

## THE FORMAL INVARIANT IN ART AND DESIGN

### A Principle of Aesthetics

The issue presented here concerns the joining of a universal principle of art and design process into the contemporary method of art analyses. I will attempt to demonstrate that this principle, often a neglected aspect by art theoreticians, is common and applicable to analyses of all visual art and design alike; representational and pure abstract art, design, crafts and architecture. This principle is demonstrated in the art pedagogical theory by the Bauhaus teacher, Johannes Itten and I will show why his ideas offer the possibility to explore and make analysis of both art and design using the same criteria. The psychological reaction stimulated in the mind by contrasting effects by juxtaposed contrasting abstract parts of form and of color is of prime interest in Itten's theory. These reactions he associated with aesthetic experience triggered by abstract non-verbal visual stimuli. A non-verbal stimulus is understood as perceived contrast between abstract parts of forms, between lines, between textures and between colors. This principle of contrasts may therefore be considered as a common denominator of all visually perceived impressions; art, design and environment.

Itten's pedagogical theory is practiced in most art schools in the Western world. His basic principle of art is of prime importance in art education but is not commonly included in research and analysis within art historical theory. In traditional art historical method of analysis two opposite views exist: the one of the Formalists, where form is regarded the foremost important aspect in art and design, and the other of the Critical writer's on art, for whom the concerns are the picture content.

For the Critical writers on art form and content are closely linked. Then the interpretation of the concept "aesthetics" is not a problem as it seems to adhere to the combination of the two. As "aesthetic" traditionally is synonymous with "beauty" (Webster's New Twentieth Century Dictionary) it has also become commonly associated to that which is morally acceptable. Therefore we may ask: Could it be that the content in representational painting receives more attention by the analyst than do the values of the picture compositions? Then this problem of representational fine art may have a parallel to the problem of modern Conceptual art where the philosophical content of the works seems to be a

more interesting aspect than formal qualities.

Since the publication of Itten's pedagogical theory it has been demonstrated how form and content are separate in human reaction. Therefore I will suggest that the question must be raised as to which aspect does the concept "aesthetics" belong: to the perception of form, the perception of content or does the traditional view hold, that it belongs to both. Is it possible that the reason for the acceptance of Conceptual art into visual fine arts aesthetics is due to the lack of a proper theoretical division between form and content?

Itten's theory may be viewed as an extension to the traditional formalist art historian Heinrich Wölfflin's ideas about contrasts. In his writings the art historian Ernst Gombrich promotes that any contrasting effects stimulate and create tension to our mind. Other theories that support Itten's are by the psychologist James J. Gibson, but first and foremost by the art educator Betty Edwards who bases her studies on the research by the scientists Roger W. Sperry and Jerre Levy.

That both form and color are abiding by the same criteria is verified by Itten's experiments with juxtaposed contrasting and harmonizing colors. This philosophical principle which seems to be invariant under all visual experiences I have named the formal invariant of art and design. It is a constant that is related to the brain processing of non-verbal stimuli.

In order to promote this common denominator it is necessary to distinguish the two ways of perceiving. One way of perceiving, the non-verbal stimuli in art and design generated by contrasting abstract parts and colors, is covered by Itten's theory. The other way is through the verbal literary content in representational art and environment. The subtle line of division between these two forms of perception is consistent with the late scientific research finding that humans react to sense impressions with two different but compatible functions of the brain.

The objective here is to show how the art theory of Itten deserves the joining with the traditional methods of formal art analysis. Formal analysis stops short of assuming a constant in art and design as it concerns primarily analysis of compositions of whole objects to which we associate verbal content. Itten's theory reach-

es beyond these limited boundaries as he emphasizes the psychological effects of contrasting abstract parts and colors existing in any work of art, design and environment. What the artist, designer and architect have in common in their working process is the concerns with formal composition, the juxtaposing of abstract parts and color.

