

“Zarte Empirie”: Goethean Science as a Way of Knowing

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This paper explores the ‘delicate empiricism’ proposed by Johann Wolfgang von Goethe. Goethe’s scientific work provided an alternative epistemology to that of conventional science. The author discusses the Goethean way of knowing. Particular emphasis is given to the changed understanding of process, form and participation that results from employing the epistemology expressed by Goethe. A methodology for Goethean science is introduced and its applications and their implications are explored. Goethe’s “zarte Empirie” – his delicate empiricism - legitimises and organizes the role of imagination, intuition and inspiration in science. It may contribute significantly to the emerging participatory and holistic worldview, and to providing knowledge that is in tune with nature. This paper explores how and why.

Introduction

Johann Wolfgang von Goethe (1749 – 1832) was a polymath. His achievements as a writer of prose and poetry established him in a place in German literature that England reserves for Shakespeare, France for Montaigne, Spain for Cervantes and Italy for Dante. He also played a very active and engaged part in the affairs of his hometown and region, working as manager of the local theatre as well as the mines, and serving as a special advisor to his sovereign, the Duke of Weimar. Goethe’s sketches show a lot of artistic talent and his collections of books, art and minerals are impressive and extensive.

Goethe’s scientific achievements are still lacking the recognition they deserve. He coined the term morphology and initiated it as a scientific discipline. Goethe developed theories of colour and of plant development, and engaged in studies of animal and plant morphology, geology and meteorology. But more than the actual scientific discoveries, it is Goethe’s scientific methodology that may yet prove to be his most influential contribution to science.

It comes as no surprise that interest in Goethe’s empiricism is growing at a time when science is beginning to move beyond the limitations related to a Cartesian methodology: the use of mechanistic metaphors, the exclusivity of dualistic rationalism and Newtonian materialism.

Goethe’s empiricism provided an alternative and complementary epistemology to conventional scientific practice and its underlying dualis-

tic and rationalistic epistemology that categorically separates the observer and the observed. Goethe employed an epistemology that could be called conscious-process-participation.

This epistemology focuses on process and relationship and allows for intuitive perception of direct knowledge of the world. It focuses attention on the phenomena themselves and on the dynamic relationships they form in space and time and between the observer and the observed. Goethe recognised the observer as a participant. He did so a century before the work of Heisenberg and the other great physicists of the early 20th century revealed the fundamental interconnectedness of the material universe.

Goethe's work offers a scientific methodology that can help us to explore the universe we participate in. It can lead us to see beyond the perceptual blind spots of a strict adherence to a scientific epistemology based on the Cartesian dualism of self and world, and mind and matter, which has become culturally dominant in the last two hundred years.

Owen Barfield argued that Goethe tried to establish a systematic approach to conscious participation. He suggested that Goethe's approach is an attempt to use imagination systematically. Barfield believed that in "the *Metamorphosis of Plants* and the associated writings descriptive of his method, as well as in the rest of his [Goethe's] scientific work, there is the germ of a systematic investigation of phenomena by way of participation" (Barfield, 1988, p.137).

Barfield proposed that Goethe tried to understand process by perceiving the phenomena and potential phenomena directly "as such" and not as "hypotheses *inferred from* actual phenomena" (Barfield, 1988, p.138). The Goethean epistemology is to be understood as complementary to but incommensurable with the Cartesian epistemology. It may help us in achieving a more holistic understanding of the processes in which we participate.

My intention in writing this paper is to elucidate some aspects of the conceptual and experiential implications of Goethe's epistemology and its modern day expression through Goethean science. I am by no means a well-practiced Goethean scientist and it goes almost without saying that the following is likely to be influenced by the limits of my own understanding. Nevertheless, let me try to bring you closer to Goethe's way of seeing through addressing a series of insights that helped me to find a deeper meaning in Goethe's suggestion that "there exists a delicate empiricism which makes itself utterly identical with the object, thereby becoming true theory" (Miller, 1988, p. 307).

Exploring A Goethean Way Of Science

Since Goethe, his methodology has been practiced and developed in various places. The sustained interest in Goethe's science within the history of science, philosophy of science and the anthroposophical movement has resulted in a variety of theoretical and practical approaches to Goethe's scientific work. It has also provided the context for the emergence of a still largely undefined Goethean science.

