TITLE: The Creative Process as Resolution of Ecological Tension *(paper)*

Topic: (Art, Drawing, Architecture, Design, Design Thinking, Design Theory, Cognition)

Author(s):
Val Sirbu
Artist/Designer
Canada, Alberta, Edmonton

Abstract
I argue that the creative process is a state of tension between imagined potential and the actuality of that potential. The relation between what is imagined and the actuality is not a binary but a continuum kept together by two forces. Once force is chaotic and represents the totality of all possibilities for actuality that lie within the range of perception of the artist at any given point in the process of creation. The other force is the drive of the artist to create, to subjugate potential to his will and eliminate possibilities in order to arrive at a finished piece. The artist is therefore confronted with two problems. First, is to find potential, that is, the source material from which to produce art. Second, the artist must organize this space of potential and actualize on it. Beginning from an understanding of visual perception based on Gibson's ecological theory of affordances, I argue that the resolution of these two fundamental problems is effectively a kind of ecological or evolutionary process. The human mind is very limited in its capacity to formulate lasting and accurate visual ideas. This is in contrast with other fundamental modes of human expression – language, pure logic (mathematics), or even music – most of which can be conceptualized in the mind (and reproduced by the body in the world) fairly accurately. A poem can be memorized and reproduced exactly, a tune can be hummed, etc. Not so with most visuals that the mind is capable of perceiving. Therefore, the process of resolving visual problems, of negotiating the tension between potential and actuality, is highly dependent of the capacity of the artist to represent his own visual thought. I argue that visual art and design are highly dependent on this kind of embodied cognition. By taking drawing as an example, I illustrate how such a process of resolution of these visual processes might unfold. This process is not unlike an evolutionary process, in which a visual idea or "organism" must be tested against its "environment", against other "organisms" and that over time it either "lives" or "dies" depending on its capacity to "survive". Gibson's theory of affordances helps us to understand this process, a process we might call one of generating art or design, within this ecological framework.

sirbu.val@yahoo.com

Key words: art, design thinking, design theory, cognition, representation, tension.

Main References:
[1] James J. Gibson, "*Ecological Approach to Visual Perception*", Taylor and Francis Group LLC, New York, 1986.
[2] David Buss, "*Evolutionary Psychology: The New Science of the Mind*", Pearson, Boston, 2008.
[3] Henrik Gedenryd, "*How Designers Work: Making Sense of Authentic Cognitive Activity*", Lund University, Lund, 1988.
[4] Jordan B. Peterson, "*Maps of Meaning: The Architecture of Belief*", Routledge, 1999.

The Creative Process as Resolution of Ecological Tension

Val Sirbu, B. Des., M. Des.
Artist/Designer, Edmonton, Alberta, Canada.
e-mail: val.sirbu@gmail.com.

Abstract

I argue that the creative process is a state of tension between imagined potential and the actuality of that potential. The relation between what is imagined and the actuality is not a binary but a continuum kept together by two forces. One force is chaotic and represents the totality of all possibilities for actuality that lie within the range of perception of the artist at any given point in the process of creation. The other force is the drive of the artist to create, to subjugate potential to his will and eliminate possibilities in order to arrive at a finished piece. The artist is therefore confronted with two problems. First, is to find potential, that is, the source material from which to produce art. Second, the artist must organize this space of potential and actualize on it. Beginning from an understanding of visual perception based on Gibson's ecological theory of affordances, I argue that the resolution of these two fundamental problems is effectively a kind of ecological or evolutionary process. The human mind is very limited in its capacity to formulate lasting and accurate visual ideas. This is in contrast with other fundamental modes of human expression – language, pure logic (mathematics), or even music – most of which can be conceptualized in the mind (and reproduced by the body in the world) fairly accurately. A poem can be memorized and reproduced exactly, a tune can be hummed, etc. Not so with most visuals that the mind is capable of perceiving. Therefore, the process of resolving visual problems, of negotiating the tension between potential and actuality, is highly dependent of the capacity of the artist to represent his own visual thought. I argue that visual art and design are highly dependent on this kind of embodied cognition. By taking drawing as an example, I illustrate how such a process of resolution of these visual processes might unfold. This process is not unlike an evolutionary process, in which a visual idea or "organism" must be tested against its "environment", against other "organisms" and that over time it either "lives" or "dies" depending on its capacity to "survive". Gibson's theory of affordances helps us to understand this process, a process we might call one of generating art or design, within this ecological framework.

