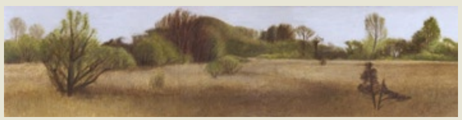
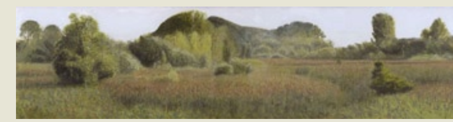
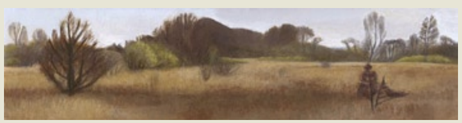
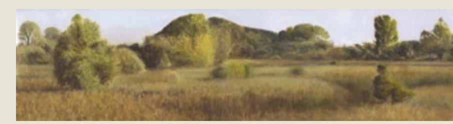


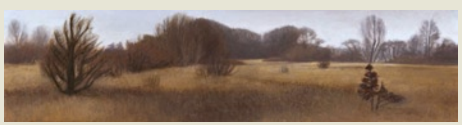
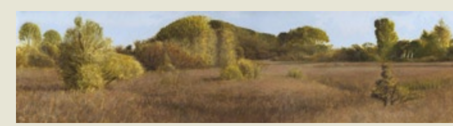
Bertolt Hering

Colours of the Seasons

Draft
for a Colour Phenology
of Central Europe
Based on two Locations
in the
Heuckenlock Nature Reserve
at the River Süderelbe
near Hamburg

with an Introduction
by
Veronika Schöne

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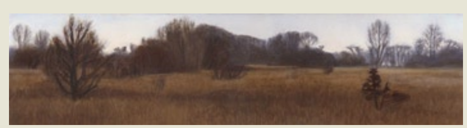
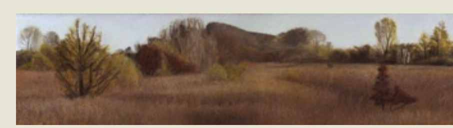



Contents

0	Acknowledgement	3
1.	The Truth of Reality by Veronika Schöne	4
2.	Basic Principles	
2.01	Colour Measurement	6
2.02	Colour Constancy	6
2.03	Comparisons with Colour Samples (coloroscopy)	6
2.04	The NCS System – the Colour Notation Employed	6
2.05	Inherent Colours	8
2.06	Nature is Yellow	8
2.07	Purely Conceptual Colour Descriptions	8
2.08	The Phenomena of Perceived Colour	9
2.09	The Depiction of Perceived Colour	9
2.10	A Visit to the Art Gallery	10
2.11	Patches	10
2.12	The Overall Colour Value	11
2.13	Nature is Fine Grained	12
2.14	“Screwing up the Eyes” (partitive light mixing)	12
2.15	Phenology – the Study of Appearances during the Seasons	13
2.16	Aspect and Singular Aspect	13
2.17	Draft for a Colour Phenology of Central Europe	13
3.	The Observation Area	
3.1	Close to Nature	14
3.2	Location 1 “Heuckenlock Panorama”	14
3.3	Location 2 “Heuckenlock Riverbank Vegetation”	15
4.	Colour Observation in Heuckenlock Nature Reserve	16
4.01	Winter (brown)	17
4.02	Winter with Snow and Ice	18
4.03	Pre-Spring	19
4.04	Beginning of Early Spring	20
4.05	End of Early Spring	21
4.06	High Spring	22
4.07	Early Summer	23
4.08	High Summer	24
4.09	Late Summer	25
4.10	Early Autumn	26
4.11	Beginning of High Autumn	27
4.12	End of High Autumn	28
4.13	Late Autumn	29
5.	Summary and Outlook	
5.1	Summary of Colour Observations in Heuckenlock Nature Reserve	30
5.2	Outlook	31
6.	Bibliography	32
7.	Film in pdf	37
8.	Imprint	38

Acknowledgement

I should like to express my gratitude to the mother of the seasons herself, resplendent with fruit – my own mother, who would take me out each day as a child, to the Woog or the Oberfeld, so that I became familiar with the changing face of nature – and to Burkhard Hilgenstock, who not only took charge of this pdf-booklet's design; he also gave me cause to hope, when I returned home confused by the phenomena of the perceived colours, that there might also be some interest among the rest of mankind in the transformations of nature's colours during the seasons of the year.

The Truth of Reality

For about two years Bertolt Hering would return again and again to the same place at the same time, in a nature reserve close to Hamburg. He was observing nature in search of its "true" colours. First he would photograph the scene – but then, on examining the images more closely, he realised that the many hues of green and yellow had become oversimplified. By means of his observation Hering discovered that perceived colours differ from the actual colours. If the perceived colours are painted, too great a degree of saturation is achieved; the colours become too blue.

During his research he established that there is no systematic description of the "objective, inherent colourfulness" of nature and the colour changes over the passing seasons. Descriptions as noted by phenologists, who achieve their conclusions purely by means of observation, are as far from the truth as other accounts. So Hering resolved to use colour samples, which categorise the "inherent colour" of objects according to extremely detailed patterns.

By cutting small holes in the colour notation samples he was able to compare the colours of small parts and segments of the landscapes with these samples. By comparing them directly and immediately he was able to avoid distortion almost entirely, and at the same time he employed a notational system to compensate for any tendency for colours to be falsified by the effect of memory.

The results of his long-term study are astounding. Particularly in his twelve-part cycle "Panorama Heuckenlock" (2004), Hering renders visible something which is extremely elusive in terms of immediate perception: the fact that nature is far more yellow than it appears, and not only during the "golden" season of autumn. Even in spring nature tends to the yellow. By engaging in long-term observation and employing the results in the artistic creation of twelve pictures corresponding to the sub-seasons of the year, he even demonstrates a "passage" – as Hering puts it – through the yellow axis, which follows the equinoxes of the year with a delay of approximately three weeks. Thus Hering develops an annual cycle, corresponding to existing cycles, which has a significantly greater range in the colour circle from green to yellow than other colour circles display. They imbue the colour sector from green to blue a far greater range, with numerous hues of turquoise. For – and this is the other surprising result of Hering's study – in "green" nature there is no blue except in plants that blossom with blue colours themselves.

The way Hering approaches this task is in some respects almost paradoxical. He attempts to capture the perceptions of nature and to reproduce them in their absolute essence by treating them as entire objects. For the term "inherent colour" can actually only be employed at zero distance, when the colour sample is placed directly on top of leaves and bark, branches and twigs. Therefore, to capture the inherent colours of nature "in themselves", it must to some extent be treated as an object. This "objectification" incorporates all those elements that give rise to errors in the discrepancy between subjective perception and objective analysis: "atmospheric" features, movement of air and light between the observer and the perceived entity. In fact, to paraphrase a further astonishing result of Hering's study, it is not at all such "atmospheric disturbances" that are to blame for the discrepancy between reproductions of perceived colours in nature and the colours themselves. Evidently the perception itself is not false. But, as Hering once put it, this perception has no reference: "Its only point of reference is a relationship to the purely conceptual, and this has no equivalent in objectivity. If I paint perceived colours as I think they are, when these colours appear in a painting they are more saturated and lighter than the colours of the reality in question. *The idea of perceived colour sounds right – but looks wrong*." In his observations Hering established the sort of reference he is talking about here by means of colour samples with viewing holes, facilitating a "colour reproduction of the original".

An examination of landscape painting in the history of art reveals a development that reflects precisely this discrepancy between objective fact and subjective perception: the development from Realism to Impressionism. While landscape painting up until the middle of the 19th century is intent on producing as "true to life" a depiction of the landscape as possible, in the second half of the 19th century the emphasis shifts to the subject: now the focus of interest is not nature itself but the perception of that nature: what happens in the eye of the beholder when confronted with that sensual data. The *how* of perception is now regarded as superior to the *what*. This development culminated in Impressionism, the name of the artistic movement indicating the new emphasis on impressions: the belief that impressions, though subjective, are no less true as a result. After all, impressions convey a context – that of subjective perception – which is just as much a reality as objective nature. In addition, however, impressions also establish a connection; they are expressions of a dialogue, a relationship that helps close the unbridgeable chasm between the individual and the world.

Changes in the way truth is conceived lead eventually to Fauvism, an artistic style that depicts nature in outlandish, challenging colours. For Gauguin the beach may be red, the trees blue. One thought underpinning this movement is that employing a new range of colours may permit the expression of different, deeper truths - which actually come closer to

the “essence” of the natural element in question than the “objective”, “real” colours ever can.
In a sense, then, the truth which is allied to subjective impressions is transferred back to the objective world.
Hering approaches this problem from the side of nature. He is not attempting to reproduce the impressions formed on the retina, nor is he interested in using realism to give nature its due, or to depict deep-seated truths by allocating colours to the natural world. Instead, his pictures can be seen as an attempt at reconciliation between subjective perception and objective truth – an attempt to close the chasm once again. He may not explicitly treat this discrepancy as a theme, but he goes along with it and adopts the approach that the “truth” can only reside within “reality” in a sense which encompasses all its aspects. This conciliatory attitude betrays a romantic impulse which is also expressed by the longing to capture nature in its beauty by means of colour, though not by attempting to depict its magnificent range of colours, or to render it mistily atmospheric. The colours he employs are far too neutralised for that, possessed of an unconscious, liberated quality – and if we describe this as “atmospheric” we are saying more about our own mood when viewing nature than about nature itself. Hering’s longing for colour is not a desire for colourfulness but a yearning for what might most accurately be described as tonality. This term seems to capture best the atmospheric, the “inherent colours” of nature and the process of perceiving them.

Veronika Schöne

2. Basic Principles

2.01 Colour Measurement

In physical terms colours are perceptions of electro-magnetic vibrations with a wavelength ranging between 400 and 700 nanometres. This is the range of colour visible to human beings. In nature this segment of the spectrum appears to us as the colours of the rainbow.
Daylight is composed of varying portions of this spectrum, depending on weather, time of day and other conditions. Direct sunlight has a greater proportion of colours from the longer wavelength section of the spectrum, which makes it look yellow or yellowish orange. The light of a cloudless sky, on the other hand, is composed primarily of vibrations at the shorter end of the waveband, so it appears blue to bluish-violet.
Analysis of the wavelengths of reflected light provides us with data which may be objectively correct but which does not correspond to our perception, since our perceptive organs display a constant ability to adapt to varying light conditions. This ability to adapt is called colour constancy.

2.02 Colour Constancy

Colour constancy "... permits us to perceive an object's colour as relatively constant, even when it is illuminated by light sources of varied spectral composition," (Goldstein 1996, p. 14). Edwin Land, the inventor of the Polaroid camera, "explains colour constancy as the visual system's way of dealing with the spectral composition of a light source by removing its influence from the colours of the observed object," (Welsch & Liebmann 2003, p. 260).
Colour constancy enabled our ancestors to ascertain how ripe a fruit was no matter whether it was in direct sunlight or in the shade.
This adaptive ability has developed during the course of evolution for natural habitats in conditions of daylight, but "colour constancy fails when objects are observed under extremely artificial conditions: conditions that our ancestors certainly never encountered during the course of evolution, conditions which have only emerged during the course of our cultural development," (Fischer, 1994, p. 25).
Therefore observations have only been made during conditions of daylight, to ensure that colour constancy can operate on perceptions.
Observations at Location 1 ("Heuckenlock Panorama") were made regularly at 14:00 Central European Time. This also ensures that the main source of light comes from the same direction.
Objects have a particularly strong tendency to change their colour in differing light (metamerism), when the sector of light that the object radiates back (reflects) or "swallows" (absorbs) is only a small segment of the spectrum of our visible sunlight. In contrast, objects with broadband reflection may not appear so strongly saturated (so colourful), but the broader the basis of their reflective curve is, the greater the stability of the hues. Tsz Lock Vien Cheung & Stephen Westland (2001) have established that natural surfaces possess greater colour stability than man-made ones.
This confirms the effectiveness of our colour observations, which have been performed exclusively on natural objects.

