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A Model for Scientific Research

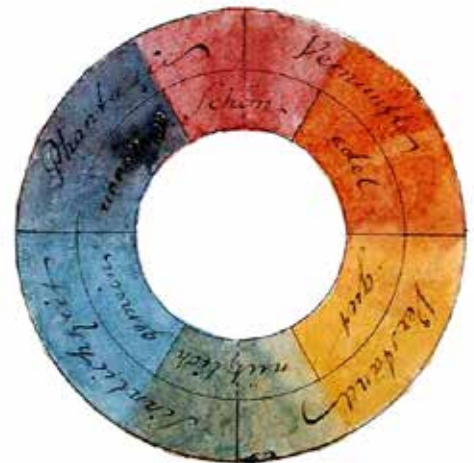
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A Model for Scientific Research

A Consideration of Goethe's Approach to Colour Science

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Your long work with colours and the seriousness with which you treat them should certainly be rewarded with much success. Since you can, you must establish a model of how to treat physical research; and such an undertaking needs to be didactic with respect to both its treatment and its profit for science.

Schiller (Goethe and Schiller, 706)

1. Introduction

In this quote from his letter to Goethe, we see that Schiller had hoped for, and even encouraged, a methodologically exemplary work from Goethe's colour studies.

Unfortunately he was no longer alive to witness the final outcome, Goethe's *Farbenlehre*, published in 1810, five years after Schiller's death (Goethe 1982; 1995).

In the present paper we explore a possible meaning of Schiller's expectation and consider the *Didactic Part* of the *Farbenlehre* as a model for a Goethean science of inorganic nature. The very title "Didactic Part" indicates that not just the content but also the *manner of presentation* was consciously chosen. We investigate this idea using the structure of the *Farbenlehre*, which Goethe presents in a specific sequence of six sections.² In his introduction to Goethe's scientific works, Rudolf Steiner dedicates an entire chapter to this

1. This is a revised English version of the article: "ein Muster..., wie man physikalische Forschung behandeln soll...", *Elemente der Naturwissenschaft* 100 (2014): 152–171.

2. Gögelein emphasised a different aspect in his investigation of the structure of the *Farbenlehre*. Among other things, he discusses to what extent the *Farbenlehre* can be understood "as symbolism of the process of attaining insight" (Gögelein, 149ff). A series of works on the philosophical basis of Goethe's scientific works and the problems concerning the theory and history of science arising in that context can be found in Amrine et al. and Seamon & Zajonc. These collections contain works that follow and further develop Goethe's scientific method in different areas, especially biology. Works that are limited to the fields of optics can be found in Grebe-Ellis & Theilmann.

structure titled “The System of Goethe’s Colour Theory”, although he mainly addresses the first three and the sixth sections. He concludes:

Thus, Goethe advances from observing color as an attribute of the phenomenal world to a study of the phenomenal world itself as it appears with this attribute. In his section on the *sensory-moral effects of color* he then finally proceeds to the observation of the higher relationship between the colored physical world and the world of the human soul.

This is the rigorous, strict path of science—going from the subject as condition back to the subject as it finds its satisfaction in and with the world. The impulse of the age that led to the architecture of Hegel’s whole system is obvious in this path moving from subject to object and back again. (Steiner 2000, 183)

We attempt to show how the first stages of Goethe’s work, found in the first three sections, lead to a “material” science, as is the case in conventional scientific approaches. However, Goethe does not stop there but adds three further stages. We believe that the six sections of the *Farbenlehre* demonstrate that Goethe was able to approach his topic from six different perspectives. Thus one characteristic of Goetheanism is a “multiperspective” approach that is only made whole through the different points of view. This becomes clearer if we treat the final subsection, “Allegorical, Symbolic and Mystical Use of Colour”, as a nascent seventh section whose content Goethe only hints at, namely a kind of meditative approach to colour.

2. The Descent into “Matter”

The desire for knowledge first stirs in man when he becomes aware of significant phenomena which require his attention. To sustain this interest we must deepen our involvement in the objects of our attention and gradually become better acquainted with them (Goethe 1995, 163)

Thus Goethe begins his introduction to the *Didactic Part*. According to this, scientific activity can be kindled by everyday experiences in the world: looking out of the window or going on a walk in the fresh air on a nice Easter Sunday. This is followed by a transition from a fortuitously seen phenomenon to an intentionally created phenomenon in an *experiment*—scientific activity starts with the experiment. In the first three sections of the *Farbenlehre* Goethe describes a plethora of different groups of experiments in a particular order.