It is problematic to Itten's ideas that illustrated literary themes are by traditional art theoreticians associated with aesthetic experience. The view is here presented that representational content inevitably evokes sentimental reactions that primarily catches the attention of the analysts and critics who are not usually schooled in Itten's art pedagogical methods. In the method of Itten analysis of representational art entails a momentary disregard of intellectual content. Then it is possible that one is better able to appreciate and understand the artist's abstract arrangement of form and color contrasts and to feel the effects that the combinations give while setting aside the content. The reaction to non-verbal abstraction is supposedly subconsciously felt, but when in a conscious analytical process objects within a composition are studied in terms of juxtaposed contrasting parts and contrasting color, one becomes aware that abstraction gives the viewer an opportunity to react to non-verbal stimuli. Itten does not discuss the disagreements between Formalists and Critical writers on art but he does indicate that juxtaposed contrasting form elements and colors is the interesting aspect within aesthetics.

The concept "abstract" means in this context any visual marks in works of art and design and in nature that do not illustrate any recognizable object. "Representational art" is synonymous with more or less naturalistic illustrations of a theme as in traditional and modern figurative art. The expression "concept" and "intellectual content" or "literary theme" stands for the verbal topic in representational works of art. Within the expression "color contrasts" the contrasts between light and dark values are also included.

### **What Kind of Art should be preferred in our Time?**

The artist's ability to compose by juxtaposing of contrasting abstract parts and colors and then to create

harmonic effects seems to be associated with artistic talents in Ittens theory. Then it becomes a paradox if the art analysts and critics in evaluation of artistic expression is primarily interested in the meaning of picture content before the formal arrangement. The arguments about what kind of art is most important; representational or abstract, is also a paradox. Is it possible that such disagreements are kindled because pure abstract art is believed to be missing something? Could it be that interpretations of a hidden subject matter in pure abstract works of art becomes a challenge to some analysts due to the overriding of the value of the formal principle of abstract? Another dilemma has evolved as artists of modern conceptual, installation and performance art, to a great extent and sometimes all together, chose to ignore the importance of composing by abstract parts and colors in their works. I suggest that it is possible that these problems originate in the unresolved arguments between Formalist and Critical writers in the past, in the lack of proper division between form and content.

Needless to say that in the process of creating figurative art a division is made in the artist's mind between the two aspects, abstract form and literary content. Themes in art depend as much on aesthetic composition by abstract parts as do pure abstract works of art and designs. Before the published ideas by Itten, there has not existed a theory proposing a common principle for analysis of formal composition, applicable to all art and design, in terms of reaction to juxtaposed abstract parts of objects and of contrasting colors. It is my belief that an evaluation of form and color composition neglecting the effects created by the formal invariant is incomplete. However, the conscious analyses of abstract parts as totally separate from the evaluation of content is only possible in theory. As shown below, that Itten's theory proves to deal with the different reactions in two separate brain functions demonstrates a link between visual art and psychology of perception.

### **Both Verbal and Non-verbal Contrasts are Stimulus to the Mind**

It is Ernst Gombrich's opinion that unexpected chan-

ges are deviations from the ordinary and that through the perception of our environment we are both scanning for dangers and seeking pleasures in contrasting effects. In his book *The Sense of Order* he established that surprises are caused by unexpected visual, audible and intellectual contrasts. He says that changes from previous experiences, excite and stimulate our minds and that the stronger the stimulus, the more it receives attention. We react more immediately to strong contrasts and to new unexpected changes in art, design and environment alike than to images that are familiar to us. The capability to become surprised is for Gombrich part of the basic ability for physical survival and a force behind creativity. It seems as if there is satisfaction in surprise (contrasts) which is also reward for curiosity. Nature offers its own visual surprises in contrasting effects: a branch of a tree with leaves blowing in the wind appears different from moment to moment. The fine artist and designer are always searching for new visual constellations of contrasting abstract forms and colors.

