

CROSS-DISCIPLINARY STUDY IN COMPLEXITY AND TRANSFORMATION: TRANSFORMING AESTHETICS

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Abstract

Through a cross disciplinary study involving artists, physicists, designers and architects exploratory experiments are conducted on the theme *complexity and transformation*. The aim of the experiment was to lift aesthetical reasoning into a dynamic and inclusive way of working that involve the participant. The model *process based aesthetics* is presented here which proposes a balance between *event* and *artifact*. A central concept within this model is *aesthetical phase transition* which was developed through results from empirical studies of degenerative material transformation. Concluding thoughts concern how creative industry can become more innovative by recognizing the importance of an aesthetical consciousness at all levels of development.

Keywords: pragmatic aesthetics, embodiment, complexity, gestalt, multisensory, cross-disciplinary, transformation, art, design, ecology

Introduction

Through the support of the Swedish Research Council, a three year art/science project entitled “*Cross-disciplinary studies in complexity and transformation*” was started in 2003. This project has brought together a group of twenty artists, physicists, designers and architects to conduct a number of workshops that are structured around *aesthetically* based experimental studies of complex and changing phenomena. These workshops were planned to stimulate perception, physical involvement and creative / systematic evaluation. The theme *complexity* was chosen because it is a concept that deals with holistic systems that place *order* in relationship with *disorder* (Heylighen 1996) and allows or even invites contradictions of order for the sake of an enriched design process (Venturi 1966). The second theme, *transformation* has to do with:

1) innovative change over *time* as well as 2) *spatial* reorientation of elements and relationships through the use of filters/ patterns. Accepting the dichotomies inherent in complex systems and the unpredictable nature of change is therefore central aspects of this project.

Why an aesthetical focus in this cross-disciplinary study? An important aim here is to begin the process of transforming aesthetics by examining phenomena that lie at the periphery of or beyond the current established aesthetical boundaries. Art, architecture, design and crafts are all fields that are traditionally involved in aesthetical activities. and there is a great deal of energy channeled into exploring new aesthetical expressions. However, there is little effort concerned with renewing the field of *pragmatic aesthetics* to keep up with these changes. Physics is based on the rigorous traditions of mathematics and natural sciences, yet within the field of physics it is an accepted fact that aesthetical judgment is applied in research (Greene 1999). Aesthetics is therefore, at some level, affecting the direction of scientific discovery.

While a theory is being constructed, its incomplete state of development often prevents its detailed experimental consequences from being assessed. Nevertheless, physicists must make choices and exercise judgments about the research direction in which to take their partially

completed theory. ...It is certainly the case that some decisions made by theoretical physicists are founded upon aesthetical sense. Of course, nothing assures that this strategy lead to truth. Maybe, deep down, the universe has a less elegant structure than our experiences have led us to believe, or maybe we will find that our current aesthetic criteria need significant refining when applied in ever less familiar contexts. Nevertheless, especially as we enter an era in which our theories describe realms of the universe that are increasingly difficult to probe experimentally, physicists do rely on such an aesthetic... So far this (aesthetical) approach has provided a powerful and insightful guide.

/Theoretical physicist Brian Greene 1999 p. 166-167

Although aesthetics are of central importance in many fields that deal with complex issues our current aesthetical discourse is not yet open to innovative renewal.

Pragmatic aesthetics

The concept aesthetics can be traced back to two main schools of thought: 1) Analytical aesthetics aims to separate aesthetical theory from practice as well as to institutionalize aesthetics as belonging only to the fine arts; 2) Pragmatic aesthetics defines aesthetics as perceptual involved experience in the everyday world which aims to unify theory and practice (Dahlin 2002, p.15-16). There is of course a grey zone between these two schools of thought, however, we argue from a primarily pragmatic view in this paper.

Dewey has outlined the main conditions of *pragmatic aesthetics* (Dewey 1980, p 38-44). He considers aesthetical experience as one that is immediately felt and has a unifying holistic quality. His view of aesthetics involves a process of events that brings together *intellectual* and *practical experiences* through emotions. *Emotions* guide a course of actions and give energy to shape perceptual stimuli into a unique aesthetical experience.

