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Mental Furniture by Dennis Leri

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> "The Mental Furniture articles contained herein appeared in the newsletter of the Feldenkrais Guild, In Touch. They are intended as a sort of archaeology of Moshe Feldenkrais' influences. I don't critique his views in the light of current understandings. That's for another time and place. Here, I only attempt to round out some of the allusions to domains of knowledge that Moshe Feldenkrais made in the course of his teachings." (Dennis Leri)

Mental Furniture #1

Sherlock Holmes

"...a man's brain originally is like an empty attic and you have to stock it with such furniture as you choose. A fool takes in all number of every sort that he comes across, so the knowledge that might be useful to him gets crowded out, or at best is jumbled up with a lot of other things, so that he has difficulty in laying his hands on it. Now the skilled workman is very careful indeed as to what he takes into his brain attic. He will have nothing but tools which may help him in his work, but of these he has a large assortment, and all in the most perfect order." So said Sherlock Holmes to Dr. Watson. (A Study in Scarlet, A. Conan Doyle)

Browsing around in a bookstore in Tel Aviv, Israel, in 1979 I found a copy of the complete stories of Sherlock Holmes. Moshe noticed the book as I carried it into the Feldenkrais Institute. He immediately began to discuss the stories and quote from his favorites. Seemingly, he knew them all by heart. Wanting to discover for myself 'whodunit,' I told him we could discuss the stories after I had finished them. We did share and enjoy a mutual enthusiasm for the stories. Moshe took to calling me Dr. Watson for a while. In response to my questions he would say, "Elementary my dear

Watson," or, "Given what I have done today, what do you think I will do tomorrow Dr. Watson?" 'Sherlock' Feldenkrais had many of his favorite detective's traits.

Moshe had an incredible library in his house. One of his very favorite books was one on criminal psychology produced by Scotland Yard. Moshe: "More real psychology in there than in a hundred psychology books." Jeremy Krause corroborated Moshe's enthusiasm for the book in a discussion we had in the summer of '92. Moshe knew his library well. And, even more to the point, he knew how to find what he needed in it. He once told our San Francisco training his method of studying anatomy. Rather than study anatomy from the beginning of a book straight to the end, he instead would consult his books after working with someone. In that way he could relate his unique encounter with a person to the otherwise academic subject of anatomy. He built up a very encyclopedic and concrete knowledge of anatomy by grounding it in actual experience.

But anatomy books and physiology books were not a major part of his library. There were books from almost every domain of knowledge. All those books and their related fields of knowledge constituted Moshe's 'mental furniture.' The word furniture means different things to different people. We can form an image of individual chairs, table, couches, stools, etc. But, we find it harder to form an image of furniture because it's not a thing but a collection of things, a whole greater than the sum of its parts. We can understand Moshe's need or appreciation for anatomy books, books on physics and mathematics, psychology books, judo manuals, etc. They are pieces of some greater whole. We often find it difficult to form an image of the greater whole that constituted Moshe's mental attic. We may even question why it might be important or interesting to look into the matter. In future columns I will examine some of the 'pieces of furniture' in Moshe's mental attic. Here we'll simply introduce the idea and hint at a pragmatic methodology useful to link it all together.

Sherlock Holmes had a method of using his mental furniture. He would observe the crime scene and all persons relating to it. Additionally important to Holmes were the incorrect conjectures of Dr. Watson and the Scotland Yard detectives. Holmes would make guesses -- hypotheses, inferences -- based upon what pieces of his mental furniture were 'moved.' If, for example, he smelled a certain odor then the piece of furniture relating to chemistry and poisons would be 'moved.' In that way he would form a hypothesis about the means and motivation of a crime. The hypothesis would guide his investigation and that hypothesis might change. Hypotheses which Holmes called 'deductions' are more properly called abductions after C.S. Peirce, a 19th century philosopher. Considered by most Europeans to be America's greatest philosopher, Peirce distinguished three types of inferences: deduction, induction and abduction.

Peirce formulated it this way.

Deduction:

Rule - All the beans from this bag are white. Case - These beans are from this bag. Result - These beans are white.

Induction:

Case - These beans are from this bag. Result - These beans are white. Rule - All the beans from this bag are white.

Abduction:

Rule - All the beans from this bag are white. Result - These beans are white. Case - These beans are from this bag.

