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The Uncomplete Sky

The Clouds of the Dutch Masters of the 17th Century

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[\(For figures and references see the German text\)](#)

To Stanley D. Gedzelman who taught us to see the clouds.

Jacob van Ruisdael's view of his hometown Haarlem, as seen from the dunes of the village of Overveen, situated northwest of the city, looks to the southeast with the big church of St. Bavo in the centre. The red roofs of the town shimmer in the light of the sun, cumulus clouds tower to the sky. Some thin feather clouds can be seen near the southeastern horizon and a few flat midlevel clouds drift in the sky. The sun stands almost exactly in the west, while the sails of the windmills are set into the northwestern wind.

Seen meteorologically, the weather situation can be explained in that during the course of the night a cold front with thunderstorms and showers has passed over Holland from the northwest, pushing away the warmer air mass advancing it. Near the rear of the front some cirrus clouds as well as a few midlevel altocumuli can be observed. The fresh maritime polar air mass will soon come under further high pressure, but here, close to the cold front, the air is still unstable enough to create medium and tall cumulus clouds. Now, in the late afternoon, some of these clouds have already decayed and their remnants can be seen at the upper rim of the painting. The wind direction has changed from southwest to northwest as two of the seven windmills have their sails still facing to southwest while the other, active mills have turned their sails into the wind direction now prevailing (Fig. 8).

This painting's sky that, meteorologically correct, reflects a weather situation which is typical for Europe, is good evidence of an exact and detailed reproduction of nature. In fact, there was no such realistic depiction of landscapes and skies in art before the Dutch masters of the 17th century and as a consequence, literature on the realism of Dutch landscape paintings today fills the scientific libraries. In his lectures on landscape painting, John Constable, already in 1836, remarked on the meteorological coherence of Ruisdael's "Winter Landscape" (c. 1670, Philadelphia Museum of Arts, cf. Badt 1960, Gedzelman 1991). More recently, in the course of climate change, climatologists have become interested in the paintings of the masters of the Golden Age. In 1982, Lamb pointed to the influence of the Little Ice Age on the socio-economic development of Holland and the paintings relating very closely to it (Lamb 1987, p. 250-257).

At the same time, a further discussion in art history began again on realism of Dutch landscape painting of the 17th century. It was quickly shown that "realism" may not be understood in a way that the paintings of the "Gouden Eeuw" (Golden Age) reflect a linear reproduction of nature (Freedberg/de Vries 1991). Still Life paintings often show flowers that flourish in different seasons, together in a vase, depictions of architecture shift optical lines in favour of a comprehensive picture, and landscapes turn out to be pieces of topographic phantasy. The paintings have to be considered as compositions put together from pieces of realistic depictions where the whole, however, is more than a summarizing completion of single components.

Weather - now and then

With respect to the Dutch masters' reproduction of clouds the question is, therefore, if they represent meteorological reality. Climatologically, the linked question is if "the weather" of Holland in the 17th century is comparable to our weather of today. The Little Ice Age is commonly assumed to have started during the mid-Sixteenth Century, ending about 1850 (Flohn 1993, Glaser 2001). Compared to the higher temperatures of the preceding medieval climate optimum temperatures decreased considerably in several phases since the 16th century, still the "Little Ice Age" may not be misunderstood as a period of consistently bad weather. The mean temperature was significantly lower, winters were very much colder and expanses of water remained frozen over longer times.

Extreme minima of temperature were registered between 1693 and 1699. This cooler climate, however, did not lead to a generally different manifestation of clouds. As today, we find the same clouds in all the different climate regimes of the world although appearing in different frequencies. Thus, we can conclude that the painters of the Golden Age had the same clouds before their eyes as we see them today (Fig. 31).

Clouds in painting and clouds in nature

There is hardly another natural phenomenon that still today affects man as directly as the weather. Thus, the change in climate towards longer and colder winters obviously greatly influenced mankind and consequently the Dutch society of the 17th century, which was marked by seafaring and agriculture, looked upon the weather as a main cultural theme. Of course, the phenomenon of Dutch landscape painting is not explained completely with this, but without acknowledging climate worsening, the Dutch paintings of the sky cannot be understood (Fig. 74).

