

The Goethean approach and human artifacts

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Johann Wolfgang von Goethe brought his creative sensibility to bear on a wide range of natural phenomena. His scientific work included writings on botany, zoology, comparative anatomy, morphology, weather, geology, and physics (Miller, 1988) that span thirteen volumes of the Weimar edition of his collected works (Amrine, Zucker and Wheeler, 1987). Although Goethe never formulated a "method" per se, a distinctive approach to the study of phenomena emerges when his scientific work is considered as a whole. The Goethean approach is generally associated with the direct investigation of "natural world" phenomena: color, weather, minerals, plants, animals, landscapes, ecosystems. With the extension of scientific methods¹ to social spheres in the decades following Goethe's death, it suggests that Goethe's scientific approach could also extend there. Goethe himself hinted at its appropriateness for human processes in his terse reference to "Example of a city as the work of man" (Goethe in Miller, 1988, p. 75; all subsequent Goethe quotes are from Miller unless otherwise noted). However, in the three recent anthologies of Goethean science (Amrine, Zucker and Wheeler, 1987; Seamon, D. and Zajonc, A., 1998; Holdrege, 2005) there are only two examples of its use in the social sciences. Margolis (1987) writes about Goethe and psychoanalysis, and Kaplan (2005) describes his use of the approach to understanding social development work. This is not to suggest that social dimensions of phenomena do not appear in either Goethe's work or the many examples of the application of his approach to various natural phenomena -- they do, in particular in landscape

¹ "Scientific method" is admittedly a broad and problematic concept. I use it here to describe the systematic study of phenomena towards acquiring new knowledge that can be verified by others.

and ecological studies (e.g., Brook, 1996; Suchantke, 2001). There have, however, been relatively few examples of the application of Goethe's approach to the social sciences.²

This paper won't remedy that lack, but I do suggest that Goethe's approach can be productively used in the social science sphere, just as it has been in the natural sciences. By way of example, I explore the general applicability of Goethe's approach to investigating human-made artifacts. Following an overview of Goethe's approach and a summary of the approach as taught today, I describe a personal case study of the Goethean approach to the study of a simple household artifact. I assess the experience and results, and conclude with a consideration of some challenges in applying Goethe's approach to the study of human activity.

Goethe's universe

Although Goethe's approach is primarily a way of knowing (Wahl, 2005), it implies at the same time a particular understanding of how the world is organized. In Goethe's world view, nature is "alive and active, with its efforts directed from the whole to the parts" (20). Everything is interconnected and dynamic and in a process of formation (*bildung*). Goethe's world view is monistic. Concepts, ideas, even the "archetype" (*urphänomen*) are not separate from phenomena, standing behind it, but part of the phenomena.

This living, dynamic, interconnected world is known first through the senses. The Goethean approach is strongly empirical, emphasizing the importance of direct observation and experience in knowing the world. The phenomena is central, but Goethe also recognized that perception is a participatory act, anticipating phenomenology by 100 years (Heinemann, 1934; Seamon, 1998). The observed works on the observer as much as the observer works on the

² Of course the boundary between "natural" and "social" science is fuzzy, if not arbitrary or even fictitious. Landscape and ecological studies cannot help but consider human land use and impacts. By the same token, psychology must consider biology; geography, history and economics must consider land, climate and ecosystems. In a monistic outlook like Goethe's, nature appears everywhere, everything interpenetrates.

observed. In a play on words ("an ingenious turn of phrase"), "objective thinking" for Goethe "means that my thinking is not separate from objects; that the elements of the object, the perceptions of the object, flow into my thinking and are fully permeated by it; that my perception itself is a thinking, and my thinking a perception." (39) The observer-as-subject does not disappear when "thinking objectively" (if even that were possible).

Empirical data is *always* understood within a theoretical framework, and so it is important for the investigator to be conscious of the framework being used. Goethe went a step further though, bringing his artistic sensibility to bear on the investigation. The careful, detailed observation of phenomena is complemented by what he called "exact sensory imagination" (46). Phenomena are processes that are in a constant state of formation, and empiricism can only examine parts of a process, snapshots in time. Because a process exists and develops through its interconnections, it has an integrity that cannot be grasped through dissection or reduction (although they may contribute to understanding). This is especially the case with living organisms. In order to grasp the living whole of the phenomenon, the investigator must bring the phenomenon to life in the imagination.

Experiments play an important role in Goethean science, but Goethe cautions against the easy temptation of drawing false conclusions. Experiments are properly used to recreate previous experience, or to coax new experiences out of phenomenon under specific conditions. Using experiments to prove a hypothesis is "detrimental" (15), because of the tendency to ignore experiences that fall outside of the hypothesis: "Thus we can never be too careful in our efforts to avoid drawing hasty conclusions from experiments or using them directly as proof to bear out some theory. For here at this pass, this transition from empirical evidence to judgment, cognition to application, all the inner enemies of man lie in wait." (14) For the investigator, phenomena are

part of many causes and effects; the appropriate question is not one of causes or purpose ("what are they for?"), but of determining the conditions under which phenomena arise ("where do they come from?"). (121)

Goethe described different stages or modes of knowing, using different terms in various writings. In one place he describes a sequence flowing from "empirical phenomena", observations found in nature, to "scientific phenomena", where the phenomena is understood well enough to reproduce under controlled conditions, via experiments, to "pure phenomena", which is a purely mental process, where the heart of the phenomena is comprehended, and "the human mind gives a definition to the empirically variable, excludes the accidental, sets aside the impure, untangles the complicated, and even discovers the unknown." (25) Elsewhere he describes an empirical phase of careful study yielding to the necessity of visualizing internally the various observations in order to gain a sense of the whole. Empirical observation gives way to an intuitive perception:

If I look at the created object, inquire into its creation, and follow this process back as far as I can, I will find a series of steps. Since these are not actually seen together before me, I must visualize them in my memory so that they form a certain ideal whole.

At first I will tend to think in terms of steps, but nature leaves no gaps, and thus, in the end, I will have to see this progression of uninterrupted activity as a whole. I can do so by dissolving the particular without destroying the impression itself.

If we imagine the outcome of these attempts, we will see that empirical observation finally ceases, intuitive perception of the developing organism begins, and the idea is brought to expression in the end. (75)

Elsewhere, Goethe describes his general process as proceeding from empirical observation to archetype (118), and elsewhere, "of what nature bears within itself as law" (147).

Goethe's concept of "archetype" is one of his more difficult concepts. In his "Maxims", Goethe describes the archetype in four ways: as "ideal" in the sense of the "ultimate we can know"; "real" because we experience its expression; "symbolic" because it represents all instances; "identical" because it is identical with all instances. The archetype is expressed concretely through phenomena. The archetype describes an inner lawfulness or logic or coherence, a "structural range" (120) within which the archetype can be expressed. Naydler (1996) describes it like this: "The Archetypal Phenomenon is experienced when a group or sequence of phenomena reveal an underlying meaningfulness and internal coherence which is grasped by the intellect in a moment of intuitive comprehension." (p. 103)

Goethe sought to identify archetypes for minerals (Amrine, 1998; Steiner, 2000), plants and animals. Through the emphasis of one aspect over another, the archetype manifests in various forms. Goethe described his archetypal plant in a 1787 letter: "The primordial plant is turning out to be the most marvelous creation in the world... With this model and the key to it an infinite number of additional plants can be invented, which must be logical, that is, if they do not exist, they *could* exist, and are not mere artistic or poetic shadows or semblances, but have an inner truth and necessity. The same law is applicable to every other living thing." (328-9)

The archetype should not be considered as a Platonic ideal form standing behind phenomena (Heinemann, 1934). Nor is it a blueprint or formula, or an abstract or symbolic rendition separate from the phenomena. Nor is it a statistical average or composite. The archetype is not separate from the phenomena. When challenged by Schiller that his archetype

