

# Decomposing Stimulus Complexes and Dissecting Art: A Theory of Evaluation

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## Summary

A theoretical model is presented, which attempts to account for the evaluation of complex stimuli in terms of their constituent elements that are relevant to the intent of the assessment. The subjective evaluation of a compound stimulus is postulated to be a function of the number, weight and integrity of critical components, or sub-qualities, and their interactions. The model has application to the evaluation of any stimulus complex including works of "art". For illustrative purpose, it will here be applied to the analysis of pictorial works of art.

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## Key words

Model • Complex stimuli • Art

This communication presents an attempt at a conceptual model of how a complex sensory stimulus is composed and evaluated in terms of its component variables. A formal deconstructionistic approach towards delineating the critical elements that enter into the evaluation of such complex stimuli is also hoped to provide insight into how such information must be organized and decoded. Deconstruction or decomposition of the complex may help generate hypotheses regarding processes of encoding, storage and retrieval, including the development of coherent representations and their interactions in comprising complex percepts, and the requirements of the nervous system for their storage and recall. The ideas presented here arose as a result of my familiarity with the photographic images of the artist Christopher Muller (for example see Figs. 1-3), and the attempt to understand the evaluative processes that are involved in assessing such images in terms of variables that define them within the construct of "art". Therefore, in order to exemplify an application of this model, this paper will focus on the composition and decomposition

of complex visual images, using Muller's pictures as illustrative examples. However, this theory has general applicability to the assessment of any complex stimulus, including any other art form, be it music, literature, etc., and other complex categories, which can be evaluated, such as a personality structure or a beauty contest.

## *Sub-qualities*

My basic premise is that the overall subjective evaluation of a visual image, or any other work of "art", is a function of the integrity and weight of definable formal critical elements, which I will refer to as "sub-qualities". These sub-qualities are used, not necessarily consciously, in the process of composing, as well as in evaluating an image, a sculpture, etc. Works of art or any other complex stimuli differ in terms of *number*, *relative importance* and *integrity* of the critical sub-qualities that go into its composition and evaluation. These variables are postulated to determine the subjective evaluation of an image, or any other work of art or any other stimulus

complex. They could interact in various ways, for example:

$$E = \sum_{i=1}^n g_i w_i s_i \quad (1)$$

which states that the subjective evaluation of an image or any work of art ( $E$  = subjective overall quality) is a function of the number ( $n$ ) of inherent sub-qualities ( $s$ ) that are considered to compose the work, whereby each sub-quality has a value ( $g$ ), which is a measure of its *integrity* or *goodness*, and a value *weight* ( $w$ ), that is, its relative *importance* for the work in terms of *dominance* and in terms of the *interactions* between the constituent sub-qualities. The values for  $w$  and  $g$  could be assessed either via a rating scale of, say, between 0-10 or 0-1, or on a ranking scale from one to total  $n$  of identifiable sub-qualities, with the most important and best having the highest rank. The posited multiplicative relationship between  $w$  and  $g$  is arbitrary. Another possibility would be, for example, an additive one:

$$\sum_{i=1}^n (g_i s_i + w_i s_i)$$

In discussing a specific work of art such as a photographic image or a painting in terms of the concept sub-qualities, an ideal procedure would be to systematically *fragment* and to *decompose* it, i.e., to dismantle a work by extraction or transformation of its constituent sub-qualities. Although such a systematic decomposition would be feasible and necessary in order to test the validity of the postulates put forward, for the present purpose it will suffice simply to imagine such a process. How would such a complex image be influenced by eliminating a particular sub-quality? From the formula above, it follows that the smaller the number of sub-qualities ( $s$ ) that are said to comprise an image, the more dependent is the overall appraisal ( $E$ ) of the work on the integrity ( $g$ ) and weight ( $w$ ) of its individual components: the larger the number, the less impact have  $w$  and  $g$  of any sub-quality on the overall subjective evaluation. Accordingly, we can hypothesize that the subjective evaluation ( $R$  = rest-quality) of an image decomposed or reduced by extraction of a sub-quality ( $x$ , with  $x=0, \dots, n$ ) would be a function of the number, integrity and weight of the remnant sub-qualities relative to the original total number of defined sub-qualities and their integrity and weight. We can express this relationship as follows:

$$R = \frac{\sum_{i=1}^{n-x} g_i w_i s_i}{\sum_{i=1}^n g_i w_i s_i} \quad (2)$$

Consequently, the more such elements that we choose to define as being inherent in a work, the more resistant the remaining overall *rest-quality* ( $R$ ) of the image would be to an extraction of or failure of one of these, since more are left over to “carry” the image. The smaller their number, the more vulnerable would be the residual overall quality to elimination or transformation of any one of them.

This equation as a first approximation is based on the simplified assumption that after a subtraction of a sub-quality the values  $g$  and  $w$  of the remnant  $s$  remain the same. A more valid assumption would be that, after such an extraction ( $x$ ) the  $g$  and  $w$  values of the remaining  $s$  will change, with the consequence that the overall  $R$  could potentially even increase, rather than always decrease as in equation 2. We can express this as

$$R(y) = \frac{\sum_{i=1}^{n-x} g_i(y) w_i(y) s_i}{\sum_{i=1}^n g_i(y_0) w_i(y_0) s_i} \quad (3)$$

whereby  $y=n-x$ , the number of remaining sub-qualities;  $y_0$  = the original state;  $x=0, \dots, n$ , the number of extractions:  $g_i$  and  $w_i$  are now a *function of*  $y$ . This equation can also account for the failure of a work of art; due to a conflict or collision between intended or perceived sub-qualities of the artist (insert values into the denominator) and the expected or perceived  $s$  of the viewer (insert into numerator). The smaller the resulting  $R$ , the bigger the discrepancy, and the less likely that the work will be accepted or “understood”.