As far as I am aware, in recent years, there has been practical research inspired by Goethe's methodology in Germany and Switzerland (e.g. Schad, 1977; Bochenmühl and Suchantke, 1995; Suchantke, 2001), Scotland and England (e.g. Colquhoun and Ewald, 1996; Colquhoun, 1997), as well as the United States of America (e.g. Holdrege, 2001).

The theoretical interest in Goethe's scientific studies has also led to a wide range of publications (e.g. Steiner, 1950; Bortoft, 1986; Seamon and Zajonc, 1998; Brook, 1998). Goethe's way of science has been referred to as a science of wholeness (Bortoft, 1996), a science of qualities (Goodwin, 2000), a contemplative science (Zajonc, 2002), and a phenomenological science (Seamon, 1998). All of the authors mentioned above provide informative explorations of Goethe's way of science.

Goethe engaged with science out of the same deep empathy for and curiosity in nature that drove him to express nature's creativity as a writer and an artist. He was doubtful as to whether conventional scientific methodology should be accepted as the only and exclusive approach to gaining meaningful knowledge and insights about nature. While recognizing the importance and power of the measuring, quantifying, analytical and purely rational focus of his contemporaries in their scientific studies, Goethe followed his intuition and relied on his own, direct experience of the natural world as a source for his scientific insights.

In doing so, he developed a Goethean way of science that uses rigorous attention to direct experience, empathy, intuition and imagination as a path towards meaningful insights into nature's creative process. This artist's approach to science allows for a more appreciative, qualitative, meaningful and participatory engagement with nature. A similar relationship to nature can, to some extent, be experienced during any attempt at expressing natural detail and beauty through art, poetry or any other form of creative expression.

Bridging the Gap: An Artist's Way of Science

The artist's gaze continuously shifts attention between the details of the phenomena and their impression as a whole. Artists intend to intuitively understand the intimate relationship between the part and the whole; to feel the interconnection that unites all detailed diversity into a dynamically transforming whole. Through exploring their participatory relationship with the world, artists are able to express this dynamic and interconnected process in their artistic gestures, portraying the creative essence of Nature momentarily in their own creative expression.

The emphasis on paying direct attention to the phenomena themselves and the empathic and intuitive attitude employed in the process, are both important aspects of Goethe's methodology. Most artists spontaneously engage with the phenomena in such a way without necessarily being conscious of the why and how of their approach.

Goethe, on the other hand, directed his conscious awareness toward the process of engagement itself. He developed a methodology for a participatory, phenomenon-focused science which allows anybody who engages in its sustained practice to access an experience of reality as process, interaction and relationship. Moreover, the resulting experiences are not arbitrary projections by individuals but can be verified by others.

Goethean science is a science because it offers a methodology for gaining reliable knowledge about the nature of reality. Goethe practiced as a solitary explorer of a new way of seeing, but he always implied that anybody who would engage in his way of seeing would have similar experiences and insights. It is a prerequisite of any science that a community of people can engage in its methodology and can verify the validity of any individual findings through repeating particular studies and reaching a consensus about their results and meaning.

A Methodology for Goethean Science

Goethean science developed Goethe's method by expanding it to a participatory process that engages communities of practitioners through cooperative research and consensus. Furthermore it aims to develop applications of Goethean methodology to improve humanity's understanding of and our relationship with Nature. Goethean science could become an important catalyst in the emergence of a holistic and participatory worldview, which

aims for appropriate participation in natural processes – the prerequisite for a sustainable society

In an article entitled *Goethean Science as a Way to Read Landscape*, Isis Brook argues that the method of Goethean observation “allows a role for schooled subjectivity” (Brook, 1998, p.51). She stresses that while Goethe was keenly aware of the shortcomings of our conventional epistemologies “he believed that a knowledge utterly in tune with the nature of things in the world was possible. It was this knowledge towards which his science strove.” Brook’s article provides an informative and instructive review of the Goethean methodology practiced by the School of Life Science, a Goethean science research institute that was co-founded and is managed by the evolutionary biologist Margaret Colquhoun.