Physiological Colours

Goethe begins with the simplest of experiments: looking at a coloured object and observing the effect. The result of this experiment is that the perception of a coloured object is followed by the perception of a complementary coloured afterimage of the object.

The crucial difference between the experiment and an everyday experience is that the conditions for the appearance of colours are intentionally and consciously created in an “experimental setup”. A further difference from everyday experience is that, for the experiment to be successful, the observer must have a certain level of awareness or attention: they must focus on the object for a specified time and suppress the urge, which immediately arises, to let their gaze wander over the object and the surrounding environment.

Changing the conditions of the experiment, e.g. the form or colour of the observed object, also changes the results according to a lawfulness which can be determined through extensive variations of the experiment.

As Goethe notes, experiments of this kind satisfy a criterion of scientific experiments: they can be created at any time and are thus repeatable. Anyone can carry out these experiments anytime and anywhere if they employ the necessary diligence.

A possible objection might arise that for a given colour different observers may see an afterimage with a slightly different colour. However, since the *eye of the observer itself is part of the experimental setup*, this does not change the objectivity of the results: the differences correspond to the slightly different properties of each observer's eyes and thus are part of the variations of the experimental setup. Since Goethe did not use the title "individual colours" but "physiological colours" for this section, we can assume that he was aware of this possibility and approved of the generalization from the individual to the universal case. As Wilson and Brocklebank have shown, the colour of the afterimage is closely and systematically related to the corresponding complementary colour for additive colour mixing (Wilson & Brocklebank).

Physical Colours

Goethe does not, however, move on to introspective observations of the objects under consideration. Instead, he transitions to optical experiments in which the observer's eye plays a diminished role in the experimental setup. He thus takes the path which has been followed by the sciences for centuries, i.e. the observer becomes more and more removed from science.

Goethe proceeds to describe increasingly complicated experiments from various areas of optics. He calls colours that arise in colourless conditions "physical colours". He begins with colours of the cloudless atmosphere — the blue of the sky and the colours of sunrise and sunset — and the appearances due to refraction. These are followed by corresponding experiments with prisms, diffraction colours of microscopic structures and lastly interference and polarization experiments.

Goethe's experiments with physical colours, which occupy the largest portion of the *Didactic Part*, cover nearly all the colour phenomena known in his time. He carried them out using the technological means of his day and acquired a large collection of apparatus with which he not only repeated the experiments described in the literature but often varied or extended many of the parameters. Although it has been claimed otherwise, Goethe was definitely not adverse to using technology.³

Common to all physical colours is that they are not produced by the observer's eye but rather by the physical properties of the experiment. They belong to outer nature as appearances. Hence, without exception, they can all be reproduced such that the observer's eye is no longer part of the experimental setup. Goethe implements this detachment and often replaces the human eye as the imaging instrument of vision with an imaging optical element or "technical eye" (Goethe 1995, §299–305). This is consistent with a shift from what Goethe calls "subjective experiments", such as looking through the prism at a

3. After the publication of the *Farbenlehre* in 1810, Goethe continued experimenting until his death in 1832, and maintained a keen interest in new scientific reports and discoveries of his contemporaries. Several critics of the *Farbenlehre* attribute to Goethe a negative attitude towards technical experiments or technology in general and base their claims on different passages (e.g., Carrier). However, Goethe's reservation refers to an unreflective handling of the results of observations gained through the use of technical devices. For example, in *Wilhelm Meisters Wanderjahre* Goethe's Wilhelm says that a "higher culture" is needed to get the right picture of the disproportionately close image seen through a telescope (Goethe 1987, 183). Other passages to which Linnemann calls attention indicate that Goethe had a positive relationship with many technical achievements of his time and even tried to introduce them in the different institutions where he worked in Saxe-Weimar (Linnemann).

contrast, to what he calls “objective experiments”, such as projecting a contrast through a prism onto a screen.