2.03 Comparisons with Colour Samples (coloroscopy)

In "Determining Colour in Biology" (1958), Paclt offers the definition: "The term 'coloriscopy' (Koloriskopie) unites for us all the methods used to evaluate an unknown colour by making a visual comparison with a large enough number of colour samples from the same colour group, thus defining its appearance without any form of measurement. The colour samples used in such comparisons could be drawn from accurately measured standards (e.g. Munsell's Color Atlas), which would appear advantageous in many cases, but they could simply be colour samples classified by name or number of various symbols," (p. 17).
The 20th century has provided us with the means to make definitive statements about colour, which still posed a problem in the 19th century: the systems of Wilhelm Ostwald and Albert Henry Munsell, linked to colour samples on material, and the NCS System, established in 1979 on the bases of four chromatic psychological elementary colours.

2.04 The NCS System – the Colour Notation Employed

Once Ewald Hering's theory concerning the processing of colour sensations by means of three opposing pairs (light-dark, yellow-blue and red-green) had been confirmed, models came into existence which arranged these opposing pairs on crossing axes: The CIE-Lab System, the RGB System for video and monitor technology, the ACC System and, in 1979, the Swedish NCS System from the Scandinavian Colour Institute, with its purely phenomenological approach. The NCS System, employing solely the six elementary colour terms, can be employed to describe perceived colour without the use of comparative samples.
In each quarter of the NCS Colour circle there ought to be 9 intermediate points, at uniform optical distance from each other; thus the 40 hues of the colour circle form a sound basis

for colour determination. The fine degree of differentiation in the sector from green-yellow to yellow-green is particularly advantageous for the observation of natural colours; here NCS is superior to the Munsell System (popular in English-speaking areas) and the German system based on DIN 6164.
From my experience with applications of this system in the realm of natural colours I would make the following critical observation: the elementary colour blue has been chosen in such a way that it is very close to the green-blue printer's colour cyan. This leads to extremely fine differentiation in the green-blue quadrant, which is hardly necessary in the observation of natural colours, while as a corollary the red-blue quarter of the colour circle has a number of disproportionately coarse differentiation. Furthermore, the NCS System adheres to Ostwald's concept of full colour, thus arranging colours of identical lightness at different levels in the colour space. Therefore the NCS colour atlas contains additional lines of identical lightness values. The following brief introduction to the system is taken from the 1996 NCS Colour Atlas:

NCS colour space

In this three-dimensional model, called the NCS colour space, all imaginable surface colours can be placed and thus be given an exact position - an NCS notation. In order to more easily understand the parts included in the NCS-notation, the double cone is divided into two-dimensional models, the NCS colour circle and the NCS colour triangle.

NCS colour circle

Is a horizontal section through the middle of the NCS colour space where the four chromatic elementary colours are placed like the points of a compass. Each quadrant between the chromatic elementary colours has been divided into 10 equal steps. In the figure, the hue Y90R, yellow with 90% redness, has been marked.

NCS colour triangle

NCS colour triangle is a vertical section through the NCS colour space. The base of the triangle is the grey scale from white W to black S and the apex of the triangle is the maximum chomaticness C in the current hue, here Y90R. Colours of the same hue can have different blackness or chromaticness values, i.e. different nuances. This can be illustrated in colour triangles, where the scales of which are divided into 10 steps. In the figure, the nuance 1050 has been marked, a colour with 10% blackness and 50% chromaticness.

NCS colour notation

Colour notations are based on how much a given colour seems to resemble two or more of these six elementary colours. In the NCS 1050-Y90R, for example, 1050 indicates the nuance. This means the degree of resemblance to black S and to the maximum hue C. In this case, 10% blackness (s) and 50% chromaticness (c) of a maximum of 100% (100-10-50) is the whiteness; 40%. The hue Y90R indicates the percentage resemblance of the colour to two chromatic elementary colours, here Y and R. Y90R means yellow with 90% redness.

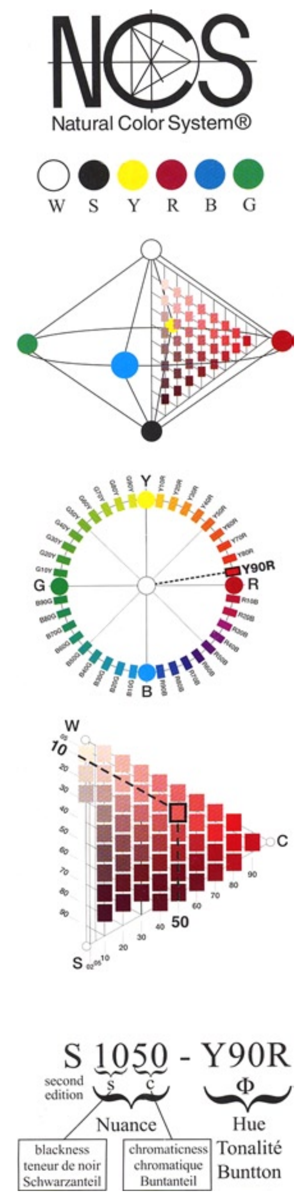


Fig. 1: The NCS System

2.05 Inherent Colours

If the light conditions, i.e. the spectral composition of the light, are constant, colour comparison with standardised colour samples can be employed as a practical and simplified measurement process for the determination of the reflectance of various objects. In 1996 the Swedish Professor of Architecture Karin Fridell Anter made a revolutionary attempt to determine natural colour with the help of a colour system (NCS): “The Inherent Colours of Plants, Stones and Soil”. To record inherent colours she employed standardised light and placed the object on a non-shining surface, making coloroscopic comparisons with NCS samples from immediate proximity (distance 0). Thus she not only eliminated the sunlight shining through the leaves but also ruled out the influence of the typical light composition for time and location. In her study of inherent colour Anter is able to make fundamental statements about natural colourfulness.

2.06 Nature is Yellow

“With the exception of certain flowers, all inherent colours in nature contain a greater or lesser yellow component (see Fig. 2),” (Anter 1996, p. 21). Thus, with the exception of plants that blossom in purple or blue, the entire blue half of the colour circle is absent in natural inherent colours.
“Flower colours do not cross the third ‘ultrablue’ (in the NCS System the hue –B), and leaf colours only begin with leaf-green (in the NCS System the hue G20Y),” is also the conclusion reached by Wilhelm Ostwald (1930, p. 18), again excluding the blue-green sector of the colour circle from natural colours. The Heuckenlock observations will confirm these statements and suggest further restrictions of the sector in which vegetation and soil colour appear (see illustration below with emphasised colour sector). When applied to a less “yellow-friendly” colour circle, such as Ostwald’s, this means that all the landscape colours observed at Heuckenlock are restricted in 95% of cases to only slightly more than a fifth of a colour circle: to 75° of the 360° of the total circle.

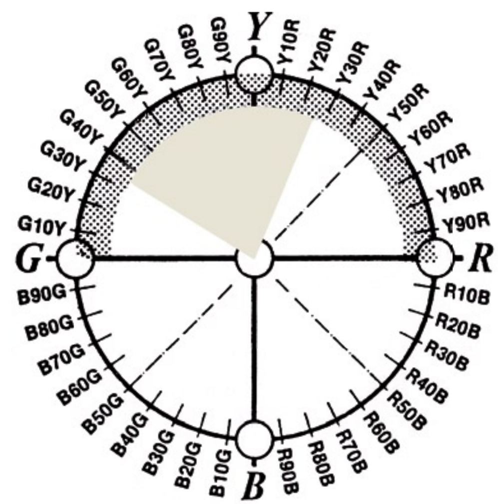


Fig. 2: Colour hues of measured inherent colours in nature, with the exception of certain flowers.

This is a staggering conclusion, since under normal observation conditions we do not have the impression that nature is so yellow. “Normal observation refers to a location where material occurs naturally, when there is an observation distance of several metres, normal daylight and the absence of comparable colour samples,” (Anter 1996, p. 11). The results achieved by normal observation, when expressed in purely verbal (nomenclatural) terms, can be seen by the colour descriptions we find in the works of geobotanists and phenologists.

2.07 Purely Conceptual Colour Descriptions

Descriptions of colours perceived in nature without any comparison with colour samples can be found in the works of geobotanists such as Hartmut Dierschke (1981), Reinhold Tüxen (1986) and Otti Wilmanns (1999 and 2000), and of the phenologist Jochem Nietzold (1993).
Purely conceptual (assigned) descriptions follow the classification of colours that we employ in everyday language. It should be noted at the outset that purely conceptual colour descriptions are lacking in any form of referential clarity, since their conceptual framework is extremely inexact in terms of our ability to differentiate colours (which can recognise about a million shades).
Moreover, the discrepancies which appear in comparison with coloroscopic observations are both striking and confusing. Let us take as a first example the “violet brown” (Tüxen 1986, p. 78), familiar to every lover of nature from the period of pre-spring and the beginning of early spring, when the colours of the growing buds gain in intensity. If we compare this violet-looking brown with colour samples we come to the conclusion that it is actually a medium or light reddish brown: Y50R (Orange) or Y60R.
“Turquoise” is the name Otti Wilmanns (2001, p. 803) gives to the leaves of *Vaccinium uliginosum* (bog blueberry), although a direct comparison with a colour sample suggests perhaps G20Y or G10Y, a shade 10% to 20% more yellow than a mid-green!
A final example concerns that elementary term used to describe colour: “green”. If the word “green” is used without any modification to describe the typical leaf green of vegetation (G40Y to G50Y), the reader within the four walls of his urban environment may quite inevitably think of a green which is neither blue nor yellow and which resides within the psychological basic colour of green (G or G10Y), such as the

unquestionably green colour found in the traffic lights in the street nearby... and he would not think at all of the green-yellowish character of the chlorophyll green (G40Y to G50Y), which is in fact what is meant here.
The conceptual descriptions above, provided by botanists, have certainly not been formulated with the intention of confusing or misleading us: they simply correspond to our perceptions and to our limited linguistic resources when we observe colours under normal conditions without the use of colour samples. They represent the phenomena of perceived colour, as in Anter (2000) or of apparent colour as in David Katz (1911).

2.08 The Phenomena of Perceived Colour

The primary obstacle to methodical observation of natural colours are the phenomena of apparent colours, which frequently contradict the conclusions that can be drawn by a direct (coloroscopic) comparison with colour samples. However, a certain order can be perceived within this contradiction.
Anter (2000) employs the NCS System for a purely conceptual description of perceived colours. Children and adults with little knowledge of colour classification are deliberately invited to create colour descriptions in the terminology of the NCS Systems (estimates of percentage proportions) but without the use of colour charts. These results can then be compared with the range of coloroscopic observations employed in colour samples.
In terms of hue, the discrepancies are such that all the perceived colours tend to blue, whether it is in the red or the green half of the colour cycle: perceived colour is always more blue than the more or less yellow inherent colour.
In the cases described above relating to conceptual colour descriptions a hue shift from the yellow to the blue also takes place; in the case of “violet-brown” wood this shift is from mid-brown across the red towards violet, in the case of *Vaccinium uliginosum* it is from yellow-green to turquoise, and in the case of chlorophyll green it is the misleading shift from the yellow-green that is meant by the term “green” to the physiological mid-green.[1]

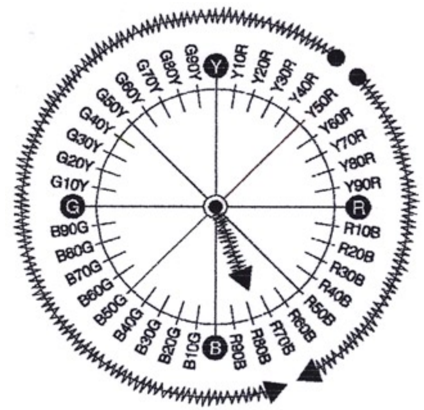


Fig. 3: “vanishing point” for landscape colours according to Anter

Anter, who makes no precise differentiation between the effect of distance from the objects in question and the phenomena of perceived colour – which also appears when these distances are short – postulates a colour “vanishing point” for landscape colours at approximately R75B (see Fig. 3). The movement corresponds to the effect of atmospheric blurring, which accords with Goethe’s law of the blurring of the bright against the dark.
A simple explanation of the Phenomenon is possible: the significant superiority of yellowish hues in nature, as described by Anter (1996), may well have consequences on the level of simultaneous contrast. According to Goethe, the overwhelming yellow colours “demand” their complementary blues. To formulate it to accord with the terms employed by Carry van Biema (Reprint 1997, Plate XVI): the “flooding” of yellow colours provokes “the action of yellow”, which shifts the hues close to yellow in the direction of the physiologically complementary blue.
After the purely phenomenological approach she follows, Karin Fridell Anter refrains from suggesting this explanation in her work.