Colquhoun teaches the Goethean approach in four stages: 1) exact sense perception; 2) exact sensorial fantasy; 3) seeing is beholding; and 4) being one with the object (Brook, 1998, p.53). The preparation for the engagement with the Goethean methodology could be considered a fifth stage. It involves acknowledging our own personal involvement in how we usually meet the world, the fact that we all habitually employ a set of basic assumption and concepts. We all have a history as observers and have formed ideas about the world, which influence what and how we perceive.

Brook argues that in this preliminary stage “individual subjectivity is distinguished from a form of universal subjectivity” (Brook, 1998, p.53). As we are becoming more aware of our own involvement in the way that we perceive the world, we expand our consciousness to the point that we are able to perceive how certain phenomena are inviting our prolonged engagement and study. Let me introduce the four stages of Goethean observation in some more detail:

1. Exact Sense Perception

At this stage the focus is on the detailed observation of the facts we can perceive through all our senses while suspending all form of personal judgement and evaluation. Isis Brook suggests that at this point one “lets the facts speak for themselves” and proposes that drawing is a good way to enter into this way of seeing as it alerts us to the “details of pattern” and shifts us from a “seeing roses” to a seeing “a particular rose” mode of perception (Brook, 1998, p. 54). We try to go even further and make an attempt to suspend all classification systems that we usually employ, so we stop seeing a rose and encounter the phenomenon, formally called rose, *as it is*.

2. *Exact Sensorial Fantasy*

Goethe called this next stage of his method ‘*exakte sinnliche Phantasie*.’ Margaret Colquhoun and Isis Brook refer to it as ‘exact sensorial fantasy’ (Colquhoun and Day, 1999; Brook, 1998). This literal translation can lead to misunderstanding. Henri Bortoft fittingly calls this stage “exact sensorial imagination” (Bortoft, 1996) and thereby avoids the implications of ‘not being real’ that the word fantasy evokes in the English language.

This is the stage where imagination is employed as a legitimate tool of scientific investigation and as the key to entering another way of knowing, an alternative epistemology. The way of perceiving form, process and participation employed in Goethe’s epistemology furthers understanding of phenomena in their dynamic temporal dimension. We no longer “see the thing in an objective frozen present” and begin to see movement and transition, which makes us aware of the “flowing processes” and stops us from “freezing them with the solid nature of the exact sense perception” (Brook, 1998, p.55).

As we enter into this process oriented and dynamic way of seeing, we imaginatively perceive the form of the phenomenon as an expression of the process of its own transformation, moving through its history to its present and into its future.

Once we are able to focus our awareness on the dynamic transformation of the object and its form, we can try to imagine the dynamic unfolding of the phenomenon differently. That is to say, we can wilfully imagine a different sequence of transformation than the one that emerged based on our engagement in stage one.

While repeating some of Goethe’s studies of plants and light, I have experimented with moving through a leaf sequence of a plant or the spectral sequence of colours in an arbitrary order that did not correspond to the underlying natural process. It is a difficult task that exercises imagination. What I experienced was that imagining the impossible – the not natural - resulted in a bodily response that indicated to me that I was leaving my participatory engagement with the phenomenon’s process of transformation or its coming into being. Brook explains: “the second stage could be seen as a training of the imaginative faculty in two directions: Firstly to free up the imagination and then to constrain it within the realms of what is possible for the phenomenon being studied” (Brook, 1998, p.55-56).

3. *Seeing is Beholding*

In this third stage of Goethean observation the aim is to suspend active perception and, as much as possible, only receive. We simply behold the phenomenon in the dynamic awareness we reached through the use of our imagination. This is the stage where we “allow the thing to express itself through the observer,” argues Isis Brook: “what is expressed is the being of the phenomenon, something of its essential nature.” She suggests that these experiences are often best expressed in “emotional language,” and “through poetry, painting, or other art forms” (Brook, 1998, p.56).