Physical colours, which are characterized by Goethe as “nascent”, do not exist as substances, but are transient and vanish without a trace as soon as the experimental conditions for their appearance are no longer fulfilled. However, they can all be detected and verified technically, e.g., photographically, or spectroscopically as characteristic intensity distributions. They have a factual nature in the observed world.

Chemical Colours

Goethe understands “chemical colours” to be the colours of objects, pigments and dyed materials. He begins by looking at the colours produced by tempering steel as a kind of transition from physical to chemical colours. For Goethe, understanding always arises from following the process of how an appearance arises. With coloured substances, however, this can be limited if one is not able to penetrate complex areas of chemistry. Goethe is able to follow this process to a certain degree with the influence of acids and bases on plant juice colours. He then describes the colouration of metals produced by chemical reactions and finally the colours in the different realms of nature. He concludes the section with a few paragraphs on chemically produced variations of refraction in glass. In the final paragraph he mentions how desirable it would be if his research on chemistry, for which he can only give “rough indications”, could be worked on by chemists in the future “in a general way that is consistent with science as a whole” (Goethe 1995, §687).

3. The Bottom of the “U”

As the physiological colours are, so to speak, facts of perceptual processes and the physical colours are facts of observable physical processes, we could say that the chemical colours are facts of matter, as they exist as properties of substances in the external world. Thus, the first three sections of the *Farbenlehre* “descend” from perception into a material science of colour. This is equivalent to a narrowing of the natural diversity of phenomena through the scientist’s experimental apparatus and an increasing control of the conditions under which these phenomena appear. This narrowing occurs even with physiological colours through the attention or awareness required by the observer. In this respect, the *Farbenlehre* does not differ from the usual procedures in science.

However, even though Goethe conducts physical and chemical experiments using apparatus, he takes utmost care not to describe any phenomenon partially or in isolation. In particular, he varies the conditions within an experiment as extensively as possible in order to prevent a phenomenon from being reduced to a partial phenomenon. Clearly, Goethe did not see a problem in an experimental treatment *per se* of the arising of colour. Rather, such a treatment becomes problematic only when a partial phenomenon is observed and then accorded more significance than other partial phenomena.

Goethe’s prismatic experiments are well suited to illustrate this point. His *Contributions to Optics*, the didactic and polemic parts of the *Farbenlehre* and many other small studies, some only published after his death, show that Goethe carried out all the prismatic experiments known at the time, especially Newton’s experiments. What he criticizes in Newton’s approach is that he prioritized some observations over others as primary observations and used them to derive the others as secondary (Goethe 1951, 285ff; 1957, 420; 1958). Regarding Newton’s basic experiment (Newton 1704, 13ff), for instance, he points out that Newton does not vary the distance between prism and screen, but singles out one individual situation, which he uses to derive all the others (see Müller). Furthermore, without any justification based on experiments, Newton prioritizes the well-known solar spectrum over its reverse or complementary spectrum (see Bjerke; Holtmark

1969; 1970). One can say, that with this *empirically unjustified* prioritization Newton provides grounds for Goethe's objections.

Goethe is not opposed to colour research at a certain stage reducing a phenomenal domain to *its measurable quantities*, but rather to the reduction of a phenomenal domain to a *subset of phenomena*. At this stage of the treatment the "holistic nature" of Goethe's approach is preserved *within* the phenomena that are reduced to what is measurable. This difference from traditional methods of science is linked to Goethe's demand for a pure empiricism at the stage of empirical phenomena and his view that a theoretical conclusion based on an isolated phenomenon is problematic (Goethe 1932).

General Observations Looking Inwards

Goethe's *Farbenlehre* does not remain with an empiricism of the material aspects of colour, but adds another three sections, which start from "matter" and gradually widen the focus to include the overall context.

Goethe chose the rather enigmatic title "General Observations Looking Inwards" for the fourth section, which follows "Chemical Colours". Rudolf Steiner comments on this title:

General observations looking inwards, i.e. towards the shared natural grounds from which the colours emerge. Goethe is never satisfied with the mere observation of external facts, but looks for the underlying inner grounds, i.e. grounds which are no longer perceptible to the senses, but only to reason (Footnote by Steiner in: Goethe, 1982, 266.)