We assume that when we view a finished product we consciously or subconsciously assess it on the basis of sub-qualities and their interactions. With experience we become familiar with a criterion of sub-quality, as it has been dictated by experts (i.e. the market, the critics, the artists). The criterion has properties that may be difficult to define objectively but for some reason represents something that we can agree with, whether due to acquired notions or whether a result of genetic dispositions to dealing with images in terms of balance, color, color combinations, information content, etc. (Zeki 2000).



**Fig. 1.** Christopher Muller "Bussy harvest", 1991/92.



**Fig. 2.** Christopher Muller "Collage", 1997.



**Fig. 3.** Christopher Muller "Regrets", 1994.

Since Christopher Muller's photographic images, which are mostly still-lives and collages, prompted my speculations and theory, they should be amenable to analysis by use of its suppositions. A discussion of his work based on the hypothesis of sub-qualities as espoused above has, in fact, been carried out elsewhere, and is available upon request (Huston 2002). Such an individual analysis focuses on a) "simple" basic sub-qualities, such as color, size, brightness, and grain, etc. b) the formal compositional sub-qualities, such as form, pattern, perspective, etc., that are taught as fundamental tools of the craft, c) "higher order" sub-qualities, such as the associative value of items in the image, the flow and balance between sub-qualities, and the novel poetic, aesthetic, philosophical and ideological

sub-qualities, which distinguish the work, and d) the invariant sub-qualities that permeate the body of work, and which characterize and define it and the artist.

An important aspect of this theory which deserves to be highlighted here, is the necessary interplay between sub-qualities during the process of evaluating an image (or any other work of art); that is, the flow or interaction between them, which determines the harmonic properties of the work. Here we can postulate that our viewing of an image involves both conscious and unconscious assessment of the whole realm of sub-qualities, which compose it. More important is to emphasize that when we *actively* confront an image our perception thereof is not invariant, but on the contrary, is determined by a *flow* between the images' sub-qualities, whereby one or a set of such can dominate and recede in rapid succession. For example, when viewing a Muller image (see Figs. 1-3), the associative elements can predominate at one point in time, whereas compositional sub-qualities (color, form, other abstract qualities) may take over completely at another moment. Such a switching between component sub-qualities can be willed, since we can consciously decide to focus on one or another, or it can be uncontrolled, as one quality displaces another in predominance. Uncontrolled switching between simpler perceptual elements is illustrated by the well-known reversible figures of Gestalt Psychology.

If our viewing and evaluation of a complex image depends on the interplay between such sub-qualities, our nervous system must necessarily provide the possibility to encode, store, and retrieve such representations accordingly. Each sub-quality constitutes a separate complex representation at the moment of its recognition or extraction from the image. Hebb's reverberating circuits and higher-order cell assemblies (Hebb 1986) are obvious candidates to account for the organization of and for the separate yet parallel storage of such multiple sub-qualities, which are integrated in the evaluation of such stimulus complexes (Hebb 1968). As Hebb has emphasized, the cell assembly is a function of experience; and learning "further modifies the pattern of interfascilitation between assemblies to produce new combinations of assembly activity" (Hebb and Farreau 1969). The number and type of sub-qualities which enter into the evaluation of any complex stimulus, such as an image, vary between and within individuals. The establishment and recognition of sub-qualities, like any other conceptual and perceptual organization, of course, depends largely on experience, i.e. on learning, although

organizational innate factors can also play an important role (see Goldstein 2001). Most sub-qualities related to art evaluation are decided by convention, by the artist and the critics, that is, by a consensus of “experts”. This selection, of course, must change over time, in order to allow for new developments in art. This consensus by experts and reliance on learning to recognize sub-qualities also restricts meaningful art evaluation to the initiated minority. Thus, the degree to which sub-qualities establish stimulus control over our evaluative behavior determines our ability to evaluate a visual image or any other stimulus complex in terms of the criteria for what constitutes “art”.

## References

- HEBB DO: Concerning imagery. *Psychol Rev* **75**: 466-477, 1986.
- HEBB DO, FARREAU O: The mechanisms of perception. *Radiol Clinf N Amer* **7**: 393-401, 1969.
- HUSTON JP: Quality flow. In: *Christopher Muller, Seeing Things*. Verlag für Moderne Kunst, Nürnberg, 2002, in press.
- GOLDSTEIN EB: Pictorial perception and art. In: *Blackwell Handbook of Perception*. EB GOLDSTEIN (ed), Blackwell, Massachusetts, 2001, pp 344-378.
- ZEKI S: *Inner Vision: an Explanation of Art and the Brain*. Oxford University Press, Oxford, 2000.

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## Appendix

I had the fortune to work with Jan Bureš for two fruitful years during the early occupation of Prague in 1970-71, and consider him as a formative mentor and teacher. One important thing he taught me is that to be a good scientist does not mean you only have to be such, and that life has many dimensions which one must and may involve oneself with. As this special issue is in honor of Jan Bureš, I find it fitting to contribute some ideas which deviate from my routine scientific concerns, and touch on a hobby, namely, the question of how do we assess complex stimulus configurations which are meant to be works of art.