2.09 The Depiction of Percieved Colour

In the years around 1800 the fine arts and the natural sciences were closer than is the case today. Studies of nature conducted under conditions of daylight at any specific location had an “empirical function” (Galassi 1991). Pigment notations would frequently be found on line drawings, providing the necessary information for a later colour version. The practice of making oil sketches out in the open culminated with artists such as Corot. Then, in the second half of the 19th century, the impressionists began their attempts to capture the phenomena of perceived colour in plein air painting. By 1900 painting was dominated by blue, turquoise and violet shadows and the habit of placing patches of pure colour next to one another, to be mixed “in the eye” by partitive light mixture; this prepared the way for the ‘liberation of colour’ in the early 20th century.

[1] In Runge’s book Colour Sphere (1810) under the heading “green” we find yellow-green plant green. On 21.10.2003 I made a comparison with NCS samples, using a well-preserved copy of the book in the Hamburg State Library, and established the presence of G50Y and G40Y. A reference to an older concept of green that had plant green at its centre. It corresponds to the traditional pigment “sap green”. In reproductions of Runge’s coloured copper engravings his “green” is generally represented in too cold a light, considering the psychological base colour (except by Matile 1979, Colour Plate 1).

2.10 A Visit to the Art Gallery

When I had been conducting coloroscopic observations of nature for about six months I was struck by Jochen Hein's work "Grass" (1998) in an exhibition at the Hamburger Kunsthalle art gallery. It seemed unbelievably blue, and this prompted me to return to the location with my NCS colour samples. I was not particularly surprised that the grass had been painted in a bluer hue than would occur in nature, but when I studied the works in the main collection I noticed the willows in a river landscape by Riusdael. The lighter underside of the leaves was visible on some of the branches moving in the wind. Presumably *Salix alba* (white willow) was being depicted. The colour saturation was low. The typical bluish impression I knew from my observations in Heuckenlock was present. Still quite inexperienced in judging hues, I estimated that this was a very blue Green B50G or at least G10Y. But what happened when I looked at the painting through the mask hole of my colour samples? As soon as they entered my field of vision, the colours of the willows in Ruisdael's painting turned out to be a Yellow-Green G50Y, but not the blue-green hue I had expected.
And yet when I again looked at the picture without the colour samples I once more had the impression that the leaves were a blue-green hue. I realised that it really was possible to conjure up the phenomena of perceived colour, just as it is created in nature, if the colour values of the individual areas, as evaluated with colour samples, are once again employed in a picture. The willows looked blue even though they had been painted with yellow-green hues.
I took this as confirmation that my procedure – using a mask with a hole to observe certain areas of the field of vision in direct optical proximity – was correct. The first colour atlas, which I used in Winter 2002 / 2003, was constructed from Biesalski's "Atlas of Plant Colours according to DIN 6164". I used a mask with a hole beside the page with the colour samples, which meant that as my eye travelled from the hole to the relevant sample, my evaluation of the colour might still be distorted by the phenomena of perceived colour.

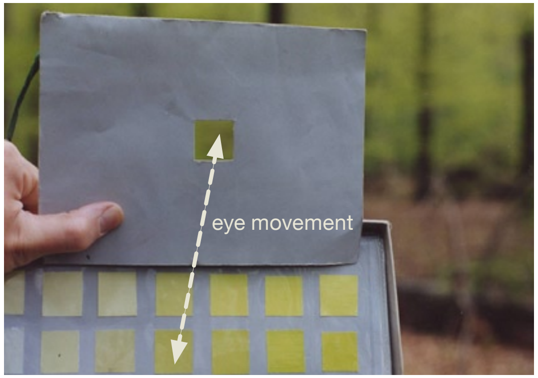


Fig. 4: First colour atlas built according to DIN 6164 with the eye movement marked

However, the second colour atlas, which I used from summer 2003 onwards, used NCS colour samples and the arrangement of samples employed in the NCS colour triangle. Now I could use the mask between each of the samples, so there was a chance to make a comparison in the direct optical vicinity of every colour in the notational scheme (see Fig. 5). This meant that the visual phenomenon of perceived colour could virtually be excluded from my observations, while the changes in colour appearance caused by the distance of the object and any atmospheric blurring remained perceptible.

2.11 Patches

A procedure of this sort enables the field of vision to be divided into individual areas of various shapes. We can describe these individual areas as patches, in line with the term used by Forman & Godron (1986) as indicated by Otti Wilmanns (2001). To some extent I have adhered to this practice, using sketches printed out before conducting my observations (see Fig. 6 on the following page). It could be carried even further to produce a "history of patches throughout the year", making references to different plant names unnecessary. While I often allocate individual colour notations to specific plant species, it would also be possible to note down only the arrangement of patches seen from one point of view in the field of vision and their colour composition, making comparisons between the colours of these patches in the previous and subsequent seasons.
A quantitative evaluation in terms of the number of portions of the field of vision to which specific colour values are assigned would

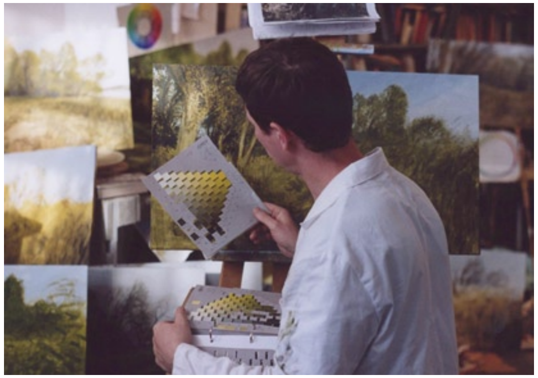


Fig. 5: Second colour atlas using NCS

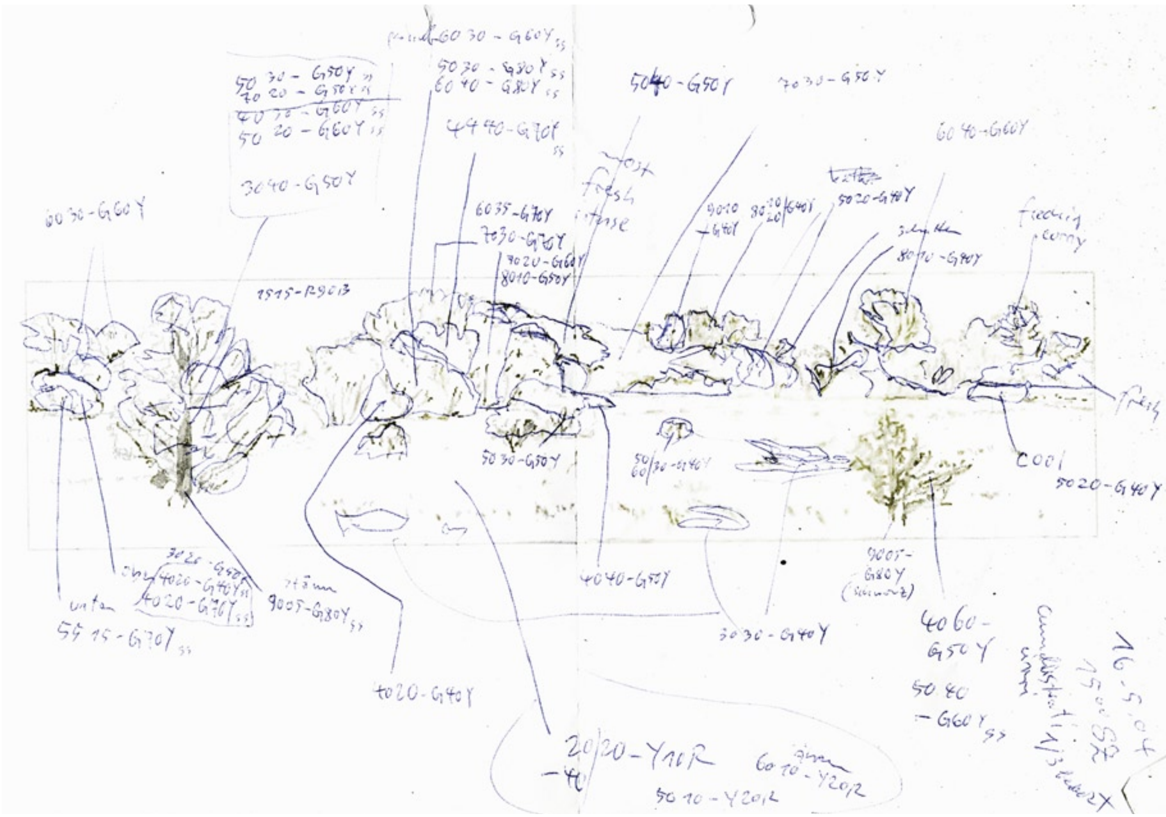


Fig. 6: Form for notation of colour values in the observation area, 21 x 27.9 cm

be possible by using a network of patches, with colour definition, to cover the field of vision. This would mean progressing from a phenology based on biological categories to one attuned purely to colour. It would still be possible to use such observations as a means of recognising plants and plant associations if they had been analysed elsewhere in terms of colour composition. This could for a basis for the analysis of vegetation in inaccessible areas. Changes in the vegetation on large areas of moorland, for instance, can only be observed by flying over the area. Description of vegetation in such areas by means of detailed colour analysis could be conducted from a distance.