If you think about this a bit you can see that with deduction there is no possibility of error and no possibility of novelty. In going from the general to the specific it must follow that the beans are white. With induction there is a possibility of error as well as correctness in our guessing. Each drawing out of a white bean is a new confirmation of our guess while the drawing out a differently colored bean would be really novel. The general rule would be invalidated with a singularly different result. But we are justified in making the guess because in every result so far the beans have been white. While the probability is high for all the beans being white it is by no means certain. With abduction the guess stands the greatest chance of being in error but with it comes the possibility of the greatest creative leap. Here, unlike in induction, we conclude without any prior evidence that the beans are from the bag. We have a Rule, All the beans... ; we have a Result, These beans are ... ; and we guess the Case, These beans are from this bag. That's the guess. Peirce considered one of the greatest abductions of all time to belong to the astronomer Kepler. With abduction one invents context for content. In Kepler's case he initiated a new world view.

Schematically, this is Kepler's hypothesis: For all bodies in motion, the fact that a given body moves by describing an elliptic orbit implies that that body passes through given positions geometrically determined in such-and-such a way; but Mars passes through given positions geometrically determined in such-and-such a way; hence Mars moves by describing an elliptic orbit.

Kepler on scant evidence used what he knew from one field, geometry, to generate a hypothesis concerning anomalies in Mars' orbit pertaining to the field of astronomy. After making his hypothesis he gathered more evidence to support it. It is vitally important that a hypothesis be falsifiable; otherwise it is not testable. Kepler generated not just a new observation but a new way of doing astronomy. I maintain Feldenkrais did the same for the domain of learning and education. To abduct means to lead or take away; to kidnap. Here it means to lead away something from both semantic fields of explanation thereby bringing forth a new semantic field. Semantic fields are something like contexts for understanding words and deeds. A Feldenkrais training hopefully creates a context for understanding words and actions related to one's being able to generate a series of actions that would be understood by one's peers as a Feldenkrais lesson.

Each of us has our own mental furniture. Our work as Feldenkrais practitioners can be refined by quantum leaps through our making abductions and learning how to test them so as to validate or invalidate them. A piece of our mental furniture (our areas of knowledge, i.e., cognitive domains) can get perturbed by the particulars presented to us in our practices. We then make guesses that orient and guide our lesson. We are presented with more particulars and we make more guesses and so on. Moshe once said that without the ability to go from the particular to the general and general to particular anything (of importance to understanding and advancing the Feldenkrais Method) done in a particular lesson would die with that lesson. Some practitioners do great individual lessons but they do not see what in their lessons has general import and what has only incidental import. 'Import' means to bring something in and what is most important is brought most deeply in. Being able to juggle a number of general principles with any number of particular percepts and guess what is important and needed, defines what a practitioner is.

I don't think we have taken into account the kinds of abductions Moshe may have made given the motions of human bodies and the domains of knowledge that he commanded. We need to look at his and our own mental furniture. If we choose wisely what we have in our attic then we can begin to form and test the kind of hypotheses that distinguish our work.

Mental Furniture #2

Scientific Causality and the Laws of Nature

I promised in the last article to talk about Moshe's 'mental furniture.' I begin with the notion of causality. The scientific and pedagogical traditions that inform Moshe's work employ causality. Moshe loathed facile, uncritical 'cause-effect' reasoning. However, he adhered to scientific explanation in those domains where it was applicable. Scientific causality in the proper context is a forcefully persuasive concept. When misunderstood it can be misused and inappropriately applied. Pedagogical causality concerns itself with the quest for understanding, freedom and self-determination and will receive its own column.David Bohm begins his book Causality and Chance in Modern Physics with "In nature nothing remains constant. Everything is in a perpetual state of transformation, motion and change. However, we discover that nothing simply surges up out of nothing without having antecedents that existed before. Likewise, nothing ever disappears without a trace, in the sense that it gives rise to absolutely nothing existing at later times. This general characteristic of the world can be expressed in terms of a principle which summarizes an enormous domain of different kinds of experience and which has never yet been contradicted in any observation or experiment, scientific or otherwise; namely, everything comes from other things and gives rise to other things." He goes on to say, "This principle is not yet a statement of the existence of causality in nature. Indeed it is even more fundamental than causality, for it is at the foundation of the possibility of our understanding nature in a rational way."