The phenomenon now takes the active role, and the observer simply encounters the phenomenon with an open mind, no preconceived notions, and having first gone through the process of familiarizing him/herself with the phenomenon through the preparatory stage and then through exact sense perception and exact sensorial imagination (or fantasy). Beholding the object in such a way, we offer the phenomenon our human capacity for conscious awareness so that it can express itself.

When this happens, the experience of the phenomenon revealing itself in one’s own consciousness feels very much like a sudden flash of insight, much more like something received than something created. Brook puts it this way: “To experience the being of a phenomenon requires a human gesture of ‘self-dissipation’. This effort is a holding back of our own activity – a form of receptive attentiveness that offers the phenomenon a chance to express its own gesture. The result of this effort may be an inspirational flash or Aha!” (Brook, 1998, p.56).

4. *Being One with the Object*

Stage three flows directly into stage four. At the point of being one with the object we “conceptualise to serve the thing: we lend it this human capacity” (Brook, 1998, p.56). Isis Brook suggests that the four stages could also be summarized as: perception, imagination, inspiration and intuition. She acknowledges that since each stage builds on the experiences the observer had in the previous stages, each stage is harder to articulate to somebody who has not engaged in this methodology actively before and experienced the various stages. Brook describes stage four as follows (Brook, 1998, p.57):

What becomes possible at this stage of perception is, in the inorganic realm, the appreciation of laws and, in the organic realm, the apprecia-

tion of type. For Goethe type is more than a descriptive plan shared by plants or animals and thus requires more than an exploration of outer form and its constituent parts. Being one with the object allows an appreciation of the content or meaning of the form as well as the form itself. This content is only available to thinking as only in the process of thinking can the outer appearance of the thing, and its inner content be combined by conceptualisation.

When form is understood as an expression of process, all form is seen as intrinsically meaningful since it communicates to the attentive observer where it comes from, where it is going, and how it relates to other forms and processes. Form expresses its own coming into being through relationship. The patterns in this process of transformation can be discerned as laws and types - as possible paths or modes of expression. Each phenomenon has these possible modes of expression, which communicate how it relates to its wider environment, to the phenomena around it. These relationships define what is possible in the object's, the phenomenon's, the form's transformation and how it occurs.

Referring to her own experience of working through Goethe's studies of the metamorphosis of plants, Brook suggests that: "the leaf sequence can be experienced as if one is living in the changing forms of the leaf rather than seeing the individual static representations" (Brook, 1998, p.55). This 'living in the changing forms' is a particular kind of experience facilitated by Goethe's epistemology. It expresses a new perception and conception of process, form and participation, which is reached through engaging in the practice of Goethean science.

Form, Process and Participation in Goethean Science

The process of paying focused and sustained attention to the phenomenon and the subsequent internalising of the impressions gained, through the imaginative act of aiming to reproduce the phenomenon internally, results in the direct experience of the dynamic aspects of nature that Goethe described in the beginning of his *Die Metamorphose der Pflanzen*. Goethe suggested that we can "learn to know the laws of transformation, through which [nature] produces one part through the other and displays the most diverse forms through the modification of a single organ" (Goethe, 1790).

In the introduction to his general work on morphology, *Zur Morphologie*, Goethe describes his dynamic understanding of form as an expression of process even more succinctly: “Form is a moving, a becoming, a passing away. The study of form is the study of transformation. The study of metamorphosis is the key to all the signs of nature” (Goethe, 1806).

The only way to understand what Goethe seeks to communicate here is through actively engaging in his methodology. His scientific writings only reveal meaning if we employ his way of seeing.

Employing a conscious-process-participation epistemology in the study of the natural world results in a new way of perceiving the spatial-temporal dimensions and relationships of form. Form becomes an expression of the process of its continuous transformation, which in turn is linked to a larger process that unites the form with its environment and its observer.

Through the use of imagination, we open up to our ability to perceive intuitively and therefore become more receptive to sudden insights as we expand our field of empathy beyond our bodies to include the phenomena around us. Goethean methodology guides us towards a conscious-process-participation epistemology.

Goethean Science investigates natural process via direct experience of forms and their relationships in time and space. The Goethean epistemology of conscious-process-participation provides a way of knowing that allows us to experience and, within limits, comprehend objects from within. I will return to this Goethean kind of ‘objective thinking’.