1. Ecological Perception

The implications of Darwin's theory of natural selection were foremost in the minds of American pragmatist philosophers at the turn of the last century. Darwin's theory brought to the forefront ecology, that is, the relations between organisms and their environment. This "unitary, coordinative relation that reflects an animal's ongoing, adaptive functioning in an environment" [1] stands in contrast to a Cartesian or Newtonian worldview which clearly delineates between matter and mind. One mode of representation, the ecological, describes the world as a "forum for action" while the other, Cartesian, as "place of things" [2]. While in the Cartesian worldview the world is reduced at its most basic level to "inert matter in mechanical interaction" [3], the ecological worldview is reduced to "pure experience" [4] as described by William James. James, a pragmatist and a renowned psychologist, was concerned about psychologists' assumption that the subjective mind can stand alone from the objective physical world. He rejected this Cartesian mind-matter dualism and emphasized that the "mind [is] in the midst of all of its concrete relations" [5]

and that to study it requires a study of the environment as well. The mind, for James, cannot exist in a vacuum.

This claim to pure experience evokes a similar claim by Descartes; "I think, therefore I am." Interestingly, the word "think" was used by Descartes to mean not thinking in the contemporary sense but something more like awareness. Therefore James' claim to pure experience might appear superficially alike to a fundamental Cartesian axiom. The key difference is James' emphasis on the relation between the observer and the environment. To James this relation defines awareness. "Immediate experience consists of things and their relations." [6]

For James, pure experience represents a ground of potential out of which knowing arises through selection. To know something, to be a "knower", implies that which is known, "the object known" [7]. Therefore, unlike the Cartesian view in which the observer stands removed from the material world and where psychological phenomena are distinguished from the physical, in James' radical empiricist tradition, the observer's self-awareness is relative to the environment. This relational quality between observer and environment is not derived later through cognitive processes, instead, James argues, it is itself a constituent of pure experience. Interestingly, James refers to this ground of potential, that is, proto-phenomenological pure experience, as a "quasi-chaos." [8]

J. J. Gibson's theory of ecological visual perception builds on these ideas by emphasizing, like James, the observer-environment relationship. Gibson's thinking is illustrated through two of his main concepts as well as two complementary ones from Barker and Peterson. The first Gibsonian concept is the concept of the invariant property of an object. The invariant is that property which remains constant despite changes in the observer's point of view, movement of the object, changes in its surface properties, changes in lighting, etc. For instance, when looking at a cat, the visual properties of the cat change over time as the cat moves or the viewer moves in relation to it. The human observer does not associate any of those properties as alone signifying the “catness” of the cat. Instead the viewer simply sees a cat, regardless of whether it is walking, lying down, hiding behind a chair or whether it is wet, dry, dirty, etc. This higher level property that is perceived regardless of constituent properties is what Gibson refers to as the invariant property.

The invariant might be better understood in relation to Gibson's concepts of the optical array and optic flow. For Gibson, an optical array is analogous to the information coming in through the eyes and it is a result of light bouncing around a scene which contains within it the properties of the environment. Importantly, the optical array is in a constant state of flux, what Gibson calls optic flow. For Gibson, to perceive is to act in such a way as to generate optic flow which in turn reveals the structure of the environment and the invariants of objects within it.

The second Gibsonian concept is that of the affordance. An affordance is what an object affords an observer. For instance, an object that has a top surface smaller in height than the height of the knee of the observer makes possible the activity of sitting. If an object is large enough to cover the observer from a given point of view then that object affords hiding behind. Affordances are relational properties between the observer and the environment. "[An affordance] implies the complementarity of the animal and the environment" [9]. Heft summarized it as "the perceived functional significance of an object, event, or place for an individual." [10] Gibson places this central concept in Jamesian terms:

> An affordance... points two ways, to the environment and to the observer. So does the information to specify an affordance. But this does not in the least imply separate realms of consciousness and matter, a psychophysical dualism. It says only that the information to specify the utilities of the environment is accompanied by information to specify the observer himself, his body, legs, hands and mouth. This is only to emphasize that exteroception is accompanied by proprioception - that to perceive the world is to