### **The two Ways of Reacting**

That we react differently to verbal and non-verbal stimuli is a recent scientific finding, made during the last century by Roger W. Sperry and his students at California Institute of Technology. The author of *Drawing on the Right Side of the Brain*, Betty Edwards reports on Sperry's work that shows how two different hemispheres of the brain serve two different functions: verbal intellectual processing on the "left side" and processing of perceptions of non-verbal abstract images on the "right side". In her doctoral studies, Jerre Lewis found indications that the two modes of processing tend to interfere with each other, preventing maximal performance. She suggested that this may be a rationale for the evolutionary development of asymmetry in the human brain – as a means of keeping the two different modes of processing in two different hemispheres. Edwards write that the compatibility of the two modes is important in perception of environment as in art; representational art stimulates the left brain hemisphere through its intellectual content, but also provides non-verbal stimuli to the right hemisphere. The presence

or absence of verbal stimuli is the difference between the representational and the abstract aspects of art, respectively. Verbal intellectual stimuli in fine art are always dependent on abstract elements, as is the content in a song to the musical tones. However, the tones to the text of a song and the abstract in representational and pure abstract art and design are independent of verbal content.

### **The Psychological Reaction to Non-verbal Visual Experience**

The Reason for Realism by the psychologist James J. Gibson is an extensive research on human perception of art and nature. In his youth he had become interested in how we perceive the changing landscapes when riding a train. In researching the perception of nature, he found a constant of perception in the reaction to contrasting textures in landscapes, which he referred to as "invariants", as if there were many. Considering the basic principle of art teachings, as presented by Itten, I suggest that reaction to the juxtaposition of contrasts is but one constant, which is then an invariant, not only in the perception of art but of all visual images in our environment. Gombrich's writings of the tensions created between contrasting elements in art and design bridge both Gibson's and Itten's theories.

The suggested formal invariant of art is then inherent and identical in perception of representational art, abstract art and design. This principle is based on the special psychological reaction we have to juxtaposed and contrasting abstract forms, contrasting lines, contrasting textures and colors – a reaction arising in the non-verbal, right brain hemisphere. In both the creative process and in the teaching of art, the formal invariant seems of primary importance. As do the artist and designer it is necessary for the analysts and critics to evaluate and acknowledge this principle of the abstract elements and colors in representational and abstract art and design. For the sake of a joint method of art and design analysis the non-verbal and verbal response need to be separated in theory and regarded as psychological stimuli to the mind. This will permit evaluation of the effects by form and color as different from the effects by verbal content.

### **Juxtaposing of Contrasting Ideas is an Invariant Principle of the Art of Literature**

The formal invariant principle for visual art and design gives reactions to tensions that are processed by the right brain hemisphere. Juxtaposed contrasts of intellectual ideas, those that are verbally expressed, also produce tension. Such reactions, processed by the left brain, might provide a basic principle for the art of verbal expression. What the visual and intellectual expressions have in common is that both causes tension, produce surprise reaction and receive attention. As stated above, verbal contrasts may create sentimental reactions and non-verbal contrasts do not. Examples of such surprise by intellectual content in representational art to its contemporary viewers are plentiful in the history of art.

### **Art Theories that fail to describe the *Formal Invariant***

Early in the 20<sup>th</sup> century Heinrich Wölfflin in his writings *Kunstgeschichtliche Grundbegriffe* promoted Formalism. He separated objective form, that which is without meaning, from subjective form, that which carries meaning. Using five sets of contrasting effects, classified into two divisions of linear versus painterly technique, he distinguished between the art of the Renaissance and that of the Baroque. Renaissance art was identified as linear art and Baroque as painterly by its gradients between lighted areas and dark shadows. He did, however, neglect to extend the idea another step and to acknowledge a principle of art, the formal invariant, based on the psychological reaction to juxtaposed contrasting abstract parts of form elements and of colors within one work of art. Therefore he stopped short of theoretically establishing a criteria that for Itten originated in representational art but is applicable to analysis of abstract art and designs as well.

Itten's theory is separating the non-verbal responses from the verbal in fine art and environment. Therefore, I believe, in demonstrating the compatibility of the two responses his ideas are also bridging the disagreements between Formalists and Critical writers. The critical writings on art has its basis in Kant's 19<sup>th</sup> century aesthetics which is an intellectual philosophical view considering the division between matter and spirit.