These words indicate that what belongs to the "essence" in a field of research are not only the outer facts, but also the concepts, ideas and context with which they are connected. These are found by an inner activity, not outer observation. So it is mainly here, after the first half of the book, that Goethe explicates concepts such as "polarity" and "intensification" and fully develops the colour circle. Remarkably, his expositions at this point hold not only for the physiological, but also for the physical and chemical colours. Even though everything presented in this section applies equally to physiological, physical and chemical colours, the content of the section could not be developed out of any one of these areas. This development is only possible because Goethe eschewed reduction to partial phenomena in the earlier sections.

If we bring the course of the book so far before our mind, this section appears — as the heading suggests — to be something we colloquially refer to as a "U-turn". In this section, the step-by-step descent into the "material", outer aspect of colour, which is accompanied by specializations, is now at a turning point, which will subsequently lead to the general introspective observations, the "underlying inner grounds ... which are no longer perceptible to the senses, but only to reason" (ibid). They are "general" only in that Goethe develops them out of an overview of *all available empirical observations*. Were this not the case, we would have to speak of "generalized observations" that undertake, on a conceptual level, what Goethe avoided on an experimental level, namely giving more significance to a particular interpretation of a subset of phenomena and a subsequent derivation of other phenomena from this interpretation. In this respect, the complete specialization and temporary narrowing to the material is a precondition for ensuring that the subsequent search for inner coherence does not become subjective or misguided.

The concepts and order of appearances described in this section are not specialized for *specific* cases of observation and therefore do not lend themselves to a quantitative or mathematical treatment, as Holtsmark showed (1971). If this is desirable – as it is often the case for physical or chemical questions – it can be done within the treatment of physical

(or chemical) colours. No contradiction arises between a quantized statement and the general statements if the mathematical treatment phenomenologically describes the empirical data. The colour circle, as a geometric system, allows quantitative statements that are tailored to a specific field, e.g. to physiological colours, of which a mathematical treatment shows that the colour circle either does not stay circular (CIE-Diagram) or needs to be presented in a curved colour space within which the diameters are no longer straight lines (Gschwind).

In this section, no new observations of the sense perceptible world are added, but rather conceptual observations based on sense observations. Goethe called this form of knowledge “experiences of the higher kind” (Goethe 1932, 23).

4. The Ascent into the “Essence”

Although a continuous specialization of the observations was necessary and desirable in the first three sections of the *Farbenlehre*, this specialization must be overcome in order to advance to the “essential” characteristics of colours. These “essences” are developed in the “General Observations Looking Inwards” insofar as they can be approached from external observations. Two more sections follow in which “the essence” is given two further meanings.

Relationship to Neighbouring Fields

After dealing with the interrelation of colours in the previous section, Goethe considers the interrelation of colour science and other scientific and cultural activities. He dedicates several paragraphs to its relationship to the fields of philosophy and mathematics, but also to physics as a whole, dyeing, music theory and others. Here Goethe extends into a larger context the considerations that in the previous section stayed within the phenomena of the first three sections. Thus there is a transition from epistemological concerns to those of application and practice. In summary, this section investigates how colour science becomes meaningful within other fields and cultural activities.

Sensory-Moral Effect of Colour

In the remarkable final section of the *Farbenlehre* Goethe, develops an “aesthetics of colour” (footnote by Steiner in: Goethe 1982, 289) or, as we would say today, a psychology of colour. He does not, however, use the method of the external observer who carries out experiments on people who do not know the background of these experiments, as is sometimes the case in psychological studies. Rather, when observing colours, Goethe practices a “self-observation of the soul” and describes the moods he experiences. We might only realize his mastery if we attempt such formulations ourselves, or compare his descriptions with the everyday language we use when attempting to express a personal reaction, rather than an individual perception, by using such phrases as “I feel good” or “that annoys me” etc. The subtitle Rudolf Steiner gave his *Philosophy of Freedom*, “Some Results of Introspective Observations Following the Methods of Natural Science” could be given to this section of the *Farbenlehre*.

Firstly, Goethe characterizes colours individually, then he investigates the impression of colour combinations: he calls pairs of complementary colours “harmonic” combinations. Pairs of colours obtained by passing over an intermediate colour in the colour circle, e.g. blue and yellow, he calls “characteristic” combinations. Adjacent colours in the colour circle, such as yellow and green, form “characterless” combinations. Lastly, he derives the potential aesthetic effects of these combinations for the artist (Goethe 1995, §848ff).