"was not an observation from experience" but "an idea," Goethe retorted, "Then I may rejoice that I have ideas without knowing it, and can even see them with my own eyes."³ (20)

The unification of object, perception and thought achieved through "exact sensory imagination" is a direct way of knowing. "Let us not seek for something behind the phenomena - they themselves are the theory" (307), where theory is understood in its traditional sense as a "way of seeing" (Amrine, 1998). "There is a delicate empiricism that makes itself identical with the object, thereby becoming true theory." (307) In fact, for Goethe the observer has little say in the matter:

When in the exercise of his powers of observation man undertakes to confront the world of nature, he will at first experience a tremendous compulsion to bring what he finds there under his control. Before long, however, these objects will thrust themselves upon him with such force that he, in turn, must feel the obligation to acknowledge their power and pay homage to their effects. When this mutual interaction becomes evident he will make a discovery which, in a double sense, is limitless; among the objects he will find many different forms of existence and modes of change, a variety of relationships livingly interwoven; in himself, on the other hand, a potential for infinite growth through constant adaptation of his sensibilities and judgment to new ways of acquiring knowledge and responding with action. This discovery produces a deep sense of pleasure and would bring the last touch of happiness in life if not for certain obstacles (within and without) which impede our progress along this beautiful path to perfection. (61)

³ One of the shortcomings of collections of Goethe's scientific writings is that they are arranged by theme (Naydler) or subject (Miller) and not chronologically. As a result, the development of Goethe's thinking is obscured. Brady (1998) argues that as a result of Goethe's friendship with Schiller (the beginning of which is described in "Fortunate Encounter"), Goethe was prompted to reflect on and sharpen his understanding of the "idea" in nature. Phenomenology holds that we must conceptualize in order to organize the sensation into a perception ("my perception is a kind of thinking"). The idea is an organizing structure, or "illuminating intention" (p. 98) that is inseparable from the phenomena, but through which the phenomena becomes visible; a new intention or organizing structure gives a new perception. "[W]hile Goethe sustains Schiller's objection that the symbolic plant represented an idea, he alters the meaning of that term to explain how he can see his ideas before his eyes. His original empiricism has been made more self-conscious, but the goal of perceptual truth remains unchanged." (p. 98)

The "many different forms of existence" require different modes of thinking to fully know the object, including poetic *and* scientific modes (Root, 2006). In knowing the object, the object becomes "an organ of perception," a new way of sensing the world.

Towards a Goethean method: The Nature Institute

Goethe never constructed his approach as a "method", although he described in many places how he approached his scientific studies. Recognizing the potential, various educators have systematized Goethe's approach in different ways for the purpose of articulating, practicing and teaching how he worked. The many variations of doing Goethean science, as Isis Brook (1998) has noted are indicative of a "living and developing tradition."

Biologist Craig Holdrege (2005) uses the metaphor of conversation to frame Goethean science. This approach is at the heart of courses he teaches at the Nature Institute in upstate New York (Nature Institute, 2006). In keeping with the conversation metaphor, research is not between a knowing subject and a passive object, but between two partners. Holdrege argues that "there is no *the* Goethean method" because of the necessary human dimension in the process (Holdrege, 2006): each individual will have a unique conversation with nature. A conversation, as a process, is open-ended, ultimately leading to the "limitless discovery" that Goethe described. A successful conversation requires an open approach; as Goethe wrote, "being as quick and flexible as nature." (64) A conversation requires paying careful attention to one's sense impressions and accompanying thoughts that arise, as well as one's "prejudices" which illuminate or color the investigation. A successful conversation means treating the partner with respect. "Nature is my partner in the conversation," Holdrege writes, which means "I'm acknowledging that nature is something in its own right." As with any honest conversation, both partners change

in the process. The honest conversation requires the scientist to develop new capacities (the "new organs of perception"). The conversation requires setting aside of "habits of mind" like single causes, reductive explanations, and restrictive positivism. Through such a process, the practice of science is not just the production of theory, but the process of self-transformation (Amrine, 1998), or as Holdrege (2005) writes, "Goethean science means treading the path of conscious development." (p. 30) Holdrege notes that as an outcome of the conversation, the scientist has engaged with the world, changed it, and so bears a new responsibility for the consequences of that change.

Holdrege presents the Goethean approach as a process. The investigation starts with a riddle, which gives the conversation focus. The investigator should be sensitive to first impressions, feelings or thoughts (writing them down is helpful). The investigator then immerses herself in the phenomenon, carrying out a methodical, focused inquiry into the phenomenon, building up an "ordered picture." This observation may be supplemented with experiments to bring forth new perceptions under specific conditions. The research community provides an important source of additional observations. The inquiry then oscillates between this focused observation and "open awareness" (observing without any special focus), being mindful of what thoughts arise. The methodical observation and open awareness is complemented with the "exact sensory imagination" (46) described above, or what Holdrege calls "exact picture building", where the investigator re-creates the whole phenomenon in the imagination. This recreation will reveal new questions, new riddles. From his botanical research, Holdrege (2005) observes that "the plant begins to reveal itself as a process." Through this iterative process of focused observation, open awareness and imaginative re-creation, the investigator begins "to see the whole", the archetypal phenomenon, accompanied by the sensation that "now I am knowing."

Towards a Goethean method: The Life Science Trust

Isis Brook (1998) describes a four-stage Goethean approach taught by biologist Margaret Colquhoun at the Life Science Trust in Scotland.⁴ The process begins with a preparation phase. As preparation, it is important for the observer to be aware of her or himself; this will help the observer to be conscious of the prejudices brought into the investigation. As with Holdrege, first impressions are important because they are often experienced without prejudicial baggage.

Brook describes the first stage as "exact sense perception." This is the empirical study, "the detailed observation of 'bare facts.'" At this stage it is important to set aside personal judgment as much as possible, as in "Let the facts speak for themselves." Drawing is a useful exercise to help one notice details. It may be helpful to deliberately ignore some knowledge (e.g. nomenclature, a "bracketing out") when observing. The goal at this stage is to free oneself from "habitual categories" in order to see new elements and relationships. This stage of "amassing facts" can be thought of as an "outer process" of perception; and is the foundation for the following stages.

Brook describes the second stage as "exact sensorial fantasy", where one perceives the "time-life" of phenomenon, as a thing in process (in time and therefore with a history). This requires the imaginative recreation of the process in one's imagination. Examples are imagining a

⁴ Brook's course notes describing an approach to the Goethean method are available at: <http://www.lancs.ac.uk/depts/philosophy/awaymave/405/wk8.htm>. The Life Science Trust is associated with the anthroposophical movement in Great Britain. The framework that Brook describes is very similar to the four-stage process described by Jochen Bockemühl (1985). I think that due to an editing error in her 1998 *Landscape Research* article, the reference to the four-step process was incorrectly attributed to Goethe (p. 53), and should have been attributed to Bockemühl. In 1985, Bockemühl was director of the Natural Science Section of the Goetheanum, the international center of the Anthroposophical Society. Bockemühl precedes his four stages of the investigation by a "first impression" encounter with the phenomenon. The first stage comprises an empirical study of the phenomena, collecting detailed observations of the "surface" of things. The second stage sets the empirical observations in motion, imaginatively seeing them in their development and transformation in time. The third stage achieves the archetype, the fourth stage experiences the phenomena in a full, inner way. Bockemühl assigns these stages to the four esoteric elements: empirical observation is "earthy" in its solidity; the imaginative recreation of phenomena is "watery" in its fluidity; the experience of the archetype is "airy" in its expansiveness and pervasiveness; the culminating full inner experience of the phenomena is "warm" (or fiery). A similar description appears in Hoffman (1998); he cites Bockemühl (1985) as the source of this particular structuring. Wahl (2005) also provides a summary of Brook's description.

plant from root to flower, or from seed to fruit. This inner process of imagination takes the thing into the realm of movement.