In spite of the broad discussion on realism of Dutch landscape painting there is only little material of meteorological validity in the literature of art history. This is surprising if one considers that the sky covers up to three quarters and more of the paintings. Mainly from the theoretical argument of painting, the debate amounts to little more than a hint on the "illuminating books" and "schilderboeken" e.g. of Karel van Mander, Samuel van Hoogstraaten, Gerard ter Bruggen and finally Gerard de Lairese who pointed out the importance of a well painted sky, as offered in nature, to the painters. (see summarizing Esmeijer 1977). The examination of the meteorological precision, however, is another item.

Analysis of the meteorological elements in the painting faces the problem of interpreting Dutch skies in a double sense: if the paintings are compositions, it has to be validated if the depicted weather fits into the painting. The example of the Haarlem bleaching grounds at the beginning of this chapter is meteorologically consistent since the depicted weather situation is adapted to bleach the linen. However, an interpretation of this painting as being a meteorological still life (Fig. 32, 33) would fall short as it would e.g. leave out the iconographic meaning of linen bleaching (Michalski 1992).

Secondly, weather consists of a variety of different situations which - especially in our latitudes - express themselves in a broad diversity of clouds. The World Meteorological Organization (WMO) by developing a cloud catalogue has tried to take this into account (WMO 1987). The painted clouds can be defined in most cases by comparing them with the catalogue following the rules of the WMO which in turn can be taken as evidence for a realistic reproduction.

The realism of artistic depiction

L. de Vries (1991) emphasized that "realism" in Dutch landscape paintings cannot be understood in the way that it deals with a nature-identical reproduction of the painted items. Paintings are pieces of art that carry the personal handwriting of the artist. Furthermore, in 17th century Holland, several schools of painting formed which coined additional characteristics on the individual signatures of the painters. Esaias van der Velde (1590/91 - 1630) gives a good example for this. It is well known that E. van der Velde liked to incorporate mid-level altocumuli and high cirrus clouds in his paintings. In his "View of Zierikzee" (Fig. 3) a long streak of cirrus stretches diagonally over the sky.

The American meteorologist Stanley Gedzelman has compared weather situations typical for Europe with Dutch paintings in different studies (Gedzelman o.J. 1989, 1991), and explains this special depiction of the sky with a low-pressure system that passes north of Holland (Gedzelman, o.J. p. 7.5). As a matter of fact, long cirrus streaks are found frequently in the vicinity of fronts (Fig. 34).

However, this work of E. van de Velde remains an exception in the paintings of the 17th century because such a sky with cirrus banners as the only and determining element is unique (Gedzelman, o.J., see also Neumann/Ossing 1997). In later works of van de Velde, cirrus and veils of cirrostratus are often found but for the most part in combination with other clouds.

Another rarely painted cloud is a deck of altostratus (the mid-level cloud veil) which due to its homogeneous grey-blue colour causes a uniformly tinted sky. Pieter de Molijn's "Dune Landscape with a farmstead" (also called "The Evening", Fig. 36) depicts such a sky. The dense altocumulus tears open at the upper left corner of the picture and lets the evening sun illuminate the scenery. A high cloud veil can be seen through the cloud gaps.

Compact altostratus in Europe can form in subtropical maritime air masses; the distinguished edge - usually not a characteristic of altostratus - can appear during the appearance of a cold front which shifts away the warmer maritime subtropical air. Such a meteorological situation is presented in Fig. 35.

This very realistic reproduction of a sky with dense layer clouds is not typical for the Dutch landscape painting of the 17th century. A homogeneous sky is rather the exception, and this does not refer only to the cloud type represented here.

Cumulus: the ubiquitous cloud

The clouds depicted mainly by the Dutch masters are cumulus clouds. Cumuli are typically formed in unstable air when heating of the ground is sufficient to warm an air parcel so that lifting takes place. Jacob van Ruisdael's "Haarlemmpjes" (Fig. 8, 33) show such clouds in a masterly execution over a summer landscape. Almost all of the Dutch landscape artists have painted cumuli, be it as the only cloud type at the sky or together with other clouds.

In particular the painting of these cumulus clouds has attracted criticisms (Walsh 1991, Gedzelman 1989). Cumuli frequently have a sharply defined cloud base; in most paintings, however, this is not found. Furthermore, the cumulus clouds in the pictures of the Dutch masters are bent unrealistically due to reasons of the dynamics of the painting. In Salomon van Ruysdael's "Landscape with a farmstead" (Fig. 40) traces of this compositional treatment of painting can be found.