> coperceive itself. This is wholly inconsistent with dualism in any form, either mind-matter dualism or mind-body dualism. The awareness of the world and of one's complementary relations to the world are not separable. [11]

A third concept, that of the behaviour setting, was discovered by Barker, a psychologist roughly contemporary to Gibson. Barker decided to study people ethnographically by establishing a research centre in a small Midwestern town. He then proceeded alongside his research group to document in detail the lives of the town's inhabitants. What he realized is that the best predictor of behaviour is not sensory stimuli, or other traditional explanations but simply the behaviour setting the person found themselves in. Behaviour settings are not just places, but socially mediated contexts that change over time. For instance, the school classroom constitutes different behavioural settings during class, at recess, and after school. Gibson's own writings point in this direction:

> The richest and most elaborate affordances of the environment are provided by other animals and, for us, other people...When touched they touch back, when struck they strike back; in short, they interact with the observer and with one another. Behaviour affords behaviour and the whole subject matter of psychology and of the social sciences can be thought of as an elaboration of this basic fact. [12]

Finally, we take into account Peterson's analysis of the relation between objects, people and meaning. Peterson argues that objects that inhabit behaviour settings or that are acted upon in sociocultural contexts acquire relative value, status, and meaning that is, perceived by people as intrinsic to the objects. When a baby girl perceives the affordances of a vase and is attracted to explore its properties she may find out, to her dismay, that such action has drastic negative effects on her mother who scolds the child and imposes behavioural rules relative to the vase. While previously the vase may have been perceived by the child in terms of affordances and valences in relation to the exploratory tendencies of the child it now has also acquired value and meaning that in turn immediately guides action. "We need to know what things *are* not to know what they are but to keep track of what they mean - to understand what they signify for our behaviour." [13]

The symbol as described by Peterson in Jungian terms represents the highest level of analysis for the purposes of this account of perception and creativity. Tjeu van den Berk provides us with a vivid illustration of the manner in which a simple everyday object acquires powerful symbolic meaning. Berk describes the death of the father of theologian Leonardo Boff who could not attend the funeral.

> Several days later, his brother sent him a package with half a cigar, which was the last his father had smoked. Full of emotion, he placed it on his desk, where it stayed for years. He conveyed this as if he was talking about a sacrament. His father ‘was present in the appearance’ of that cigar. Without a doubt, Jung would have called this an authentic process of symbolization. We need to realize that the cigar is not by nature a symbol. It became a symbol because Boff projected his entire soul onto this object. He made a symbol of it… To us the cigar is not a symbol, but a sign which refers to Boff’s father. However, we can sense from this narrative that it is a symbol to Boff. [14]

2. The Creative Process

This account of visual perception rooted in Gibson and complemented by Barker and Peterson as well as James helps us to situate ecological perception within a broad context. This hierarchy spans from the most basic irreducible ground of pure experience all the way to value judgments and higher order symbolic and socio-cultural meaning. A central argument of this paper is that visual perception and the production of visual art and design are, in a sense, facets of the same activity. In fact, much of what art and design education is about is precisely expanding the perceptual span of students up and across this hierarchy. On the one hand, practical assignments are designed to attune students towards higher fidelity properties of the environment; to see lines, shapes, lighting, and colour or to study projections, perspective, constructive drawing, etc. These exercises

develop technical proficiency while public critiques and studies in art and design criticism and the humanities develop students' capacity to operate at a conceptual/philosophic level.

The central question that follows this account is the how of the visually creative process. When confronted with the potential and complexity that lies latent in the ground of pure experience how does the artist or designer even begin to think about resolving it? The paralysis which artists and designers are confronted with in this moment of inception is in fact analogous with what Peterson describes as the confrontation of the individual with the unknown; the blank canvas, the white piece of paper, etc. At this point in the process virtually everything that falls within the lived experience of the visual artist may constitute a point of departure. The totality of this potential is overwhelming and it leads to paralysis. "What does something that might be anything mean? In the extremes, it means, the worst that could be (or, at least, the worst you can imagine) and, conversely, the best that could be (or the best you can conceive of)." [15]

Peterson argues that the human brain is evolved to address the tension between the known and the unknown. The unknown is roughly analogous to an anomalous event, that is, an unexpected event that interrupts one's pattern of activity. A small anomaly may be ignored altogether if it does not affect the task at hand. A large anomaly can completely alter not only one's pattern of behaviour but one's conception of the world. Peterson illustrates this through analogy with behavioural studies of rats.