This part of the *Farbenlehre* is noteworthy because Goethe is looking for a relationship between the way colours are produced and what one feels in the moods associated with colours. He is looking for a bridge between “feeling and science” – between *Poetry and Truth* – the title of his autobiography and a central motif in Goethe’s work.

Compared to the section “Relationship to Neighbouring Fields”, which was more concerned with external relations and applications, he now turns to the internal relation, to the human being. Even if we look at a coloured surface, the observation is introspective with the aim of finding a characterization that complements the external colour phenomena. In other words, after showing the essence of the sensible colour phenomena in “General Observations Looking Inwards” and the essence of colours with respect to their significance and application for the arts and sciences in “Relationship to Neighbouring Fields”, the “Sensory-moral Effect of Colour” deals with the essence of colour for the human being.

In the last paragraphs of the *Farbenlehre*, under the heading “Allegorical, Symbolic and Mystical Use of Colour”, Goethe briefly indicates one further intensification of this perspective by seeking an expression of spiritual beings in colours – after which he withdraws to safer grounds once more:

We must grasp how yellow and blue diverge, and should reflect especially on the intensification in red where the opposites incline to one another and merge to create a third element. Then we will certainly arrive at the mystical and intuitive perception that a spiritual meaning can be found in these two separate and opposite entities. When we see them bring forth green below and red above, it will be hard to resist the thought that the green is connected with the earthly creation of the Elohim, and the red with the heavenly creation. (§919)

But we had best not expose ourselves to suspicions of fantastic imaginings at the end; all the more so since a favourable reception of our colour theory will enable allegorical, symbolic, and mystical applications and interpretations to emerge in keeping with the spirit of our age. (§920)

In §919 we can see that Goethe expresses how the awareness of phenomena observable in the sense world can lead to a “mystical and intuitive perception”, which opens a door to the being of colour. With Goethe’s final words in mind, we could interpret Steiner’s suggestions for meditations on colour, especially the “rose-cross meditation” described in “*An Outline of Esoteric Science*” (Steiner 1997, 291ff), as the missing seventh section to the *Farbenlehre*.

5. External and Internal Perspectives

If we investigate the questions posed in each section independently from the topic of colour we find the following questions:

1. What are the properties of the perception granted by the organ that gives us access to the phenomena in question?
2. What are the physical conditions and properties that allow the phenomena to arise?
3. What are the material conditions and properties that enable a “complete manifestation” of the researched field?
4. What is the inner order of the researched field?
5. What significance does the research have for others?

6. How do the phenomena affect the human being and what inner observations are possible when we experience them?
7. What deeper relations, qualities and beings can express themselves through the phenomena?

Through these questions we find the multiperspectivity that allows Goethe to write one *Farbenlehre* and not several on the “Physics of Colour”, the “Physiology of Colour Perception” or “Colour Psychology”. For a holistic science of colour, all these different aspects are significant.

However, “multiperspectivity” is not meant to imply that we can obtain different, independent perspectives of the object of observation in an arbitrary order, and simply add or leave out other perspectives. Rather, these perspectives are internally related – as has been shown – and form a process of development or an evolution of the cognition of this field.

If we understand this process as taking place in stages that correspond to each section, it begins with the physiological phenomena in an integral overarching nexus. On the one hand, a coloured object or a pigment (a fixed colour) is involved in these phenomena and, on the other hand, an optical image in the “frontal eye” and a physiological reception of colour in the “rear eye”.⁴

A more analytical approach begins in the next two sections. Basically, we can say that in the physical colours the frontal eye is recreated using optical elements and Goethe does this in manifold ways. Today, we can replace the rear eye with technical detectors (which was not possible in Goethe’s time), e.g., with the sensor in a digital camera. Thus, at this stage the human eye is replaced – to a certain degree – by a “technical eye” – as part of the experimental setup. This process of “separating” the eye from our individual organization leads, on the one hand, to detaching the phenomenon from ourselves. On the other hand, this separation allows us to share the phenomenon with others *under the same conditions* (whereas in the physiological colour experiments observation was only accessible to one observer under the same conditions). Thus, in the first stage of the process, conditions and characteristics of the rear eye are studied, whilst the focus in the second stage is on the frontal eye, including its detachment from the human organism.

