WHAT IS PHENOMENOLOGY?

By

Michael J. D'Aleo

Introduction

A few years ago I recall standing in the checkout line of a large store. There were still a couple of people in front of me who were paying for their purchases when a woman came up behind me with her approximately three-year-old child. The woman first glanced at the long line and then noticed a simple child's puzzle near the checkout. The simple puzzle had three or four wooden cutouts that would fit nicely into the flat piece of wood from which they had been cut. Each piece was cut in the shape of a barnyard animal and was painted appropriately. "Look," the woman said to the child, "this is a sheep!" With this exclamation she removed a particular piece of wood that was shaped and painted in the outline of a sheep.

Immediately, I saw a problem:

> *"That's not a sheep," I thought to myself. "That's only a cutout piece of wood painted to represent a sheep. A sheep is much larger, has a particular smell, makes a very characteristic sound, its body is covered with a very unusual material that feels soft, often oily and leaves a funny scent and taste on your hand. Have you ever helped someone try and catch some sheep or helped to shear them? Sheep are fast, skittish, they can jump…These animals have many unusual ways of behaving … this is only a part of my experience of sheep. – Please, take the child somewhere where they can have an experience of sheep!"*

I never said anything to the woman or her child but this moment made clear the distinction between a concept that is given and one that arises out of actual sensational experiences.

Having a young child of my own, I can sympathize with the plight of the woman and her child. The checkout lines in many stores are often designed to overwhelm you as each item competes for your attention and interest. As an adult, we can develop the capacities to ignore or "tune out" the myriad impressions that bombard us in such an environment; a child cannot. However, without careful discrimination we as adults can just as easily begin to "tune –out" the many other sense impressions in our world. When this happens, we may begin to sense that our life has become a routine in which we are simply going through the motions, that we have lost our connection to not only the world but also ourselves.

A brief historical context

Many teachers, parents and perhaps older students may have heard that Waldorf education encourages the use of a phenomenological approach to science. While even saying the word, "phenomenological" can be difficult for a person encountering it for the

1158 Quince Ave.
Boulder, CO
80304

first time, there is even less familiarity with the meaning of the word and its relation to the approach to science advocated by many Waldorf schools. In fact, phenomenology does not have its origin in Waldorf education but instead, the roots of phenomenology can be traced back to European Continental Philosophy of the late 17th and early 18th century. While many people familiar with Waldorf schools may know that Goethe (1749-1832) and Steiner (1861-1925) advocated for such an approach, there were parallel efforts by Alexander Gottlieb Baumgarten (1714-1762), Johannes Mueller (1801-1858) and Edmund Husserl (1859-1938). Additionally, in reading any of the writings of the great historical scientists, one finds references to a process that can be described as seeing a "pattern or lawfulness" in observations, that had not been seen before, or simply been overlooked by others. Examples of this can be found in the notebooks of Leonardo da Vinci, the dialogues of Galileo Galilei and the notebooks of Johannes Kepler. In each of these cases, a deeper understanding of a given set of phenomena is reached not by accepting the work of their predecessors, but instead, by looking again at the phenomena described by others and then "seeing something new".

For example, in Galileo's time (early 1600's) the commonly accepted view of objects that fall "naturally" (simply dropped) was that a heavier object would fall faster than a lighter one. By carefully reviewing the argument that was made *to support* this view, Galileo noticed an inconsistency in the argument. Through a combination of intuitions, thought experiments and actual demonstrations he was able to conclude that all "heavy" objects (ignoring feathers, dust, etc.) would fall through the same distance in the same time, that each object's speed (velocity) would increase at the same rate and furthermore, that the rate of acceleration was constant. This example is often used in the 10th grade Waldorf Physics block in the study of Mechanics.

Another clear example advocating for an experiential approach can be found in da Vinci's notebook in which he describes the difficulties he had with the scholars of his day. In da Vinci's time (about 1500), much of the scholarly debate in universities focused on how to interpret the work left by the "Masters" rather than an individual inquiry into the phenomena of the world. This of course was at odds with da Vinci's own process of keen observation. In *The Notebooks of Leonardo da Vinci* as translated by Edward McCurdy (Reynal & Hitchcock, New York, 1938), the first entry reads:

> *If indeed I have no power to quote from authors as they (i.e. the scholars) have, it is a far bigger and more worthy thing to read by the light of experience, which is the instructress of their masters. They strut about puffed up and pompous, decked out and adorned not with their own labours but by those of others, and they will not even allow me my own. And if they despise me who am an inventor how much more should blame be given to themselves, who are not inventors but trumpeters and reciters of the work of others.*

Consciously observing the phenomena of the world this is the starting point for the middle school science curriculum.