2.12 The Overall Colour Value

When we approach a natural landscape for the first time we gain an initial overall impression which reveals a great deal about the primary colour composition of this particular place at this particular time. However, if we then immerse ourselves in this landscape and its world of colours, we then only perceive details, and our perception starts to emphasise and clarify the differences (differentiation), but the overall colour value fades from our consciousness, though it remains with us on an emotional level, since the colour environment that surrounds us does not stop transmitting its colour signals to us. A comparison with colour samples (coloroscopy) preserves the characteristics of the common tone, while the colours perceived in normal observation promote differentiation.
“The red of a leaf blown on to moist soil by the autumn wind can be so beautiful that we bend down to pick it up and take it home with us. But the red will not have the same effect in any other environment; it has attained its particular tone because of the colour of the field, a colour which we did not even perceive.” (Renner 1946, p. 63). Here the red of the leaf represents a perceived colour, while the colour of the field corresponds to the overall impression, which has not been noticed.
Traditional tonal painting preserved an awareness of the unity of colours in nature, but this was lost as artists began to concentrate on the presentation of perceived colour and the “liberation of colour” in Expressionism and Constructivism. It is time we became aware that what the colours in modernity were liberated from was in fact nothing but their natural context. Kurt Badt explains clearly what happened in the 19th century: “Delacroix made it apparent what he meant by liberation in painting when he remarked that the first task of an artist was to determine the tone of a picture (la gamme d’un Tableau). For him,

this was not determined in advance by nature or the natural colours of objects; instead, it was the product of the artist's free choice. It depended on the intention he aimed to realise in that particular picture, on the spiritual approach he had decided would dominate a certain preordained theme. In the seventeen century Poussin had applied the same general concept by transferring the tone, which he called the modus, on to the character of the subject. However, Delacroix went much further. He also defined the character of the subject independently, by making the tone subservient to his artistic intention. This insight meant a great deal to those who came after Delacroix. Let us consider Monet. When you look at his series – the *Haystacks*, the *Cathedrals* or the *Waterlilies* – it is stunning how different the use to colour is. This difference is not a result of the lighting but of the painter's free right of disposal over the impressions of nature." (Badt 1965, p. 64)

2.13 Nature is Fine Grained

Natural colourfulness is characterised by Otti Wilmanns (2001) "by irregular borderlines with gentle colour transitions and by the fine nature of its colour components, such as clumps of grass in a cattle pasture. (Wilmanns, 1999). It might be appropriate to speak of the "internal grained quality", which term could also describe structures based on small lines or a fine mesh, such as branches in the tree-tops during winter. The use of the term refers to "fine-grained", as first suggested by Forman & Godron (1986) along with "coarse-grained", both terms being used by these authors for analysis of aerial photographs. Here they differentiate between a "matrix", meaning a large background area, "corridors", meaning elongated elements of the picture and "patches", which can be fine or coarse grained isolated elements. In our differentiated form of notation such a classification can be controversial. Even though a rock is defined as a patch, for example, it might still be possible to subdivide it according to structure, location, surface vegetation and therefore colour. We shall therefore consider fine elements the smallest of the colour building blocks at our disposal here, and we shall also speak of the internal fine-grained quality." (Wilmanns 2001, p. 795) This recalls the "division of a local colour into numerous chromatically neighbouring yet still clearly distinct degrees of colour," as Kurt Badt perceives in the works of John Constable (Badt 1965, p. 25). It is this fine-grained aspect of nature that makes a combination of coarse patches (indicating large colour expanses) appear so inadequate. In contrast, it is a typical quality of painting to imitate the fine-grained nature.

2.14 "Screwing up the Eyes" (partitive light mixing)

When the size of a patch is below a certain level, far less than that of a sample, it becomes impossible to match up individual colours. As a practical solution to this effect painters tend to "screw up their eyes" – to see out of focus deliberately so they can identify colour as distinct from structure and object. Thus a natural scene that, on close inspection, is composed of finely-distinguished nuances, merges into colour areas that are optically mixed. This way of mixing colours, a special form of additive colour mixture (a technique used for example in the display of lines on a monitor screen) is referred to as partitive colour mixture. Whether we want to do so or not, for each structure the opportunity to perceive its individual colour components separately vanishes at a certain distance. Since it was my objective from the outset not to depict individual details (singular aspects) but to capture the overall colour of a landscape, the coarsening of the notation process that must occasionally be taken into account as a result of this does not represent a disadvantage.

If we study the details of a plant at close quarters, we discover that the play around the yellow hue is as characteristic here as in the seasonal cycle. When Rumex aquaticus (red dock), for example, is in blossom and studied from close proximity (Riverbank Vegetation 14. 6. 04), it has both green (5050-G50Y) and

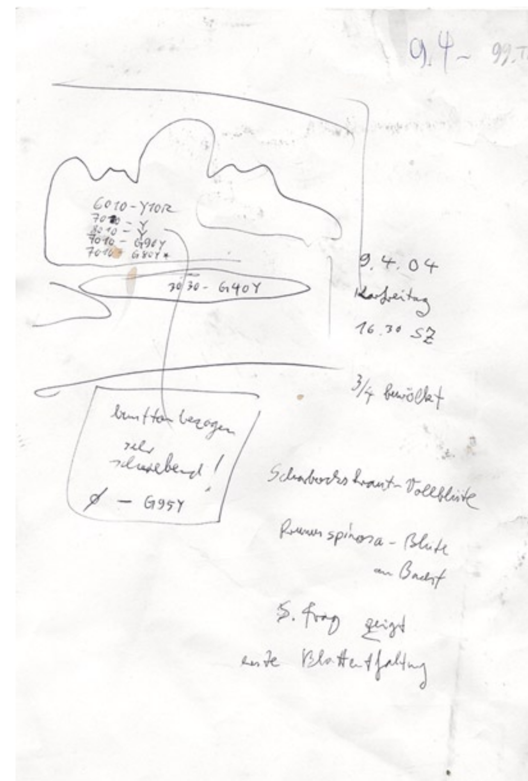


Fig. 7: Summarised Notation, 21 x 29.7 cm

red (4050-Y90R) components. However, from a distance (2 metres) these colours merge in the blossom area to form a medium yellow-brown (3040-Y10R).
To summarise the field of vision as a small number of values by assessing the singular portions of the patch areas, as I regularly did for the riverbank vegetation from even larger distances (see Fig. 7 on previous page), brings us closer to the objective of conveying the overall colour of a landscape as the exact description of individual colour components. In general the over-emphasis on blossom colour and other details is the most frequent reason. Frieling, for example, fails to evaluate the colourfulness of a landscape at a certain point in the year. We shall therefore trace the result of partitive light mixture on the hues, the sum of landscape's hues, throughout the year.

2.15 Phenology – the Study of Appearences during the Seasons

According to Seyfert (1960), phenology is "a branch of science concerned with the links between the development of vegetation and weather... 'phaino' means 'appearance' and 'logos' is 'knowledge' or 'science'. Thus the meaning of phenology could be summarised as the study of the appearance of plant development over time under the influence of weather. The term 'over time' indicates that the data to be collected in phenological studies are purely calendar dates. Data referring to agricultural yield – such as the amount of rye produced per hectare – are gathered by an 'agraro-meteorologist'." (p. 6)
Phenology was founded by Linné, while Ihne (1895) proposed the names of sub-seasons that have become accepted today (Pre-Spring, Early Spring, High Spring, etc). At present the German meteorological office, for example, has a network of volunteer observers who report on the appearance of selected vegetation during various phases of development.[2]

2.16 Aspect and Singular Aspect

"During the course of the year plant associations alter their appearance, their aspect, to a lesser or greater degree. In addition to the spring aspect we can also distinguish the summer, winter and autumn aspects," (Hofmeister 1977, p. 150). Hartmut Dierschke (1981) follows Hofmeister in his use of the word "aspect" when he writes: "The lush, fresh green colour of the leaves dominates in terms of determining aspect." (p. 179) However, he continues, referring to a blossom aspect, to speak of "... the white *Anthriscus* aspect ..." (p. 180), and then he proceeds to modify the use of the word, no longer meaning the appearance of a plant association during simultaneous development but instead one part of this: "... the first coloured fruit aspect ..." (p. 183) and "... coloured aspects ... formed not so much from blossom but more from ripening fruit." (p. 184). Thus Dierschke has completely transformed the use of the term "aspect" so it now means the description of a detail from the appearance of the whole over time, while the word was originally used by Hofmeister to mean appearance at a point of time as overall effect. Here I am interested in capturing the overall colour of a landscape rather than being distracted by a blossom or a fruit – as long as it does not "determine aspect". I would also suggest retaining the use of "aspect" in the sense first used by Hofmeister, as a temporal unit marked by the spatial conglomeration of various details of appearance.
The attempts by Johannes Itten and Heinrich Frieling to depict natural colour through seasonal changes floundered because details were given too much prominence, thus distorting the view of the whole.
I should not like to go along with the suggestion by Jochem Nietzold that "aspect" can be restricted solely to colour appearance – "The colour appearance and change in a landscape... is called the aspect," (Nietzold 1993, p. 110) – however, in this paper I would like to encourage awareness of the colour character of sub-season aspects.

2.17 Draft for a Colour Phenology of Central Europe

If, instead of examining plants' stages of development, we observe their basic physical characteristics – i.e., their colourfulness, among other things – by means of which we can recognise the developmental stage they have reached, we come closer to the concept of phenology focussing purely on colour. The Heuckenlock study is intended to indicate the feasibility of this colour phenology. In that sense it forms a draft for a colour phenology of Central Europe, which in turn could serve as an example for a colour phenology of the temperate climate zones (i.e. one determined by seasons) on Earth.

[2] Phenology links:
Global Phenological Monitoring:
http://www.dow.wau.nl/msa/gpm/
European Phenology Network (EU):
http://www.dow.wau.nl/msa/epn/index.asp
The UK Phenology Network:
http://www.phenology.org.uk/
National Phenology Network (USA/Canada):
http://www.uwm.edu/Dept/Geography/npn/
MeteoSchweiz (Switzerland):
http://www.meteoschweiz.ch/de/Beruf/Landwirtschaft/Phaenologie/phaeno.shtml
Phenological Studies of the Baltic Sea Project:
http://www.b-s-p.org/program/pheno.htm
Potsdam Institut für Klimaforschung (Germany):
http://www.pik-potsdam.de/~rachimow/epn/html/resultok.html
Deutscher Wetterdienst (Germany):
http://www.dwd.de/de/FundE/Klima/KLIS/daten/nkdz/fachdatenbank/datenkollektive/phaenologie

3. The Observation Area

"In autumn, when the leaves become bronze, yellow or red in colour, then the grass should also be faded or yellowed, to provide the background colour to the magnificent colourfulness of autumn as intended by the Creator: but thanks to the scythe and the grazing cow, the grass is greener at this time than in any other season. While the colour green is otherwise so soft and agreeable, this green can have the same cutting effect as the most violent scarlet, and it often disturbs the harmony of the wonderful autumn colours," (Renner 1947, p. 63). Here Paul Renner, the designer of the Futura font, is pointing out to us that our manmade rural landscape, is already strongly influenced by this intervention in terms of natural colourfulness. The monoculture crops, the reaping, harvesting and ploughing, all represent such powerful assaults that if we want to discover how natural colour proceeds through the seasons, we are today obliged to restrict our study to one of the few nature reserves.

3.1 Close to Nature

"As a result of its climatic situation Central Europe was originally a pure forest region... forests which still predominantly resembled ancient woodlands, in terms of species composition and structure, could be considered close to nature." (Hofmeister 1977, p. 11).
Without needing to explore the connotations of terms such as ancient woodland, the term 'close to nature' can be understood – also for future reference – to mean corresponding to the vegetation that would develop if man were to cease tending the land immediately, which may also be described as potential vegetation.
The glacial valley of the Elbe was created by glaciers melting at the end of the last ice age.
Originally the banks of the river were most probably dominated by areas of open shingle, "while the flood-plain clay sedimentation developed to a great extent during the historical period, following the severe soil erosion in the river's catchment area due to clearance of the forests," (Ellenberg 1996, p. 391).
This means that the extent to which this location is 'close to nature' has already been reduced. Fertilizer from farming land upstream is carried to this location by the water, raising the soil's nitrogen content here.
"The natural vegetation, i.e. the plant layer that would cover the Elbe Valley under present conditions there if man had not prevented its development by logging and mowing is flood-plain forest. The remnants of such vegetation can be found in the Nature Reserve on the River Süderelbe. Here the softwood flood-plain forests grow..." (Meyer 1956, p. 5) This is the last area of tidal flood-plain forest in Europe, which is to say that flooding takes place not only in spring and other high-water periods; instead, there is constant tidal movement depending on the rising and falling of the water in the North Sea.
There are remains of a flood-plain elm-ash forest on slightly higher areas which are therefore less susceptible to flooding. A thorough colour-phenological study of the vegetation composition in these areas, with a bush level that display considerable colour variation - including *Crataegus* (hawthorn), *Sambucus nigra* (elder) and *Euonymus europaeus* (European spindle) – is yet to be conducted.
Today the softwood flood-plain forest is dominated by tall poplars. According to Böcker & Koltzenburg (1996), so-called American poplars - *Populus x canadénsis* (Canadian poplar), *Populus deltoides* (eastern cottonwood), etc – are planted for the wood-processing industry, since they grow more quickly and straighter than the Central European *Populus nigra* (black poplar), and without lumps in the wood. *Populus nigra* is being displaced by American poplars, and in fact, *Populus nigra* is in danger of vanishing throughout Europe. Although Ellenberg doubts that they are close to nature in Northern Germany (1996, p. 399), the poplars in Heuckenlock Nature Reserve seem to thrive, regenerating themselves and spreading further. At locations which are moist or wet *Salix alba* (white willow) and *Salix x rubens* (hybrid crack willow) both grow. The *Phragmites australis* (common reed) form extensive areas of *Phragmition* (reed beds).
According to Helmut Preisinger (1991), the plant-sociological associations manifest here can be divided into tidal reed beds, tidal influenced ruderal riverbank vegetation, tidal influenced flood-plain forest, and mixtures of these categories.[3]