> A rat (a person) is a complacent creature in explored territory. When in unexplored territory, however, it is anything but calm. A rat moved from its home cage to a new and unknown environment – a new cage, for example – will first freeze (even though it has never been punished, in the new situation). If nothing terrible happens to it (nothing punishing, threatening or additionally unpredictable) it will begin to sniff, to look around, to move its head, to gather information about the intrinsically frightening place it now inhabits. Gradually, it starts to move about. It will explore the whole cage with increasing confidence." [16]

Davidson describes the left/right brain divide as a specialization in dealing with negative and positive affect, respectively. Peterson interprets this as specialization in dealing with the unknown and the known [17]. The known is safe and reassuring; it is associated with smiling children and the comfort of home. The unknown is dangerous and confusing; it is associated with chronic stress, anxiety and fear. The rat in the new environment is confronted with the unknown, that is, negative affect. First it freezes, then, it begins to slowly and cautiously explore the new territory. Eventually it grows comfortable and unknown passes into the domain of the known, that is, the domain of positive affect. Peterson argues that this transformation of unknown territory into the known lies at the heart of human adaptive capability and it is the blueprint for creative activity.

> The capacity to create novel behaviours and categories of interpretation in response to the emergence of the unknown might be regarded as the primary hallmark of human consciousness - indeed, of human being. Our engagement in this process literally allows us to carve the world out of the undifferentiated mass of unobserved and encountered "existence" (a form of existence that exists only hypothetically, as necessary fiction; a form about which nothing can be experienced, and less accurately stated). We carve the world as a consequence of our direct interaction with the unknown – most notably, with our hands, which enable us to manipulate things, to change their sensory aspects and, most importantly, to change their importance to us, to give them new, more desirable *value*. [18]

The motor homunculus, discovered by Wilder Penfield, illustrates the manner in which the human body is mapped across the brain. These bizarre images of the human body may be regarded as the brain's conceptualization of the body and the relative size of body parts as the degree of relative importance the brain attaches to them. The hands of the homunculus are huge precisely because through them the brain projects itself literally onto the world. Peterson further emphasizes this relation between hand and mind:

> The most outstanding characteristic of the motor homunculus, for example – the hand, with its opposable thumb – is the defining feature of the human being. The ability to manipulate and explore characteristic of objects large and small – restricted as a general capacity to the highest primates – sets the stage for elicitation of an increased range of their properties, for their utilization as tools (for more comprehensive transformation of their infinite potential into definable actuality)… [19]

Therefore, to be creative, according to Peterson, is to encounter the unknown, to explore it and to transform it into the domain of the known. Creativity is the discovery of knowing, in the pragmatic Jamesian sense of the term. Crucially, the use of our hands to transform our physical environment (literally the unknown) into the built environment (literally the familiar, the home, the known) is, according to Peterson, directly connected to our cognitive capacity for creativity; the emergence of new and useful concepts out of confusing or indeterminate circumstances.

> The process of creative exploration – the function of the knower, so to speak, who generates explored territory – has as its apparent purpose an increase in the breath of motoric repertoire (skill) and alternation of representational schema… Permanent instantiation of the new behaviour, undertaken if the behaviour is successful, might be considered development of new skill. Knowing how is skill. [20]

Note the connections tying Peterson to Gibson to James. Recall for instance James's earlier description of pure experience as a "quasi-chaos" and the function of the *knower* in relation to it. In these terms, creative activity is understood as a process of transformation. A person who finds themselves in a state of confrontation with anomaly, the unknown, will experience a state of tension between a potential actuality of the ground of indeterminate unexplored territory. To resolve this tension, I claim, the visually creative individual must address the span of their own visual perception. If we are to assume that Gibson's conception of ecological perception is correct and that the artist is therefore immersed in a relational state of being with his own environment then by necessity the visually creative act must engage with the hierarchy of ecological concepts outlined previously. The artist or designer cannot help but see the world in these terms; that is, in terms of invariants, affordances, behavioural settings and higher order symbolic meaning. It is not relevant whether the visually proficient person actually uses such terms (usually they do not, but sometimes they do, for instance, designers who have adopted Gibson's term *affordance*) - what matters is that they behave in such a manner that these concepts are useful in describing the relation between him and his context. This context, this ground of potential, constitutes "quasi-chaos" and through its exploration the visually *knowing* individual (the skilled individual) creates meaningful expressions of that which through *knowing* becomes *known*.