Goethe's 18<sup>th</sup> century theory of color does somewhat suggest that humans are psychologically affected by colors. In the late 19<sup>th</sup> century, the Formalists did not consider a psychological reaction to abstract form elements or colors and due to their inability to analyze in terms of juxtaposed abstract parts rather than of whole objects the arguments with the Critical writers went on into the 20<sup>th</sup> century and has not yet been solved. They were not able to assume a formal invariant of art and thus the separation or the compatibility between form and content could not be properly discussed.

### **Psychological Theories that verify the *Formal Invariant Principle***

The concept of the formal invariant principle originates in the psychologist James J. Gibson's idea of a constant in how we react to contrasting textures in nature. The ideas by Gombrich and Gibson are in agreement with Itten's theory. The contemporary art teacher, Betty Edwards, based her research on Sperry's and Levy's findings and concluded that the reaction to objects gives associations by the "left" brain hemisphere to associations to prior experiences resulting in personal emotions. She added that the reaction to abstract parts elicits non-personal feelings that are not sentimental. From her research on drawing ability, she found that, when drawing naturalistic representational pictures, the intellectually responding left brain hemisphere interferes with the right brain hemisphere that processes non-verbal response. Edwards says that according to Levy, this happens because the verbal response distracts the other brain function from the act of observing naturalistic form accurately due to preconceived ideas that we have of how things look. Edwards introduced drawing techniques that allow the non-verbal response to work without interruptions. Edwards' ideas is then supporting the formal invariant principle of art and design.

### **Itten's Theory of Form and Color**

Itten taught the Basic Course at the leading art and design school, the Bauhaus, in the 1920's. His method of teaching form, first published in 1963's, (*Gestaltungs- und Formenlehre*) marks a bridge between art and

psychology of perception. Through the study of historic works of art, he became aware how artists have composed visual elements using the principle of contrast in abstract elements of form and color. In his later publication about color (*Kunst der Farbe – Studienausgabe*) he summed up into a common denominator the effects created by the juxtaposing of different forms, by different qualities of lines, different textures and colors. He demonstrated the contrasts within form with simple diagrams: large – small, thin – thick, rounded – straight, dark – light and so forth (Ill. 1, page 40) and he showed how harmonies are created by the balance between these contrasts. Based on Goethe's color circle, he created his own version (Ill.2, page 40) and found the same constant in the reactions to contrasting effects by colors as to form. The greater the difference, the stronger the tension stimulus would be.

Science explains colors in terms of colorless light waves in which every spectral color has its own wavelength. When two contrasting (complementary) color-lights are mixed, they together become white light, as if neutralizing one another. When two contrasting color pigments are mixed, they become gray. When two non-complementary, but related colors are mixed, the hue changes towards one or the other color, dependent on the amount of each in the mix. Mixing all colors together as paint, the pigment-blend will become dark gray or black, but as light the mixture will become white light. It is as if contrasting colors are neutralizing one another as if striving for balance.

Itten referred to harmonies between colors as the "color effect". He suggested that colors in combinations change in the mind's eye to give a new effect. For example: one white square on a black background seems bigger than a black square of the same size on a white background. The color red does not give such a strong effect when placed on a light background as it does on a dark one. When a gray square is painted on ice blue, the gray appears to be a red gray, which is the complementary color to ice blue. When gray is painted on red surroundings, then the gray will appear ice blue. It is as if the mind gives a response to balance a contradictory reaction.