Stage three is "seeing in beholding." "One attempts to still active perception to allow the thing to express itself to the observer", to "make space for the thing to be articulate in its own way". In this stage, the detailed information of previous stages is transcended. This is what Goethe referred to as "a new organ of perception" (39). This is a period of insights, which Brook describes as "exhilarating." Although such experience seems subjective and emotional, Brook argues that this is the *least* subjective stage -- something essential of the object has been revealed (Goethe's "objective thinking"). "To experience the being of a phenomenon requires a human gesture of 'self-dissipation'" (Brook, p. 56). This is the "Aha moment", a moment of inspiration.

The culminating fourth stage uses "intuitive thinking."⁵ While building on the preceding stages, the intuitive stage grasps the content or meaning of the phenomena, by uniting the perceptual form with the conceptual elements of the phenomena, a process accessible only via thinking. "What becomes possible at this stage of perception is, in the inorganic realm, the appreciation of laws and, in the organic realm, the appreciation of type;" a description of archetype. Brook cautions, "Our ability to think creatively and to initiate future action is the faculty being used here, and thus the dangers of abstract creation not tied to phenomenon are great."

Although Brook presents the Goethean approach as defined stages, she notes that in practice the boundaries are not so firm, and the investigation may move back and forth between stages. The process of investigation does not end with the fourth stage. Processes continue to develop and change, generating new phenomena to investigate. New questions arise. Also, once

⁵ Holdrege (2005) comments on the use of the word "intuition" to describe this kind of knowing: "We can use the word intuition here as long as we don't think of something vague, but rather a nondiscursive form of seeing connections that is comparable to the experience one can have most purely in mathematical insight." (p. 50)

the fourth stage is gained, it is possible to "grow" alternatives in the imagination. For example, in studying landscapes, other possible uses can be suggested once the intimate knowledge of place is won.⁶ As with Holdrege, Brook notes that such knowledge gained of the phenomena also conveys a moral responsibility to use that confidence wisely.

Towards a Goethean method: Steiner's exercise

Another expression of the Goethean approach can be derived from an exercise designed by Rudolf Steiner⁷ to develop the control of thinking. The first of Steiner's "basic" training exercises uses an implicit Goethean approach to studying a simple object (Steiner, 1997). The goal of the exercise is to develop the capacity of controlled and focused thinking. The object being studied is arbitrary. The goal of the exercise is *not* to understand the object itself, but to develop the particular skill of thinking in a deliberate, willful, structured and focused way. The simple, commonplace object provides a baseline against which one can recognize intrusive random or speculative thoughts and dismiss them. The exercise incorporates the main features of the Goethean approach. Floris Lowndes (2000) provides a series of structuring questions for the exercise, and which can easily be adapted to frame a Goethean approach to the investigation of human-made artifacts, and through them to broader social and historical processes.

As preparation for the exercise, one first chooses an object of investigation. For the sake of the exercise the object should be a human-made object. Preferred objects are those with no moving parts, and of simple construction. Once the object has been selected, one should learn as

⁶ Bockemühl (1985) describes the investigation as continuing to seeing the thing in its context. "The plant also lives in the periphery. It grows into a relationship with that out of which it arises." (p. 31) This continuing investigation mirrors the investigation of the organism.

⁷ Rudolf Steiner (1861 - 1925), among many other accomplishments, was a scholar of Goethe. He edited and wrote introductions for Goethe's scientific work for the Kürschner edition of German literature (Barnes, 2000), a fourteen year project. During that time he also wrote two books about the philosophical implications of Goethe's scientific work (*A theory of knowledge implicit in Goethe's world conception* written in 1886, and *Goethe's conception of the world* written in 1897, near the end of the Kürschner project). His *Philosophy of freedom* (1894), written during that period also incorporated Goethean themes. This work was undertaken several years before Steiner founded the anthroposophical movement. Goethe's approach to the world provided an inspiration and starting point for Steiner's subsequent research and activity.

much about it as possible -- its history, the manufacturing process, uses, inventor(s), predecessors, and so on.

The actual exercise consists of thinking about the object, and only the object. Ideally, this should be done as a daily exercise for 15 to 30 minutes at first, and for less time after practice. Lowndes suggests using a seven-part sequence to structure the thinking, which can be organized as a series of questions:

- a. physical: What is it made of? What are its properties?
- b. historical: How is it made? How is it used?
- c. emotional: Why this design? What are my feelings about it?
- d. creative: Who created it? Invented it?
- e. desire/need: What need or desire led to its invention?
- f. origins, background: What preceded it? What was its context?
- g. archetype: What is the concept of the thing? Other forms?

The investigation moves through the questions in sequence. As the investigation develops, new questions about the phenomena will occur, requiring further research. As one becomes proficient with the questions, Lowndes suggests running through the sequence in reverse order.

This exercise shares the same basic structure as the process described by Holdrege and Brook. The preparatory phase includes selecting the object of investigation, but approaching it with a set of generic riddles (i.e., Lowndes questions). The exercise adds the activity of preparatory research, to provide additional ready-made observations to incorporate into the study of the object. The implicit prejudices that one brings to a natural object are explicit and external in this exercise, which helps one recognize them as add-ons to the process. The explicit

preparatory research and the structuring questions make this approach especially useful for studying human artifacts, where much of the artifacts existence has transpired beyond the realm of direct experience.

The actual investigation begins with a focused study of the physical object, and although this is only one of seven categories of investigation, it is the foundation of the rest of the exercise. This empirical study is complemented by the other categories. The imaginative recreation of the process through time comes into play with the biographical and origin questions. The other questions lead to other imaginations which culminate in the question of archetype. The questions themselves formalize the conversation which leads from the physical object to a form that can only be grasped via the intuitive thinking, the "now I am knowing."

Because the object of investigation is a human-made artifact and not a natural phenomenon, it incorporates dimensions that natural objects do not. For example, human-made objects are the products of human societies, social relations, economic ties, intentions, creativity, hopes, desires, and so on. The human artifact brings with it the human world, and the series of questions helps to structure an investigation that otherwise can easily run away with itself. While the human-made artifact is no more complex than a plant or animal or even a rock, it is no less complex either.⁸

Human artifact case study

How might this third example work in practice as a Goethean approach? This section describes such an application to the study of a simple human-made artifact. The following

⁸ It should be noted also that this human dimension also exists for natural phenomena. Humans interact with nature, and in many cases have played an important role in shaping the context in which the natural object exists. The plant may be an "exotic", or only grow in boundary areas of human activity (e.g., roadsides). There are very few spaces that have not been touched directly by human hands, and it is fair to say that the entire planet is indirectly being shaped by human activity. Lowndes's questions can also help to structure the exploration of the human dimension of natural objects.

description should be read as a proof-of-concept, to suggest the kinds of results that are possible. Just as minerals, plants, animals and ecosystems each have special characteristics that direct the investigation, so too do human artifacts, which will be apparent in the following report.

I chose a cast-iron frying pan as the object of my study.⁹ The frying pan satisfied the criteria of being human-made, and of simple construction. As part of the preparatory work, I read Wikipedia (2006) articles on iron and cast iron and read esoteric perspectives on iron (Pelikan, 1973). As the exercise progressed, I became more attentive to references to iron and cooking utensils in things I read or saw and these in turn informed my exercise.

a. Physical: What is it made of? What are its properties?