In the third stage, the section on chemical colours, the focus is placed fully on the phenomenal by “analysing” the coloured object itself. Here, the eye is not included in the experimental setup of any of the experiments described by Goethe. Gone are the elusive appearances of the physiological colours. Gone are the transient appearances of the physical colours that disappear if generative conditions are no longer fulfilled. Rather, all appearances are properties of matter.

Metaphorically speaking, we can compare the process thus far, i.e. from the first to third stage, to a gradual “closing” of our organic eyes. We do not perceive the phenomena in the later stages as directly as we did with the earlier physiological appearances, but rather adopt a manner that is more practical than observational as we engage in a specializing and analyzing laboratory activity.⁵

4. Georg Maier made this distinction between the “frontal” and “rear” eye (private communication, see: Maier, 219). What we call imaging corresponds to the physics of the frontal eye. The rear eye, which, unlike the frontal eye, is supplied with blood, is the living (or etheric) part of the eye and enables us to sense brightness and colour (Maier, 219).

5. It is interesting to compare this activity with the term “optics without an eye”, which Johannes Grebe-Ellis coined for physical optics (Grebe-Ellis, 21f). It is worth mentioning that Goethe would probably have rejected “optics without an eye”, but not optics that develops an “optics with a detached eye” alongside an “optics with an eye”. However, according to Goethe’s approach “chemistry without an eye” seems to be both appropriate and necessary.

This is the situation we call the bottom of the “U”, which represents a “material” science of colour. Using the metaphor of fully closed eyes at the “U-turn” – i.e., at the transition to the fourth stage – the “General Observations Looking Inwards” section then corresponds to opening our eyes, but this time inwardly! Before the mind’s eye we survey everything that has been demonstrated experimentally and review the individual, specifically arranged (or modified) appearances in order to develop what Steiner, carrying Goethe’s idea forward, characterized as a “*higher experience within experience*” (Steiner 1988, 82). So within our metaphor, closing our outer eyes is the prerequisite for opening them inwardly.

In the fifth and sixth sections the inner eye gradually opens further. Whilst the introspection in the fourth section, “General Observations Looking Inwards”, stayed within the realm of experimental results, we now take account of the scientific work in relation to the sciences, arts and culture in the “Relationships to Neighbouring Fields” section. Thus, in the final stage, we can develop the introspective observation further into an observation of the soul, which can discover internal characteristics as essences of colour.

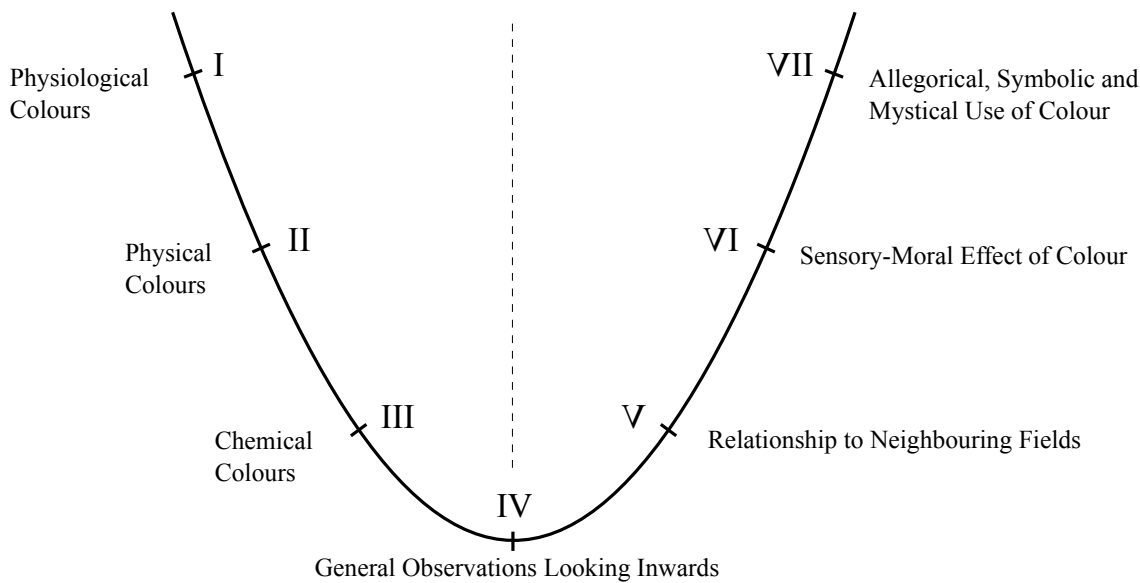
It seems to us that just as the previous stages formed a developmental process and each necessarily builds upon the preceding ones, this final stage would also not be possible without the other stages. First of all, the preceding work enables one to know the external conditions and properties of colour and therefore creates the prerequisite for having something “in view” – as a kind of afterimage – when opening the eyes inwardly. For observation of the soul, the external conditions and properties become an aid for, on the one hand, discovering the internal conditions and properties and, on the other, for separating them from our own “conditions and properties” (e.g., one’s personal mood on a specific day). The latter represent *not constitutive but modifying conditions* for the observed colour and its psychological qualities. If this separation does not occur, there is no scientific activity according to Goethe. In other words, at this stage we apply the scientific method to inner observation.