1158 Quince Ave.
Boulder, CO
80304

The Approach

A phenomenological approach to science *begins* with the premise that all empirical knowledge must start with sensory impressions. Every concept we form, be it in science or everyday life, must ultimately be based upon sense impressions or a combination of sense impressions and other concepts. Initially we can think of these sense impressions as the basic senses we use every day such as sight, sound, taste, touch and smell. In time we may become conscious of other sense impressions for example our sense of motion, balance, thoughts, etc.

The foundations for such an approach to an understanding of the world was outlined in depth by Rudolf Steiner, the founder of Waldorf educational methods, in his book *The Philosophy of Freedom* or *Intuitive Thinking as a Spiritual Path.* One of the central themes in this book might be outlined in the following manner. When we experience a new or unfamiliar environment for the first time, we choose specific observations to focus on and then mentally remove these details from the whole of the environment in which we are observing. There are myriad choices of possible observations but we can only focus on a finite number at any time. Having decided to focus on specific observations, we then find relationships or order within these observations. Relationships also appear between the observations that have been separated and the whole environment from which they were removed. Initially, one can think of the observations as sensed based perceptions and the relationships as thought based conceptions. Later on, when the capacity to distinguish between perceptions and conceptions is more clearly developed, one can also take thought as the basis of perceptions as well.

The fascinating part of the process outlined above is that the activity of looking for the relationships between the perceptions is not linear nor one that can be arrived at through logic. The process of finding the relationship for the "first time" is often referred to as intuition. Intuition is the process by which one first has an insight into a conceptual framework that can unite a given set of perceptions, or a set of perceptions with other concepts. This is the "aha" or "eureka" experience of the scientist, inventor, artist or investigator. In that moment a new relationship is seen and it is then *and only then* that logic can be rightly applied to determine if the relationship will hold true in the context of the other relationships that are known. *This process of looking for a relationship among phenomena is the true activity of thinking.* Thinking *is not* simply the recollection of previously know facts.

And herein lies the biggest distinction between a phenomenological educational approach to science and a more conventional educational approach. In a phenomenological approach, one strives to give the students an experience of the phenomena and then have them wrestle with finding relationships or order. This process actually cultivates the true powers and capacities necessary for thinking. Here thinking becomes an activity, a verb, something that is dynamic and living. In a more conventional approach, the laws or relationships are initially given and then the student is guided through a proof of why they hold true. In this second approach, the students do not need to utilize their own thinking capacities in the same manner since they simply need to follow a logical argument rather than having an insight themselves as required in the phenomenological approach. In this second case, the thinking becomes a process of data acquisition and accessing.

What is interesting about these two approaches is that in fact, almost every new idea and invention that has arisen in science has resulted from a person consciously or unconsciously using a phenomenological approach. Often this can unconsciously result when a scientist is working with an old concept, one that has often been passed down for years, and suddenly the scientist sees something new in the phenomena. In that moment, the scientist leaves the conventional view of looking at the problem using old fixed concepts and instead, becomes interested in some new detail and suddenly desires to "make sense" of this new situation. This is precisely the kind of thinking that we are ultimately trying to instill in the students in a Waldorf school. It does not necessarily matter whether they are going to become scientists later in life. The sciences give us an opportunity to develop in every student the capacity to enter a situation, take stock of it (make observations) and then make sense (find relationships and form concepts) of the situation.

The Young Child

Now of course one cannot initially ask that a young child participate in such a process. To make observations, one needs to have senses that are well developed and have a rich background of experience with which to make comparisons. What is more, a young child needs to experience for herself how to separate out specific sense impressions from the rich world of experiences that are possible to be perceived. And finally, the world or sensory environment that a child does experience needs to be one in which none of the impressions are either overwhelming or too narrow in their context. To properly educate the very young child, it is not so much a question of "teaching" but rather one of ensuring that the proper environment, one that is rich in sensations and also deep in context, can occur.