Itten held that the eye and brain can only expe-

rience color through comparison and contrasts. He wrote that the principle of color harmonies is identical to the principle of harmony in music. Indeed, one common meaning of “harmonious” and “disharmonious” is the same as “pleasant” and “unpleasant” in art and music. But for Itten, the concept of color harmony needed to be elevated from subjective feeling to an objective ordered law, and the clue to understanding what this law might be was in the physiological process. For example, we may look at a green square for a while, then when shutting our eyes an afterimage of the contrasting (complementary) color appears as a red square. This experiment indicates that it is the physical eye or the mind’s eye that brings forth the complementary color in its attempt to create balance. When a gray-toned color is placed beside a pure violet, the gray will appear to be a yellowish gray because violet and yellow are complementary. A pure blue color will make a gray to appear orange-gray. In every instance, no matter which pure color the gray is placed on, it will seem as if it has a tint of the complementary color. This phenomenon is named simultaneous contrast. However, when a medium gray square is placed on a gray surface, it just produces a gray afterimage. This proves, according to Itten, that the medium gray is fulfilling our expectations of balance, and that the phenomena of simultaneous contrasts show that the eye is only at ease or in balance when the law of the complementary is completed. Yellow, red and blue contain all colors, and two or all three of these primary colors become gray when mixed together. That all other color-mixes do not add up to gray is for Itten a disharmonious sign. For him, the eye seeks a totality and becomes satisfied when such balance occurs.

Goethe was the first to point to this phenomenon of color balancing, explaining it this way: when the eye catches a color, it automatically brings forth another color that together with the first completes the whole color circle. He said that in striving for totality, the eye seeks a colorless room beside every colored one, in which to produce the color wished for. He held that here lies the fundamental principle for color harmonies.

Itten’s twelve-parted color circle shows that the com-

bination of the primary colors yellow, red and blue, each at its maximum power, are together harmonious colors. (This does not mean that harmony is felt in physical mix of contrary colours.) The placement of each of these colors forms a regular triangular constellation within the color circle (Ill. 2, page 40). When mixed together, these primary colors also become dark gray. Art educators and artists refer to this as a triangular harmony. A four-color harmony is created when orange-red, violet-red, violet-blue and yellow-green are arranged together to form a square on the circle. When mixed together they also become gray. The illusory triangle or square may be rotated into any position on the color circle and the colors at each corner remain in harmonious balance.

Itten suggested that the harmony of visual art is to be experienced in the juxtaposing of contrasting abstract elements and colors. For him, the constant in perception of contrasting and harmonizing effects by color verified the principle of contrasts in the perception of non-verbal abstract form. He was then able to present one complete basic art theory for composition of abstract form and color in representational as in pure abstract art and design. All share in this common principle for perception of the non-verbal, that which I have named the formal invariant of art.

### **Art’s Link to Science**

Creativity entails contrasting effects and change. We react to new constellations of contrasts with surprise. Such new psychological experiences may be equal to the growth of physical life. Life proceeds with slow, or more rapid changes, new inventions and renewals on the basis of that which already exists. Practical creative changes are necessary to sustain physical life. I suggest that the perception of contrasts in visual art and design is one aspect of the psychological phenomena involved with the perception of aesthetic nature. Then the pleasurable visual effect produced by contrasts in art is connected to human psychological needs and necessities.

Natural science shows that contrasting charged energies are the force behind physical growth. Natural matter varies in visual appearance; the molecular struc-

ture of every snowflake and every leaf is unique. That the appearance of every human face and every living being on earth is different could indicate that such contrasts is not only practical but for aesthetic purposes as well. The teachings of Itten demonstrate that the reaction to visual abstract elements in nature and art is in accord with natural science. His theory about the mind's reaction to color contrasts, which augments the formal invariant principle of form, line and texture, suggests that this may be a scientific matter within psychology. Therefore does Itten's theory demonstrates a link between art and natural science.

### **The Impermanence of Harmony**

In the writings by the Greek philosopher Heraclitus (5<sup>th</sup> century B.C.), as presented by G.S. Kirk in *Heraclitus; The Cosmic Fragments*, the idea is proposed that all of nature is in motional flux between dual forces. This flux was believed to be the power behind growth. The concepts of harmony, order and balance were important in ancient literature. Still, on all levels of personal existence – physical, practical and psychological – it seems as if life is striving towards an (more or less) envisioned permanent order. However, as in music, reaction to visually perceived images entail only momentary balanced harmony and order. In physical living nature lasting harmony is an impossibility.