This might explain why Goethe does not jump directly from “Physiological Colours” to “Sensory-Moral Effect of Colour”, even though both rely on the same experimental setup, i.e. observing a colour and noticing the result. In that case, the subsequent optical experiments could appear as a detour or even as the wrong turn. For us, however, this indicates that after the “Physiological Colours” the conditions necessary for undertaking an observation of the soul in a scientific manner are not yet fulfilled. In this respect it is worth mentioning the work of Kees Veenman, who makes an introspective observation during the observation of physical experiments that leads to the “essence” and a qualitative characterization of colour (Veenman, 2009).

It becomes apparent from the whole process that a holistic or Goethean science is not an “alternative” to a specialized or “instrumental” science. On the contrary, it seems that the latter is a condition for the former, a necessary activity without which it is not possible to advance to the “essence” of the field.⁶ It may be an obvious objection that considering the state of present day technology it would be impossible for a single person to complete

6. We recommend the excellent summary which Amrine and Zucker wrote as a postscript to a “round table” at Harvard University in 1982. They summarize different problems and possibilities relating to the question of whether Goethe’s approach to science offers an alternative *for* modern scientific endeavours, an alternative *within* modern scientific endeavours or no alternative at all (Amrine & Zucker).

“Open Eyes” / “Integral” / “Essence”



“Closed Eyes” / “Separate Parts” / “Material”

Fig 1. The structure of Goethe’s *Farbenlehre* as a developmental process or evolution of scientific knowledge. The seventh stage, which appears here as “Allegorical, Symbolic and Mystical Use of Colour”, is not an independent section as are the other sections but the final subsection of the section “Sensory-Moral Effect of Colour”.

all the different stages *in detail* – that was not possible even in Goethe’s time and he was conscious of that fact (Goethe, 1957, 412ff). However, Goethe did not have a single ingenious researcher surpassing all his peers in mind – instead he tried to build a network of researchers working together in scientific cooperation.

Figure 1 shows the process of scientific development in a “U” shape with the clearly marked U-turn. This form of representation reminds us of the stages of human development as Rudolf Steiner presents them in his *Outline of Esoteric Science* (Steiner 1977). We have developed this form independently and it applies to evolution as well, namely, it begins in an integral nexus, leads out of this to the disintegration of the nexus (wherein humans no longer have access to the spiritual in the world, though this separation does allow freedom) and in the future will lead to a new, but in this case consciously experienced, integral nexus, which would not have been possible without the preceding stages.

As scientists today we are shaped by material physical science. In this sense, we are at the lowest point, the bottom of the “U”. In view of the above, however, this is a good thing! It is possible to not only consider the structure of the *Farbenlehre* as a methodological model for a scientific project but also to understand it as an evolutionary history of the scientific activity of humanity. In a way, the research of the first three stages is behind us. It seems to us that the task is, first of all, to continue this process with all its possibilities into the present time and then make the U-turn, i.e., take the first steps that lead out of “material” science towards a more “integral” science. In this sense the later sections of the *Farbenlehre* are our future.

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