Perhaps no environment can surpass nature in its richness of sensations or depth of context. Again, the key is not to teach the child to see the observations and then tell them the concept, but rather to allow this process to occur naturally while the senses of the child are developing. Recall the example given at the beginning of this essay concerning a sheep. Take a few moments to focus on the environment and sense impressions found on a small farm.-- Now compare those to the impressions found in a checkout line at a large store or to focus on the sheep more specifically, consider the impressions given by an interactive computer program in which animated images of sheep move across a flat screen accompanied with corresponding digitized sounds.-- Which of these environments will a young child be able to "take in" and which gives the child a richer, fuller context on which to know not only an individual sheep, but the full context of forces and activities that help define how sheep "are?"

It might now be even more apparent why the classrooms for the Waldorf Kindergarten students and early grades are organized in the way they are, and why the activities of the morning circle and "play" are such a central part of a child's "education."

1158 Quince Ave.
Boulder, CO
80304

The Middle School Years

Skipping ahead now to the middle school students, we can see that they are definitely in a different place with respect to their individual relationships to the environment and their own self-awareness. By sixth grade the students become very observant of their surroundings. They begin to really notice all of the "odd things" about the adults in their lives and also can become self-conscious of their own outer appearance and inner feelings. It is at this time that a teacher can start working consciously with the students' own observations both those of the individual as well as those shared collectively by the class. The students can be shown a scene such as a sunrise and then later, the teacher can ask them to recall specific observations that were made, what the order was in which they occurred and if there are any relationships (concepts) that can be found between the observations (perceptions).

For example, in the 6th grade I took the class into a small, completely dark, room and using a high quality light dimmer, ever so slowly increased the level of illumination in the room from total darkness to incredible brilliance (we used a 500 watt bulb). This exercise was done with little talking but I was careful to increase the level of illumination in stages so that the students could really "take in" the phenomena. During the review period the next day, the students were overflowing with observations. It started with the obvious such as, *"At first, I couldn't see anything and then I saw someone's head!"* After trying to figure out whose head it was, another student offered, *"Initially everything was in black and white,"* while another said, *"and it was also kind of "flat", two dimensional like."*

As I slowly focused the conversation, the class began to order their perceptions and noticed that the "scene" started with little to see other than the very dim glow of the lamp. Slowly, varying shades of darkness were perceived and out of this the students began to distinguish familiar forms (the classmates head). The students then began to notice that some colors on their clothing were more easily discernible during the "darker phases" than other colors. White was seen early on, but it took a brighter level of illumination to distinguish white from yellow. Red was also seen fairly early, while a relatively bright level of illumination was needed to identify a blue stripe on a sweater that had a black appearance under lower levels of illumination. By the time the light bulb was at its maximum level of brightness, we were all "blind" again, as all we could see was white brilliance. One of the key points the students finally articulated was that the colors changed with the level of illumination. Less obvious but equally present was the role that color plays in our ability to take a two-dimensional image of color and form, and relate it to our everyday three-dimensional spatial orientation. This was just touched upon, as it would become clearer through their experiences in painting class and their study of Renaissance art in 7th grade.

The middle school years is also the time that the students can first make a basic distinction between the world as observed and the world as conceived. The students of this age are *not* ready for a philosophical exploration of the foundations of knowledge but it is appropriate to make a distinction between what one actually sees (smells, hears, and so forth) and the feelings and thoughts that arise from these sensations. Again, the teacher does not have to go into a deep philosophical discussion with the students but instead can

1158 Quince Ave.
Boulder, CO
80304

simply point out the distinction *within the context of comments made by students in the class.* The pedagogical importance of helping a young adolescent see the difference between sensations and feelings, or thoughts is probably apparent. Here the science lesson presents an opportunity to properly balance the strong feeling life of the early teenager without resorting to any moralizing.

It is important to be clear about how one might deliver a lesson using a phenomenological approach. First, with little to no introduction, the class is brought into an environment in which the phenomena that are to be discussed the following day are observed. There need be no elaborate scientific setup and in fact, by bringing the lesson out of regularly encountered environments the students can develop a sense for how the phenomena in question relate to the world at large. As the activity or process to be observed unfolds, the students should be encouraged to observe the phenomena as fully as possible with minimal prodding from the teacher to "look at this" or "did you hear that?" At the same time, the students should be discouraged from communicating in any manner or asking questions out loud. Finally, when the experience or experiment has been completed, and just before the class finishes, the students can be asked to recall or remember the sequence of events. The importance of having the students live with the process (sequencing is an important tool for clear thinking) they have just observed should not be overlooked. Sometimes a teacher can leave the students with a question to consider but the teacher should always be careful not to lead the students toward a conclusion.