The lower edge of a cumulus marks the condensation level in the atmosphere, i.e. the temperature level at which the water vapour of the atmosphere condenses. In fact it can be stated that these sharply defined cloud bases are often missing. However, this is not always the case; in Koninck's "Extensive Dutch Landscape" (Fig. 22) they set up the counterpart of the horizontally striped landscape in the picture's composition. And furthermore, not every cumulus has such a horizontal base (Figs. 37, 38)

Nevertheless it has to be stated that these bent cumuli exist in various painted Dutch masterpieces, also the cumulus specialist, Jacob van Ruisdael, used this pattern in his early works. This phenomenon could even be found in other styles of painting outside Holland; e.g. N. Poussin in his "St. Matthew and the Angel in a Roman Landscape" (1639/40, Painting Gallery Berlin, Cat.Nr. 478A) painted such a cloud with a curved tail.

But Dutch landscape painting of the 17th century is characterized by a strong dynamic. After 1650 such bent clouds hardly appear any more, and the theoretical problem in painting of straight horizontal bases is brought to a solution. In many cases it is resolved by hiding the cloud base behind trees or a similar feature in the painting or just by giving a hidden hint of its existence (Abb. 41, 82).

The cumulus cloud bases thus have disappeared more or less completely, what remains is a diffuse lower edge. A painting from the school of Jan van Goyen (Fig. 42) shows this treatment clearly: cumuli in warm and wet air hang over a landscape, virga of rain out of a cloud indicate the onset of showery precipitation (see also Fig. 39).

Aert van der Neer's depiction of a scene on ice (Fig. 77) shows flat cumuli to the left and towering cumulus clouds to the right. For a late winter afternoon, this is quite exceptional though not impossible: cumuli form due to labilisation of the atmosphere as it takes place with warming of the ground. For the depicted scene this seems improbable. With decreasing power of radiation in late winter afternoons the sun can hardly warm the soil to an extent that towering cumuli develop. Rather, cooling could be expected which would lead to the forming of fog over the surfaces of ice.

On the other hand, in summer such a cloud type can develop (Fig. 43) at night. Due to its heat capacity the soil can cause cumulus development also after sunset.

What is missing in the skies?

A statement that the sky in Dutch landscape painting does not represent all states of weather needs a closer differencing. At first, one can agree with Rostworowski (1981): the skies over the Dutch landscape paintings represent all the main genera of clouds (the WMO counts ten of these) though with differing weighting. On the other hand it has to be stated that the picture of the sky element "cloud" is not complete.

Walsh (1991) stated that the typical Dutch sky would consist of drizzle, showers, heavy clouds and fog and that this does not appear in the pictures. Though this point of view may be influenced by sunny California it bears the true observation that mostly fine weather and rarely bad weather is depicted. And, if bad weather is painted then it is weather clearing up. Jan Asselijn's "Collapse of the Muider dike" (Fig. 26) gives a good example for this as in this picture the sky clears up after a flood storm during the preceding night. The weather corresponds to the passage of frontal systems of a stormy depression. Thick and dark shower clouds (huge cumulus or cumulonimbus) can be noticed to the right. Ragged stratus and torn stratocumulus clouds as well as the two men on the dike leaning against the wind indicate stormy and turbulent wind.

Another sky with showers is offered by Wouwerman's "Pathway through the dunes" (Fig. 30). A strong rain shower falls from a big cumulus, an arc cloud is indicated vaguely and stretches to the right. Some ragged cumuli are seen and hint to strong wind.

On the other hand, the annoying view of a winter stratus deck which would offer a uniformly grey can be transformed into a dramatic scene when this cloud clears open (Fig. 2). Wind starts to blow and tears open the grey sky, above the grey deck the sun shines brightly on higher stratocumulus.

The sky, thus, is used consciously by the painters to create a certain mood in the pictures as is demanded by the "schilderboeken". Without a sky, landscape paintings would lack in expression, the sky is the "soul of all scenery" (Gedzelman, o.J.)

Nevertheless, in spite of all the variety of the skies in Dutch landscape painting of the 17th century it remains to state that certain skies do appear only rarely or even not at all, e.g. long cirrus streaks, sharply defined cloud bases, but also homogeneous layer clouds, as already mentioned.

