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THE ROOTS OF FUNCTIONAL INTEGRATION

PART II: COMMUNICATION AND LEARNING

"It's not a question of meaning—but a question of being"
—Moshe Feldenkrais,
Amherst, June 23, 1981

Preface

IN THE FIRST PART of this essay I set out to find the basic underlying process that we experience in a Functional Integration lesson. I labeled this process, functional integration, with small letters to emphasize its universal character, and I suggested that it involved a human and biological capacity to synthesize action and perception through sensory interaction. In this second part of the essay I hope to articulate the way in which a lesson is able to evoke this biological process through the special character of its communication and the way of thinking that leads to integrated action and skill. For Moshe, a lesson was a direct connection of nervous system to nervous system through the medium of the skeleton. This is his very unique contribution. It has, I believe, profound implications for the understanding of our nature as human beings and as living beings. As all of this involves organizing oneself to function, to act in the world, it touches on many areas of what we call the human sciences. Rather than noting how these fields of knowledge speak to Feldenkrais, I will reverse the process and show how understanding Feldenkrais can speak to those who would further our human understanding of ourselves.

Prologue: A Second Look

I BEGAN WITH a description of a lesson with my client Jeff, during which I used a hard flat surface to gently press Jeff's foot. The consequence of this lesson for Jeff was a profound shift in his self-image and ability to use his foot. Since my verbal thinking process focused on evoking Jeff's standing reflexes, I was truly surprised. I asked some questions such as, "How is it in the first place that eliciting reflexes leads to something we call Functional Integration?" and "Was I eliciting reflexes or giving a lesson?" These were provocative questions. But they could not and cannot lead to further understanding. On taking a second look, I must have been doing something more than I could verbalize.

There is often a problem in describing a lesson in words or attempting to understand it at this level. Verbal description is a way for me to communicate with you; it is not really thinking, as Moshe repeated to us often. In this instance, what I actually did in contact with Jeff was more than my description implied. My action was "informed" by my training. Many skills were involved. These include trained sensitivity and ability to feel Jeff's smallest response and respond to it in turn.There is also my way of organizing myself so that my movements through the whole of myself began to contact Jeff through the whole of himself.

Moshe trained us the same way that he did lessons; that is, he got us to learn first before we could verbalize our learning. I can say, then, that I "embodied" the method better in doing the lesson than any of my verbal reports and questions indicated. Moshe was very aware of the dilemma of description. Actually he did describe Functional Integration to us and in great detail. His thinking, simple as it was, went beyond what I could understand during my training. That is how I explain to myself the belief stated before, that he did not fully articulate what he meant. For myself, I discovered that Moshe described this very lesson, using a hard board as an artificial floor, during my training in San Francisco in 1977. Luckily, it was taped and recently made available through the efforts of Bob Knighton.

These taped discussions were made on July 9, 1975 and again on July 23. The occasions were the second and third discussions between Moshe and Karl Pribram. During the discussion of July 9, Moshe describes how it is possible to evoke activity in a paralysed muscle. He suggests that you can not get a muscle to work by focusing on the muscle. But, "If you can provoke a function in the body and repeat it in different ways until you get a response from the brain that must use that muscle in order to respond to the stimulus that you use, the function is integrated and the muscle works." Moshe goes on to describe how by touching the small toe first with the board he waits for a response in the next toe and so forth until eventually he feels the whole antigravity response in the leg, i.e. he feels the person push the board with his leg. He says, "It's as if the brain recognizes, `that's standing.'" By making the action of the nonworking aspect a part of an entire function, one brings out "the integrative reserves of the brain."

In retrospect, what I had done with Jeff was not only to stimulate his foot and evoke his standing reflexes, but actually evoke the whole function of standing. In the lesson of July 23, Moshe demonstrated how powerful the evocation of the whole function is in organizing the entire self in the action. Marsha, his young subject for this lesson, had walked, since her first beginning steps, with her right foot turned inward. Her entire right side was affected, including her hand. As she also had to stand and walk in gravity,

her pelvis, back, shoulders, and neck had adapted to the difference in her two legs. To deal with the tone of each muscle involved would be impossible. To deal with the difficulty in gravity would equally be impossible. When Marsha stood in the gravitational field, she could not organize her way of standing in any other way. Her system was too busy with taking care of her safety in gravity. The force on her leg was too great for her to detect differences, and she was stuck with her habit. During the lesson Marsha lies safely on her back with a soft roller for support under her knees. With the very light touch of the artificial floor, out of gravity, her system is cleverer. She can begin to respond with the function. Since the whole function is involved, Marsha begins to change her hip, her back, and her head and neck. Everything organizes for action. Her head begins to shift to the center. Even her hand softens and changes.Those of us who saw this lesson can remember how differently Marsha walked at the end. Those of you who have an opportunity to listen to this tape can hear Moshe describe his process step by step.