Engaging in Goethean epistemology and methodology opens our conscious awareness up to perceiving the world beyond the dichotomy of the individual self and the world. It bridges the Cartesian chasm that separates our individual experience of the world from the world itself. The mutual exclusivity of dualistic categories like self-world, mind-body, mind-matter, subject-object dissolves into a more dynamic understanding of these useful distinctions or categories. Their rigid either/or oppositions give way to both/and reasoning. Mutually exclusive dualities turn into dynamically related, interacting polarities between which our experience of reality emerges.

Goethe provided a methodology for shifting into what Henri Bortoft calls a “holistic mode of consciousness” (Bortoft, 1996). Our perception of form, process and participation changes drastically if we enter into this holistic mode of consciousness.

Craig Holdrege discusses one of the implications of such a changed understanding of form and process. In his article, *Where Do Organisms End*,

he suggests a shift “from a traditional notion of separate biological organisms to the conception of ecological organisms, of which the biological organisms are part.” This shift ultimately results in an understanding of organisms that Holdrege articulates as follows (Holdrege, 2000, p.16):

The organism *is* interaction with other organisms within the context of a habitat. The single organism (or species) that is supposed to compete with others *does not exist*. It is far more appropriate to view organisms as members of a differentiable whole that has never dissolved into discrete entities.

The potential implication of this kind of understanding of nature and our own role as organisms within that larger process of interaction and changing relationships could work as powerful catalysts in the gradual shift towards a more holistic and participatory worldview. Understanding ourselves as integral participants in natural process rather than as detached controllers, manipulators and predictors of nature, we would re-evaluate the importance of cooperation, symbiosis, community, as well as humanity’s appropriate participation in natural process.

A serious contemplation of the concept of ecological organism proposed by Holdrege would ultimately force us to reconsider the competitive, materialistic, mechanistic, and dualistic aspects of the reductionist worldview that currently still strongly inform our theories in biology, economics, sociology and politics.

It is equally possible to reduce the world to parts, as it is to reduce the world to a whole. Reductionism and holism, mechanistic and organic metaphors, and competitive and co-operative explanations of living interaction are all needed for a truly holistic understanding of natural process. The problem is that our current understanding is heavily biased towards one side of the spectrum.

We need to learn to consciously shift between epistemologies and be aware of their conceptual implications and limitations, acknowledging the perceptual blind spots of each particular epistemology. The Goethean epistemology of conscious-process-participation does not negate the validity of reductionist science, it merely challenges its position as the exclusive source of reliable knowledge about the world and offers a way to overcome the limitations of the dualistic subject-object-separation epistemology. In doing so, it facilitates the emergence of holistic consciousness and the development of holistic science.

Goethe's Holistic Consciousness and the Emergence of Holistic Science

The holistic consciousness that can be accessed through a sustained engagement with Goethe's methodology allows for an embodied awareness of the way that reality emerges from a process of continuous change and transformation, which expresses itself in a network of mutual relationships that connects the universe in its material, conscious and spiritual dimension into a unified whole. Margaret Colquhoun explains her motivation to engage in Goethean science as follows (Colquhoun & Day, 1999, p. 28):

The process of studying nature in a Goethean way involves a striving towards and working out of that experience of 'being at one with' all that is around us and of which we are part. 'All creation' and the landscape includes ourselves. But being a part we are also apart – in that we think, judge, and are capable of choice – a choice of whether or not to act in harmony or in disharmony with our surroundings. This seems to be unique to the human species. Choosing to act in harmony or even knowing the experience of 'being in harmony' do not come naturally to we humans at our current stage of evolution.

The five stages (including the preparatory stage) of the Goethean methodology taught by Margaret Colquhoun can help to experience the gradual shift from a subject-object-separation epistemology to a conscious-process-participation epistemology that I suggest to be the fundamental difference between conventional science and Goethean science. It is a shift from a science of quantities and measurable and predictable parts that determine the function of the whole, to a science of qualities and conscious awareness of the relationships and interactions between the parts out of which the whole emerges and which are dependent on that whole.

