Is there a Science of the Feldenkrais Magic?

Keynote Address by Carl Ginsburg, Ph.D.

We are in a work, a profession, that crosses two worlds, two domains. One domain is the phenomenological, the realm of our experience as it is, before we interpret it, make ideas about it, make meaning of it, or explain it. Here we rely on our ability to be present, to take in the whole, to respond, and act in the moment through our senses. We work without words in our heads, without making intermediate cognitions of what we know in our sensing and acting. We eschew diagnosis and analysis. We open our attention to take in what is before us in the moment. In this domain we make magic. We have wonderful new experiences of ourselves. So do our clients. There is a funny thing about our magic. It allows us to guide ourselves and our clients to increased self knowledge, what we call awareness, and to shifts in patterns of moving and doing. We call that learning "education."

The learning we speak of is in the realm of experience, in shifts in the structure of our consciousness. We don't give this to anyone. It happens for each person who is willing to enter the process, who is willing to explore inner sensation and feeling. The learning happens equally in the realm of observed behavior. Now we cross to another domain, the realm of external observation.

Inner exploration has not traditionally been in the realm of what we call science. Yet we cross into that world of external knowledge also. A new pattern of self mobilization, a new way of doing, is experienced as more reliable, easier, more effective. Experience as such, and the old trouble a person has is replaced and forgotten. We can observe this in the external behavior of the person. We can ask: How is it possible that our nervous system operates in this way? We can ask: What is happening in the nervous system during a Feldenkrais lesson? What changes when we learn in this way? We can ask: Is there a science of the magic?

Here is an interesting dilemma for us. We know in our experience that our process works, that we can learn new patterns, shift our attention, improve our sensitivity, develop our awareness. We know we can guide others to a similar result. Yet when we are accosted by someone who asks, "Where is the scientific proof?," we are left with our mouths hanging open. People operating in a scientific frame of reference have a problem in accepting what we do. Of course, we know that if they try out the process openly, they too will experience results similar to what we experience. One difficulty is that terms of the proof are in different domain. In our domain, one feels the differences, experiences life in a new way. We are empirical, looking for what brings about a process, not a specified result. What we do, though, doesn't go easily into a laboratory. However, if a medical doctor asks for proof, what he want is a cause and effect relation between a procedure we would apply and the solution to a patient's problem. He wants to take a laboratory approach, be able to design a carefully controlled experiment. What we do is too vague for him. How is learning related to what he wants? Somehow, we cannot reduce what we do to simple, understandable mechanisms. On the other hand, does anyone need proof that human beings are capable of learning new organizations of themselves? But then, a scientist would want to know how this relates to the wonderful results we report from our experience of lessons. In the end, everything we do in showing our work is effective for this or that can all be dismissed as anecdotal.

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There is yet another difficulty for scientists, and that has to do with the question of the reliability and significance of the domain of experience. The phenomenological realm makes most scientists uncomfortable. They know that you can't trust experience alone to decide questions of fact. You need procedures to overcome the frailty of human subjectivity. What is subjective is frequently illusory. What do we do with this? This question will become the major focus of this talk.

First, let us look at the science in our method as Feldenkrais himself developed the process of what we do. On this score, Feldenkrais actually did a major piece of practical scientific work. He asked some big questions for which, in his day, there were unclear answers. What is the optimal organization of a human being for acting in the world and in gravity? How should the musculature be used? How should the skeleton function? What is the easiest path to such self organization, and what steps make the process possible? We know what many of the answers to these questions were in Feldenkrais' view, and have experienced the results in our lessons. Nevertheless, let us look briefly at what he did.