On the following morning, the teacher has the students recall the demonstration from the previous day but without redoing the experiment or using the apparatus as a prop. The teacher's first request of the students should be to solicit observations *without conclusions, cause or relationships.* This process allows each of the students to carefully weigh and consider all of the observations without having a sense that they have to rush ahead and get "the answer" before their classmates. Additionally, the teacher needs to be careful not to have too strong a picture of what the students, "should have observed" and what the exact wording is or, "what they should conclude". If one has cultivated the right atmosphere in the class, the students will arrive at not only the observations and conclusions that were anticipated, but also, the students will often bring other observations and find additional relationships that were not intended. Again, the teacher needs to be very awake to allow for the possibility of new ways of seeing a relationship, or other means of expressing a given relationship. We want the students to experience that they are really involved in forming the concepts and not simply trying to say, "what the teacher wants me to say." Again, the relationships or concepts are only developed after all of the observations are in place. It is also important that the teacher not immediately judge a comment as "correct" or "incorrect", but instead, allow the class to try and form the judgement of whether or not a suggested relationship offered by one of the students holds true. In the end, the teacher must be the guide of the class but the process doesn't always have to move forward because the teacher is always the first to take "the next step." In fact, the best opportunity to introduce the next demonstration or experience can often arise when a student who has just understood the previous days material, asks a question such as, "Well if that's true, then what about…?" When this happens, it is usually a sign that things are going well.

An Example

During a specific lesson in the 8th grade, I recall how many of these elements came together for the first time. We had observed colored fringes (refraction phenomena) while looking through any kind of prism at objects that had light surfaces that bounded dark surfaces. In class, we developed the convention that one of the edges of the prism would always face upwards and we all held our prisms at eye level so that we would all see the same order of colors provided we all looked at the same boundary. Given this orientation of the prism, when the light surface was above the dark surface, the warm spectrum (red orange yellow) was observed and when the dark surface was above the light surface the cool spectrum (blue violet) was observed.

For homework that night, I gave each of the students a prism and asked them to draw a "scene" in their main lesson book of their own room at home. The following day I asked the students to show me their drawing and received the following unexpected response from one of the students that sounded something like this:

"It didn't work. I don't know what happened but I started to do the assignment and everything was going well and then it stopped working! Maybe something is wrong with my prism. I started to draw my wall with the window and at first there were the colors just like yesterday. Then after awhile the colors started to get fainter and sort of disappeared, so I gave up. Then when I came back later to try and do it again the colors were back, only this time, the warm and cool colors were now switched from where they were before!

I stood in the front of the class and pondered this statement for a few moments. I imagined her house, the time of year (December) and, sensing what might have happened, proceeded with questions.

"What time of day did you begin?"
"*Late afternoon*," she replied.
" Specifically what time?"
"*I started about 4 in the afternoon and worked for half an hour*."
"Is that when the problem started?"
" Yes, so I stopped and then tried again after dinner. That's when the colors switched."

I then turned to the class and asked them what had changed during that time. Eventually, the students realized that the sun was setting at that time and that their classmate had been working in a room without a light on. Under these conditions, the light colored window (there was snow on the ground, her house was in an open field) and the relative darker coloration of the walls (in a room lit only from the sun outside) gave

1158 Quince Ave.
Boulder, CO
80304

her one orientation of colors. As the sun set, everything in the room and the window began to appear dark so there were no longer any light/dark boundaries visible. When she returned from dinner it had become very dark. The class eventually realized their classmate had turned on her bedroom light so that now, the window was dark and the walls were light. These were the opposite conditions that she had started with and the reason for all of the difficulties that night!

What had happened in the class was remarkable. The frustrated student had given her classmates a real opportunity to understand the conditions for color fringe phenomena because she had observed something that at first appearance made no sense. In time, *the class* sorted out the mystery and the teacher's task was to simply find the right questions that would help the students discover the relationship *out of the students' own effort*. Finally, the student who made the observation felt empowered by her discovery.
Using a conventional approach to science education, one usually begins with "the law" and then performs experiments or demonstrations to show its justification. In a class with a conventional approach to science, it would have been very easy to dismiss the experience above as something that did not fit "the law of refraction". This can send a student the message that the senses cannot be trusted. *Yet, it was because people used their senses, and carefully so, that the lawfulness was found in the first place!*

