel's scientific sources (often the patrons or their circle who commissioned the work). We hope to find that his painstaking detail as shown in the "Saul" and related paintings is more than coincidental with the newly awakening interest in scientific detail that accompanied the widespread popularity of printing.

Bruegel, *The Suicide of Saul*, Vienna, Kunsthistorisches Museum.

These necessarily few and brief examples should indicate the scope of the possibilities available for further detailed interdisciplinary study. One of my paper assignments in the history of science classes asks students to select a painting from the relevant time period and discuss what they see in it that relates to science and technology. Not only does this give me a selection of very interesting essays that I enjoy (well, almost!) reading, but it uncovers more "connections" that merit further research. As a university our mission should include the encouragement of interdisciplinary interactions among faculty and students. In practice our divisional model has made it difficult for me (as a "science person") to become involved with the teaching of art history or even communicating with colleagues in related areas. Perhaps this sort of study can begin to bridge the gap between these areas at Grand Valley State.

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