First of all, he applied his knowledge of physics to an understanding of Judo. This methodology led him to understand what was optimal in human organization and enabled him to demystify the abilities of people who practiced Judo and other martial arts. As an accomplished Judoka, he was later able to explore his own movement and awareness, which allowed him to begin working with others. Here, he found what sort of contact facilitated a person's change, what sort of internal attitude on his part made the communication more immediate and effective. And he experienced continually, trying a new way of moving a person in each lesson he gave over a period of time, to gauge the effect on many persons. As he developed a way of working with individuals, another challenge was to explore how people could learn and develop awareness in groups. Here was the genesis of movement lessons, and he had to find out how to do this better. To this end, Feldenkrais used his classes as a vehicle for experimentation. He would record a lesson, try it out with a class, revise and refine his wording, and observe the effect with another group. Over a period of time, he came more and more to realize that when people focused on the goal instead of the process, the kind of learning he was after did not happen. This knowledge led also to revisions of the lessons. In other words, every process we use was subject to experimentation.

This kind of science had a practical outcome. It was careful and methodical. Nevertheless, it could not be taken into the laboratory. It violated another boundary: that between the external observation and the phenomenological, the internal experience. Feldenkrais was experimenting with his internal states and observing the effect on his clients in terms of their internal states. But he knew of the shifts in his clients' internal states in his observations of the changes in the organization of their actions. For him, there was no distinctions between the realms, between mind and body. I hope to show that this boundary never should have been erected in the human sciences. It creates blinders where we need light. Feldenkrais made tremendous progress without it.

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Let us cross back now to the phenomenological world, or our work. This aspect can never be discarded, for the fact is that nothing we can find from science is worth anything to us if it remains as a verbal formulation. We may be able to say where the pelvis should be in relation to the head and trunk for a person's action to be easy and efficient. Such an idea is useless to us, however, until we know where our head and pelvis are in internal space; and we can use the power of the pelvis to stand up, do a judo throw, or connect with another person skeleton to skeleton. Equally, we need to know in action what it is to guide another person into this sort of learning.

Thus I say now - there is only one topic of our work -science or no science- and that is the expansion of the field of conscious experience in daily living- what we mean when we say AWARENESS. Everything else is subservient to this. It means that a science that ignores or discards the phenomenological realm is of no use or service to our method and cause.

So what is it we need from science? Is there a science of the Feldenkrais magic? Surely, as I have shown, Feldenkrais based his work on empirical scientific procedures, and he also scoured the literature in many fields of science for corroborating evidence. But even eleven years ago when Feldenkrais died, there were only very rough answers to such questions as: what is happening in the nervous system during a Feldenkrais lesson? Classic neurology, the investigation of nerve signals and connections, important as such knowledge may be, had nothing to say to us. Nor did a cognitive science based on a computational model of thinking.

Here are some observations from our work that are confounding to the classic sciences:

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The neuromuscular system can reorganize in response to simulating an entire function or action. An example is the lesson Feldenkrais did in San Francisco on July 23, 1975. His young subject, the daughter of one of the students in the training, walked with one foot turned in and the heel pulled away from the floor as a result of cerebral palsy. Simulating the action of standing by evoking the entire standing function while the girl lay on her back (Feldenkrais used the application of a board to stimulate the surface of the foot and pressing to connect through the skeleton), the girl discovered afterwards that she could walk with her heel on the ground and her foot pointed forward.

Bringing conscious attention to the movement of one eye changes the tones of the musculature on the side of the body corresponding to that eye, even though both eyes move equally.

By attending to one side of oneself and effecting a reorganization of that side in action, one can reorganize the other side through imagining the feeling of the movement as if it were the same as the reorganized side.

In touching another person, the effectiveness of that touching is dependent upon the state of your own organization.

Let us see that there are difficulties within experimental science itself. Here is a particular difficulty in cognitive neuroscience. We experience ourselves as unified persons. Our experience itself appears as unified perceptions. But the neuroscientists who have explored what is happening in the nerve cells in relation to what we experience do not find any unity or unifying processes. Let us take Vision, for example. Whatever impinges on the retina of our eyes excites cells in the retina. These cells in turn excite cells in one of the nuclei in the brain which distributes excitation to cells in many different areas. Some cells respond to edges, others to color, others to what is horizontal and others to what is vertical. None of this corresponds to what we experience. We don’t see edges and color. We see an entire space and unified objects in that space.