Aims and questions

This paper points to the importance of aesthetical reasoning in art, design and scientific discovery and aim to answer the following questions:

1. *Event /artifact*
Is it possible to renew pragmatic aesthetics so that our understanding of complex and changing processes over time (event) can be integrated with aesthetical traditions that focus on relatively stable conditions of form in space (artifact)?
2. *Limits of beauty*
Can we retain an open attitude of aesthetics that include degeneration processes and ecological awareness that question the limits inherent in the concept of beauty?
3. *Involved participants offer alternative aesthetical methods*
Can the involvement of the participant in the aesthetical event offer an alternative, holistic method for gaining and shaping knowledge in cross disciplinary cultures?

A summary of this project: *Cross disciplinary studies in complexity and transformation* can be found in the Swedish Research councils year book: *Metod & Praktik 2005*. (Lind 2005)

Material and methods: empirical, embodied studies

The mind is inherently embodied, reason is shaped by the body, and since most thought is unconscious, the mind cannot know simply by self reflection. Empirical study is necessary.

/Georg Lakoff and Mark Johnson 1999

A total of four 2-day workshops that were structured around empirical, embodied studies were conducted during 2003-2005 with the following themes in chronological order:

- Material transformation – generative and degenerative
- Simplicity /complexity - spatial transformation
- Re-examining the film archive with the intent to analyze content and explore film projection methods (Re-Act).
- Glade: Light – color – texture: degrees of enclosed and open space

Nearly all of the twenty participants have been engaged as workshop leaders during one or more workshops. Each workshop was organized around several different sessions that could include various lab-stations. The workshop leaders were given full freedom to develop an *empirical study* that interpreted the theme, “Complexity and Transformation”, from their own, unique perspective using an embodied approach (see also Results, “Embodied thinking”). The workshops started by giving some practical and/or theoretical background and then moved on to experiments with physical phenomena asking for interaction, intervention and playfulness. In all workshops we posed the problem of challenging our aesthetical norms as well as expanding our experiential and aesthetical understanding of complex structures and transforming processes.

Material transformation – degenerative

The conceptual model and concepts presented in this paper are mainly derived from the experience and analysis of the material created during the first 2-day workshop: *Material transformation - degenerative*. The first day was lead by Akner-Koler and began with a short warm-up exercise in *haptic* experiences (Fig. 1). The exercise was intended to stimulate feelings of touch: texture, temperature, density and volume. This exercise aimed to counterbalance the dominance of our visual senses. Directly following this experience was a five hour study and presentation primarily concerned with *degenerative transformation* through chemical treatment and heat processes that break down structures (Fig. 2a-d).



Fig 1. Haptic - color Parsnip Fig 2a. Aubergine Fig 2b. Lard Fig 2c. Black pudding Fig 2d.

Fig. 1, haptic experience of colour, and Fig 2a-d show examples of degenerative material transformation in aubergine, lard, black pudding and parsnip.

The following is a general description of the four lab-stations that were set up for the session on degenerative material transformation. Each station had one energy (heat) source, i.e microwave, radiation, gas and steam, plus instruments, containers and chemicals to prepare the organic material. Dv-mini video cameras were available at each lab-station for documentation and Macintosh computers to edit the film. The participants were divided into 4 different cross-

disciplinary groups with 3 members in each group (e.g. physicist, artist, designer). The organic materials included: vegetables such as aubergine/ eggplant, potatoes, ginger etc, as well as processed foods such as tofu and black pudding. The reason for choosing these organic materials is that they are fairly solid and homogenous with few seeds or differentiated structures. The instructions were simply to transform the original material through applying heat and chemicals (the chemicals were those available in an arts studio). There was no functional purpose for the transformation and no predetermined protocol to follow. All that was asked was to actively take part, intervene, discuss/converse and document the transformation process through notes and film-making. We asked the participants to keep an open aesthetical attitude during the experiments. In this particular session we were interested in documenting the inherent structural changes of organic material under heat and chemical stress. By filming the experiments we managed to capture the sound, dialogue, motion and visual properties of transformation over time. When the groups had experienced all 4 stations they were asked to edit a short film that captured the aspects of their work that gave examples of complex and transforming phenomena. We ran the films forward and then watched the same events in reverse, both at slow and fast speed. The films were then edited into sequences that captured contrasting aesthetical changes as well as interesting dialogue. (Amateur film technology (iMovie) made it possible, both economically and technically, to edit the films.)