3.2 Location 1 "Heuckenlock Panorama"

Location 1 ("Heuckenlock Panorama") allows a view of softwood flood-plain forest and reed beds. Here the total species composition in the Nature Reserve in terms of quantity is more or less reflected. Only the young *Alnus glutinosa* (alder) in the foreground to the right is over-represented, since the species is quite rare in this area.
From the Stillhorner Main Dyke the view is to the Southwest, over a narrow tideway with reed beds to the softwood area known as Small Sand. These trees, in the centre of the picture, look like an integrated group but in fact are staggered by depth to a considerable degree

[3] link:
http://www.wwf.de/regionen/deutschland/elbe/projekt/
For the subject of poplars:
http://www.griffon-club.de/oekologie/schwarzpappel.html#B

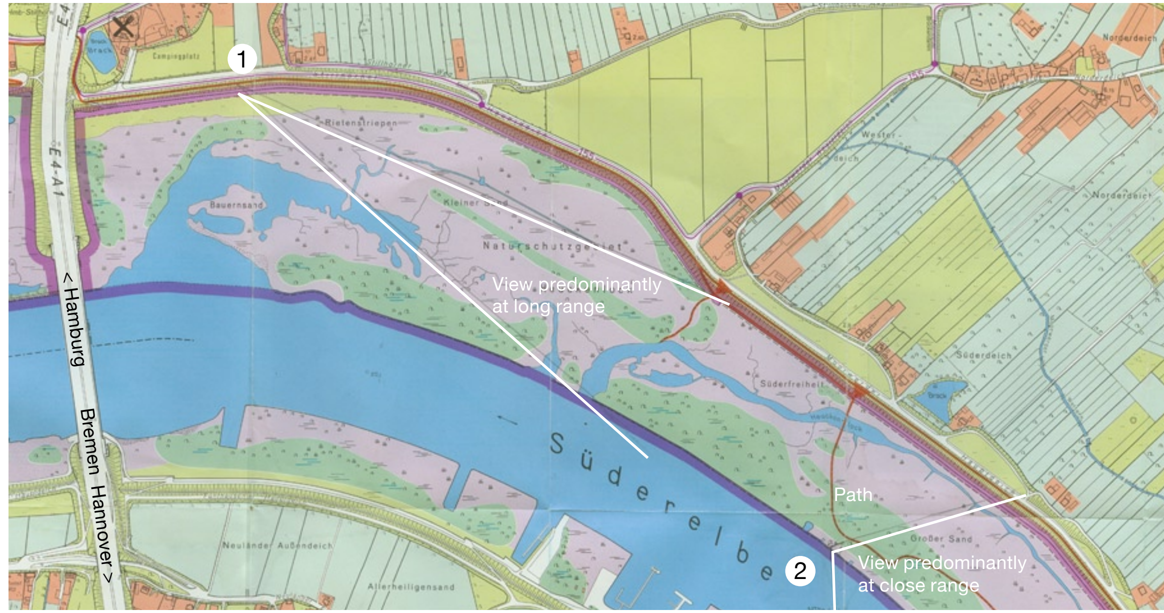


Fig. 8: Situation of the observation areas on the River Süderelbe
Location 1 (“Heuckenlock Panorama”) and Location 2 (Heuckenlock Riverbank Vegetation)
map published by the Environmental Agency in association with Hamburg Publication Office;
map based on data from Hamburg Survey Office.

(see map on this page), which allows to perceive the effects of atmospheric blurring.
Phragmites australis (common reed) dominates the large low-lying area crossed by narrow tideways which is known as Rietenstriepen).
Isolated willow trees tower up out of the reeds. In distance and on inaccessable ground I was able to identify, though not categorically, *Salix triandra* (almond leaved willow), *Salix viminalis* (basket willow), *Salix purpurea* (purple willow) and *Salix caprea* (goat willow).
Here at Location 1 the observation distance is somewhat greater than what Otti Wilmanns (2001, p. 369) suggests as ideal for colour observation of a landscape - “approximately 10 to 300 metres, occasionally more” – since it is here between 100 and 1000 metres, while Location 2 (Heuckenlock Riverbank Vegetation) presents observation at close quarters.

3.3 Location 2 “Heuckenlock Riverbank Vegetation”

Location 2 is a place with great dynamism through the seasons. It is 611.7 kilometres along the River Süderelbe at the median highwater line. The average tidal movement here is 1.1 metres. The view at eye level (1.8 metres above the ground) corresponds to the human field of vision with a range of approximately 100° to the Southeast. From the right of the area (south-south-east) where the soil is wet, moisture at the location declines to an increasing extent towards the left of the area (east-north-east).
Vegetation at Location 2 is influenced by the reinforcement of the riverbank and the movement of vessels on the river – especially the motorboats with the large swell they cause. Between the reed beds and the slightly higher area (to the left in the picture), which is in the shade of the flood-plain forest, there is an area at the edge of the high tide line with herbaceous vegetation comprised of plants characteristic for often disturbed places with rich nutrients: *Rumex aquaticus* (red dock), *Lythrum salicaria* (purple loose-strife), *Scrophularia nodosa* (common figwort), *Senecio aquaticus* (marsh ragwort), *Polygonum hydropiper* (water pepper), *Aster tradescantii* (tradescant’s aster), *Nasturtium officinale* (watercress), *Agrostis gigantea* (redtop), *Stachys palustris* (marsh woundwort). *Phragmites australis* (common reed) rise above these herbaceous plants. A little higher, on the edge of the flood-plain forest area with poplars offering shade, *Rubus Caesius* (European dewberry), *Calystegia sepium* (hedge bindweed), *Anthriscus sylvestris* (cow parsley), *Urtica dioca* (stinging nettle), *Chaerophyllum bulbosum* (turnip-rooted chervil) and *Epilobium hirsutum* (great hairy willow herb) can be found, frequently together with *Cirsium palustre* (marsh thistle), which is not visible here at Location 2.
Near the willows, where the area is frequently flooded, a soft layer forms in spring, composed of *Ranunculus ficaria* (lesser celandine), *Anthriscus sylvestris* (cow parsley) and *Deschampsia wibeliana* (“Wibels Schmiele”).
Over towards the river bank reinforcement (to the right in the picture) the *Caltha palustris* (marsh marigolds) blossom at the end of Early Spring. During the winter the combination of swell, frost and daily flooding causes the area to be almost completely cleared of the previous year’s vegetation, until the cycle begins once more.
The situation at low water when there is no flooding is depicted here throughout the year.

4. Colour Observation in Heuckenlock Nature Reserve

The terminology used in describing the sub-seasons as first proposed by Ihne (1895) have become widespread not only in meteorological phenology but also, to a certain extent, in everyday language (early spring, high summer, late summer, etc). I therefore give preference to these terms, in contrast to Harald Dierschke (1981), who introduces new phenological phases predominantly referring to beech forests. Let us now set out on a hike through the year of colours in the Heuckenlock Nature Reserve.

Pictures on the following 13 pages:

Plates 1a - 12a:
Heuckenlock Panorama
2004
Acrylic on canvas
stretched over block board,
12 panels 12,8 x 48 cm

Plates 1b - 12b:
Heuckenlock Riverbank Vegetation
2004
Acrylic on block board,
12 panels 44 x 80 cm

4.01 Winter (brown)

Heuckenlock Panorama (P)
Plate 1a:
Data from 19.1., 30.11., 24.12.2003, and 4.1.2004

Heuckenlock Riverbank Vegetation (R)
Plate 1b:
Data from 24.12.2003

At tree and bush level the winter aspect is dominated by the brown tones close to yellow of wood without leaves:

Poplars:
7010-Y and in the depths 6002-R
(P 30.11.03),
6508-Y20R and in the depths 5500-N[4]
(P 30.11.03),
6810-Y20R and 2525-Y20R (R 24.12.03),
6005-Y20R (P 04.01.04),
5508-Y20R (R 4.01.04),

Willows:
Branches 7510-Y50R and trunks 8010-Y
(P 30.11.03),
8010-Y and 7005-Y50R (P 24.12.03),
8020-G90Y (R 24.12.03),
7010-Y10R (R 4.1.04 average data),
6005-Y20R (P 4.1.04),
7510-Y50R (P 4.1.04),

The reeds display lighter shades of ochre, close to yellow. They would, under natural conditions – if there were no artificial waves caused by vessels on the water, leading to more distortions – be clearly visible until June, among the new stalks shooting up by then. The extended reed area becomes almost imperceptibly bleached. Its colour value becomes lighter, less saturated and more yellow. The seeds in the brown panicles, which blossomed in September, mature now in November and December.

Reeds:
1820-Y10R (P 19.1.03),
4020-Y30R (P 30.11.03 average data),
2030-Y20R and panicles 6320-Y30R
(P 24.12.03),
4020-Y20R (R 24.12.03).

Anter (1996, p. 41) claims that during winter "the inherent colour of most material has a chromaticness of only about 10, or even less." I can confirm this. Completely colour-free shades are extremely rare in nature (one exception is mould), but in winter the view is utterly dominated by colours with weak saturation and chromatic values around the figure of 10.

The sum of the vegetation hues is approximately Y20R, which corresponds to the soil colour.

[4] In the NCS System "N" represents colour-free or neutral.

4.02 Winter with Snow and Ice

Heuckenlock Riverbank Vegetation (R)
Plate 2b:
Data from 26. and 28.1.2004

I have not devoted a picture solely to the Heuckenlock Panorama with snow on the ground, which I observed for example on 5.1.03. Since there was only a small amount of snow it did not cover the uprights reeds completely at any point; only on the trees was a clear desaturation of the colours evident.

Snow lying on flat surfaces corresponds predominantly with 1000-N (4.1.04), i.e. colourless. On branches it has a desaturating effect on the wood. Greenish-yellow algae or lichen on the trunks of poplars is perceived as green.

Poplars:
5005-Y20R (R 28.1.04),
algae areas on young trees 6020-G80Y
(RfV 28. 1. 04).
Willows:
7010-G95Y (R 28.1.04 average data).

Frost has the effect of creating icy edges around the reed stalks. The swell on the River Süderelbe, which is more pronounced as a result of the river traffic, moves the ice layer so that it acts upon the frozen stalks like a scythe. Therefore the common reed on the tideways, where there is less swell, remains in place until summer, while the majority of reeds on the banks of the Süderelbe are broken during winter and carried further inland by the high water and storm floods, along with other remnants of annual plants.

The basal rosette of the *Rumex aquaticus* (red dock) endures the winter under the lying reed and snow.

As early as 30.1.04 I discovered seedlings of *Ranunculus ficaria* (lesser celandine) developing beneath the snow layer, at sites free from lying reed and snow.

4.03 Pre-Spring

Heuckenlock Panorama (P)
Plate 2a:
Data from 10. and 31.3.2003 and from 31.3.2004

Heuckenlock Riverbank Vegetation (R)
Plate 3b:
Data from 5. and 22.3.2004

One of the most fascinating phenomena of the seasons' progress is the range of colour changes in trees and bushes which starts as early as the end of February, during the first warm days that herald spring. During the phase of mobilisation (Braun 1998) the buds do not only swell; their colour component increases, particularly the red. I have also discovered enhanced saturation in the branches of *Salix triandra* examined at close quarters. According to (Meierhofer & Roshardt 1959), higher anthocyan content functions as a protection against frost. In the excursion report I noted my first impressions upon arrival at Location 1 on 10th March 2003: "The brown is heavier."