It is in the process-orientated understanding of the relationship between the whole and the parts that Goethean science and complexity theory meet. Both sciences understand the cyclical rather than linear causality that makes the part and the whole depend on each other in the symbiotic relationships of co-evolution. Both Goethean science and complexity theory are holistic sciences as they conceive wholes as being more than the sum of their parts. Both are paying attention to the interactions and relationships that defined the dynamics of the whole and focus more on quality rather than quantity.

Goethe provided a methodology to guide us into a holistic mode of consciousness that involves the observer as a participant and allows meaning to emerge through a raised awareness of the relationship between form and process. It allows the scientist to consciously enter into relationship with the phenomena. The biologist Professor Brian Goodwin, initiator of the Masters in Holistic Science programme at Schumacher College, argues (Goodwin, 2000):

It is generally assumed that organisms have consistent relationships to their environments that reflect reality, so that consistent emotional responses to physical processes are not likely to be arbitrary. That provides a conceptual foundation for exploring those relationships and taking qualitative experience seriously as an indicator of the nature of the process experienced.

The crucial step in turning the Goethean methodology taught by Margaret Colquhoun from being a guided process to temporarily shift modes of consciousness or epistemologies into a science is to establish it as a community and consensus based practice. In particular with regard to the fourth stage, Isis Brook warns that: “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 a phenomenon are great” (Brook, 1998, p.56-57).

As we finally begin to consciously readmit the role of imagination, direct insight and intuition into scientific inquiry we have to be especially careful to submit the results we gain to a peer or community review system that aims for consensus regarding the insights that can be gained in employing a particular epistemology and methodology in the study of a particular phenomenon. *We have to learn to separate the subjectively projected from the inter-subjectively perceivable.* Goodwin expresses his vision for a participatory, holistic science of qualities like this (Goodwin, 2000):

Creative insight has to be checked independently by other practicing scientists for its consistency with the data, and tested in various ways, so feelings about the phenomena need to be examined for their consistency within a community of individuals practicing procedures of research appropriate to that type of qualitative investigation. Such a community would be exploring the methodology, applicability, and reliability of a science of qualities, as the community of Galilean scientists explores the science of quantities.”

Holistic science understands itself as an expansion of reductionist science, not as its opposition. Holistic science transcends and includes reductionism and its focus on the quantifiable and measurable. It proposes that two mutually contradictory and incommensurable epistemologies when employed next to each other and in full awareness of their respective limitations can both provide valuable and critical information and insights about how to participate appropriately in a complex and fundamentally interconnected and unpredictable world.

The rationalist claim that reductionistic and dualistic science is the only reliable source of objective knowledge ignores some of the fundamental assumptions of the subject-object-separation epistemology it employs. It may be a characteristic of consciousness itself that objects and subjects are never as separate as postulated by the Cartesian dualism. Goethe's epistemology of conscious-process-participation offers a different conception of objectivity.

“Gegenständliches Denken” – A New Way to Think Objectively

The direct way of knowing that Goethe employed in his scientific and artistic work was described by one of his contemporaries Johann Heinroth as ‘objective thinking.’ Goethe was deeply grateful for this expression and explained in a response to Heinroth how the term ‘objective’ should be understood in the context of his work. Goethe’s conception of objectivity is very different from our modern tendency to define objective as the dualistic opposite of subjective. Goethe’s objective thinking is the result of employing a conscious-process-participation epistemology. In *Significant Help Given by an Ingenious Turn of Phrase* Goethe wrote (see Miller, 1988, p.39):

Here he [Heinroth] means that my thinking is not separate from the 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 way of thinking, and my thinking a perception.

Goethe’s objective thinking has often been misunderstood. Alan Cottrell pointed out that “the assumption of an essential dichotomy between a consciously thinking subject and an observed unconscious nature lies at the root of the inability of Goethe’s critics to comprehend him” (Cottrell, 1998, p.260). He argues that central to understanding Goethe’s delicate empiricism

is that his methodology combines *Anschauuen* (Seeing) and *Anschauungen* (Intuitions) into a participatory and organic way of thinking that overcomes the dualistic separation of subject and object. Cottrell expresses engagements with Goethe's way of working as follows (Cottrell, 1998, p.259):

As thinking comes alive in nature, and nature comes alive in the activity of thinking, knowledge of the world and knowledge of the self unite at a higher level where the danger of 'false contemplativeness' is overcome. After years of painstaking observation and thought in the sense of 'delicate empiricism,' the idea of plant metamorphosis, which is not a subjective cognitive construct tested against nature but an objective constituent element of nature, lights up within thinking.