The exercise began with a methodical examination of the frying pan. However, in the course of the focused examination, I can't help that various things I have read about iron and metallurgy and biology occur to me in the course of this study, expanding my thinking about the physical pan.

I try to look at it as "just a thing": fairly heavy for its size, hard to the touch inside and out, smooth in spots but caked with flaking residue of some sort around the outside, various shades of black in color (though if tilted in the light, there are various reds and blues reflecting off of the surface, not unlike light reflected off oily water). Although opaque and mostly black (the center of the bottom is a shiny gray), it still is capable of reflecting some images in a bright light. In the winter, in the morning, it is cool to the touch; in the summer, in the warm room, the pan too is warm -- it picks up heat. From cooking with a similar pan, I also know that it holds

⁹ I thought about what to use for some time. Steiner (1997) uses a pin and pencil as examples; Lowndes uses a pencil. Neither of these seemed compelling to me. By choosing something different from what Lowndes described, I avoided taking on his thoughts as my own. The frying pan also had a resonance for me -- it was something I used, it had some personal significance through my mother and my childhood, it also represented a simplicity, earthiness, and retro-industrial quality that also appealed. However, for the purpose of the *exercise*, the choice should be irrelevant, although compelling enough to allow one to stick for some period with what could easily become a tedious exercise. If my goal was to come to a greater understanding of the object, the choice of research object would of course be very significant.

and transfers heat well. When struck with a knuckle, the pan makes a ringing noise, though the nature of the ring varies with how the pan is held -- it also transmits sound. The pan has a particular shape: circular, with sloping sides, the top rim modified by two pouring lips on opposite sides, and a short looped handle.¹⁰ The pan has the smell of old grease. A magnet sticks to the pan.

I have been told that similar pans are cast iron, though to be honest I do not know how exactly to determine this for myself. I proceed with the assumption that the frying pan is indeed cast iron. From my prior research, I learn a number of things about iron and cast iron: Iron is an element, considered a metal, and it is the heaviest substance that can be formed out of normal solar fusion. This makes it the most abundant heavy metal in the universe, and the most common metal on our planet. The core of our planet is believed to be iron, or mostly iron, giving the planet its magnetic field. Iron has a high melting point. By itself, iron is relatively soft and of little practical use. However, when a small amount of carbon (2-4%), silicon (1-2%) and other trace elements are mixed in, the melting point drops by several hundred degrees to a temperature that can be obtained in a relatively simple air furnace. The molten fluid can be cast into molds, hence "cast iron." The resulting alloy is hard, but also brittle. The articles indicate that the silicon interacts with the carbon to enable the carbon to take the form of graphite, which gives this type of cast iron the grey color I see on the bottom of the pan. The graphite gives cast iron its thermal and sound conductivity. The presence of the trace elements gives cast iron its special character -- this interests me.

From high school biology I remember that iron plays an important role in human metabolism. The iron in hemoglobin allows red blood cells to bind oxygen from the lungs and

¹⁰ I note that identifying the lips as "lips" and the handle as "handle" betrays some prior knowledge. I might be able to infer these functions if I had never seen such an object.

transport it to the cells. Through other reading I learn about the other side of this process -- iron also readily gives up its oxygen partner which is why hemoglobin can effectively transport the oxygen (I imagine a tussle with the UPS driver to let go of the package he is supposed to deliver.) In addition to the Earth's iron, iron also rains down on the planet from space in the form of meteorites. The element iron has been cross-culturally associated with the planet Mars. Goethe described iron as a "confidant for the rigid body of the earth, a metal the least fragment of which tells us about what is taking place in the entire mass." (158)

I am struck by how constant, stable, and *inert* the frying pan is. It has accumulated dust over time, but I can wipe that off and the underlying pan seems to be unchanged. From my readings, I learn that cast iron should be seasoned by heating cooking oil to a high temperature in the pan; this will provide a non-stick surface by filling in pores in the metal, and also keep the iron from rusting. I suspect that if the pan was stripped of its encrustation and seasoning, it would rust if exposed to water. As a cooking instrument, it is repeatedly heated several hundred degrees and cooled, but remains for the most part unchanged (except for the growing encrustation on the sides). Properly cared for cast iron cookware can last for generations. I am convinced that the frying pan, just sitting on my floor, undergoes a very slow process of change over time, although mostly? or exclusively? due to external processes affecting it: moisture, dust, oil from my fingertips, perhaps sunlight, auto exhaust from the Kennedy Expressway I can hear in the distance. The pan shares the solidity and relative stability of un-worked minerals. The relative unchanging-ness of the cast iron is itself a question worth exploring. How different the frying pan is from the cat that insists on my attention!

The pan is iron and carbon and silicon, basic elements of nature. And so the frying pan is nature also, and in its mineral-ness shares the possibilities of the Goethean approach to minerals - more paths of investigation.

"Form" and "content" take on concreteness. The content of the frying pan is cast iron, which heats quickly, holds on to the heat, and transfers it throughout the pan. The form of the frying pan is its shape described above. The unity of these two properties gives the frying pan its particular utility as a cooking instrument.

I realize that there are many further possible investigations into the physical frying pan. What is the residue caked on the outside? What are the magnetic properties of the pan? How brittle is it? I read about a kind of relationship, a polarity, between hemoglobin and chlorophyll, the animal world and the plant world (Pelikan, 1973). What is that about? What does iron look like in the wild? How much iron falls on the earth? And so on.

b. Biographical: How is it made? How is it used?

Although Lowndes describes this category as "history", I think "biography" is more accurate, as the category describes the life history of the artifact.

The previous owner of our house, a woman in her mid-60s, had passed away, and her son who inherited the house had no interest in the contents. We bought the house and the woman's household, including the frying pan, seven years ago.

Most of the biography of the frying pan must be imagined, as there are no identifying marks on the pan as to manufacturer or country of origin (perhaps under the residue?). I prefer to work backwards: frying pan as object of contemplation -> gathering dust, unused part of estate - > a cooking instrument, used in preparing meals -> how many generations in the family?

purchased? traded? at some point it transformed from inventory item in a shop or on a merchant's cart to a useful cooking instrument -> some indeterminate sequence of steps from the point of sale back to the manufacturer (unshelved, boxed, shipped, unboxed unwrapped, back to its moment of creation as a frying pan. Its birth, as it were, takes place when workers bring the iron ore and heat together in a foundry. *Ore* and *coal* are destroyed as such, reappearing as cast iron in a particular shape, giving it a particular utility. Before that, there were the moments of mining the ore and coal, and the processes before that that created the tools and fuel needed to wrest the raw materials from the earth. And before that, the biological, geological and cosmological processes that formed the planet.

It seems silly to even write this, but there are many levels of detail skipped over in such a schematic treatment. I want to speed up "the life of the pan" because the day-to-day unchangingness of the pan makes for a very slow biography. Questions occur to me: how is the slow unchangingness of the frying pan the same or different from the slow unchangingness of the rocks in, say, the Colorado canyonlands? The canyonland rocks are varied, complex compared to this human artifact.

I can't help thinking that the history of the frying pan transpired under specific social conditions. Marx's analysis of the commodity keeps popping up in my contemplation, which leads me to an awareness that the biography transpires in multiple dimensions. It exists as various forms of minerals and energy transformed into the thing before me. It exists as matrix of social relations as capital flowing through various transformations up to the moment of consumption, the point where the value in the frying pan commodity is, as Marx would say, "realized," and its use value or utility can be realized by its new owner.

No, those words are abstractions, overlays. I find it very easy to drift from the frying pan and the concreteness of its history into analysis and abstraction. So instead I try to imagine the ironworkers, miners, drivers, accountants, retail clerks, working away. Also shareholders, brokers, speculators. Muscle and nerves, also human feelings and dreams, and also power relations -- some own, most do not. That word "owner" implies property, legal structures, social relations; the foundry and raw materials are "property"; the frying pan is also property.