3. Drawing, an Example

Drawing is of central importance to Gibson. He describes "the making of traces on a surface that constitute a progressive record of movement" as "the fundamental graphic act." [21] He regards it as fundamental because it is an impulse in small children as young as 16 months. Children refuse to make scribbles using tools that do not leave a mark and refuse to make scribbles without a surface to record the marks. They appear to be specifically interested in the permanent trace their own motion produces. Gibson narrows his definition of drawing as a process of "mark[ing] the surface in such a way as to display invariants and record an awareness." [22] A wonderful quote from animator Richard Williams illustrates this relationship between awareness and drawing; "We want to develop [through drawing] the co-ordination to be able to get our brains down into the end of our pencil." [23]

An often quoted and enlightening example of drawing as creative process is offered by Donald Schön in his ethnographic documentation of an architectural review at MIT in the late 1970s. In this account, a student, Petra, is describing her difficulties to a professor,

Quist. Petra is designing a school and trying to fit the building along a contour of the site. However, she finds herself unable to do so and becomes "stuck" [24], that is, she arrives at a state of paralysis not unlike the one described previously in relation to the blank canvas. As the conversation progresses both Quist and Petra produce drawings to illustrate their thinking. Through drawing Quist and Petra are depicting invariants properties of the architectural space. This in turn makes explicit the affordances of that space and the potential future use of the building suggests the manner in which behavioral settings may arise. The perceptual span is limited in order to enable the handling of complexity and the concepts involved (invariants, affordances, etc.) are used pragmatically and instrumentally especially by Quist. Crucially, the activity of drawing takes on an exploratory cognitive quality; a mode of expressing thought, specifically visual thought. Quist does not solve Petra's problem for her but instead changes what Schön describes as the problem setting. Eventually, Quist challenges Petra to reconsider the manner in which she approaches designing. He states: "You should begin with a discipline, even if it is arbitrary, because the site is so screwy – you can always break it open later." [25]

Petra, like any design student, is using drawing to explore her own perceptual span in relation to the design project. However, because her span is limited and because she lacks awareness of her own perceptual span, that is, her point of view of the project, she fails to realize that the reason why she is stuck is precisely because she assumes that what she perceives is immutable. By suggesting to begin with "a discipline, even if it is arbitrary", the professor suggests to Petra to change her point of view; to shift her perceptual span.

Effectively, what Quist is trying to do is to get Petra to look at her design context from a different level of analysis on the hierarchy of perception. Quist, as an expert possesses a greater perceptual span and more sophisticated ability in manipulating invariants, affordances or other concepts at other levels of analysis. In fact, the reason why Quist is able to perceive Petra's problem is precisely because he possesses greater perceptual capabilities and skill. The relation between perceptual ability and expertise is tightly wound. Bryan Lawson argues the conveying of this perceptual hierarchy from master to student is what defines the expert-novice relation:

> One of the major roles of design tutors is to move their students around from one part of the problem to another and the job of the design student is to learn to do it for himself. [26]

The student is often trapped in their inability to step outside the explored territory, that is, the bounds of their knowledge. The tendency of the novice is to hold on to what they know.

> Design students often fail to recognize this simple fact but instead continue to pit their wits endlessly and fruitlessly against insuperable problems which are largely of their own making. One of the most important skills a designer must acquire is the ability critically to evaluate his own self-imposed constraints. [27]

Schön describes Quist's suggestion as shifting the "problem setting" around while Gedenryd, in his PhD on authentic cognitive and design activity, draws the connection between Quist's "reframing of the problem setting" and the pragmatism of William James:

> Quist… consistently acts as a pragmatist. He acknowledges Petra's solutions as being directed by her problem setting, and thereby sees that the deficit lies not in the failed solutions themselves, but in her problematic framing: In a sense, all solutions were doomed to fail from how she had set her problem, as the impossible task of fitting the school to a screwy slope. Here, a critical element is Quist's ability to recognize the condition of being stuck; i.e. that further attempts at a solution are wasted, and to therefore switch from solving to setting the problem. [28]
>
> The rationale for Quist's actions here is ... that action has not one but two kinds of purpose or effect, in that it works as both use and testing at the same time. When action makes use of some piece of knowing, it is at the same time a test of that knowing. [29]