To arrive at scientific causality, relationships that remain constant amidst the complex processes of change and transformation are noted and studied. Specific constant relationships that emerge and are not coincidental are interpreted as 'necessary relationships.' 'Causal law' is the term given to necessary relationships between objects, events, conditions or other things at one given time and those at later times. However, the necessity of a causal law is never absolute. For example, things usually fall to the ground when we release them from our hand. Let's say it is a photo of Moshe and 'by chance' it's caught up by a gust of wind and is blown up, up and away. Bohm: "...one must conceive of the law of nature as necessary only if one abstracts from contingencies." Contingency is defined as the opposite of necessity. Chance as a form of contingency is outside the scope of things that can be treated by causal laws. Chance events do not necessarily follow from any specifiable laws. How and what does one abstract from contingencies?

'To abstract' means literally to 'take out.' Bohm: "When one abstracts something, one simplifies it by conceptually taking it out of its full context ...this is done by taking out what is common to a wide variety of similar things. Thus, abstractions tend to have a certain generality. Whether a particular abstraction is valid in a given situation then depends on the extent to which those factors that it ignores do produce negligible effects in the problems of interest." It takes training to know how and what to abstract. One needs to know how to select those factors that are important and relevant. The word 'relevant' has a meaning linked to that of abstract. Relevant is an adjective derived from the verb 'relevate' which in turn comes from the root 'to levate' which means 'to lift.' 'To levate' is used

to describe the kinds of acts that lift into attention any content whatsoever, even the very act of lifting into attention. 'To re-levate' add the prefix 're' which signifies 'again' adding to 'levate' the notion of time through recurrence. What recurs is a similarity but also difference, since each occasion is not only similar but different. Something strikes us as relevant because we re-cognize 'that' distinction or 'that' difference again. If we no longer recognize it, it becomes 'irrelevant'. Constant relationships that are relevant, that are lifted into attention and kept in attention are thereby abstracted. In establishing causality we need to make relevant abstractions.

Lifting out constant relationships is the first step towards causality. A causal law suggests itself when a constant relationship, or regularity, is seen to hold within the flux and flow of a variety of conditions. Regularities appear along with irregularities. But, as a side note, what may seem like an irregularity when first observed may in a later context be seen as having a higher order regularity. Detecting regularities and supposing them to be the results of causal laws allows us to go on to make hypotheses, i.e., abductions, concerning these supposed laws. The Greek root of the word hypotheses indicates a supposition 'put under' our reasoning as a provisional base to be tested via induction for its truth or falsity. If found wanting, that is, if the hypothesis is not verifiable then other ones are formed and tried. It is integral to the scientific method that a hypothesis be falsifiable. If a supposition cannot be demonstrated to be false, then any truth it may assert will have limited explanatory value.

In considering causal relationships, one must be careful to distinguish them from merely associated events. For example, before winter begins, the leaves generally fall off trees. But this loss of leaves is the effect of the lowering of temperature and not the cause of winter. So clearly the concept of a causal relationship implies more than just regular association in which one set of events precedes another in time. Future effects come out of past causes through a process satisfying necessary relationships. Mere association is not enough. One must show that a given set of events or conditions comes necessarily from another. Changes in one or more of the presumed causes must always produce corresponding changes in the effects. Other factors must be held constant. In considering a large number of cases co-ordinating changes on two separate sets of events strengthens the hypothesis of a causal connection. The tests, or demonstrated co-ordinations, must be reproducible. If they are not, it is evidence that there are more causes or fewer causes or other causes of the observed effects. But if it is a strong hypothesis then there is a level of predictability that comes about.

One can predict that given a specific set of conditions certain effects will follow from causes. A more subtle result is that new phenomena can be predicted. Broadening the domain of applicability of a hypothesis one arrives at laws of nature. These laws are not like legal laws applied externally to limit the course of events to certain prescribed paths but are inherent and essential aspects of things. To construct 'laws of nature' as a general category of law we need to include causal laws, laws of chance, and laws relating these two classes of law. Causality and chance are both abstractions. They are two views of any object (taking this word in its broadest sense). They are essential to effectively organizing conception and perception. Seeing constant relationships means also seeing that which is not constant, i.e., the result of chance. If we define causality we must define chance. One can even formalize the acts of perception that distinguish causality from chance. Laws of nature are constructed by human beings to account for all phenomena under consideration and to define what is causal and what is contingent. I will discuss the process of constructing meaning in a later column on Piaget.