Poplars:
7010-Y50R[5] (P 10.3.03),
5110-Y90R[5] (P 31.3.03),
6005-Y30R and 5510-Y30R (P 31.3.04),
Poplar branches 3020-Y30R and 4010-Y30R (R 5.3.04).

Willows:
6005-Y50R[5] (P 10.3.03),
6010-Y30R (P 31.3.03),
6015-Y (P 31.3.04),
willow branches 4020-Y30R, 4010-Y30R and 5020-Y40R (R 5.3.04).
Willow bark in light 3020-G90Y and in shadow 9005-G80Y / samples in light (R 5.3.04).

At Location 2, in areas frequently subjected to flooding (near the willow) a soft layer develops which consists of *Ranunculus ficaria* (lesser celandine), *Anthriscus sylvestris* (cow parsley), *Lythrum salicaria* (purple loose-strife) and Deschampsia wibeliana ("Wibels Schmiele").
In order to become photosynthetically active immediately, the leaves appear on the surface of the soil with a fully-developed leaf green colour.
Soft layer of green on soil: 4030-G40Y (R 22.3.04).
Rumex aquaticus also displays leaf green all year round. *Rumex aquaticus* (red dock): 4030-G40Y in light, and 7020-G40Y in shadow / sample in light (R 31.3.04).

[5] These strong reddish values are due to the fact that at this stage I was still employing the first colour atlas with a supplementary mask hole. Otherwise the observations would in all likelihood have been comparable to those in the following year Y30R (see 2.10).

4.04 Beginning of Early Spring

Heuckenlock Panorama (P)
Plate 3a:
Data from 4. and 13.4.2003 and from 9., and 13.4 2004

Heuckenlock Riverbank Vegetation (R)
Plate 4b:
Data from 31.3. and from 9. and 13 4.2004

At first the green tips of leaves emerge from the buds of the willows creating a “silver shroud”; it seems colourless rather than green and appears to float against the darker wood background, no matter how great the depth involved. When examined at closer quarters (0.5 metres) the previous year’s branches of the female willow at Location 2 matches 5040-Y, the bud covering 4040-Y10R, the leaf green 3060-G60Y and 2030-G60Y, while the “white shine” resulting from small bright hairs corresponds to 0020-G60Y (R 31.3.04).
Even after the first leaf surfaces have spread out at Location 2 (when seen from a considerable distance) the colour impression remains “floating”, between 6010-Y10R and 7010-G80Y, while for willows and poplars it achieves an overall average of 7010-G95Y. It is interesting that the yellow hues (G80Y to Y) are not perceived as yellow but as green. Biesalski, in his “Plant Colour Atlas according to DIN 6164” (1966), expresses it as follows: “When proceeding to darker values, No. 1 primrose yellow and No. 1.5 in particular become a clear olive green... while No. 2 becomes olive brown and No. 3 is transformed into a light and dark mustard brown.” (Beiheft p. 19).[6] Therefore the concept of green shifts towards the darker sector, to a certain degree, under the lighter yellow, even on colour charts with a single hue. Our tendency to perceive red or green rather than yellow is also demonstrated by the willows in the far left of the panorama (5015-Y20R and 5020-G90Y), which we see in nature as definite red and green rather than greenish yellow and reddish yellow.
With hindsight it is also worth remarking that the impression created by this landscape is that “it is green” – although only in the cordon of willows encircling the poplars does greenish yellow actually occur.

Dierschke (1981) writes: “Soon the first leaves appear and the forest, especially at the edges of the forest gradually take on a green sheen, moving gradually upwards from the ground.”

Poplars:
6010-Y20R and 6005-Y20R (P 9.4.04),
4010-Y and 8010-Y partially 2050-G80Y and 6525-G60Y (R 9.4.04).

Willows:
6010-Y and 6020-Y (P 31.3.04), top area 4010-Y (P 4.4.03), 3532-Y as 1. leaf green and green bushes 4720-G70Y and 4040-G90Y (P 13.4.04), partially 3030-G90Y (Panorama 9.4.04), Willows medium ground 5030-G90Y partially to 7010-G90Y (P 13.4.04), willows with branch areas 5020-G90Y and 8005-G80Y, trunks 7010-G90Y and 7020-Y and leaf surfaces 3030-G60Y and 4030-G70Y (R 9.4.04).

In the padded ground layer of *Ranunculus ficaria* and *Anthriscus sylvestris* the *Ranunculus ficaria* begins to blossom, while the leaves of the *Anthriscus sylvestris* vanish under the reed that shoots up; the *Anthriscus sylvestris* does not develop further here.

Padded ground layer:
5030-G40Y and near willows 6015-G40Y (R 31.3.04).

[6] The DIN hues correspond approximately to the following NCS hue notations:
DIN Nr. 1 - NCS G80Y
DIN Nr. 1,5 - NCS G90Y
DIN Nr. 2 - NCS Y
DIN Nr. 3 - NCS Y20R

4.05 End of Early Spring

Heuckenlock Panorama (P)
Plate 4a:
Data from 21. and 28.4.2003 and from 17. and 25.4.2004

Heuckenlock Riverbank Vegetation (R)
Plate 5b:
Data from 25.4.2004

On 17.4.04 I noted my first impression at Location 1: “Green veil covering broad area as far as... poplars in middle ground.”

The greening up of the willows is in full swing.

High colour saturation is produced by the light shining through the young leaves. The willow at Location 2 is female, but opposite it (not visible here) there is a male specimen that blossoms in yellow to 1050-G90Y (close to riverbank vegetation 17.4.04). The poplars are greening at different times for each species. The very young poplar leaves are still reddish, matching 7030-Y30R and 6040-Y40R when they emerge from the buds, upon close examination.

Poplars:
6010-Y40R, 5508-Y30R, 4020-G90Y and 5310-Y (P 17.4.04);
6010-Y in the background, with fully-developed leaves 3030-G50Y, 6040-G50Y and 7030-G50Y, wood 6010-Y (R 25.4.04).

Willows:
5020-G80Y and 3030-G80Y and right at low level 33020-G60Y and 4010-G50Y, willow trees in the middle 3035-G60Y (P 17.4.04),

At Location 2 the luxuriant growth of the *Rumex aquaticus* in the foreground of the picture is impressive.

Over towards the reinforced river bank (to the right of the picture) the *Caltha palustri*s (marsh marigold) is blossoming. Its yellow is somewhat warmer (less green) than the *Ranunculus ficaria*, which blossoms earlier.

Now the common reed (*Phragmites australis*), which will dominate the next phase, starts shooting up among the herbaceous plants.

Reeds:
3040-G50Y and in the shade 5040-G40Y (R 25.4.04).

At Location 1 the overall colourfullness of the landscape (the sum of the hues) now crosses over into the yellow sector of the colour circle, while at Location 2 this line was already crossed, between the beginning (Plate No. 4b) and the end (Plate No. 5b) of early spring.

4.06 High Spring

Heuckenlock Panorama (P)
Plate 5a:
Data from 20.5.2003, 29.4 and from 16.5.2004

Heuckenlock Riverbank Vegetation (R)
Plate 6b:
Data from 16 and 31.5.2004

The first impression I had at Location 1, as I noted down in my observation report, was: “What on earth are these colours? Nobody is going to believe this! What a patchwork of colours!”
Tüxen (1986) remarked that his beech forest presented “an incredibly unbalanced picture of revolutionary change during the first days of May: the first tops of the beeches are already bright green, while the late developers are still hesitating. Individual trees on all sides are becoming green, while others remain for a day or two clothed in a curious mosaic of violet brown and cautious green.” The poplars in blossom are a striking red against the fresh green ones (P 29.4.04).
At the end of high spring the landscape achieves the greatest intensity that occurs in the realm of green during the entire year. People admire the “amazing light” in this season and overlook the plant development processes which they have to thank for the experience of this fresh-seeming intensity of green. The intense colours in the hue areas G60Y and G70Y actually make some elements of 5020-G40Y seem like cool green. The colour saturation of the female willows suddenly recedes (with a browning effect) when they bear fruit.

Poplars:
5020-Y30Rseems red, around 3030-G80Y, 3020-G50Y and 4050-G50Y; in the depths the woods appear to be 5040-Y50R with 4020-G70Y, 5010-G70Y and 5010-Y. The two separate poplars on the right match 7010-Y and 6510-G40Y (P 29.4.04); 4440-G70Y, 6035-G70Y, 7030-G70Y, 8010-G50Y, 5040-G50Y, 7030-G50Y 50320-G40Y and 6040-G60Y (P 16.5.04); 3030-G50Y, 7020-G50Y, 7030-G50Y and with light shining through 1070-G60Y (R 16.5.04).

Willows:
3342-G42Y (P 20.5.04), 7030-G50Y, leaves against sunlight 1060-G60Y (R 16.5.04).

City-dwellers accustomed to the lush blossoming vegetation in parks during May, are surprised by the ghostly dry reeds which dictate the colourfulness of the reeds until June. In the panorama the reed shoots among the dry reeds is not yet noticeable; Location 2, which has been “cleared” by swell and ice during winter, is dominated by the young reed (*Phragmites australis*), which now shoots up in a powerful spurt of growth. The leaves have an intense greenish-yellow light when the sunlight shines through them.

Reeds:
3020-Y10R (P 16.5.04); 1040-G60Y, 1045-G50Y and closer, with light shining through, 1080-G60Y, 0070-G70Y, in bright light 3030-G40Y and in shadow 7030-G40Y (R 16.5.04).

At Location 2 *Anthriscus sylvestris* (cow parsley) begins to blossom at the bottom of the poplars, covering the ground (16.5.04), while its successor, the equally umbelliferous *Chaerophyllum bulbosum* (turnip-rooted chervil), is already coming to the fore. “White flowers are very frequent ... their inherent colour is generally of a rather yellow hue,” (Anter 1996, p. 35). Their blossoms do unquestionably appear white upon normal examination. Dierschke (1981, p. 180) calls the end of high spring the anthriscus phase, in reference to *Anthriscus sylvestris* (cow parsley).

Upon close examination the blossoms have greenish-yellow white leaves 0005-G80Y and 2005-G80Y in the shade (R 31.5.04).

4.07 Early Summer

Heuckenlock Panorama (P)
Plate 6a:
Data from 22., 27. and 29.6.2003
and from 14. and 26.6.2004

Heuckenlock Riverbank Vegetation (R)
Plate 7b:
Data from 14. 6. and from 26.6.2004

In the tree level the hue now becomes unified at approximately G50Y, moving slowly towards its annual target (G40Y). Rather than the high degree of colour saturation during high spring, at the time of the summer solstice approaches the striking aspect is the considerable variation in lightness.

Poplars:
8020-G50Y, 7030-G50Y (P 26.6.2004); 1030-G50Y, 4050-G50Y, 4060-G40Y und 9505-G50Y (R 26.6.04).

Willows:
4020-G40Y, 6030-G50Y(P 14.6.2004);
5040-G50Y (R 14.6.04).

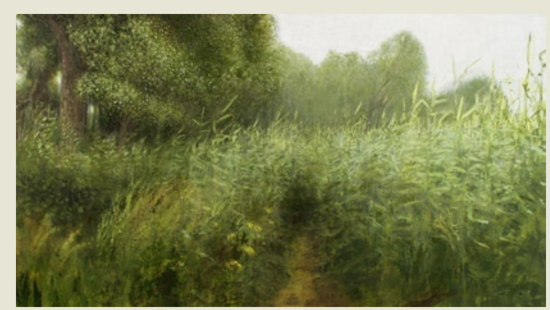
Now the young reed (*Phragmites australis*) is also visible at Location 1. It first emerges from the previous year's dry reeds at open areas around the tideways, transforming the reed beds into a carpet with a mottled bright green and pale beige effect, while at Location 2, where it grows virtually without hindrance, it has already attained a height of over 2 metres.

