

The climate in painting and science as "useful arts"

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Today, art and science lead strictly separate lives. However, the strict division between science and art is historically not very old; they actually represent two spheres that belong together.

The aim of this article is to demonstrate the relationships between the natural sciences and art using the examples of climate, geology, meteorology, and atmospheric optics. The overarching motto of the article is: "The current sharp distinction between the arts and sciences is a historical anomaly." (Stanley D. Gedzelman, 1991)

Climate in der Dutch Painting

It has become warmer on our planet: an increase in the average temperature of ~1.2 °C since around 130 years is now considered proven – reason enough for scientists at the GFZ German Research Centre for Geosciences to research the climate of the past hundred thousand years. Research into climate history at the GFZ is primarily based on studies of sediments in inland lakes, which are formed by algae blooms and other deposits.

During their investigations, the geoscientists also discovered traces of a cooling phase from the middle of the 16th century, which lasted until the second third of the 19th century. This phenomenon is known in climate research as the "Little Ice Age".

The Dutch society in the 17th century, which was characterized by seafaring and agriculture, adopted this climate change as a theme of its culture. The beginning of the Little Ice Age marked the start of Dutch landscape painting, which from the very beginning focused on weather and climate in the landscape, for example in the frequent depiction of ice sheets during this period.

Research into the climate in historical times had already made reference to the paintings of the Dutch "Golden Age" at an early stage and attempted to classify them in terms of natural scientific proxy data. However, it turned out that the depictions of the sky do not allow any direct conclusions to be drawn about the weather and climate. Conversely, however, the natural sciences can provide arguments for the art-historical debate.

Science as an Aid to Interpretation

The debate about the realism of 17th century Dutch painting, which has been going on for over a century, was sparked by still lifes, portraits and seascapes, but especially by the depiction of landscape. Around 1650, more than half of the pictures painted in Holland were landscapes. Geoscientists and meteorologists, who were involved in the analysis of the paintings, were able to contribute to the realism of the paintings. The current state of knowledge on the debate about the realism of these paintings can be summarized as follows: the depiction of clouds, climatic elements and geology in the paintings is generally consistent.



However, the paintings of the masters of 17th century are not linear depictions of real landscapes. Rather, they are compositions made up of individual, close-to-nature components, they are "invented realities". It is therefore not possible for climate research to draw direct conclusions from weather and climate representations. Conversely, the information content of the paintings only becomes apparent when natural science and art history are viewed together.



Today's strict separation of science and art often overlooks the affinity between these two spheres of human creativity. Both see the same world, only their way of describing it is different.

Science as "Useful Arts"

Art historical research uses scientific methods as a matter of course. Isotope geochemical investigations allow the precise determination of the origin of rocks that were processed into sculptures, dendrochronological methods allow the age of wooden frames and wooden panels of paintings to be determined. Neutron activation analyses under the radiation source of the Helmholtz-Zentrum Berlin confirmed the suspicion already expressed by art historians that the famous "Man with the Golden Helmet" is not by Rembrandt himself. The examination of a van Gogh painting ("Grasgrond") using X-ray fluorescence analysis at the DESY research center revealed a female portrait that Vincent painted over with the depiction of a piece of grass strewn with flowers. The theoretical considerations of music were part of mathematics from Pythagoras to the end of the Middle Ages, while the methods of sound analysis used today employ approaches from scientific seismology, blended with AI methods. These are modern manifestations of what has long been referred to as "science as a useful art", and the list could go on and on.

The (natural) sciences can serve art and painting as an aid to interpretation and translation when classifying the content depicted. But can this perspective also be reversed?

The Arts as "Useful Sciences"?

Art and science are equally creative, and their current separation is very recent in terms of human history. The German word "Kunsthandwerk" (art handycraft) still expresses this fact today. Iconic for this connection is Leonardo, who united all this in himself: artist, scientist, engineer, craftsman – genius and citizen in one person.

Even today, there are close links between art and technology. Chip manufacturers use the etching technique known from etchings – with appropriate adaptations, of course – for the production of their electronic components. Pointillism uses the knowledge formulated by Helmholtz as early as the 19th century in his research into the physiology of perception that the human brain assembles the "pixels" supplied by the cones and rods in the eye into an image. Every digital camera does this today. Helmholtz also discovered that the photoreceptors in our eyes see colors in the red-green-blue color space, in today's digital terms: RGB. Artistic aesthetics and technical-scientific application are often closer together than we realize.

How can art in the material sense help us to better understand our world? We need a new aesthetic, the beginnings of which can already be seen: The 2004 Nobel Prize in Physics was awarded to two scientists who researched the "colors" of the glue of quarks, the gluons.

The popular abbreviation "search for the world formula" describes the currently most important task of physics: the unification of the theory of the macrocosm (theory of relativity) with that of the microcosm (quantum theory) to form the theory of quantum gravity, which will probably also provide us with new insights into the origin of the universe.

Considerable progress has been made here in recent years, but at the cost of very abstract mathematical-physical constructs. The best-known approach is string theory, which comes with eleven dimensions, some of which have more weight than others. Although this can be formulated mathematically, thinking of such a world as an image is very difficult for the human imagination with our brain, which evolutionarily is accustomed used to three spatial dimensions and one time dimension. However, it is more than conceivable that art could develop an aesthetic here that creates an image of the world as it actually "is". The signet of the 2012 international "String Conference" in Munich shows that this is no mere fantasy, with Franz Marc's "Fighting Forms" indicating that the world of strings is just as little non-figurative as are the forms in Franz Marc's work..



Signet of the [String Conference 2012](#), using Franz Marc: *Fighting Forms*, 1914, Bayerische Staats-Gemäldesammlungen

(Fig.: Max Planck Institute for Physics MPP;click to enlarge)

It will still take a while until then. In the meantime, we recommend taking an analogous look at the Dutch masterpieces of the 17th century, as they were created in the "Gouden Eeuw" of the most modern nation in the world at that time. Berlin has an excellent collection in this regard.

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Franz Ossing, website:

http://bib.gfz-potsdam.de/pub/wegezurkunst/start_en.html

SMB, Painting Gallery:

<https://www.smb.museum/museen-einrichtungen/gemaeldegalerie/home/>