As an object of utility in the kitchen the frying pan has another life as a cooking tool, an extension of the cook, interacting with the world, transforming groceries into meals, and all of the connections that flow from that. The act of cooking comprises functional and creative moments; meals connect to family, social moments, and emotions, feelings, etc. Meals also suggest renewal and new life. Domestic life connects back to social relations. The renewed family member becomes worker again, new family members become future workers. The frying pan plays a part in that.

As a human artifact produced under social conditions, the frying pan biography invokes the vast web of the world economy. The frying pan, despite its iron opacity, becomes a window to a social world. At various stages of the life of the pan, threads lead off, threads that can be followed as part of the life of the pan: the lives of the people who enjoyed meals cooked in the pan; the uncountable workers who touched the life of the pan at some point. These workers are all *people*, and the labels I conjure merely locate them as nodes within a system of production. As human beings, these people have lives far beyond the narrow categories of their concrete labor. They each have a *human* biography that reaches across time, faintly echoed, if I listen carefully enough, in my frying pan.

c. Emotional: Why this design? What are my feelings about it?

Lowndes says to "always remain factual and objective, keeping the object in close view and avoiding a particular slant or interpretation." (p. 67) I find this question to be the most elusive. Do I have feelings about the pan? Does its design evoke any particular aesthetic feelings?

Hmmm. The pan has a functional, simple design, with no adornment. It is solid, and one continuous piece. The circular shape conforms to the shape of a gas or electric burner; the circularity probably has some functionality in evenly distributing heat in the pan.¹¹ The sloping sides make it easy to clean. The two lips on the rim of the pan simplify pouring hot liquids from the pan. The handle features a loop for hanging. The pan expresses a solid, grounded functionality and simplicity. I guess that this design has not changed significantly in maybe 200 years. I realize that the simplicity, the un-pretentiousness, the durability appeal to me. It resonates with what Goethe called "the economy of nature" (155), the engineer's KISS acronym, Occam's Razor. The simple, functional features are part of what drew me to the frying pan for this exercise.

The pan suggests the domestic arts, cooking. The pan is similar to one I inherited from my mother, though smaller. The pan in front of me reminds me of my mother, her cooking, my family, my growing up. I use her pan now and I like the way it cooks food. Cast iron cookware requires some extra attention to keep it properly seasoned. Using the pan and taking care of it makes me feel connected to a tradition. It is also a tool, and it helps to pull me out of the abstract computer work I usually do, and connects me to tangible, physical things. I relate to the world in a very present way when I use it. I realize that I like that.

¹¹ I bother to note this because one manufacturer has recently come out with a line of (very expensive) oval-shaped frying pans. See, e.g., <http://www.pans.com/products/bourgeat-oval-frying-pan-14-2-inches-1-7-quarts-6738.html>

d. Creative: Who created it? Invented it?

The question of "who created the pan" is not so much a question of how to attribute authorship as accessing the experience of creativity. Lowndes describes this as "the birth of the concept in the inventor's mind" (p. 71). The creative moment represents the point at which many threads come together, the Aha! moment, and the transformation from imagination into external object begins to take place. For my frying pan, where was that moment? Or the many moments?

The multiple dimensions of the frying pan become especially vivid when I consider who created the pan. Was it the person or persons in China who built the first oven lined with ceramic tiles to reflect heat back into the heart of the oven, raising the temperature enough to melt iron alloys? Whoever discovered that small amounts of carbon and silicon mixed with iron, and heated in the oven would melt and could be cast into shapes? Was it the person who realized that cast iron could make a useful cooking utensil? Or whoever actually cast the iron into a pan shape for cooking? Can these moments even be assigned to individuals? Well certainly, but did not many individuals collaborate actively or unknowingly to bring the first frying pan into existence? Here the invention, the creation is both a combination of many individual excitements of bringing something into being; and at the same time part of a broader social process of communication, collaboration, imitation, exchange.

Perhaps I am forcing this notion of "inside" and "out", "imagination" and world." Or the notion of creativity as a "moment", a point in time, rather than a space or process or timeless present. Perhaps those notions are historical constructions, indications of a particular stage in the long process of the evolution of consciousness.

I think that there is a process of creating "the first frying pan", a new configuration of cast iron for a particular utility, but there is also the creation of the pan in front of me. I could consider the creation of the individual instance in front of me the result of the production process, a process of replication. But I think of something Marx wrote, that the act of labor is preceded by the act of imagination -- "But what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality. At the end of every labor-process, we get a result that already existed in the imagination of the laborer at its commencement." (Marx, 1967, p. 174) So I contemplate this aspect of creativity -- the act of imagination that precedes production.

One could argue that the creator of my frying pan was the entrepreneur who brought together the capital and labor, the designers and production workers, who organized and directed the production and marketing process -- in a sense this person is the creator. But today, in a developed capitalist system, rarely is one individual responsible. Capital comes from many sources; the enterprise is likely owned by many shareholders. Through the financial system, the production process is connected with every other capitalist. Did the system as a whole create the frying pan? But then the experience of creation -- is it abstracted out of the process, and perhaps even disappears?

On the other hand, the actual production work, the process of transforming iron ore and coal into frying pan is carried out by human beings in their status as workers. Again I think of Marx and labor and value. The most fundamental creative act in capitalism is the production of value by workers. Were these workers alienated from their labor? Was there any joy or feeling of creativity at the foundry? I doubt that the pan was produced by an artisan blacksmith, but if so, perhaps he or she felt affinity for the work. I caution myself -- there are many types of labor.

There is also the designer of the pan, who sketched the blueprints, added the lips, calculated the length of the handle in relation to the diameter of the pan, defined the thickness -- another creator.

I think of one more dimension -- the pan is a cooking utensil, a tool. Someone used the pan. The pan was the site of transformations, from raw foods to cooked ones, to create meals. Here was another opportunity for creativity. So even for the single frying pan in front of me, so many acts of creation took place. What a faculty, so universal and everywhere!

e. Desire/need: What need or desire led to its invention?

The desire or need that led to the frying pan again converges from several paths from different periods. What led to the invention of the frying pan?

There is a sensuous desire -- cooked food tastes better. But what does "tastes better" mean? The question of "desire" leads to fundamental questions of perception, qualia, pleasure, consciousness, biological need, will, etc. Cooking breaks down complex protein molecules and plant material, making food easier for humans to digest and yielding more nutrition. Evolutionary psychology would probably hold that a preference for cooked food derived from this benefit. Likewise, humans perhaps evolved a taste for fats, and therefore fried foods, to ensure enough oils were consumed to complement the lean hunter-gatherer diet. And these evolved predispositions were expressed in a desire for a way to replicate the experience of fried food? This may have been a desire prompting the invention of something to fry in; it would also be a desire of the cook who wanted the cooking utensil.

Cooking certain foods in a frying pan is quick and efficient. It also produces specific results that are difficult with other kinds of cookware (I think grilled cheese sandwich or a fried

egg). From my readings, I learn that while a cast-iron pot can also be used for frying, the deep walls trap moisture around the food during frying, and affect the cooked food. So the frying pan satisfies a rather complex set of desires, including sensuous, aesthetic, and economic desires.

For the entrepreneur or manufacturer, one goal of production is the accumulation of wealth, another type of desire that led to the frying pan before me. This desire could only be consummated because of the desire for the frying pan by a consumer; and also by the existence of workers capable of activating the machinery of production and manipulating the materials. The workers who sold their ability to work probably did not want to make frying pans per se. A confluence of social conditions brought about the need to sell their labor power; as well as the opportunity to sell it to the cast iron cookware manufacturer.