Gedenryd interprets the activity of drawing in this context as a kind of embodied cognition. Embodied cognition is the cognitive science equivalent of pragmatists' (like James) denial

of the mind matter dualism. The idea, similar to that described earlier by Peterson is that the mind is extended into the physical domain though its embodiment, that is, through the body itself and the actions of the body (the homunculus). Recall Peterson's connection between thinking and the use of hands to transform and manipulate objects. Drawing is a form of embodied cognition. Through drawing Quist and Petra think and also act in relation to the design. This kind of embodied pragmatic thinking through drawing plays an adaptive role in relation to the design. In a sense, ideation proceeds in such a way that the drawings themselves bump up against the design problem, reshaping themselves while changing the context of design as well.

> Some moves [that is, Quist's reframing of the problem setting] are resisted (the shapes cannot be made to fit the contours), while others generate new phenomena. As Quist reflects on the unexpected consequences and implications of his moves, he listens to the situation's back talk, forming new appreciations, which guide his further/moves. [30]

Peterson, like James, Gibson and Barker is strongly influenced by Darwinian thinking. Peterson states: "You think so that your ideas can die instead of you" [31]. In a sense, the artist and the designer draw, that is to say, they act in such a way as to allow the embodiment of their visual ideas to manifest themselves, so that these ideas may fail repeatedly in the attempt to make sense of the "quasi-chaos" of pure experience and the hierarchy of visual perception and meaning.

Conclusion

To draw is therefore to engage pragmatically with one's own perceptual span. By paying attention to the drawing itself and its "back talk" the student or artist explores the tension between what they know and what they do not. Drawing is a form of knowing, of skill. It is carried out in relation to one's own perceptual span and in relation to the perceptual span of experts. It may be applied in a specific context and its own affordances in relation to its context gives the artist or designer the impetus for further exploration. Ideally, the end point of exploration is the production of a fully realized work of art or design that engages its maker and the audience at every level of the hierarchy of perception outlined previously. The fully realized work does not have to be a drawing. Drawing is used here as an example and may be replaced with any analogous form of visual expression. The fully realized work embodies the outcome of the exploration and so in a sense it embodies product-process symmetry. The work makes explicit that which is new and useful, the explored visual territory that may have previously been unknown. This transformative act which is carried out as a back and forth process through visual representation and acting on visual representation of visual exploration is what constitutes the visually creative act. Ideally, the perceptual span of this activity is broad and encompasses the full range beginning from those aspects of the environment that are directly perceived (invariants of objects, properties of the environment, etc.) all the way up to the relation between affordances, behavioural settings and higher order symbolic and sociocultural meaning. This problem is one of a tension between potential and the actuality of potential. That which the artist experiences visually (the hierarchy of ecological visual perception) constitutes a starting point while the finished piece, be it design or art, constitutes the end point. Imbued within both poles lie the unknown/unactualized potential/chaos as well as the known/the actualized potential/order.

Notes

[1] Heft, Harry. *Ecological Psychology in Context: James Gibson, Roger Barker, and the Legacy of William James's Radical Empiricism*. Hove: Psychology Press, Taylor and Francis Group LLC, 2001, 14.

[2] Peterson, Jordan B. *Maps of Meaning: The Architecture of Belief*. Routledge, 1999, 1.

[3] Heft, *Ecological Psychology in Context*, 17.

[4] Heft, *Ecological Psychology in Context*, 17.