Communication

WE ARE SO ATTUNED to the symbolic realm that we tend to think that all processes work as analogies to our processes in the domain of symbolic interaction. The domains of linguistic and symbolic interaction are extremely important and powerful domains for human beings. They literally define our humanness. It is within these domains that we create meaning, intention, plans of action, etc. But we do not organize ourselves at this level when we organize our functions. Language and symbol formation depend upon the ability to create cognitive structures in the first place. But these structures are actually sensorimotor in character, and are, in effect, functions themselves. So we must distinguish carefully between the two levels. We will see later that this important distinction is often not made clearly or not made at all.

We need then to look again at communication. If Functional Integration is a communication between two people, what then is being communicated? Moshe's description, quoted previously in part 1 of this essay, would indicate that it is not specific information or even any sort of information at all. Contrariwise, the communication involves a connection or coupling between two people that in effect creates information itself. This is an odd way to look at it, but what else could Moshe have meant when he repeated again and again that he was not a teacher, but he got people to learn? Gregory Bateson has stated that: ". . . no new order or pattern can be created without information." (Bateson 1979, p.45.) Bateson has also suggested that, "Information is news about difference." And what else but difference do we create in a lesson?

So let us say the communication in a Functional Integration lesson is a process that creates a detectable difference for a person's nervous system that the person can then assimilate and integrate into the self image. This is something quite different than what happens when we speak to each other. One way to put it is that we are dealing with an analogic as opposed to a digital communication process. Some explanation of these terms is required at this point.

When James Von Neumann first began developing computers, he built two different types of devices. One device solved equations by creating a mechanical analogy to the mathematical process. This was the beginning of the analog computer. Later, electrical currents were used to create the analog, where the variations in the continuous quantity of the current represent the variables in the problem. One very common analog device is the old fashioned watch with a dial. The movement of the dial is an analog of the movement of time. By contrast, the other device that Von Neumann built stored a program using discrete discontinuous elements. This was a digital computer. We can also represent time digitally in hours, minutes and seconds as we do with our digital watches.

Moving now to communication, we can make the following distinctions. Following Wilden we can say: "Analog differences are differences of magnitude, frequency, distribution, pattern, organization, and the like. Digital differences are those such as can be coded into *distinctions* and *oppositions*" (Wilden 1980, p. 169.) Wilden goes on to point out that: ". . . no message can be precisely repeated by another communicator." If the Functional Integration process is then analogic, it cannot be equally transmitted by language which is primarily digital. By the same token there is no proper way to model this process as if it were akin to language. Although natural language contains such analogic aspects as rhythm, intonation and sound quality, the words used in language are digital elements. A word signifies a distinction by having the sound or written form stand for what is being signified. We then can make a string of words into a sentence to make the communication. Understanding takes place when we translate in and out of the symbols. In Functional Integration we do not do this as we touch and communicate.

Here is another way to look at it. Following the ideas of Humberto Maturana, there is a domain of interaction between human beings that we can call the linguistic domain. Operating within this domain, we can carry out an interactive coupling between people which we call language commu-

nication. But this communication has a peculiarity. Each person has created out of the social interactions, during the developmental process, a particular individual cognitive domain which determined how such a communication is understood. The word, the sentence, the communicators, orient each person within his or her constructed domain. In normal communication of this sort there is no reorganization. One is oriented to what one has already constructed. Language, as used in ordinary discourse, is thus imprecise in the way that Moshe often complained of; each person has his or her own understanding of what is said.

It is possible to use language in a very different way to effect a learning process, as Milton Erickson has shown. But in our usual communication this does not happen. Erickson's work with trance does have parallels to Functional Integration. The important thing in Erickson's work is that his speaking to his client led to a shift in the client's action in the world. A successful Functional Integration lesson leads to the same outcome.