Reeds:
Dry 4010-Y20R and fresh 3040-G40Y (P 14.6.2004); 1040-G40Y, in the shade 5040-G40Y, light shining through 0070-G70Y and 0070-G80Y, in direct light 0040-G70Y (R 26.6.04).

The *Rumex aquaticus* (red dock) is blossoming. Here the light mixing from yellow-green and red-brown to mustard ochre yellow was visible (for values see 2.14 on partitive light mixing!). The *Scrophularia nodosa's* (common figwort) is blossoming, hardly apparent from a distance, while *Senecio aquaticus* (marsh ragwort) blossoming in yellow and *Chaerophyllum bulbosum* (turnip-rooted chervil) in “white” (see 4.06 *Anthriscus*!) have greater influence on the aspect.

Senecio aquaticus (colour development of the blossom as it opens) upon close examination: Unopened from above 2570-G70Y, as it opens 1270-G80Y, green inflorescence 3050-G60Y, opened corolla 2070-G90Y and the open blossom petals 0080-G92Y (R 26.6.04).

The *Calystegia sepium* (hedge bindweed) climbs up the reed, the *Agrostis gigantea* (Redtop) blossoms and the *Rubus Caesius* (European dewberry) on the left of the picture is starting to blossom. The dying *Anthriscus sylvestris* displays the first deep red anthocyanin hues of the year (7020-R10B und shine 3010-R10B). The *Salix viminalis* (basket willow) also has the first yellow leaves, now at the time of the summer solstice.



4.08 High Summer

Heuckenlock Panorama (P)
Plate 7a:
Data from 25.7.2004

Heuckenlock Riverbank Vegetation (R)
see 4.09 (Late Summer)

"... the picture is dominated by vegetative green ... " (Dierschke 1981, p. 182)

The typical leaf green of land plants employing photosynthesis, now common in numerous locations, is composed of chlorophyll a and b, and of carotenoids. This distinctive colour is due to the large amount of light – from the main overlap areas of the spectrum between sky blue and warm sun yellow, which appears in the midday sun – is repelled by the green of the plant to protect it from becoming too parched and hot; thus the light is reflected and becomes visible to us. On the other hand, the plants take advantage as far as possible of the maxima of both spectral areas – from the orange sunlight at sunset and the blue light of the sky after sunset or in the shade – and absorb this light (s. Fig. 9). The inherent colour of leaf green has been described by Anter (1996, p. 27) as a concentration of values focussed on approximately 4842-G45Y (see Fig. 10). This colour, when observed in purity and without any blurring, is dark and clear; i.e., in relation to its darkness it has a high saturation. Runge's concept of green is derived from this (see footnote [1] to 2.08, p. 9). The most distant poplars in the depths of the picture now, due to atmospheric blurring, display weakly saturated values more blue than G40Y.

Poplars:
5020-G50Y (standardized), 6210-G40Y and in the depths 7005-G20Y (P 25.7.04); 3030-G40Y (R 25.7.04).

Willows:
4030-G60Y and 7020-G60Y (P 25.7.04);

Now the reed beds at Location 1 display a uniform green hue.

Reeds:
3030-G40Y and 4030-G40Y (P 25.7.04);

It is worth noting that the bluest green present in the overall colour of the landscape – at places G20Y, in terms of the sum of the hues G40Y – is not attained at the time of the summer solstice but instead four or five weeks later, at the start of late summer. This can be explained with reference to the delayed effect of atmospheric

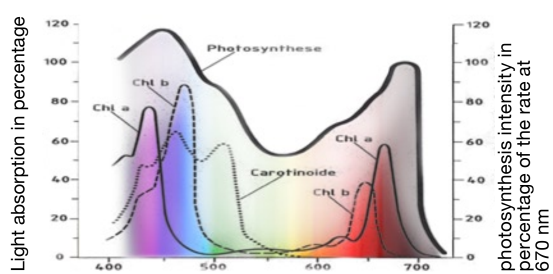


Fig. 9: Chlorophyll absorption spectrum and photosynthesis intensity according to Lüttge Kluge and Bauer: Botany

and earth warming. First comes the light and only later the warming effect, bringing with it the maximum green in the plant world.

Now the purple-red, the physiological complimentary colour of plant green appears in the blossom of *Lythrum salicaria* on the herbaceous vegetation and in the *Epilobium hirsutum* at the edge of the poplar forest.

Lythrum salicaria (purple loose-strife):
Underneath, not yet opened, 5040-R10B and the blossom itself 2050-R40B (R 25.7.04).

Epilobium hirsutum (great hairy willow herb):
Blossom petals 1060-R30B (R 25.7.04).

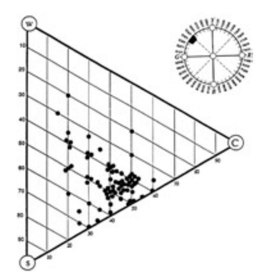


Fig. 10: The inherent colour of leaf green, according to Anter, (1996, p. 27)

4.09 Late Summer

Heuckenlock Panorama (P)
Plate 8a:
Data from 11., 26.8.2003 and from 4.8.2004

Heuckenlock Riverbank Vegetation (R)
Plate 8b:
Data from 4.8.2003 and from 4.8.2004

The exceptionally dry high and late summer in 2003 caused several plants which were completely exposed to the sunlight to become prematurely yellow.

Poplars:
5020-G60Y, 5030-G60Y, 2010-G40Y, 7020-G40Y and 9010-G40Y and a yellow 2050-Y (P 11.8.03).

Willows:
5030-G35Y, with light shining through 2060-G50Y and in the shade 6020-G30 (R 4.8.04).

The panicle emergence begins in the reed. In the reed beds at Location 1 exposed directly to the sunlight a browning effect due to the emerging panicles is apparent – they blossom as early as 26.8.03 – while the reeds at Location 2, which are more sheltered from the light, develop more slowly. Here, however, we see that the plants become brown beginning from underneath out of the shadow.

Reeds:
Green 5530-G40Y, panicles 5015-Y30R, overall 7030-G50Y (P 26.8.03); bright direct light 2030-G30Y, shadow 6030-G30Y, yellow ones with light shining through 0070-G70Y, underneath browned in the light 0020-Y10R, 2030-Y20R and 4030-Y (R 4.8.04).

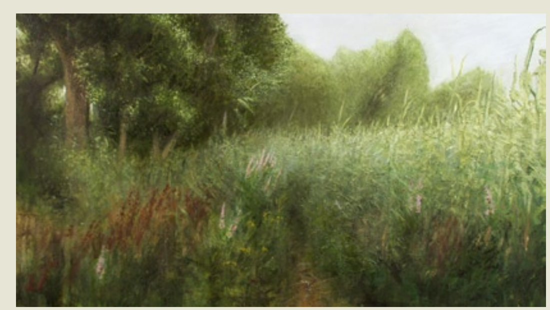
During this period it is clear that the sun's rays have an accelerating effect on the developmental process, recalling the ancient concept of "cooking" (Pepsis)[7], which suggests that "... those parts facing the sun and the warmth become strongly coloured," (Theophrastus after Goethe 1992, Volume 4, p. 53).

In the herbaceous vegetation at Location 2 a number of plants have now traversed the yellow sector of the colour circle and are moving into the red.

Beside the purple-red blossom of *Lythrum salicaria*, *Rumex aquaticus* becomes brown in the shade or red in the light.

Rumex aquaticus:
Fading 70% 4545-G60Y, 25% 4030-Y and 5% 6040-Y20R browning to 7030-Y30R and (stalks) 5050-G79Y or becoming red 6025-Y40R (average), 7020-Y30R and stalks 4060-G60Y.

[7] In his text "de coloribus" ("On Colours"), in the historical section of his „Theory of Colour", this is how Goethe translates the term from the ancient text whose authorship is disputed between Theophrastus, Aristotle and a third writer, according to Wöhrle (Aristotle1999), while Wöhrle himself translates it as "maturing".



4.10 Early Autumn

Heuckenlock Panorama (P)
Plate 9a:
Data from 19.9.2003

Heuckenlock Riverbank Vegetation (R)
Plate 9b:
Data from 14.9. and from 19.9.2003

The Indian summer is a regular climatic occurence which is repeated each year (singularity). It brings stable areas of high pressure.

Some twigs of the poplars at Location 2 now display yellow leaves. In the willows the hue G70Y becomes uniformly dominant now.

Poplars:
6040-G50Y, yellow leaves 2060-G80Y (R 14.9.03);
high 6525-G70Y, yellow 3030-G80Y (P 19.9.03).

Willows:
4040-G70Y, 6030-G70Y and in shade 7020-G60Y (P14.9.03); 2055-G70Y and 7020-G70Y (R 14.9.03).

The reed blooms and causes the reed beds at Location 1 to divide into a reddish and a greenish section. Now individual plants that stand in the sun at Location 2 are also blooming in the reed bank.

Reeds:
Green part 4060-G70Y to 4040-G80Y, red part 3020-Y80R and 3020-Y70R (P 14. 9.03).
Panicle at close quarters: in bloom 8020-Y60R and 1005-Y50R and faded 5010-Y30R, 7010-Y30R and 5020-Y40R (P 14.9.03).

The *Lythrum salicaria* is faded and, at places that gain a great deal of light, seems very red (partly 5060-Y90R R 14.9.03), while the *Calystegium sepium* becomes yellow in the light (1565-Y with green parts 3050-G60Y R 14.9.03). The Aster tradescantii blossoms. “The floodplain forests experiencesa final blossoming phase.
In the beginning of this phase the *Humulus lupulus* blossoms inconspicuously . The yellow of various neophytic herbaceous plants (*Helianthus, Rudbeckia, Solidago*) is more long-lasting. ... In general the colour aspect is formed less from blossom and more from ripening fruit,” (Dierschke 1981, p. 184).

A time during which the sum uf the hues moves, not quickly but very uniformly and with a clear direction, towards the yellow.

4.11 Beginning of High Autumn

Heuckenlock Panorama (P)
Plate 10a:
Data from 2.10.2003

Heuckenlock Riverbank Vegetation (R)
Plate 10b:
Data from 2., 11., 14. and from 18.10.2003

Now the yellow poplars at Location 1 genuinely achieve the NCS hue Y (Yellow), while in areas less exposed to the sun the hue G70Y still predominates. However, the atmospheric blurring permits the hue G30Y to appear at depths.

Poplars:
Yellow 1040-Y, 5020-G70Y, 2040-G70Y and 4010-G30Y, and even 6010-B90G (P 2.10.03); 1070-Y, 2030-G60Y (R 11.10.03).

Willows:
6020-G70Y (R 11.10.03).

Reeds:
Light shining through, yellow 0880-G90Y, green 1080-G60Y, in direct light 5020-G50Y, 8005-G50Y and yellowing with 4040-G50Y.

Herzmann (1962, p. 11) explains: “In autumn rapid destruction of the chlorophyll takes place, though the quantities had already been severely reduced. The carotinoids contained in the leaves do not alter so quickly, and in conjunction with flavone and anthocyanin (i.e. yellow or blue and red colour elements) this results in the bright autumnal colouring of the foliage. ... The change in colour that takes place as the fruit ripens is similar in process: the yellow colour of the banana caused by carotinoids is in fact also present in unripe fruit, but it is covered by chlorophyll.”

“What was previously green adopts, when it ripens, the colour that accords with its nature,” (Theophrastus after Goethe 1992, Volume 4, p. 54). Singular elements move far into the red sector or even beyond (anthocyanin with R10B or R20B), while the layer on the green side is limited to a movement towards blue up to G30Y or B90G at the most. High autumn displays a breadth of colour (a spread of hues across the spectrum) unlike that found during any other time of the year. Due to the various speed with which individual elements progress, autumn reveals a considerable section of the natural spectrum displayed by its plants, which can now all be seen simultaneously.

Between Plates No. 10 and 11, both for the panorama and for the riverbank vegetation of Heuckenlock, the overall colour values of the landscape now venture into the yellow sector.