[5] Heft, *Ecological Psychology in Context*, 17.
[6] Heft, *Ecological Psychology in Context*, 27.
[7] Heft, *Ecological Psychology in Context*, 28.
[8] Heft, *Ecological Psychology in Context*, 27.
[9] Gibson, James J. *The Ecological Approach to Visual Perception*. New York: Taylor and Francis Group LLC, 1986, 127.
[10] Heft, *Ecological Psychology in Context*, 123.
[11] Gibson, *The Ecological Approach to Visual Perception*, 141.
[12] Gibson, *The Ecological Approach to Visual Perception*, 135.
[13] Peterson, *Maps of Meaning*, 3.
[14] Berk, Tjeu van den. *Jung on Art: The Autonomy of the Creative Drive*. New York: Psychology Press, Taylor and Francis Group LLC, 2012, 48.
[15] Peterson, *Maps of Meaning*, 43.
[16] Peterson, *Maps of Meaning*, 59.
[17] Peterson, *Maps of Meaning*, 67.
[18] Peterson, *Maps of Meaning*, 67.
[19] Peterson, *Maps of Meaning*, 64.
[20] Peterson, *Maps of Meaning*, 72.
[21] Gibson, *The Ecological Approach to Visual Perception*, 275.
[22] Gibson, *The Ecological Approach to Visual Perception*, 279.
[23] Williams, Richard. *The Animator's Survival Kit*. New York: Faber and Faber Limited, 2001, 34.
[24] Gedenryd, Henrik. *How designers work: Making sense of authentic cognitive activities*. PhD diss., Lund University, 1998, 89.
[25] Schön, Donald. *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions*. San Francisco: Jossey-Bass, 1988, 49.
[26] Lawson, Bryan. *How Designers Think*. Oxford: Architectural Press, 81.
[27] Lawson, *How Designers Think*, 70-71.
[28] Gedenryd, *How Designers Work*, 88.
[29] Gedenryd, *How Designers Work*, 82.
[30] Schön, *Educating the Reflective Practitioner*, 57.
[31] Peterson, Jordan B. *2016 Personality Lecture 03: Mythological Elements of the Life Story -- and Initiation*. Filmed [January 2016]. YouTube video, 1:05:10. Posted [Jan 19, 2016]. https://www.youtube.com/watch?v=PH67HpFD2Ew

References

Berk, Tjeu van den. *Jung on Art: The Autonomy of the Creative Drive.* New York: Psychology Press, Taylor and Francis Group LLC, 2012.

Barker, Roger. *Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behavior*. San Francisco: Jossey-Bass, 1968.

Barker, Roger. *Habitats, Environments, and Human Behaviour: Studies in Ecological Psycholgy and Eco-Behavioral Science from the Midwest Psychological Field Station, 1947-1972*. San Francisco: Jossey-Bass, 1978.

Buss, David. *Evolutionary Psychology: The New Science of the Mind*. Boston: Pearson, 2008.

Gedenryd, Henrik. *How designers work: Making sense of authentic cognitive activities*. PhD diss., Lund University, 1998. (http://www.lunduniversity.lu.se/o.o.i.s?id=24732&postid=18828)

Gibson, James J. *The Ecological Approach to Visual Perception.* New York: Taylor and Francis Group LLC, 1986.

Graves, Michael. *Architecture and the Lost Art of Draw*ing, New York Times, September 1, 2012. Accessed August 20, 2014,

http://www.nytimes.com/2012/09/02/opinion/sunday/architecture-and-the-lost-art-of-drawing.html?pagewanted=all&_r=0

Heft, Harry. *Ecological Psychology in Context: James Gibson, Roger Barker, and the Legacy of William James's Radical Empiricism*. Hove: Psychology Press, Taylor and Francis Group LLC, 2001.

Lawson, Bryan and Kees Dorst. *Design Expertise*. Boston: Architectural Press, 2009.

Lawson, Bryan. *How Designers Think*. Oxford: Architectural Press, 1997.

Lawson, Bryan. *What Designers Know*. Oxford: Architectural Press, 2004.

Peterson, Jordan B. *2016 Personality Lecture 03: Mythological Elements of the Life Story -- and Initiation.* Filmes [January 2016]. YouTube video, 1:05:10. Posted [Jan 19, 2016]. https://www.youtube.com/watch?v=PH67HpFD2Ew

Peterson, Jordan B. *Maps of Meaning: The Architecture of Belief*. Routledge, 1999.

Schön, Donald. *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions*. San Francisco: Jossey-Bass, 1988.

Schön, Donald. *The Reflective Practitioner: How Professionals Think in Action*. Cambridge: MIT Press, 1983.

Sirbu, Val. *The Primacy of Drawing in Design*. MDes Thesis, University of Alberta, 2014.

Williams, Richard. *The Animator's Survival Kit*. New York: Faber and Faber Limited, 2001.