Results and discussion: generating a process-based model

By analyzing the material, notes and documentary films from the lab-station using gas the following model and concepts emerged:

Process-based aesthetics as a model

Process-based aesthetics is about exploring both time related *events* and isolated, embedded *artifacts* within events. Through alternating between *event* and *artifact* we aim to lift aesthetics into a dynamic mode of reasoning. Event means to include, it refers to performance over time, involvement and interaction with the phenomena, synthesis and holistic gestalt. Artifact means to exclude, freeze time, create distance, discern into parts and structural elements, abstract analysis. Process-based aesthetics recognizes that the course of transformation can be presented coherently by showing the interdependency between complex changing phenomena (event) and stable substances and structures (artifact). Due to the limits inherent in the 2-D media of this article we will focus on the insight gained through suspending a moment within an event. Through this suspension of time we can look for qualities that are constant and essential at each moment (Zeki 1999) and how these properties link the different phases within the event together.

The experimental situation that shaped the concept, *process-based aesthetics*, came through three steps:

1. The first was an open and exploratory study in the workshop *degenerative material transformation* that offered shared *embodied aesthetical experience* that involved all our senses. This study gave us the *experiential component* (Biggs 2004) and *coherency* that focused the development of the model.
2. The second approach was a workshop (Re-act) designed to re-examine, reflect on and experiment with the material and films from the earlier sessions in three cross-disciplinary groups that took on different sub-themes: a) material transformation, b) dendritic growth / cellular automata, and c) turbulence. These groups aimed to develop insight, concepts, gestalt, models, poetry etc. that could develop a deeper understanding of what complexity and

transformation involved. In the Material transformation group (Catharina Dyrssen, Fredrik Berefelt, Elisabet Yanagisawa-Aven, Cheryl Akner Koler) reflecting on our prior experiences studying the visual and auditive activities of the workshop events in the documentary films. Through shifting between the process of transformation and the objects that have been transformed we began to formulate the concept of *process-based aesthetics*. Using this method of film observation we began to question the aesthetic decisions made as we edited the films. What motivated where and how we cut the films?

3. The third approach was through a number of 2-3 hour seminars, e-mail evaluations and creative/academic writing and reading that focused on very selected material. This phase offered a chance to bring in the other participants that had been part of the experience. During this phase we limited our attention to the particular transformation of aubergine.

This article is a result of these three steps.

Aesthetical phase transition

The exploratory studies of aubergine / eggplant in the workshop *Material transformation* offer rich examples of process-based aesthetics and the two complementary ways of reasoning, i.e. event and artifact. When we arranged the single picture frames in chronological order (Fig. 3.a-e) it was easy to compare the abstract patterns, structures, textures etc and discuss what was going on in each picture. We discussed this sequence of pictures at one of our study groups the term *phase transition* came up. The definition in physics of phase transition has to do with material changing from one state to another, e.g. ice to water to steam. The change itself could be gradual or abrupt. In the case of the aubergine the physical phase transition was from organic material to charcoal. However, visually we recognized at least five unique *aesthetical phase transitions*. Each transition demonstrated both subtle predictable changes as well as creative and unpredictable changes. The predictable changes require perceptual skills that recognize similarities. The unpredictable changes introduce abrupt *innovative qualities* that could not be foreseen (if you had no prior experience), like the appearance of white powder on the coal black surface. In retrospect these changes, that are represented in Fig 3a-e, seem very obvious and trivial, but in fact they are radical and creative (see also Discussion).



Fig. 3a



Fig. 3b



Fig. 3c



Fig. 3d



Fig. 3e

The description below is based on suspending the event creating the following five objects:

Fig 3a: Aubergine “natural” with white porous substance and purple colored skin.

Fig 3b: The smooth white surfaces become brown and uneven and the edges are delineated.

* The group intervened in the process and decided to dip the eggplant in a chlorine solution.