### **No Harmony without Contrasts**

The concept "aesthetics" is in the contemporary art pedagogical theory by Itten understood as harmonic effects of form and of color. Also in traditional art theory does "harmony" means balanced order; "disharmony" means imbalance and disorder. In history compositional balance was created by symmetrical or a-symmetrical arrangements. Itten explains the phenomenon of contrasts and harmony in terms of a reaction in the mind. He said that psychologically, contrasts of abstract parts and colors serve one purpose; in the mind, each contrasting form and each contrasting color seeks balanced harmony in its opposite, which gives relief to tension. This suggests that without contrast, there could be no production and release of tension, nor a balanced harmony. Itten's theory of form and

color introduces the idea that visual contrasts stimulate tension and produce psychological reactions in the human mind. The formal invariant then is verified in Itten's theory as an aesthetic principle for perception of all non-verbal impressions in representational and pure abstract art and design as in environment.

### **Rhythmic Flux between Harmony and Disharmony in Art and Design may be Aesthetic Experience**

Gibson suggests that the intensity of aesthetic feelings is experienced in the reaction to the non-verbal visual impression. He says that this is happening in the flux induced by contrasts. Gombrich expresses that we need both the jolts of tension produced by contrasts and the harmony that is in the balance between contrasts. When harmony is impermanent I see it as possible that aesthetic feeling must be regarded a reaction to the motional flux between the harmony and disharmony of abstract form and color.

It is a common idea in present times that rhythms of art is similar to rhythms in music. One must then distinguish between rhythm and beat in art and designs. Monotone beat – repetitions of forms and lines – could be the same as the monotone beat in music. We may say that the tension creating rhythms between contrasts is different as it may cause stimuli to aesthetic reaction. This is a perceptive motion between harmonious balanced order and disharmonious unbalanced disorder. In this rhythm, a temporary tension relieving harmony may occurs at a point of equilibrium,



Reidunn D. Heyerdahl, MA  
Director of Kunst & Design College  
Asker, Norway  
rheyerd@online.no

as a pendulum is in momentary balance in the middle of its swing. In his book *Form og Rytme*, the Norwegian architect Brantzeg, wrote in the middle of 20<sup>th</sup> century that everything we are looking at carries its own opposite and this he regards as a rhythmic cooperation between two struggling powers. This phenomenon, he said, is known as “*coincidentia oppositorum*”, an old law of antique times referring to this cooperation between seemingly unfriendly elements. The dual forces are the most important aspect in rhythms, tightly knit as the needle of a compass is to the two dual but inseparable poles, are Brantzeg’s words. In these writings it is my aim to relay the important aspect of the artistic process; the challenge of the visual artist to compose by the principle of the formal invariant in order to produce stimuli of tension and tension relief, just as the composer of music produces rhythmic motion between harmony (consonance) and disharmony (dissonance) of tones.

Founded on Itten’s theory I suggest that aesthetic experience may be a reaction to the rhythms of juxtaposed visual abstract elements and colors, and that this is a scientific and psychological phenomenon consistent with the laws of nature, the rhythmic motion of energies within matter and the physical universe. We may assume that the coexistence of physiological and psychological rhythms is essential for our lives. The explanation how we perceive colors is a matter of physics. That the natural order is maintained by the basic principle of juxtaposing contrasting positive and negative energies is also both a physical and chemical phenomenon. By analogy, I would argue that the human reaction to visual perceived images – the reaction to juxtaposed contrasting abstract parts and colors – is a psychological phenomenon with a scientific basis, at least in part.

I do not contest that special harmonic synchrony may exist between the non-verbal composition and a verbal theme in art. On the contrary, a well designed arrangement by juxtaposed contrasting abstract forms, lines, textures and colors will enhance the intellectual content in a representational or Conceptual work. I mean to say that intellectual content do not only profit from composition by the formal invariant principle but

is totally dependent on it. I would like to suggest that the formal invariant principle, as explained by Itten, is a matter of psychology of perception that has ties to natural science. It might show to be an universal principle of aesthetics, a constant independent of style and trends of art and design in different time periods.

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