

Goethean Color Theory on the Farm

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Ever wondered why the sky is red in the morning and evening but blue at noon? Goethe's color theory based on phenomenological observation explains it better than any other. Much of biodynamic farming is rooted in the scientific approach exemplified in Goethe's practice of observation.

Background Discussion
Please read before the workshop

I. Contextual phenomenology:

Go to woodshop and have participants scan the sky and tree and roof lines using prisms (Place narrow edge of prisms down and hold close to eye). Show that sky remains white (no spectral colors), while tree tops and barn roof ridge are blue, upper edge of composter roof is orange, lower edge is green.

Observation a): blue colors appears when a dark field is below a light field, orange color appears when the reverse; green color appears when orange and blue overlap.

Observation b): color is not primarily a function of prismatic refraction (which is the same in all instances observed), but a function of context (meaning relationship between dark and light fields).

II. Reductionist phenomenology:

Use power point to project image of Newton's *experimentum crucis* on large screen. N. darkened a room with a window shade which he perforated with a small aperture to admit a narrow beam of light. The beam of light was gathered by a lense and directed through a prism, which apparently separated the light into 7 spectral colors: red, orange, yellow, green, blue, indigo, violet. N. then alternately conduited the different color fractions through a second aperture and then through another prism to show that the light did not subdivide further. (Show abstracted diagram of N.'s experiment). N. did not notice, and therefore did not investigate, whether the shape or size of the aperture had any bearing on the creation of the spectral colors by the prism. Nor did he notice, or investigate, whether proximate colors created additional colors such a green or magenta.

III. Contextual phenomenology continued:

Observation c): Notice that when we used the prism under the open sky, i.e. without confining the light through a small aperture, the prism did not create the complete color spectrum as posited by Newton. Rather the two colors that appear when a prism is used to refract unconfined light are shades of orange-yellow and blue-indigo.

Observation d) We noticed the blue color appeared on edge where an area of light was above an area of relative darkness, and an orange-yellow color appeared when an area of light was above an area of relative lightness.

Observation e) The colors blue-indigo, orange-yellow are created at edges between darkness and light.

IV. Goethe's experiments (selection of plates):

Observation f), plate 2 (checkerboard): Colors blue appears above dark edge, and orange appears below dark edge (but not on edge perpendicular to prism axis)

Observation g), plate 5 (black rectangle on white): blue above, red below (notice radiant of red to yellow, and violet to blue).

Observation h), plate 6 (white rectangle on black): red above, blue below (notice radiants).

Observation i), plate 8 (bars between rectangles): edge spectra overlap and create green (in light bar) and magenta (in dark bar).

Observation j), plate 10 (white apertures of different sizes): notice complete fractional spectrum occurring in small white aperture due to overlap of edges (orange-yellow overlapping with blue-indigo to create green around a small white center). The overlap does not occur in the large aperture and therefore the green is not created.

Observation k), plate 10 (black apertures of different sizes): notice the creation of magenta at the center of the aperture around a small black center. The overlap does not occur in the large aperture and therefore the magenta is not created (OBS. magenta is a color not observed by Newton because it falls outside his experiment).

V. Semi-opaque medium ("Truebes Mittel")

Use of semi-translucent egg (Goethe used various media such as vessels filled with cloudy water, etc):

Observation l), egg before luminous background: egg appears to be orange in color, not just white).

Observation m), egg before dark background: egg appears blue, not just grey).

Observation n) (use 1" of milk diluted with water in tall glass): repeat as above.

VI. Why is the sky blue at noon, but orange (and shades of red) in the morning and evening?

Observation o) (illustration Proskauer, p.41): on a sunny and clear day, we see the darkness of space through a luminous (light-filled) medium (“light over dark”), creating the appearance of the sky being blue.

Observation p) (same illustration): on a sunny morning or evening, we see the bright sun through a relatively darkened medium (“dark over light”), creating the appearance of the morning or evening sky being orange (red, purple, etc).

VI. Conclusions:

1. The physical colors of the light spectrum created by a prism are a function of the context of lightness and darkness in which they occur. The phenomena of the blue sky (during the day) and the orange horizon (in the morning or evening) result from the juxtaposition of darkness and light filtered through a semi-transparent medium such as the atmosphere. The blueness or orangeness is not in the sky or the atmosphere as such, but arises from the interaction of light and dark perceived by the human observer (or a man-made instrument such as a camera).

2. Goethe’s color theory reflect his more general theory of knowledge, i.e. how we know anything in the phenomenological world.

To quote Kaethe Sehmsdorf, who summarized a recent discussion around the dinner table regarding Goethe’s epistemology as follows:

“Johann Wolfgang von Goethe, the German polymath genius of the later 18th and early 19th centuries, addressed the question of how we know and transmit anything by telling us that the act of knowing occurs in three different ways: a) through sensory perception, in which we orient ourselves to something through sight, sound, touch, taste, and smell, b) conceptually and linguistically, by applying scientific measurements (and corresponding labels), and c) intuitively, through non-verbal, non-rational, inspiration.

Goethe said that we only understand something deeply by becoming full and active participants with it. This profound understanding is achieved directly through doing, or alternatively *through the medium of artistic expression*. The artist’s vision, embodied in the poem, painting, dance, play, etc., wraps the sensory input, the conceptual framework (observable measurements represented by concepts), and the intuitive, wordless understanding together into an integrated expression, drawing the observer into the experience as part of the thing itself. Goethe says that in the moment of interaction with the art form, the observer actually *becomes the theory*: a full and active participant in the *process of knowing*.

Goethe’s ideas were elegantly articulated, and extraordinarily forward thinking for his time, and they have more recently become accepted as a best practice for some forms of education, such as the Waldorf system, but also in new discoveries in the psychology of learning and development.”

3. For the farmer, the implications of Goethe's color theory and more generally his theory of knowledge are to emphasize the importance of the whole person in the process of *knowing anything* on his farm, the plants and animals, the soils, the weather, the sources of energy, and so on. This contrasts with a reductive, so-called scientific, approach that emphasizes measurements and instruments to the exclusion of the human being observing, feeling, intuiting, and interacting with the environment of which he is an inextractable part. For example, if you take a soil test to measure pH or N, P, K levels, you have achieved important knowledge which, however, becomes meaningful only in the context of the farmer's knowledge of his soil from other indicators derived from observing how fruits, vegetables, weeds, macro- and micro-organisms, rainfall or drought, and even (dare I say it?) his intuition of the liveliness (or deadness) of the soil at various times of the season. This is a point that Walter Goldstein (research director at Michael Fields Agricultural Institute in Wisconsin) made speaking at this workshop two years ago. He also spoke about new ways of assessing soil quality at various conferences, to include not only objective measurements of empirical data, but contextual observations and intuitive perceptions. His recommendations are solidly rooted in Goethe's way of knowing.

4. In final conclusion, let us emphasize that we have only dealt with the so-called physical colors involved in the prismatic spectrum. Goethe also investigated thoroughly other qualities of color, such as the physiological responses in the human eye, and the chemical qualities of plant colors (and other physical objects and bodies), as well the spiritual, moral, and artistic implications of color and color theory. These we will have to deal with another time. But always Goethe's reflection on what color is reminds us that if we remove the human being from the act of knowing, we are left without a frame of reference to guide us in how to use any knowledge for anything, let alone the pressing questions in our own time: how to live sustainably in a diminishing world, and how to make sense out of what to many appears an increasingly meaningless existence. In following Goethe's approach to science as exemplified by Steiner's teachings and in biodynamic practice, we can regain a sense of purpose and focus as farmers, as members of our communities, and as human beings.

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