Fig 3c: The volume shrinks and the surfaces are transformed into dark charcoal with a cracked pattern across the surfaces.

Fig 3d: The entire form becomes a glowing, orange gestalt.

Fig 3e: Powdery white surfaces appear on and around the form.



Fig. 4a



Fig. 4b

When we removed three phases and changed the chronological order it was no longer possible to see any sign of transformation. Figures 4a (alias 3e) and 4b (alias 3b) are decontextualized and isolated objects with no obvious relationship to a common event.

Embodied thinking

By performing the experiment of material transformation one is actively involved with constantly updating the aesthetical experience in relationship to the present changes taking place. There is no time for deeper analysis and reflection, because you are actively involved in the changing process. Due to the constant flow of energy (in this case gas) and the spontaneous involvement of the participants in the event, there is always something happening. We needed to rely on our *embodied thinking* (Lakoff and Johnson 1999) in order to keep up with the transformation. In our case study we noted that when an aesthetical phase transition was maturing in a dramatic way, the participants were often quiet. The embodied expression of the phenomenon was shared naturally through tacit experience. Through *perceptual import* (Langer 1953) and the overall aesthetical experience we gained knowledge of the activity. Current research in embodiment (Lakoff and Johnson 1999) suggests that our ways of reasoning arise from the commonalities between our mind and body immersed in the environment we live in. Through perception and motor activity we build up a pool of experience which greatly affects how we act and think on both a survival level and a cultural /social level. According to Lakoff and Johnson, this embodied thinking is to a large extent non-linguistic. This means that our actions and the results of our actions through artifacts that we produce and manipulate are central for understanding how we think.

Aesthetical dialogue and behaviour

Going back through the film archive from the workshops we recognized the following actions: 1) Perceptual and aesthetical reactions, 2) Scientific inquiry, 3) Aesthetical preferences/ judgments, 4) Aesthetical abstraction, 5) Aesthetical action, 6) Empathy, 7) Metaphoric association.

Perceptual and aesthetical reactions such as “*Look how quickly the smoke twirls around the edges*” are interwoven with questions concerned with scientific inquiry that ask to explain / speculate about why certain phenomena occur, for example “*Do you think that the heat speeds up the process of oxidation which in turn changes the white surface to brown? But why the color brown?*” Aesthetical preferences were also shared that summed up personal judgments, with comments like “*Look at this ugly rough deformity that sticks out*” or “*Yuk! That smells terrible*” or “*The glow is warm... and beautiful*” reflect such judgments. Aesthetical abstractions were on the whole fairly limited during the performance with the exception of a few individuals. Statements such as “*The direction and position of the dominant element is unbalanced*” or “*The curved axis has a with a strong accent*” were uncommon. Aesthetical action is when a suggestion is formulated that affects an aesthetical process such as “*I wonder how white we can make it*” or “*I think we should take away the outer layer and see if the inside is also black*”. We also expressed empathy for the struggle the organic material was going through, as expressed in

statements like *“This black pudding is so stubborn, I can see it is not interested in transforming itself”*. There were also references to metaphorical associations such as *“The witch has been awakened”*.

These comments offer a little insight into the event that the artifact is embedded in. The above dialogues express the reactions from our visual and non-visual senses such as kinetic, haptic and smell, as well as some semiotic and narrative involvement. To give more insight into the activities, discussions and atmosphere of the *event* we refer to the performance / exhibition planned in November 2005 at Konstfack/Höglagret. We are also working on a website that eventually will open up our archives.

Concluding discussion

Finally we would like to refer to the comments we received from the referee who judged our abstract for this Helsinki, conference “Joining Forces” 2005. He/she wrote:

“Interesting, although the underlying concept of designing seems to be rather traditional (object-oriented / physical phenomena). Is it really these aspects of the design process, that ‘scientific and business communities’ are interested in?”

It is this attitude in the research communities that we would like to address with this paper. There is a strong tendency in the general research culture of today to avoid “object – oriented /physical phenomena” in the real mundane world, dismissing it as trivial. We argue that it is through aesthetical/ perceptual studies of, and interaction with, physical events and phenomena - that do not overlook substance/object/artifact - we can find alternative methods and theories that may carry new insight into understanding innovative processes. The definition for innovation used here is based on Håkan Edholt’s (2004) research which recognizes an interdependency between both systematic and creative performance. The radical and unpredictable changes of the transformed aubergine are in direct relationship with its organic structural qualities as well as the other conditions of heat, chemical and social interactions through transformation.