In using our hands and ourselves in contact with our client, we are involved in an analogic process. We call what happens for the client "learning". And it is precisely because the communication is not involved with a symbolic domain that this can happen easily. This is not to say that the symbolic domains are not present during a lesson. A lesson occurs always in a social context. A client must decide to come and decide to come back depending on whether the lesson makes a difference in his or her life. In some sense a lesson is not complete until the learning becomes a part of one's daily action in social life. Verbal awareness can be part of this process, as I pointed out in the first part of this paper. The distinction I am making here is between the analogic communication in touch and person-to-person contact as contrasted to everyday social discourse. Loosely, Moshe spoke of this contact as a kind of language. But for him it was always a language more precise, more exacting than anything that could be communicated in words.

How do we accomplish this precision? We must find what the client needs and avoid imposing our own conceptualization. By reducing the effort, the force of contact, one is able to begin to detect an organic necessity in the communication. For Moshe this was a direct connection, nervous system to nervous system. We can call this pacing, coupling, or tracking. We can also call it dancing together.

Metacommunication

DANCING TOGETHER IS A complete phenomenon. It begins the moment a person enters the room. Every gesture and word is important as well as the quality, sensitivity and intention of each touch and movement. Communication at this level must be looked at phenomenologically.

During the lesson with nine year old Raissa, a child with cerebral palsy unable to walk or stand, Moshe is in continuous contact with her. As Raissa comes into the room in her wheelchair, Moshe makes a welcoming gesture and sits and smokes. He waits for Raissa to respond. Moshe describes his communication in this way: *"I just sit and don't bother her. She is not going to be cured—not to be in pain. She sees a friendly chap there."*

Moshe speaks to her from the distance about the previous lesson. Raissa is made to feel that she is important but she is also not imposed upon. When she is ready, she goes to the table and Moshe lets her transfer to the table in her own way without correcting her, despite her difficulty and despite the fact she has gone to the floor first.

The table lesson begins with Moshe taking Raissa's arms and beginning to roll her right and left. She giggles and enjoys the movement. She holds her arms in a contracted position. Moshe plays with her arms lightly. She begins to lengthen them herself. It becomes obvious, however, that she feels no necessity of lengthening her arms. Moshe shows her slowly, so that she will feel it and says, as if it were not important, "If you stretch your arms, they will not interfere with you." Moshe produces the movement so that the use of the arms becomes a necessity. But when she doesn't get it at this point, he does not remind her. She continues to laugh. Then one sees that she lengthens her arms without prompting. Moshe's comment is: *"Everything is considered for its own value, from her point of view."*

At some point Raissa changes her giggle. Moshe detects the change in tone. He stops this part of the lesson and begins another activity. He detects her need even before she is aware of it.

In a later part of the lesson, Moshe addresses the issue of standing and using the feet. Raissa's ankle bones were fused in an operation. Despite this Moshe can still induce her system to begin movement of the ankle joint. The body will reject the fusion, he suggests. But, "If you push with the same force as the floor, you will get the same result as the floor." She experiences the floor as hostile since her system cannot cope with it in gravity. There is safety on the table and no need to succeed. There is no force of the floor and no gravity. The table itself is a communication.

During this part of the lesson Moshe talks to another person in the room about the fusion operation. All his com-

ments are actually meant for Raissa, "That she can and will (improve) in spite of the silliness and the irresponsibility and wickedness of our culture." He notes that she actually listens.

Among the many things he says are: That in a few lessons she will be able to walk to the table, that it is criminal to make another difficulty (the fusion) like that for her, that we will not destroy the fusion, but by making the hip and knee move, destroy the effects of the fusion. He speaks about a surgeon in Paris who refuses to make useless operations. He says, "She understands by sensation better than what I explain now."

At the end of the showing of the tape and discussion, there is a tape sequence showing Raissa going to the table again. This time she stands on her feet and supports herself to make the transfer. She does this spontaneously. She was never corrected. Yet she clearly learned.

Skeletal Connection —Skeletal Consciousness

THERE IS A MOMENT in the lesson with Raissa, during which as she lies on her back with a roller under her knees, Moshe begins to gently push her knee. Normally Raissa's legs stay bent with her hip flexed. As Moshe pushes, his push is actually directed in such a way that her back makes the movement of extending. It is the same movement she would need to make in order to stand. The push goes through her spine and herself. After doing this movement a few times, her leg spontaneously straightens. How does this happen? The movement of straightening her leg is also part of the function of standing and extending her back. Since she has no image of this function, she can neither extend her back properly nor straighten her leg. The only way to make the function is through the skeleton. This is a language understood by her nervous system, as long as she has sensation. The only trick is to make the skeletal movement precise to her necessity.