Now, when the first experiments were done correlating the activity of neurons with features such as color it was postulated that somewhere the various processing cells must project to some place where it all comes together again. Or at least there must be some cells that respond to features so that we see a recognizable something, a face we know or an object; a grandmother cell, if you will, that lights up when you recognize your grandmother. In thirty years and more of research, no such cells have been found; there is no place where it all comes together. In fact, the most popular view among cognitive and neurological researchers these days is that the brain is a collection of separate processing modules.

What we have as Francisco Varela, our invited speaker to this conference, has said, is a disjunction between experience and the external description, what it is you come up with when you look at the mechanism of the brain.

For some scientists, the easiest way out of the difficulty is to discount experience entirely. What we call conscious experience is merely epiphenomenal and has no influence or importance in the working of the nervous system. The evidence of the Feldenkrais Method alone makes this pretty hard to swallow. Another alternative is to postulate a dualism in which a nonmaterial entity, the mind, does the integrating. The famous neuroscientist, John C. Eccles, takes such a view and says that “the unity of conscious experience is provided by the self-conscious mind and not by the neuronal machinery …” Daniel Dennett says that the unity of experiences is an illusion. Gerald Edelman calls the inability of neuroscience to deal with the problem of perception, a scandal.

But the problem is not just the unity of experience; it is also the unity of behavior. Nicholai Bernstein’s observations, made many years ago in the Soviet Union, are particularly to the point. Bernstein is now being credited as the father of movement science. The power of his observing and his originality of interpretation are astounding in retrospect. Here are some quotes: “A muscle never enters into a complete movement as an isolated element.” “A movement never responds to detailed changes in each small part.” Bernstein, by the way, spoke of Functional Integration (published in English in 1967) before Feldenkrais must have used the term.

We have now laid out the ground of our difficulty. The question is: Are there traditions among scientists to help us? The answer fortunately is: yes. We must, however, go out of the mainstream of thinking. What is most exciting is that the last few years we have experimental evidence to substantiate the alternative views. The experimental evidence has been hard to find.

Let me divert a little bit to try and explain why. Part of the difficulty is the nature of the scientific method in the laboratory. The laboratory method is to try to keep as many variables controlled as possible. You want to be able to isolate one variable if possible. Thus, experiments are done with animals sometimes immobilized or otherwise restricted in movement. Settings are as far from natural as possible. Animals are often under anesthesia. An animal, for example, might be passively shown target stimuli while recordings are made of nerve cell impulses. Much experimentation with human subjects was and is also done with the experimental subject passive rather than active. It turns out what you see in the brain is completely different if the animal or person is active. This was not known until experiments could be performed this way. But so much research was done without looking to the question of whether the research subject was passive or active, that much of the information gained isn't relevant to understanding how the nervous system is operating in a living, active situation. It was just assumed that what was found in the laboratory situation could be transferred over to actual life situations. One cannot ignore the results of experimentation. On the other hand, specific experiments can be misleading without a coherent context in which to place the results. In addition, important data may be missed, discarded, or not recognized as having significance. The major difficulty has been, is, and probably will be for a long time to come, the problem of creating a conceptual framework. A lot of Feldenkrais' successes were based upon the fact that he had a more useful conceptual framework. So were the successes of some of the pioneers of alternative approaches that we now celebrate. Bernstein, who we have already mentioned, became aware of the structural complexity of every so-called conditioned reflex, and became fascinated with the study of movements as integral formations. He found that the organization of movement was not based on specific muscles, nor upon metric relations, but upon the topological properties of space. Thus the observation that one's handwriting is the same whether made with the wrist and hand or the arm and shoulder.

Pioneer K. U. Smith found that the learning experiments of the behaviorist psychologists were useless in developing methods to get human beings to develop new skills. He, like another pioneer, J. J. Gibson, developed an alternative view because he had to solve practical learning problems in order to help train servicemen in World War II. Smith found ways to apply the ideas from a new science, cybernetics, to learning tracking skills. Gibson's problem was different; he had to find ways to study visual perception in relation to flying airplanes. Gibson was one of the few psychologists of his time who did not reject phenomenology. He used it in the design of his research and thinking, which led him to an "ecological" theory of perception in which he emphasized the active processes of the perceiver in relation to a world of "affordances" for perception.