Newton's insight of the universal law of gravity could be stated like this: As the apple falls, so does the moon, and so indeed does everything. Explicitly,

A : B:: C : D :: E : F

where A and B represent successive positions of the apple at successive moments of time, C and D those of the moon, and E and F of any other object. This insight of Newton is as seductive as it is reductive. It is a compelling hypothesis that relates the behavior of all physical objects in the universe. It is elegant, simple and testable. It led the way in the quest by subsequent thinkers to reduce all phenomena to physical and testable laws.

Moshe Feldenkrais was a world-class scientist who could clearly distinguish at what level of human functioning cause-effect thinking is and is not relevant. Next time I will give examples from the history of causality relevant to our work. So we close with the notions of causality and the laws of nature as our first pieces of mental furniture.

Mental Furniture #3

Galileo

Moshe Feldenkrais said that if you want to understand human action shift your focus from knowing 'why' to knowing 'how'. That shift did not originate with Moshe but with Galileo Galilei (1564-1642). It is what differentiates the natural philosophy of the Ancients represented by Aristotle (394-322 B.C.) from the origins of modern science represented by Galileo. Galileo is granted the honor of being the first modern scientist. In a future article I will make the case for Moshe Feldenkrais being the last modern scientist.Aristotle held views on many subjects from drama to mathematics to biology. His views on causality and motion will be mentioned here. Aristotle distinguished four types of causality: 1) material cause - the matter from which a thing is formed; 2) formal cause - the form to be realized; 3) efficient cause - that which actually causes the event, and; 4) final cause - the purpose to be realized. Aristotle used the example of a statue to illustrate his point: the block of marble from which it is to be hewn is the material cause; the form which is present in the sculptor's mind during the work is the formal cause; the sculptor himself, through the intermediary of his tools, in his chipping away at the stone is the efficient cause; the destination or purpose of the completed statue is the final cause.

The first three causes refer to the thing itself. The fourth cause, final cause, evidences the very existence of a thing as the realization of a purpose. For Aristotle every living and every inanimate thing has purpose. Explanations which traffic in a thing's purpose are called teleological. In Aristotle's view the natural place for things is at rest. All motion is either natural or violent. Natural motion describes an object's movements towards its future final resting place where it achieves its purpose. Violent motion results from external forces which push or pull an object. For Aristotle, the cause of all natural movement is the Prime Mover. The Prime Mover does not set all things in motion at the beginning of time but instead draws all things unto it at the end of time. Not external gravity, but rather the object's own innate tendency explains why an object falls to earth. Aristotle's world view is common-sensical and intuitive. It held sway for 2,000 years.

Galileo, in the process of inventing the mechanistic world view, ousted purpose, or teleology altogether from science. He narrowed his scope of concern to a description of how an object, any

object, moves. He was not concerned with appearances but with relationships of number, time and space. The mechanistic world view, much derided nowadays, appeals to mathematics for the basis of its inquiry into the working of nature. Galileo considered nature, "...a giant open book written in the language of mathematics." Mathematical idealization, quantification, thought experiment, and limiting one's concerns to the 'how' characterized Galileo's counterintuitive shift away from Aristotle. Virtually all historians of science name Galileo as the first 'modern scientist.' In addition to his scientific accomplishments, he also was credited with writing the best prose of his era. Almost single-handedly Galileo overturned 2000 years of stifling dogmatic belief.

Galileo was immensely popular with his contemporaries. Learned, an inventor, a gifted conversationalist and story teller, a friend of the Pope, he was a sought after guest by people from many levels of society. Were he not so popular and had he not been a friend of the Vatican then surely he would have been burned at the stake for his revolutionary and heretical views.

While he may or may not have been the actual inventor of the telescope, he was its first advocate. Galileo saw to it that telescopes became readily available to scholars and ordinary people. He also saw to it that his name was associated with the device thereby spreading his fame. On one occasion, Galileo invited people to look through his telescope at our moon, the planets and their moons, and the sun and the stars. Interestingly, while looking at the moon only two amongst twenty-four actually saw what we now see. Either they could make no sense out of what they saw or they felt they were being deceived by Galileo. The common world view shared by Galileo's contemporaries was that heaven and earth operate by different laws. Galileo supported the heliocentric views of Copernicus and Kepler but he went further. He demonstrated that there is but one mechanics and dynamics operative both on earth and in the heavens. In creating a new unified view of the cosmos he became our contemporary. Before Newton could espouse his Universal Laws of Nature, Galileo first had to create both new phenomena to observe and new ways to think about phenomena.