The sense of the skeleton is a particular sensory experience evoked in a lesson that is unique to Feldenkrais work. As a practitioner, I connect myself to my client, skeleton to skeleton. As I move with the whole of myself, my client feels himself moved. The experience, however, is of a different quality than if I just took my hand and moved my client. If I am in essence asking my client to experience a complete function, and if the function itself is being produced through the contact, that is, the skeleton is acting in a functional arrangement, then the person's nervous system begins to respond to produce the same function. Muscles that the person may have organized in movement in some particular habit pattern now begin to organize in a way appropriate to the evoked function. If learning is reorganization, as William T. Powers (1973) has postulated, then our work with the skeleton is indeed a key to learning. A person's system reorganizes, that is learns, as soon as a new experience is presented to it in a distinct way. The experience is of a complete act, not of a particular movement, not of a muscle or a bone, not of an isolated part. We are not conscious of the learning itself, but we do recognize the feel of the skeletal contact and the change in our functioning.

Karl Pribram has described in his search for the engram for movement that each thing he thought was represented in the nervous system turned out to be not correct. His interest as a neurosurgeon in the motor cortex led him to experiment with stimulating different areas of the cortex. One thing he noted was that stimulating the same place could produce different movements. It became obvious that muscles were not represented, and neither were movements. When he considered such observations as the fact that a person writes equally and with the same handwriting on a sheet of paper or on a blackboard, he had to conclude that it was an entire behavior itself that was represented. Every movement as well as the entire posture is different at the blackboard as compared to writing on a sheet of paper. But the handwriting itself is an invariant. It has a structure the way a visual perception of an object does. One recognizes, for example, a pack of cigarettes no matter what size or position the image is on the retina. The represented action, that is, what you produce in the environment, is then an "image of achievement."

The image of achievement, however, is not useful until you have a way to organize your action to fulfill the image. Take the example of writing with one's left big toe. Despite the fact one may never have done this action before, one can form letters more or less well. Somehow the result of the action is matched against the plan to form letters. We have now introduced the element of feedback. Powers (1977) has beautifully described simple human movement in terms of feedback and reference signals. He uses the example of opening a car door to some preset angle. As one opens the door, the force used is related to the reference state, i.e. the angle of the car door. But the force varies with each disturbance of the situation. For example, if a wind suddenly blows against the car door more force is used. Powers concludes (1977, p. 30): "Organisms do not *react*. They *act* and their actions always control some set of sensed variables inside or outside the organism."

It is the ability to act itself that we are dealing with in Functional Integration, and how this ability is organized in the person. We are not interested in the steps needed to open a car door, but

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how to be able to do it. This requires what Moshe called the self- image. Our work through the skeleton as well as our work with development deals directly with this self image, and not with specific acts. The self-image, however, is not some fixed thing; it is the ability to fulfill the images of achievement, the ability to affect the environment. The fact that direct contact through the skeleton evokes function and thus learning and change in the self image is an extraordinary fact. It is Moshe's crowning discovery.

Learning

A FIRST ATTEMPT TO write with the left big toe is most likely crude. But as we practice, our ability to form letters will improve. We increase our speed and precision. We learn. The match between what we want and what we actually produce gets closer. The change, is not with regards to the specifics of forming letters. It must be something else, connected to our self image, our ability to act in general. In order to form letters well with the left big toe, we should also be able to do anything better with the left big toe. Moshe called this process differentiation.

One could say that learning requires differentiation. One begins with something global and crude, such as the first movements a baby makes. With differentiation, the child can move fingers and arms, legs and trunk. Differentiation brings refinement in speech, sensitivity, discrimination, etc. To perceive is to differentiate one thing from another. Note that there is no real distinction between perception and movement. In part 1 I cited the example of Madeline J. from Oliver Sacks' book, *The Man Who Mistook His Wife for a Hat.* Madeline, if you recall, began to differentiate the movement of her fingers as she began to differentiate separate objects in her tactile perception.

And then there is integration. If everything is global, there is nothing to integrate. To be able to use the whole of oneself in one's action, one must be able to complete the self image, and to be able, in movement, to feel all the parts working together.

The sensory experience of a Functional Integration lesson therefore involves all these elements: Differentiation, skeletal connection, and integration. The thinking involves thinking in terms of function and how one can evoke a function through the process of the lesson. Lastly, the person must bring the changed perception, the new self image to awareness and into action. This is the complete learning process.