The frying pan lies at the end of a long line of desires. Before the frying pan, there were other desires: the desire for better ovens, better metals, and better tools that led to the discovery of the cast iron metallurgy. Curiosity is also a kind of desire, also social recognition. These help to propel the creative, inventive process forward.

I must be careful in thinking through this question of desire. The frying pan is the product of human intentionality; designed and manufactured to satisfy various desires. But human desires are a complicated mix of things. Certainly we have biological needs, including the need for fat in our diet. But attributing human desires like "fried food" to evolution, while perhaps providing a neat answer, is a hypothesis that cannot be proved or disproved. The fondness for fried food could just as much arise from advertising, junk food in schools, economic pressures that favor fast food, and so on. I remind myself that the Goethean question is not "why is there a frying pan?" but rather "under what conditions does the frying pan arise?" This leads to the next question.

f. History, origins, background: What preceded it? What was its context?

As the exercise proceeds, the areas of exploration broaden. There are many currents that lead to the frying pan. I realize how sketchy my knowledge of history is. The thoughts that arise in this stage are as much questions as realizations.

The obvious context for the frying pan is as a cooking instrument. One avenue of exploration then is the history of cooking. It makes sense to me that the various desires mentioned above drove the development of cooking technique and cooking tools. Cooking also implies fire, and the discovery how to make fire was an important marker in human evolution.

Following from my consideration of the physical properties of the pan in the first step, I note that the cast iron frying pan falls into several general categories. As a container, it separates the heated substance from a flame. This allows flammable substances (e.g., cooking oil) to be heated without combusting. It also provides a way to heat liquids. The pan then is a boundary, defining an organized inside and a chaotic outside. But both inside and out are hot, as expressed in the idiom "out of the frying pan, into the fire." That this idiom exists indicates a cultural vector to explore -- human production activity becoming metaphor for other social experience.

The properties of cast iron allow it to transfer heat but remain basically unchanged (within certain boundaries). This enables a cast iron container to be used in the heating and transforming of many substances, not just food. Such containers could also be used for metallurgy itself, or for other chemical processing. Perhaps this use pre-dated the use of cast iron for cooking. Cooking is also a chemical process, a process of transformations. In this sense it is related to chemistry and metallurgy. What mental transformations took place -- take place -- in

the act of transforming substances? One learns that one can change the world through interacting with it. Cooking is the alchemy of food.¹² What realizations happened over a frying pan?

One observation leads to another. As a domestic art, cooking and the frying pan invokes the social division of labor along gender lines, the obscured role of women in the advance of technology, and the diminution of women's work in general.

From my bit of research, I learn that cast iron was one of many developments that converged to make the Industrial Revolution possible. New casting techniques in the early 1700s allowed for thinner casts and cheaper ironware. Cast iron provided a cheap and durable material for the first steam engines and railroads and other machinery, structural material for bridges, and fire-proof construction material for early factories. Other powerful historical currents flow into the process.

The frying pan is part of the history of cooking. It is part of the history of metallurgy. It is part of social history. It is also part of the history of tools, of people constructing tools and using them to interact and change their environment, and in the process, change themselves. I have a powerful sensation of human history, a thrum of human activity.

g. Archetype: What is the concept of the thing? Other forms?

In the case of human made artifacts, or in particular, my frying pan -- what is the archetype? I am not sure that I can provide a satisfactory answer to this question.

My first attempt at this question is to think of archetype as a general category. There is the defining content (cast iron) plus form (frying pan shape), what makes it a "frying pan" as opposed to a wok or dutch oven (much less a cannonball or a Franklin stove). I can relax the form constraint a bit, so that cast-iron cookware describes the category: I can visualize different

¹²I think I am being clever when I think of this, but googling on "alchemy of food" phrase on September 3, 2006 turns up 1,040 hits.

shapes and functions by stretching or shrinking the handle and sides and diameter of the pan to come up with a range of utensils. I can constrain the form and function and release the constraint on content -- I can visualize various types (aluminum, Teflon coated, stainless steel) and various sizes of frying pans. Or perhaps "containers" captures the archetype.

Thinking of archetype as general category is too forced, too artificial, applying some outside definition to the thing. I re-read the way Holdrege (2005) writes about archetype -- he describes it as "seeing the wholeness" of the thing, as the "quality of knowing itself", something that emerges out of a process and context, described often as a "governing idea" (118), but an idea that is *expressed, experienced*.

The most fruitful thought I had about the archetype arose after waving the pan around and thinking about the handle and weight. The archetype, I thought, has something to do with "hand tool." There is a certain lawfulness about hand tools in that the weight and size are bounded by what can be safely and efficiently wielded by hands. The hand tool has a handle and a working surface. Within that general constraint, I imagined extending and shrinking and metamorphosing parts into different tools: other kinds of cookware, then hammers of different shapes, carpentry tools, garden implements and so forth. (This stretching and shrinking I pick up from Goethe's description of animal type.) Beyond a certain size, the tool requires multiple hands, or external power sources, requiring another order of organization to operate; it ceases to be a "hand tool."

Moreover, this broad conception of "hand tool" tied together thoughts arising from the other questions. Tools are made of nature. For example, my frying pan is made of iron and trace elements; it comes from the mineral world. Tools incorporate nature and the process of humans interacting with nature. At the same time, humans interact with nature *using* tools. We

experience nature differently via tools -- the relationship is mediated. I think of Marshal McLuhan's work (e.g., 1967), that tools extend the human. Tools require skills; they help a person develop intellectually, socially, creatively. I think of Engels's (1987) essay on "the role of labor in the transition from ape to man": By using tools we change ourselves. We also change the boundaries of the possible and with it the topography of the human-nature relationship.

I remember a poster for a museum exhibit on tools I saw some 20 years ago, showing 30 or more different kinds of hammers, each tailored to a specific task. This reminds me of George Basalla's book (1988) on the evolution of technology: Tools change over time, and this process can be seen as an evolutionary process, with various factors shaping the development, adoption, dispersion and extinction of tools and the skills that go along with them. The threads of human history and desire and labor and creativity and nature seem to come together. In this thought of archetypal frying pan as hand tool, I feel like I have arrived at what Goethe described as "the pregnant point from which several things may be derived" (41).

Did I see the archetype? I don't know, or rather, I'm not sure. A better question is, was I knowing the thing? I think yes. I also realize that "knowing the thing" is not a destination. It is instead an unfolding; also (as Holdrege (2005) notes) "at once a completion of a process and the beginning of a new one." (p. 51)

With the archetype question, the exercise reaches a turning point. By working through the exercise from (a) to (g), as described above, the exercise follows Goethe's "genetic method" of proceeding from empirical observation to archetype. By reversing the order, so that it flows from archetype to object, the process mirrors organic processes of evolution and development.

Lowndes (2000), in describing the process as "seven stages of descent", uses biological terms: "(1) archetype (2) descent through the 'family tree' (3) the dawning intention and discovery (as

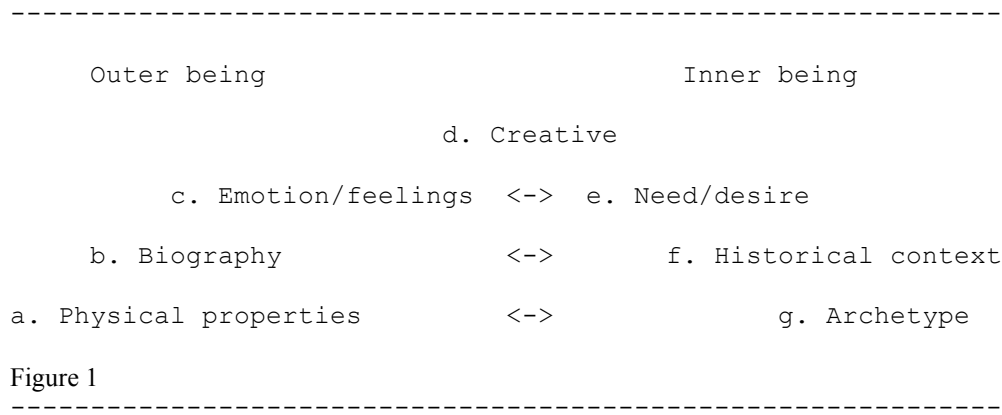
conception), motivation for its creation (4) creation (5) 'embryo stage' (6) birth and growth (7) maturing, perfection/completion." (p. 73) The replaying of the sequence, from archetype to object recapitulates an imagined process of the object in its becoming, out of a historic context, sparked by desire, shaped by ingenuity and creativity and artfulness, emerging out of the mode of production, shaped and used by human hands. When I try imagining this, the sensation is like fast-forwarding through history, or riding along the crest of a wave about to break on the shore.