Goethe's science of participatory phenomenology and conventional science, rooted in the Cartesian dualism, employ two distinct epistemologies, which could complement each other in providing us with a more holistic and integrative understanding of the natural world, but as Cottrell reminds us, "the dualistic mode of thinking militates against taking the notion of participatory thinking seriously" (Cottrell, 1998, p. 260).

Goethe's "*gegenständliches Denken*" (objective thinking) rests in the fundamental unity of the observer and the observed – the fact that ultimately subject and object are not two, but participate in a wider process that unites them into mutual dependency. Cartesian objective thinking on the other hand assumes mind and matter, self and world, as well as subject and object to belong to mutually exclusive dualistic categories.

The Goethean epistemology is built on a way of thinking objectively that is based on the experience of our fundamental unity with nature. Whereas the Cartesian epistemology is built on a way of thinking objectively that is based on the assumption of our fundamental separation from nature. Both are valid epistemologies and can provide useful knowledge about reality. To integrate these two ways of knowing is the next great challenge in the evolution of human consciousness.

A culture and society rooted in the awareness of its own participatory relationship to the natural world will develop quite differently from a culture that is predominantly created from within an epistemology and corresponding worldview of separation from Nature. Humanity is currently in the process of becoming critically aware of the fact that the latter type of culture and society is utterly unsustainable.

Goethe's 'delicate empiricism could play an important role in the fundamental paradigm shift that needs to precede or at least coincide with any serious attempt to move humanity towards a more responsible and sustainable way of participating in natural processes.

A Living Comprehension of Nature as Participatory Process

Goethe was convinced that "the manifestation of a phenomenon is not detached from the observer – it is caught up and entangled in his individuality" (Miller, 1988, p. 307). Goethe believed that to "attain in some measure a living comprehension of nature, we must ourselves remain as mobile and plastic as the example nature presents to us" (quoted in Colquhoun, 1997).

Direct attention to the phenomena, awareness of our involvement in natural process, and the ability to employ and consciously shift between a variety of epistemologies may help us to become mentally flexible enough to reach the kind of 'living comprehension of nature' that Goethe speaks of. Such a comprehension requires us to move beyond dualistic subject-object-separation. Goethe argued that (see Miller, 1988, p.39):

The human being knows himself only insofar as he knows the world; he perceives the world only in himself, and himself only in the world. Every new object, clearly seen, opens up a new organ of perception in us.

Henri Bortoft summarizes Goethe's process of direct knowing as active seeing followed by exact sensorial imagination. Out of the stage of exact sensorial imagination arise the intuitions and inspirations that Colquhoun (Colquhoun, 1997) and Brook (Brook, 1998) separate out into stage three and four. Bortoft suggests that it is a procedure for refining our perception. It shifts us out of our accustomed way of perceiving, which Bortoft calls informational perception, into a way of perceiving the depth of the phenomenon.

Informational perception labels things and measures things. It cuts us off from the direct and participatory experience of the phenomena from which Goethe drew his direct knowledge of natural process. In one of his aphorisms on the theory of nature and science Goethe uses an example from his theory of colour to express the intentions of his phenomena-based

rather than concept-based science. He writes (Goethe around 1820 in Miller, 1988, p. 307):

The ultimate goal would be: to grasp that everything in the realm of fact is already theory. The blue of the sky shows us the basic law of chromatics. Let us not seek for something behind the phenomena – they themselves are the theory.

Goethe's living comprehension of nature fully integrates the human being in the natural world. An understanding of nature as participatory process overcomes the dichotomy of humanity-versus-nature that has ingrained itself in our current understanding of reality due to the predominant subject-object epistemology. This reintegrates humanity and all the artefacts we have created into a worldview that acknowledges the inseparability of humanity-and-nature. Goethe warns (Goethe, 1781):

Even the most unnatural *is* Nature; *even the creations of the crudest philistines express some of Nature's genius*. Who does not see Nature everywhere, will see her nowhere in the right way.