Functional Integration and Science

IT CAN PROPERLY BE said that Functional Integration is an empirical art form. Moshe developed a practice and a means to communicate the process. He was clear that many of his discoveries were reproducible. He was also aware that to transmit the process to others required a considerable period to develop the awareness and skill in communication. He couldn't write a cookbook. He didn't investigate his discoveries in a laboratory. He did read everything he could get his hands on that could substantiate what he had already discovered.

Collectively, we have had considerable experience in using this method to help thousands, perhaps tens of thousands, of people to learn. So we do know that much of what we practice does work. Corroboration in a tightly controlled study may be just around the corner. But let's assume the essentials of our process are correct. What then would a proper understanding of human beings look like in the light of our knowledge and experience of Functional Integration?

The first insight out of this work is that living beings organize themselves to act and perceive. That is, we as living beings are not organized by our external environment as postulated by behavioral psychologists. We are self-regulating beings. "Life," says Piaget, "is essentially autoregulation." (1971, p. 26). K.U. Smith says (1970, p. 83): "Behavior is not a passive response to the environment; it is a process of self-generation and self-regulation of stimuli by movement to actively control both the external and internal environment." Compare this quote with the previous quote of William T. Powers: "Organisms do not *react.* They *act* . . ."

A second insight is that learning can not be avoided. Given the supporting conditions for reorganization, or some novel situation in which a person is actively exploring, the nervous system is ready, willing and able to learn. By learning we do mean organizing and reorganizing. As Moshe used to say, "You'll do it whether you want to or not." Powers (1973) suggests this is the most fundamental category of learning. It "alters behavior, but does not produce *specific behaviors.*" (1973, p. 179). It also alters perception.

If we look at the characteristics of this kind of learning, we can note the following: it is not dependent on external reinforcement. It is equally not dependent on knowledge of results. It does not require repetitive practice. It does require the following: real-time, i.e. immediate, sensory feedback; a sense of ease and improvement after the learning; and integration of the changed state into daily activity. It is what we have been categorizing as a shift in the self image.

Basically, most work in experimental psychology has not dealt with this category of learning. Some exceptions are Piaget, K.U. Smith, and in a more

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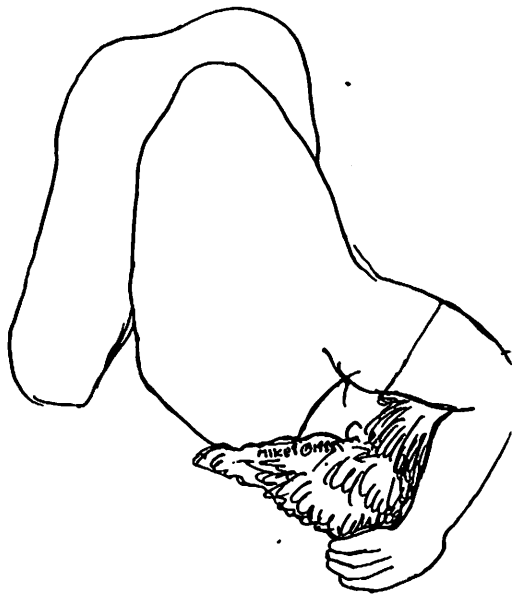
theoretical model building way, W.T. Powers. From a theoretical biological viewpoint the work of Francisco Varela and Humberto Maturana has expanded on the ideas of Piaget and the cybernetic-icists such as Powers.

A third insight is that learning is hierarchical, and that the organizations evolved in the process are basically what we call cognitions. Because of this, all higher cognitive levels are dependent on the acquisition of basic sensorimotor intelligence. This is why Moshe believed that the improvements resulting from Feldenkrais work would carry over to all other areas of life.