A brief comment on bookwork

Finally, it is important for all students to make the experience and the discovered relationships their own. In the middle school years, a lot of time can be spent developing clear and orderly descriptions of what took place and the relationships that were uncovered. While these descriptions can initially be completed as a class together, in time each individual child should begin to develop a responsibility for his or her own record of "what happened." In any case, the teacher should check and make suggestions on "first drafts" to ensure that each student is developing a clear relationship to observations, sequencing and finding appropriate relationships. For some experiences, a detailed illustration might capture all of the phenomena and relationships and a written essay would be redundant. In time, each teacher can develop a sense for the balance between written work and illustrations, rather than simply insisting that each demonstration must include both. By the end of the block, each student would ideally have a main lesson book that helps him or her to "remember" all of the experiences that were encountered and have a *feeling* (sense) for all of the relationships that were found.

Where does this lead? A brief sketch of some elements of the high school physics curriculum.

Phenomena based methods can continue to be used in high school and from my experience, very successfully. If the students have a solid foundation in observation and stay attentive to the phenomena under consideration, then they can really delve into almost any topic in science and understand it in context. For example, in the 9th grade the students begin a study of thermal phenomena by performing a few experiments and then making clear distinctions between the concepts of heat and temperature. A modest beginning no doubt. However, by the end of the second week of the block, the class will

1158 Quince Ave.
Boulder, CO
80304

have progressed toward the solution of basic algebraic problems in thermal physics. For example, the students can calculate how warm a known mass of cool water in a bucket will get, if a specific piece of hot copper is cooled by plunging it into the bucket of water. In our school the students perform this activity in the context of making a hammered copper bowl. The physics block ends with a fairly thorough understanding of a four-stroke internal combustion engine. And yes, the students do disassemble an automobile engine before we speak about how it works.

In the 10th grade, the students develop the laws of Mechanics and take up some of the same questions that Galileo wrestled with as pointed out earlier.

In the 11th grade, the students deal with the non-material world in physics, the field theories of electricity and magnetism. Here the students wrestle with forming concepts from experiments that can only tell us indirectly about what is being experienced. The electric or magnetic fields themselves are not visible. Yet, we can see effects on sensible phenomena (objects) that tell us about how these forces behave. In our school the students also study Atomic Theory in the 11th grade. Now the students have the mental ability to really work with the phenomena as well as the conceptual framework that evolved in to the atomic model of matter. What is more, by waiting so long to expose the students to this model it is possible to take the students beyond the simplified version of this theory usually studied in more conventional science programs. This means that in conjunction with the work on field theory described above, the students can now develop an appreciation for the general descriptions and ideas that are being discussed in even the most recent research in which the experiments result in phenomena that have lost most of the qualities we normally associate with matter! Again, this can only occur when the students have developed a clear understanding of the distinction between the perceptual world of the senses and the conceptual world of the mind.

In the 12th grade, the students delve into visual phenomena. Now, they can finally take on some of the philosophical questions that arise when we ask, "How do we see the world?" Or expressed in another form, "What is the foundation for knowing?"

Instrumentation and Equipment

When speaking with parents about phenomenological methods the question of instrumentation can often arise. Yes, electron microscopes and electric-meters can be very useful tools for scientists and engineers. However, it is very easy for students, most adults and even many scientists to lose track of what is actually being observed. For example, the "image" created by an electronmicroscope appears to be an "object" but is in fact a visual representation of varying strengths of an electric field. While the distinction made can seem small, the implications of such statements can be tremendously important as one proceeds deeper into the sciences. Therefore, in the schools we would only want to use equipment that students are able to understand with their present mode of consciousness. This implies simple equipment in the middle school years and somewhat more sophisticated instrumentation later on. Remember, the thinking capacities of the students have less to do with what instrumentation they can use and more to do with how they work with the observations they have made.

Michael D'Aleo teaches Physics and Physical Sciences at the Waldorf School of Saratoga Springs in Saratoga Springs, NY and is an instructor in the summer high school teacher-training program at The Center for Anthroposophy in Wilton, NH. After being a class for teacher for grades 6 –8, he co-authored a book with Stephen Edelglass, *Sensible Physics Teaching,* a guide for teaching Physics in grades 6-8. Prior to teaching, Michael worked as a design and development engineer in the electronics industry and is listed as an inventor on seventeen U.S. Patents. He is currently the director of research for SENSRI, a non-profit scientific research group that investigates that methods and applications of phenomena based science.