To the Ancients, a vacuum was unthinkable. But Galileo conducted a thought experiment. Archimedes had shown that what makes lighter objects sink slower or even float while heavier objects sink quicker depends on the density of the medium. Galileo reasoned that if a medium got less and less dense and in fact became a vacuum, then a heavy and a light object falling through a vacuum would fall at the same rate. It was decades after he died that someone was able to create a vacuum and prove Galileo correct. The ancients had reasoned that light things fall more slowly to the earth while heavier things fall more quickly because that is their nature. Galileo did another thought experiment. What if you tied a light object and a heavy object together. Their combined weight being heavier they would fall faster. But on the other hand, given their different natures, with the slowing effect of the lighter they would fall slower. This thought experiment revealed a contradiction in the Ancient world view.

Galileo stated that the natural state of objects is motion. He refuted the notion that things are naturally in a state of rest. He demonstrated that a ball rolling down a slope picks up speed and that the same ball loses speed rolling up a slope. He reasoned that a horizontally moving body in the absence of friction or opposing forces would naturally continue to move forever. Galileo performed another experiment with balls rolling down an inclined plane. Trained as a musician, Galileo possessed an excellent 'ear'. By putting instrument strings across the plane he was able to hear any differences that the two balls might make as they rolled down. If the heavier rolled faster it should be readily evident to his ear. There were no discordant noises. In another thought experiment he mentally increased the angle of the incline to the vertical thereby approximating free fall. To

Galileo, all physical objects must fall at the same rate when one subtracts wind resistance. He was the first to give mathematical expression to the falling object's acceleration. He delineated the notions of speed or position, velocity and acceleration.

Of all Galileo's inventions, the notion of acceleration is the most profound. Distance divided by time equals speed. Speed specifies the rate of a body's displacement, say 55 mph. When we describe speed and the direction of motion we are specifying velocity, say 55 mph to the north. A quantity described by both magnitude (how much) and direction (which way) is called a vector quantity. Velocity is a vector quantity. A quantity described only by speed is a scalar quantity. Constant velocity implies both constant speed and constant direction, i.e., motion is unvarying and along a straight line. Constant speed is not the same as constant velocity. A car on a circular track may have a constant speed but its velocity will be changing at each instant as its direction changes. Acceleration = change of velocity/time elapsed. Acceleration occurs only when there is a change in a body's state of motion. Velocity is the rate at which the position of a body changes and acceleration is the rate at which velocity changes. A change in velocity is a change in its direction or its speed or both its speed and its direction. The rate of change of velocity is acceleration. Acceleration measures how fast things change. It is the rate of change of the rate of change. When in a later article we come to discuss Moshe's ideas about awareness it will be crucial to have some understanding of acceleration.

Galileo maintained that sensory qualities were secondary to primary dynamics. By discounting the evidence of the senses he was able to make relevant abstractions, that is, to use thought experiment and mathematics to provide descriptions that are counterintuitive. To quote, "...Aristotle merely formulated the most commonplace experiences in the matter of motion as universal scientific propositions, whereas classical mechanics ...makes assertions which not only are never confirmed by everyday experience, but whose direct experimental verification is fundamentally impossible... Aristotelian physics thus has the advantage over classical mechanics in that it deals with concrete, observable situations constantly encountered. But from a scientific point of view this very advantage constitutes its weakness..." (The Mechanization of the World Picture: Pythagoras to Newton, E.J. Dijksterhuis. Princeton Paperback, pages 30-31)

By examining the life and work of Galileo and his successors, we can gain fresh insight into our work. The shift from knowing 'why' to knowing 'how' is central to the foundation of the scientific method and of the Feldenkrais Method. Galileo invented the notion of thought experiment so dear to Einstein. The relevance of thought experiments to understanding how to construct lessons is crucial. Galileo literally invented the ideas about gravity and acceleration implicit in our work. Surely any thinking about Functional Integration and Awareness Through Movement which includes the contributions of Galileo and other figures from the history of science will be rewarded.