Well, a lot has moved forward in academic and scientific circles in the last few years. It could be looked at as downright revolutionary. It is based, however, on the work of many pioneering scientists who were not satisfied with the received views of those who had academic prominence. What has changed in recent years is the amount of research material supporting alternative understandings, and the gradual adoption of a really different conceptual framework. Let's look again at what we know as Feldenkrais teachers that needs accounting for from a scientific perspective.

A true science of human beings needs to take this all in, and not isolate itself to the abstract and the formal. Only in recent years have some researchers and theorists approached this kind of understanding.

First and foremost, we know that our somatic system has both stability and extraordinary plasticity as revealed by our lessons. This plasticity is evoked, not by teaching specific and detailed skills, but by creating conditions in which new patterns can emerge. There is a parallel to the developing and growing child. Here, too, patterns emerge and are adopted as these patterns serve the child's intentions toward the world. The child's patterns have indeed a quasi stability, but are succeeded by newer and better patterns.

In other words, this kind of

learning involves some kind of self organizing within the nervous system, and thus within the muscular and skeletal systems. How is this happening? What must the nervous system, in fact our entire system, be like in terms of its organization for patterns to emerge? It is action that is organized, but at the same time, perception and the skill of using the senses in the service of organized action. Remember clearly: we are not teachers, but our pupils learn. This means our pupils are creating order and pattern in response to our lessons. Varela has pointed out that the nervous system will do this with anything happening in its domain. Feldenkrais called the nervous system the greatest anti-entropy device in existence.

A third question is: where are the patterns? How are they forming in the nervous system? Is there a mechanism? Unified actions must cross specific areas of modular activity. They cannot be "programs." They are also time bound.

These are some of our questions. Whatever we understand about the nervous system needs to account for what we know. It must also give an accounting for the phenomenology of human experience. To do this, a systematic and accurate description of the phenomenological realm is essential. Hopefully, Dr. Varela will be able to speak to this issue during his talk. I will also defer to Dr. Varela to give many more details about the scientific issues. He will describe some research approaches that open up a way of solving many of dilemmas we have posed. His talk, "Large Scale Integration in the Nervous System and Embodied Experience," will directly address our questions.

Now we must give some sort of outline in answer to our questions. There are many roots to a new thinking in different areas of science. I have already mentioned Bernstein, Gibson, and K. U. Smith. Karl Pribram, who was very familiar with Bernstein's work, made many prophetic speculations about the nervous system in relation to perception and action thirty years ago. One in particular that I believe now has come to fruition in Varela's research is that there is a system of connection and organization in the nervous system that does not depend upon nerve transmission. I will return to this in a moment. First, let us note where there has been major progress.

We must begin with the study of distributive processes in networks. To get to learning, change, fitting oneself to the constraints of the moment, the plasticity we talked about, a system cannot be linear and hard wired. We cannot use fixed algorithms, fixed categories. In a distributive network, we can have seemingly random processes that result in the formation of patterns of connection in the network in response to whatever constraints are put in. The brain can be thought of as an extremely complex network of this kind. The pioneering papers on neural networks were published, starting in 1943, by Warren McCulloch and Walter Pitts. This separated the problem of understanding the integrative behavior of the nervous system from the biological details of how nerve cells behave. It also provided a formalization of brain processes and helped lead the way to artificial intelligence. Humberto Maturana and Jerome Lettvin joined forces with McCulloch and Pitts in the 195Os, and through a series of investigations of a frog's visual system, produced a pioneering paper, "What the Frog's Eye Tells the Frog's Brain." What they found was that "it is not the light intensity itself but rather the pattern of local variation of intensity that is the exciting factor." The frog's brain is responding to contrast, convexity (whether a surface is curved), moving edges and dimmings related to movement or rapid darkening. "The eye speaks to the brain in a language already highly organized and interpreted." In other words: the frog either sticks out the tongue and catches a fly, or jumps in the pond to evade the looming large animal approaching. Such behavior is coherent to a frog's life. Perception and action are inseparable and connected in a network.