4.12 End of High Autumn

Heuckenlock Panorama (P)
Plate 11a:
Data from 23.10.2003

Heuckenlock Riverbank Vegetation (R)
Plate 11b:
Data from 23.10.2003

The colour transformation now takes place very rapidly, analogous to first greening in early spring. The willows lose their leaves earlier than the poplars. The willow at Location 2 is already almost completely denuded of leaves. Fallen poplar leaves forma loose covering on the ground and, to some extent, on the reeds.

Poplars:
5030-G90Y, 6020-Y20R, rechte 3050-G90Y, minimal remains of yellow 1060-Y10R (P 23.10.03); tree-tops overall 2050-Y, fallen leaves 2060-Y, 2040-Y, dry fallen leaves 2030-Y30R and 4030-Y30R (R 23.10.03).

Willows:
6030-G90Y, 3040-Y, 7010-G90Y (P 23.10.03); 4010-Y, green patch 7020-G70Y (R 23.10.03).

In the exposed reed beds at Location 1 – in contrast to the reeds at Location 2, which are largely sheltered by trees – the browning of the common reed is already completed. The reed in the riverbank vegetation remains green at the top for longer.

Reeds:
6020-Y20R and 0425-Y40R the panicle, now with a light appearance (P 23.10.03); 2020-G40Y, 7010-G40Y, from below, drying towards above 2030-Y20R (R 23.10.03).

It is noticeable that the leaves of the *Rubus Caesius* become brown and then rot on the ground without yellowing. This is possibly an effect of their anthocyanin to ward off the cold. Herzmann (1962, p. 11) explains the chemical aspect of the browning of green leaves: “Even weak acids destroy chlorophyll with browning, and then pheophytin is created, which contains no magnesium.”

Lythrum salicaria becomes yellow with a ‘heavier’ yellow of 3050-Y10R. With high colour saturation it serves as an advance indication of the sum of the hues to be found in the subsequent late autumn. The warm yellow Y10R provides the accent and the direction of the autumnal movement, in the same way that G70Y indicates the development of the young foliage in high spring.

4.13 Late Autumn

Heuckenlock Panorama (P)
Plate 12a:
Data from 2., 10. and 15.11.2003

Heuckenlock Riverbank Vegetation (R)
Plate 12b:
Data from 2., 10. and 15.11.2003

Whe I arrived at Location 1 (2.11.03) I noted my initial impression: “Amazingly red already!”
The defoliation of the tree level is almost entirely complete. Singular willow trees still match Y10R, which then moves to Y20R.

Poplars:
4010-Y10R, at parts in the light on the right 1050-Y (P 2.11.03); 4020-Y10R, 5020-Y10R (R 2.11.03);

Willows:
Left 6020-Y10R, 7020-Y50R. Bushes 3060-Y10R (P 2.11.03); Salix viminalis (common osier) 2040-Y10R (R 15.11.03).

The seeds in the reed do not ripen until winter, and the reeds continue to bleach throughout the winter.
Now the reeds at Location 2 are predominantly dried (“cooked”).

Reeds:
3020-Y30R, 4020-Y30R and 5020-Y30R (P 10.11.03); yellow-green, light shining through 2060-G70Y, in upper areas 0050-Y50R and 0040-Y, in direct light matt 2015-G50Y, stalk green 5030-G40Y, dry underneath 2020-Y20R and 6010-Y20R (R 2.11.03), bleaching to 1030-Y20R (R 15.11.03).

The robust leaf-green *Urtica dioica* (stinging nettle) now also assumes a more yellow green 5530-G60Y (R 2.11.03).

Rubus Caesius:
Isolated anthocyanin-red leaves 3020-Y70R and 6040-Y70R, yellow leaves 3040-G90Y (R 15.11.03).

Until the end of November the colourfulness of the vegetation returns to its winter state.

5. Summary and Outlook

5.1 Summary of Colour Observations in Heuckenlock Nature Reserve

Over a period of two years colour observations were made regularly (approximately every 10 days) of the reeds situated in the glacial valley of the Elbe River and of the tidal softwood forest in the Heuckenlock Nature Reserve. During daylight conditions natural colours were coloroscopically compared with standardised colour samples of the NCS System, at location 1 (panorama) with an observation distance of 100 to 1000 meters at 14:00 Central European Time and at Location 2 (riverbank vegetation) with an observation distance of 1 to 100 meters at 15:00 Central European Time. The observations suggest fundamental exemplary statements about the colour changes during an annual cycle in natural landscapes within the moderate climatic zones, determined by the seasons.

The winter colour shade of the vegetation in Heuckenlock, which is predominantly very uniform - Y20R (wood brown) – and which also corresponds to the hue of the soil (in beech woods Y40R), is transformed in early summer to a similarly dominant chlorophyll green hue - G40Y (leaf green) – which is determined by the relationship between chlorophyll and carotine pigments characteristic of land vegetation taking part in photosynthesis. In addition to the two extremes of summer and winter colours, during the transitional periods in between, pendulum movement across the yellow sector of the colour spectrum takes place (see Fig. 11). In spring this pendulum movement occurs within a dramatic proliferation of yellow-red and yellow-green hues (“a patchwork of colours” according to Tüxen), which produce yellow only as a mixture of their hues. Yellow is also the dominant blossom colour during this period. The origin of new vegetative life in spring in G90Y (yellow/green yellow) with the first green up can also be detected from a distance.
The highest saturations of landscape’s overall value occur in high spring and high autumn (G70 and Y). The hue Y (yellow) is in hight autumn also the sum of hues in an additional colour mixture. In high autumn the spectrum of natural colours in its widest range is revealed – from the mid-green G30Y that appears cool in nature to cold red tones R20B only visible in details.

When projected on a seasonal cycle, the main colour change periods of the landscape as a whole (passing through the yellow sector) are found in early spring and high autumn (see Fig. 12). The passage of the yellow sector forms a yellow axis during the year. In 2003 this followed the equinoxes with a delay of approximately 3 weeks.
This study suggests the possibility of a colour-oriented phenology (colour phenology) of Central Europe.

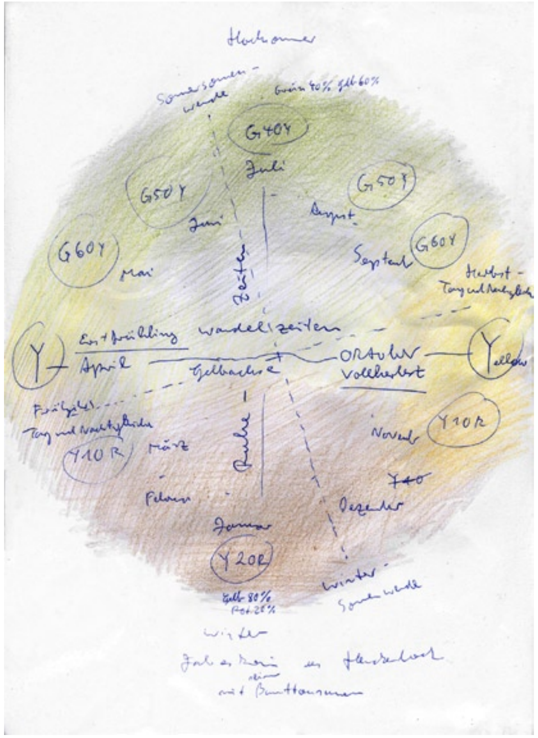
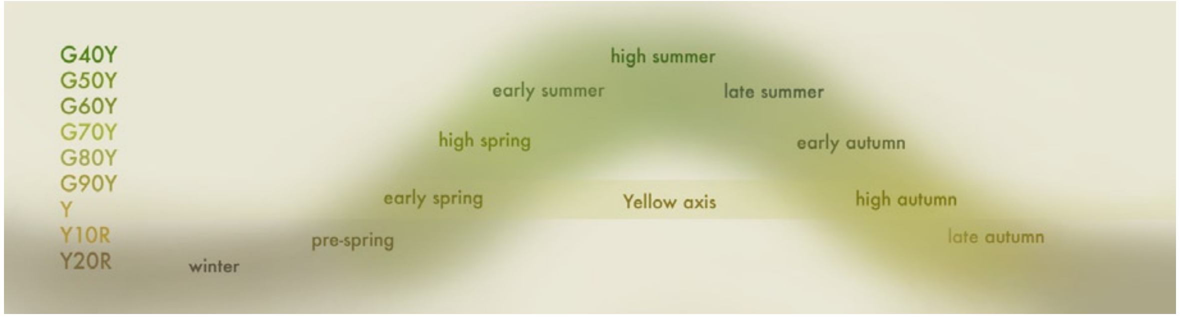


Fig. 12: *Seasonal Cycle of Heuckenlock*
2004
ballpoint pen and coulored pencil on paper
21 x 29.7 cm

Fig. 11: Pendulum movement of the sum of hues in Heuckenlock



5.2 Outlook

Since I became involved with this subject I have come to feel increasingly amazed that such a fundamental occurrence as the change in colour of vegetation through the seasons is virtually unknown, even to people who are active in the arts and have been educated in aesthetics, and that the subject has never been methodically studied – though it has dominated our environment and that of our ancestors for thousands of years. Greater understanding of the processes involved could be achieved by colour phenological studies that also draw on phytochemistry and plant sociology. In the realm of aesthetics this could provide the opportunity to establish an independent theory of natural colour. This is how Roßmüller (according to Salisch, 1902, p.17) explains natural beauty: "It is not that the tree and the plant world has been created according to man's taste, but that the taste of mankind has gradually moulded itself to them." We can therefore regard landscapes close to nature as a basis of our culture, preceeding historical time. And thus the botanist Reinhold Tüxen postulates a harmony in plant associations close to nature: "Like all natural organisms – i.e. those that have grown or become organic – plant associations as such are entirely harmonious, in terms of colour, form of proximal existence and also the temporal sequence of their rhythmic expressions of life," (1961, p. 67).There are numerous traditions that we could pick up once more, like a dropped thread, and link to the theory of natural colour. One would be Goldschmidt's theory of main sun chord, developed in 1901, which constructs harmonies around a yellow centre adjusted to the dominance of yellow in nature. Then there is Guckenberger's colour concept for a city, using Pfullingen as an example (1990), which he derives from landscape colour. As long as there are still nature reserves, we can learn to read "the meaning of colours in nature" that Steffens (1810) has in mind. And what was not possible for Steffens is available to us, thanks to the colour systems developed in the 20th century. This is also how we can understand Rudolf Steiner's visions in "The cycle of the year as breathing-process of the Earth and the four great seasonal Festivals":
"Today the force must reawaken in man, to unite something spiritual with the sensual appearance of the world... It must be possible to grasp the autumnal Michael thought as the blossom of the Easter thought." [8]
The yellow we could read in spring as the sum of landscape's hues, appears in the yellow shining autumnal leaves as the chlorophyll declines sensually and visibly.

Plate 13: *Schöner von Boskoop*
2004
Acrylic on wood, 30 x 30 cm

[8] „Heute muss wiederum die Kraft in dem Menschen erwachen, unmittelbar mit der sinnlichen Erscheinung der Welt etwas Geistiges verbinden zu können ... Gefunden werden muss die Möglichkeit, den Herbstes-Michael-Gedanken als Blüte des Ostergedankens zu fassen."
(Rudolf Steiner, „Der Jahreskreislauf als Atmungsvorgang der Erde und die vier großen Festeszeiten", 1980, S. 39)

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Plate 14: *Early Spring and HIgh Autumn*
2004
Acrylic on wood, diameter 30 cm

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2004
Acrylic on wood, diameter 30 cm

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2004
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see pdf also on the CD.

please bear in mind that colour rendition on screen and in print can deviate strongly from the original.

the CD-label shows a detail from the painting:

Entwurf Jahreskreis (Draft Year Cycle)
2004
acrylic on wood,
22,4 x 21 cm

compiled for the exhibition **Farben im Jahreskreis** WESTWERK. October 2004
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