Although performing experiments in degenerative material transformation may seem contrary to the constructive and generative aims of design there are many parallels with design.

The intensive transformation process (of aubergine) embodies many aesthetical qualities in a time-bound process (figure 3 a.-e), mirroring the exploratory ways of how design works (Geydenryd 1998 p. 123-124). Designers formgiving strategy can often involve exposing “material” to the influence of external energy, forces and stress, that invite or inflict change. Every aesthetical reaction and judgment to these qualities can stimulate an act which can affect how the transformation (design) process develops. And to rely on our senses to value these changes in relation to the past, current and possible future events are also reminiscent of the design process. In other words, we propose that this experiment of transforming aubergine simulates aspects of the design process by creating situations that engage aesthetical exploratory practice, and support a participatory action within this process.

Yet the degenerative material transformation contrary to the design process does not aim to solve any design task. The aim was to cast light on a collective aesthetic process involving an object, where the final status of that object / artifact - a traditional design result/product- was not the focus. Process-based aesthetics shifts interest to phase transitions throughout the process and treats the object and the final result as embodied phases within the process, rather than an

ultimate goal in itself. In this case study of burning aubergine, the organic material was the catalyst of the design game, to trigger actions, re-actions, interaction and reflection.

Open attitude of aesthetics

Through the study of degenerative material transformation that dealt with deformation, decay, deterioration, shrinkage etc. we were able to direct aesthetical awareness to conditions that traditionally lie outside the concept of beauty. In the dialogue from the films it is clear that what typically is classified as ugly, e.g. burnt aubergine, gives dramatic aesthetical experience where emotions and value judgments are expressed. Participants, for example, direct their attention to the cracks on the eggplant that they feel express a sense of beauty. Likewise aesthetical involvement could be mobilized by dissecting the eggplant to expose its inner, raw meat.



FIGURE 5 Dissecting the charcoaled aubergine

One initial motivation for opening aesthetics to accept complex structures and degenerative material transformation grew from the limitations found in classical and modernistic aesthetics based on geometrical, ideal forms, from which other shapes/forms are generated (Akner-Koler 1994). These form and space traditions are still dictating the conditions for beauty, at least for design and architecture, and ignore what we have begun to refer to in our cross-disciplinary group as, the "amorphic field". A parallel motivation was that traditional "design" aesthetics excludes any concepts that deal with ecological reasoning such as entropy, decay, erosion and life cycle degeneration phases, etc. (footnote1)¹.

How one chooses to organize knowledge and expression through aesthetical experience should not be restricted to the limited realm of beauty, especially considering that the concept of beauty is constantly transforming over time as well as being subjected to individual preferences. The scope of aesthetics should be inclusive, not exclusive, in order to engage in a multitude of expressions. This open attitude of aesthetics is shared by several philosophers, artist and researchers such as e.g. Dewey (1980 p 130), Greenaway (1995, film productions), Brian Green (1995) and Krauss & Bois (1997) Marr (1982).

To conclude: We propose that the creative industries, as well as the scientific and design community, can learn to be more innovative by recognizing that an open aesthetical consciousness, at any level of development, can directly shape our understanding of the complex and dynamic events that we are all presently immersed in.

¹ footnote 1 In 1996 Konstfack received state funding to develop, spread and apply knowledge concerning ecology. The exhibition – *Transformation and Conjunction* with Akner-Koler's sculptural work together with the artist Kjartan Slettemark in 1996 at the Future Museum in Borlänge, marked one of the activities inspired by this theme. Akner-Koler's sculptures gave examples of how ecological thinking could influence form theory and practice and Slettemark's contributions changed lifeless junk into sculptural life forms. Included in this exhibition were the results, by industrial design students, from a course lead by Akner-Koler on aesthetical studies and product applications in ecological cyclical processes. (Degerman and Törner 1996)

Participants

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