Maturana went on to work on color vision, and discovered that he had to shift the discussion even further to make it biologically appropriate. The idea that the network maps the external world did not work when trying to understand the network. The terms were different. "... it required us to close the nervous system and treat the report of the color experience as if it represented the state of the nervous system as a whole." This was radical. I am only giving a sketch here, but Maturana developed what I believe is the first complete formulation of a systems biology from this work. From here, Varela, Maturana's student and later his partner, went on to develop his book, Principles of Biological Autonomy. Here, he paralleled the organization of the immune system and the nervous system. I bring this up because around the same period of history, Gerald Edelman, who had won a Nobel Prize for his work on the clonal selection theory of the immune system, was developing the Theory of Neuronal Group Selection to understand how the network could produce cognition and experience. Unlike the direction scientists interested in parallel distributive processing were taking, Edelman insisted, as Maturana and Varela have, that we must find out how a nervous system works in a biological system. We can not deal with life as if we could formalize everything.

We are embodied, living entities. I am here speaking to you. I use my mouth, tongue, voice box and breathing, and form words and sentences in English. These are structural invariants, attractors, that I learned through my development. They are communicating to you, which is my intention. You take them in and understand them as your history dictates. You have also gone through a development and learning which, while not identical, parallels mine. It is in the act of doing this interaction with each other that the words become symbolic. My making of them is a somatic action which also includes my standing and facing you, how I hold my head, my shoulders, how I use my voice tone, my facial expressions. I am actively using my balance. Nothing in what I do here is isolated. Nor is what you do isolated from your state of breathing and attention, how you hear or do not hear my words, how what I say sets off your own conversation with yourself, how you are sitting, and so forth. We are all experiencing something most of the time we are awake, and part of the time we are sleeping. How much richness there is depends on our developed awareness. Much of what goes on we take for granted.

A true science of human beings needs to take this all in, and not isolate itself to the abstract and the formal. Only in recent years have some researchers and theorists approached this kind of understanding. Edward Reed, who calls himself a movement scientist, and has worked with Gibson and later with Edelman, makes this kind of approach. I will recommend to you to read some of his articles on a theory of action. I also highly recommend A Dynamic Systems Approach to the Development of Cognition and Action by two developmental psychologists, Esther Thelen and Linda Smith. These authors, in addition to describing their research on child development, develop a truly cogent and biologically coherent account of child development based upon Bernstein, Edelman, J. J. and E. J. Gibson, chaos theory, and the idea that the organizations of ourselves that we take for structures "emerge from relations, not from design." These authors give one of the best accounts of Edelman's theory, and cover in detail Merzenich's research on brain plasticity, and Wolf Singer's work on time-locked dynamic processes in the visual cortex.

This later work may be the key to something startlingly new that can lead to a solution to the problem we started with: that our experience of ourselves as a cognitive subject doesn't mesh with what researchers find in investigating nerve signals in the brain. Singer discovered that, when a cat saw a single stimulus figure, this triggered synchronous bursts of oscillations in neuronal groups in spatially separate parts of the visual cortex. Varela, in his laboratory in Paris, has now found a way to observe such synchronous oscillations in widely different parts of the nervous system; a kind of vertical organization that seems to unify intention, action, and perception. We are extremely fortunate to have him here at the conference, and he will speak on Saturday evening.

Let me end by saying that all this recent scentitfic work, which seems to corroborate and fit with what we have discovered through our method, is exciting and encouraging. It should excite us and encourage us to continue what we are doing. Perhaps it will help us articulate better what we can observe and communicate to others. But let us not be seduced by ideas. We need to continue our practical ways of exploring and developing. We need to stay with the phenomenological human realm. Let us continue the development of our awareness and keep noticing the elusive obvious. In the end, hopefully, we can begin a dialogue with the scientists who have, in their own way, come closer to our view.

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