Additional notes on the Steiner exercise

The above case study provides an example of how Steiner's exercise might also serve as a Goethean approach to social science research, using an artifact as entry point. Before assessing the opportunities and dangers of such an approach, there are some additional features of the Steiner exercise that should be noted.

Lowndes organizes his seven categories in a particular way that highlights certain relationships among them (see Fig. 1). Categories a - c are specific to the individual object or phenomena -- individual properties, individual history, individual feelings or emotions. Categories e - g relate to the phenomena in its generality. Creativity (d) straddles both the general and the specific. Categories a - c can also be understood as ways of experiencing the phenomena in the world, as a sensual thing that can be touched, struck, observed, used, etc. Categories e - g are internal to the phenomena, and can only be grasped conceptually. They give rise to the phenomena, they are both the past and the generative forces that give rise to the phenomena. While the historical context (f) is based on the empirical observations of others (the historical record), history, as a complex of forces which produces the artifact, can only be

assembled into a meaningful whole in the imagination. The archetype in particular can only be apprehended imaginatively.



The arrangement of the categories indicates a correspondence between physical properties (a) and archetype (g), as in "identical with all instances" and "symbolic", representing all instances. Likewise biography (b) represents an individual history whereas (f) represents the broad historical context from which the individual history can emerge. The need or desire for the thing (e) corresponds with the emotion or feelings evoked by the thing (c). By seeing the process flowing from archetype to physical, some of the categories take on added meaning. For example, emotion/feelings (c) represent a nurturing stage. It represents the stage of individual desire that pushes the human being to transform the creative flash into concrete thing, corresponding to the "social desire" of (e).

Lowndes uses the term "outer being" and "inner being" to describe the empirical, sense-perceptible categories and the conceptual, thought-perceptible categories. "Being" is a problematic word. "Being" evokes something individual, as in "human being", but it also is a form of "to be", as in "be-ing": present, alive, not in an animistic sense, but in the sense that the is-ness, of the frying pan is part of a human, expansive unfolding process that one can participate in. Categories d - g can be considered the "inner being" of the phenomena in the sense that Owen

Barfield (1977) used when he described "meaning" as "inner being." "Meaning" is perhaps an equally difficult concept, but it relates here to the concepts described above. The frying pan connects to the needs and desires and social connections and history from which it developed. Through the contemplation of this complex web of connections and interactions, the frying pan can be understood in a deeper way. The frying pan also gives those connections and interactions a concreteness, a tangibility or reference point. In the metaphoric conversation, history is expressed through the frying pan. I talk with history.

Challenges and opportunities

Goethe's scientific work examined natural phenomena. Non-traditional uses of Goethe's approach raise several questions. Is it appropriate, even valid, to extend it to human artifacts? Are there any special issues in using Goethe's approach to human artifacts or activities? And in any case, does the Goethean approach give us any new knowledge or insight?

The application of the Goethean approach to human artifacts, although perhaps non-traditional, can be justified in several ways. First, Goethe's scientific interests were wide-ranging and included inorganic phenomena, including minerals. Inasmuch as all artifacts consist of natural materials,¹³ Goethe's approach to those materials can be extended to human artifacts. For example, it makes sense to use Goethe's approach to geology and minerals in studying at least the basic material of the frying pan.

The fact that it is a human artifact, shaped by human hands and taking meaning from a human context should not invalidate it as an object of study. *All* phenomena have a human context. Human beings change the environment. The human hand has affected the context in which "nature" is found, by shaping (if not creating) the context, and contributing to the presence

¹³ Even if the materials do not occur "naturally" they are composed of natural elements that once occurred in some natural state.

of the organism through activity like transporting or eliminating species, transforming ecosystems, and so on (e.g. Simmons, 1993). So the organism being observed exists in a human (social and historical) context also. This human dimension is acknowledged in many descriptions of Goethean science in practice (e.g., Hoffman, 1998; Holdrege, 2006), and in particular those dealing with place and landscape (e.g., Brook, 1998). In addition, in a profound sense, "nature" is a social construction (Evernden, 1992). The way we, as a culture, tend to see "nature" betrays a consciousness of self separate from nature that extends through the various binaries:

human/nature, mind/body, self/world, idea/matter (which the Goethean approach tries to overcome). So there is a social and historical dimension to the investigation of the plant or animal present in the prejudices that we bring to the process. The "Goethean approach" itself is a social construction, a product of history and imbued with a world outlook. Also, the process of investigation is the interaction of humans with phenomena. The activity itself is a *human* activity of engaging with nature. The Goethean approach is more aware than most scientific methods of this phenomenological dimension. The whole process drips with humanity, and so turning the focus of Goethe's approach to human artifacts, is not alien to the process. Lastly, in the unity of the world, human artifacts are also part of the world. The segregation of human artifacts, or social processes, is arbitrary. While such artifacts or processes may present special, even daunting problems, nevertheless they are also expressions of the universe.

Goethe recognized the importance of the cultural, social and historical dimensions of phenomena, and included them in his explorations. He hinted at such applications in his description of the "genetic method," where he included the fragment "Example of a city as the work of man." (75) He explicitly examines social and historical dimensions in *Theory of Color*, considered to be his most extensive scientific work (Miller, 1988). Goethe included not just

results of his color experiments, but also descriptions of industrial applications (e.g., dyeing), the use of color in various cultures, and the "sensory-moral effects" of color. Only by using a "multifold language" (Root, 2006) can the phenomenon be fully understood.

Although the traditional use of Goethe's approach has been with natural phenomena, a "living and developing tradition" includes experimentation and extension. Maura Flannery's (2005) report on protein molecule research is one example. Goethe's approach traditionally relies on technologically unmediated experience ("man himself is the best and most exact scientific instrument possible" (311)), but Flannery pushes the use of Goethean techniques to phenomena that can only be experienced with the aid of electronic imaging equipment like x-ray diffraction, MRIs, and computers. As a result, two levels of imagination are required: first to render the accumulated data into a perceptible structure, and then the traditional imaginative re-picturing of the representation.