Why are such clouds missing? The "Gouden Eeuw" painters had the same clouds before their eyes as we have today, the "Little Ice Age" did not lead to a completely different appearance of the sky. This suggests that there could be other than meteorological reasons for this selective cloud painting.

It is agreed on that the masters of the 17th century were very sharp-eyed observers of nature. Of course they will therefore have perceived those clouds in real nature, in the visible world, that they painted rarely or not at all. It can thus be assumed that the explanation is found in the composition of the pictures: the sky is always dominated by clouds, not cloud *structures*.

Apart from crystalline structures, a straight line is an exception in nature. Therefore, it is an eye-catcher. The same is valid for repeating patterns on surfaces. The hardly painted, sharply defined and almost straight-lined base of cumulus clouds is such an element in the sky which attracts the eye (Fig. 37). A long banner of cirrus cloud in a cloudless and blue sky coins a structure on the sky (Fig. 44). This is also true for wave structures that can be observed frequently in the sky of an always-restless atmosphere (Fig. 45). Furthermore, repetitive patterns attract the eye (Fig. 46). Undulating currents in the atmosphere frequently create lenticular clouds (Fig. 47). And, finally, there is no other cloud that dominates the sky such as a thunderstorm with its optically striking accessory clouds (Fig. 48, 49)

It is, therefore, a straightforward idea to exclude these structures that hit the eye because they would distract attention from the setting of the picture or would mark their own dominant structure on the picture's composition.

This is also the case with the contrary. Nimbostratus, the cloud of steady rain, or a thick deck stratocumulus (the most frequent cloud of our latitudes) does not appear. The argument above is valid here inversely: the sky is a measure for the creation of dramatics in the paintings. Very frequently the clearing-up of the sky after a shower, the passage of a front etc. is shown. A uniform stratus or nimbostratus sky with steady drizzling rain cannot contribute very much to the development of the picture scene.

Painting composition and mass aesthetics

It can be assumed that another factor has influenced the selection of the painted clouds. With Dutch painting of the 17th century, art, for the first time in history, has stepped into a relation between customer and producer that is dominated only by the market. The socio-cultural background can be sketched roughly like this: around 1640 the Dutch navy consisted of about 35.000 vessels, in 1650 Holland had the biggest merchant fleet of the world, the armed navy was twice as strong as the English and French together. 17th century Holland was particular in that, in contrary to its main feudal concurrents, there was no Emperor who united all the political powers in his hands.

Here, parties and a parliament of estate who enhanced the autonomy of the provinces and the Court of Orange, who tried to fortify absolutism stood against each other without a defined centre of power. In such a constellation an oligarchy of rich citizens, nobles, merchants and wealthy peasants could develop (Schulze 1994, p. 82ff). In order to represent their wealth, these surrounded themselves quite self-understood with objects of art, and their attitude reached out far into the poorer social layers. For Dutch citizens, the possession of paintings was as self-understood as the possession of furniture (Zumthor 1992, p. 218-223). In short: in almost every Dutch household pictures hung at the walls.

Mass culture creates a taste of the masses. North (1992) could show that beginning from the mid 17th century, landscape paintings determined the larger part of the requested production of paintings. Thus, the reproduction of the sky in the paintings is determined by the market, in

addition to the reasons for the picture's composition. Experiments are possible only in a limited frame, if the purchaser's request pre-determines the merchandise. This, also, is a reason for the prevalence of certain and the non-prevalence of other types of clouds in the paintings.

Turning to pure numbers: following van der Woude (1991), between 1580 and 1800 a total of eight to ten million of pictures were painted. A research project at the University of Amsterdam comes to the conclusion that around 1650 alone the guild painters threw a production of roughly 70,000 paintings on the market (Frijhoff/Spies 1999). Of this gigantic amount of paintings, less than 1% has survived and can be found today in museums and collections (van der Woude 1991, North 1992). Given this huge number of paintings it would not be any surprise if the depictions of the sky would have also incorporated the phenomena we have summed up here as hardly or non-existent. The question to be resolved therefore is if such sky paintings have not vanished together with the big amount of paintings that do not exist anymore, or if also the pictures in the galleries and collections of today reflect this meteorological variety. Such an inventory, however, should take place in front of the background of a meteorologically sound interpretation of European weather in the mid-latitudes.

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When in Berlin, please visit the original paintings in the [Painting Gallery](#).