In his book *The Rebirth of Nature*, Rupert Sheldrake mentions that T.H. Huxley was asked to write the opening article to the first issue of the scientific journal *Nature* in 1869. Referring to Goethe's understanding of Nature, Huxley suggested in this article that "long after the theories of the philosophers whose achievements are recorded in these pages, are obsolete, that vision of the poet will remain as a truthful and efficient symbol of the wonder and mystery of Nature" (in Sheldrake, 1991, p.70). Huxley began his article with a combination of Goethe's descriptions of nature, which are quoted below (see the journal *Nature*, 1869, vol. 1, p.9):

Nature! We are surrounded and embraced by her; powerless to separate ourselves from her, and powerless to penetrate beyond her ... We live in her midst and know her not. She is incessantly speaking to us, but betrays not her secret. ...She has always thought and always thinks; though not as man, but as Nature. ...She loves herself, and her innumerable eyes and affections are fixed upon herself. She has divided herself that she may be her own delight. She causes an endless succession of new capacities for enjoyment to spring up, that her insatiable

sympathy may be assuaged. ... The spectacle of nature is always new, for she is always renewing the spectators. Life is her most exquisite invention; and death is her expert contrivance to get plenty of life.

Conclusion

Why is Goethe's "Zarte Empirie" of critical importance for us today? The brutish empiricism of reductionistic and mechanistic science and the irresponsible application of everything that becomes scientifically and technologically possible have progressively deteriorated the web of relationships and diverse processes that maintain the health of the planetary biosphere, ecosystems, communities and individuals. The fabric of life is unravelling with humanity as a conscious witness but also a cause of the disintegration. We are desperately in need of what Goethe called 'knowledge utterly in tune with the nature of things.'

Goethe's 'tender empiricism' and the methodology developed in Goethean science could help us to responsibly integrate the wealth of knowledge humanity has gained through conventional science and its reductionist methodology, mechanistic metaphors and dualistic epistemology, into a more holistic, process-oriented understanding of our own participatory role in the wider processes of nature.

In describing and practicing a complimentary way of knowing to the dualistic epistemology of subject-object separation, Goethe established the basis for a holistic science that pays attention to relationship, process and participation. Such a phenomenological science, aware of its own epistemology, can contribute responsibly to the emerging holistic and participatory worldview.

Humanity is becoming aware of its fundamental interdependence and participatory involvement with the life sustaining processes of the planetary biosphere. Insights from the complexity sciences are reaffirming that our ability to predict and control complex dynamic systems is very limited. Global climate change, rapid loss of biodiversity, and the collapse of marine and terrestrial ecosystems, as well as the disintegration of society are examples of our limitations and the urgent need for changes in humanities impact on the planet.

We are in the process of a fundamental shift in society's guiding paradigm, as our motivation for achieving knowledge changes from an aim to increase our ability to predict, control and manipulate natural processes to

an aim to increase our ability to make the complex dynamics and relationships in nature more intelligible in order to participate appropriately in the health and wholeness sustaining processes of Nature.

Goethe's "zarte Empirie" – his delicate empiricism – may become an important epistemological tool to guide us towards appropriate participation and therefore towards sustainability. The ability to consciously and responsibly switch between epistemologies in full awareness of their respective perceptual blind-spots will help us to integrate reductionist knowledge and holistic wisdom.

In providing a methodology for shifting into a holistic mode of consciousness that is accessible to everyone, Goethean science could contribute to the evolution of human consciousness. In overcoming the separation between the self and the world, as well as mind and matter, Goethean science stimulates rather than negates our awareness of the spiritual dimension of reality and the sacredness of nature.

Goethe's delicate empiricism may help us realize that we are participating in a process by which the universe is observing and experiencing itself. Systematic practice of Goethean methodology will change our understanding of the nature of the material world, the nature of consciousness, and of our own human nature as conscious and *responsible* participants in and integral parts of Nature.

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