Closer to the themes discussed here, Allan Kaplan (2005) describes an example of the application of Goethe's approach to social phenomena. With a co-worker, he facilitated an annual gathering of aid workers, where they discussed issues they faced in the very difficult work of social development in Africa. Like Holdrege (2005), Kaplan describes the process as conversation. Although "conversation" between humans can be easily grasped, with the danger of being dismissed as commonplace, an honest, meaningful, revealing conversation that transforms the participants is not so easily achieved. The process oscillates between reflecting on what participants have observed (the focused observation), and using "imaginative faculties" to *understand* (a holistic experience) as opposed to *explain* (an analytic experience). The goal of the process is to arrive at the "formative idea", or "intention" alive in both the individuals, and the broad aid work process in which they are engaged. "Intention" is meant here not as "goal", but in

a phenomenological sense as "the intention informing the system", "to focus on living activity; such intention is a verb, a doing, which produces the phenomenon, which becomes the phenomenon's *gesture*, and it is this we are trying to read."¹⁴ (p. 325)

The application of the Goethean approach to human artifacts presents some special problems that either do not exist or are not as severe for natural objects. One obvious weakness of the exercise described above is the relative absence of direct observation. While I could observe the frying pan, and use it to anchor the exercise, beyond the physical-ness of the pan I had to rely on the research of others. Although the frying pan is "mineral", the artifact has a biography beyond the natural setting of its raw materials. If I was investigating a rock, I would see its natural setting, its relationship to other geological strata, the environmental forces that shaped the landscape, its relationship to the local flora and fauna. The human artifact is far from its natural roots -- the mountains where the ore was dug, the fields that fed the miners and iron workers and truck drivers and shop clerks, and all of the other parts of nature that undergirded the production of the frying pan. I must imagine most of its existence.

In addition, the results that I obtained depended on the mix of prior experience and reading that I had done. This prior research included both observation of the phenomena, as well as writings that shaped my understanding. Goethe recognized the importance of observations by others in supplementing what he himself was able to obtain, but also cautioned about accepting the explanations that came with the observations.

Distinguishing between "real" knowledge and the made-up is perhaps the biggest danger. Goethe was certainly conscious of this danger: "In observing nature on a scale large or small, I have always asked: Who speaks here, the object or you?" (308) How does one distinguish those two voices? Goethe described the general dilemma in *Theory of Color*:

¹⁴ Formative idea and intention in the way Kaplan uses it can be understood as descriptions of archetype. See also footnote 3 above.

An extremely odd demand is often set forth but never met, even by those who make it: i.e., that empirical data should be presented without any theoretical context, leaving the reader, the student, to his own devices in judging it. This demand seems odd because it is useless simply to look at something. Every act of looking turns into observation, every act of observation into reflections, every act of reflection into the making of associations, thus it is evident that we theorize every time we look carefully at the world. (159)

Such theorizing is unavoidable; the solution is to be as aware of it as possible. Goethe continues:

The ability to do this with clarity of mind, with self-knowledge, in a free way, and (if I may venture to put it so) with irony, is a skill we will need in order to avoid the pitfalls of abstraction and attaining the results we desire, results which can find a living and practical application. (159)

This can be accomplished, Goethe held, by anchoring the investigation to the phenomenon, to always keep it centerstage, and to return to it frequently. Empiricism roots the imagination:

I do not mean an imagination that goes into the vague and imagines things that do not exist; I mean one that does not abandon the actual soil of the earth, and steps to supposed and conjectured things by the standard of the real and the known. Then it may prove whether this or that supposition be possible, and whether it is not in contradiction with known laws. (Goethe, in Naydler, p. 118)

In the case of human artifacts, the "standard of the real and the known" becomes problematic once one moves beyond the "outer being" investigation to the "inner being", because history and social relations are contested territory. By necessity, one must stray from the concrete object under investigation, and reconstruct its past using the tools of the anthropologist, archaeologist and historian. In this poking around in the dust of history, there are many opportunities to lose sight of "the real and the known."

These are real but surmountable problems. Surmounting them requires honesty and, as Goethe says, self-knowledge. However, the Goethean study of abstract human categories like "racism" or "globalization" would be foolish and futile. These are already-processed

constructions, not concrete phenomena. With such an abstraction, there is no reference point to anchor the investigation, nothing, as it were, to talk to. The approach to investigating such phenomena instead should be through concrete expressions of the phenomena. For example, "globalization" is a large, complex, uneven, dynamic process. Instead, I think the Goethean approach could be productively used on individual presentations of globalization: a hedge fund; the local Wal-Mart; the International Terminal at O'Hare; and so on.

But even if the study of human artifacts is a valid use of the Goethean approach, and the apparent problems are surmounted, what do we gain from using such an approach? Why bother? As a way of knowing, the Goethean approach leads towards discovering the primal or archetypal or formative quality of phenomena. Once the archetype is won, one has gained insight into the whole, into "the inner truth and necessity", the "pregnant point... which yields several things." (41) The whole can only be grasped as a whole via such a method of imaginative insight.¹⁵ Since the artifact is the tangible expression of manifold processes, by grasping the archetypal process, one gains a deeper insight into the historical process. Of equal importance is the "metamorphosis of the scientist" (Amrine, 1998), of gaining new ways of seeing.

While the example of the frying pan may sound trivial or even seem to parody Goethe's great work, a similar approach enjoys some popularity as a genre of social writing, the "commodity biography." A recent example is Pietra Rivoli's (2005) *The Travels of a T-Shirt in the Global Economy: An Economist Examines the Markets, Power, and Politics of World Trade*.¹⁶ Rivoli follows a hypothetical t-shirt from the cotton fields of Texas to a factory in China

¹⁵ Flannery (2005) points out that all of science in fact relies on both creative, imaginative activity ("discovery") as well as "justification," the construction of experiments, gathering of data to justify the insight. Since "justification" is what generally gets published and advances science, the intuitive or imaginative processes are ignored or denied in writings about the practice of science. Per Flannery, "by looking at the aesthetic of science and at inquiry as involving more than empiricism and reasoning, then the validity and significance of Goethe's method of scientific inquiry becomes much more evident." (p. 284)

¹⁶ National Public Radio broadcast a series based on Rivoli's book in April, 2005. The broadcast and supporting material is available at <http://www.npr.org/templates/story/story.php?storyId=4622200>. Rivoli also appeared on an International Monetary Fund book forum in October, 2005; the transcript is available at <http://www.imf.org/external/np/tr/2005/tr051019.htm>.

to a shop in New York to a used clothing market in Tanzania, and in the process, as the title pretty much explains, reveals various dimensions of the global economy today. There are other examples, typically cross-disciplinary as a matter of necessity, that also reflect this approach.¹⁷

While generally not explicitly Goethean, the idea that by burrowing into a part, and by understanding the instance and its interconnections, its "inner being," one might arrive at an understanding of the whole has a productive tradition in historical and cultural research.

The Goethean approach can enhance that kind of research method by helping to reveal new connections to the researcher. These connections can then be mined for new insights. The Goethean approach also encourages the researcher to see the thing not just in, say, its economic connections, but also its natural, historic, and poetic connections, i.e. in a multifold way. The frying pan example above only introduces a research project. As such it is incomplete and tentative. But it hints at further areas to explore, for example, the production process from mine to kitchen; gender, domestic work, technology and science; the experience of creativity in the modern economy; or the role of tools in the human-nature relationship. Perhaps most important, the Goethean approach, in its quest for the "formative idea" or "intention" or "archetype", drives the researcher towards a whole understanding of not just the thing but of something universal and comprehensive. "Now I am knowing."

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¹⁷ Holdrege (2006) described a similar approach he used in a high school lesson. Using sugar, he was able to explore with his students the chemistry of sugar, how the body processes it, the sugar cane plant, and the history of the sugar trade, including slavery and colonialism. Douglas Feick informed me of John Stilgoe's wide-ranging work on landscapes, culture, environment, history, etc. etc. (see <http://www.people.fas.harvard.edu/~stilgoe/index.html>). The *Uncommon Ground* collection edited by William Cronon (1995) contains examples of exploring social phenomena and through them the contemporary human-nature relationship, e.g. Susan Davis's study of SeaWorld ("Touch the Magic") and Jennifer Price's "Looking for nature at the mall: A field guide to the Nature Company." I am guessing that for most cases, Goethe never figured into the research plan. However, I also hazard that an explicit use Goethe's approach would enhance any research project.

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