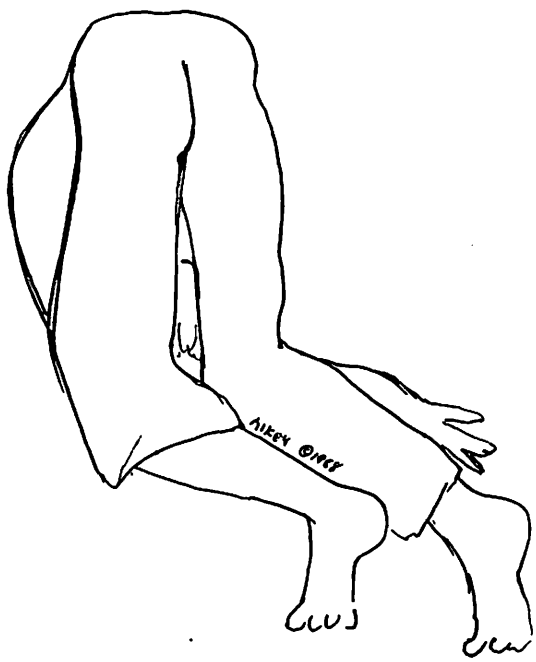
Piaget (1971) is most articulate. He says (1971. p. 4): ". . . no form of knowledge, not even perceptual knowledge, constitutes a simple copy of reality, because it always includes a process of assimilation to previous structures." Knowing then involves reacting to reality and transforming it ". . . as to include it functionally in the transformation systems with which these acts are linked." (p. 6) "Perception is meaningless without some accompanying action. . . knowledge at all levels is linked to action. . . " (p. 7). For Piaget, the organization involves an action schemata and a derived operative schemata. The schema always ". . . derives, by means of successive differentiations, from a series of earlier schemata having their origin far back in reflex or spontaneous initial movements."(p. 9)

Piaget is writing about development. But it is a description of what we do, and a description of the integrative process.

A fourth insight is that the skeleton completes the loop between the environment, the musculature, and the nervous system. With this insight, I have found no precedent in the scientific literature. But Moshe believed that the skeletal arrangement had to be represented in the nervous system. It therefore must be involved in learning to function. The one field of endeavor that I know of that recognizes the skeletal structure in this way is applied kinesiology, a chiropractic discipline. Some chiropractors, following the lead of Eccles, who was one of the great investigators of the cerebellum, believe the representation of the skeleton is in the cerebellum. Through matching the actual state of the skeleton with an image of functional organization as in an ideal state, the cerebellum regulates the organization of the musculature in action. Thus the musculature will organize through selective contraction and weakening to protect a disordered structure. A corollary to this is that organizing the skeleton to a functional state will allow for a reorganization of the musculature.



A fifth insight follows from the fourth. It is that the living system seeks optimal functioning and therefore optimal protection. Optimal here means optimal within the confines of available choices. Thus Moshe's observation that a nonfunctional injured knee will become functional if the other leg becomes more severely limited. Here Moshe discovered substantiation in the work of the Russian medical researcher, Speransky, and in the work of a French physician, Leriche, who was a pioneer in the study of pain. Moshe noted how the nervous system reorganizes a situation with ease when survival is at stake. If reorganization is so available to the unconscious, what ability could we have with awareness?



The sixth follows from the fifth. That which expands choices for a person, expands the range of the optimal. True learning always increases choices.

The seventh insight is that a supported system will learn better, and be

more available to reorganization and assimilation. This is a basic cybernetic insight. There are so many applications, from supporting a cerebral palsied child so that he feels safe enough to let go of his protective reactions and therefore be available to learn, to working with an injured person's good side so that the injured side will be supported and thus available to reorganization and healing.

An eighth insight is that in communication in a lesson, a person can not refine his or her organization very much past the level of the practitioner. Practitioners then must continue to refine their own process, and improve their own organization to be able to be a better guide to the learning of others.

Moshe's insights derive from his way of looking at things from a different perspective. The experimental and practical data remain as is. The power of his way of thinking is revealed in the efficacy of his method in actually getting people to learn. That others such as Powers, Smith, and Piaget have thought along the same lines indicates that there is merit in shifting perceptions. For one thing it simplifies thinking and understanding. Experiment in science has never been enough, in itself, to make a case. In the human sciences in particular, the real problem has been one of clarifying the thinking. Some of Moshe's insights, however, are quite novel and constitute an original contribution to our understanding. They are also immediately practical and lead to a change in action, a change in the way we behave towards others. We can be more humane and humanly precise in the way we interact with each other.

It behooves us then to begin to communicate what we know to the scientific community. We need to find ways to show the validity of our approach and bring it to a larger social context. In a third and last part of this paper, I would like to show that there is already a basis for such a context. It is in the work of scientists, Karl Pribram, William Powers, K.U. Smith, and others such as Maturana and Varela who have created revolutionary conceptualizations that can fit with our process. This third part of this paper then will deal with cybernetics, systems theory, and Functional Integration.

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1) Third Feldenkrais-Pribram discussion, July 23, 1975, Tape 5 in set. This lesson was shown and discussed in detail by Moshe during the Anherst training on June 29, 1981. It is othe tape for that date, PM session.

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