Mental Furniture #4

Piaget and the Notion of Reversibility

Moshe Feldenkrais listed Swiss psychologist Jean Piaget as an author to read. Personally, until recently I had read only Piaget's more philosophical work. In looking over his work on childhood development I was struck by its many deep resonances with Moshe's work. Piaget had this to say on 'the biological problem of intelligence,' "Verbal or cogitative intelligence is based upon practical or

sensorimotor intelligence which in turn depends on acquired and recombined habits and associations. These presuppose, furthermore, the system of reflexes whose connection with the organism's anatomical and morphological structure is apparent. A certain continuity exists, therefore, between intelligence and the purely biological processes of morphogenesis and adaptation to the environment. What does this mean?" (Origins of Intelligence in Children, pg. 1)

What indeed does this mean to us? Piaget correlates ontogeny, the historical path of changes formative of an individual, and phylogeny, the history of the evolution of the species in a way that clarifies Moshe's notion of organic learning. He focuses on the role of the organism, specifically the sensorimotor system, in learning. Piaget directs his inquiry away from the ontological, that is, explanations and descriptions of what things are and towards the ontogenetic, that is, explanations of how things come to be. Piaget might rephrase philosopher Martin Heidegger's, "Why is there something rather than nothing?" by asking, "How is there something rather than nothing?"

Piaget divides the whole time of childhood development into four stages, each with subdivisions. They are: (1) The period of sensorimotor intelligence from 0-2 years. (2) The period of pre-operational thought from 2-7 years. (3) The period of concrete operations form 7-11+ years. (4) The period of formal operations from 11 years onward.

Regardless of the stage or subdivision thereof, Piaget identifies three essential operations involved at every level of growth whether 'physical' or 'mental': assimilation, accommodation and adaptation (sometimes called equilibration or re-equilibration). Reflexes must be used for the organism to adapt. Piaget sees reflexes as organized schemata of actions delivered by the species to the infant ready for use. Accommodation occurs when contact with objects (in the general sense) modifies the action of the reflex. The consolidation and strengthening of reflex action by virtue of its functioning is assimilation. The progressive adaptation of reflex schemata presuppose their organization. Every reflex is directed towards the world. As it encounters its world its action is modified. The scheme whereby it continues to direct its searching actions and where the reflex comes progressively under the control of cortical activity is its organization. The organism's various organizations of reflex schemata are its means of assimilating novelty, first in the form of nourishment and later as data. Assimilation elaborates and extends reflexes, acquired reflexes and habits. It does so by distinguishing and differentiating: those objects that elicit the reflex; those that relate different objects to endogenous needs, e.g. hunger; those objects that generalize its capacity to recognize different objects. Objects of all kinds are assessed via tactile and kinesthetic interaction as sources of nourishment, excitation, or as cues to perpetuate action for its own sake. Those assessments are the pre-cursors of more formal processes of judging.

Accommodation is the process whereby the schema, through it contact with objects, changes its structure, that is to say, 'reorganizes,' to make place for the what was assimilated. Accommodations give rise to new organizations based upon previous ones. Assimilation is the action of learning to identify, recognize and generalize objects. Accommodation is the modification of the action of assimilation. Adaptation is how the processes of assimilation and accommodation are brought into balance, i. e., how they are re-equilibrated, to assure the organism a fit with its environment. At all stages of development, on each and every level and in the structures connecting levels the three operations are in constant interaction. For example, later cognitive stages remain connected to the sensorimotor level albeit through a more complex organization.

Let's take an example familiar to almost any first year Feldenkrais trainee: the sucking reflex. Endowed at birth with certain primitive reflexes, human development begins when there is a lack of fit between primitive reflexes and the environment. That lack creates a state of disequilibrium which the organism will strive either through altering itself or its environment to return to equilibrium, i.e., it adapts. The sucking reflex is at first elicited by anything at all that touches the child's lips. In the beginning the reflex is not developed enough to keep the nipple in the mouth. With development the child performs the sucking better and more selectively. It will not wait for the nipple to touch the mouth but will search anything that touches its cheek. Also when hungry, anything that is not the nipple will be rejected. So, the sucking reflex becomes elaborated into a schema for, among other things, nursing at the breast. The global reflex of sucking becomes more specialized in that it connects to its mother's breast or its bottle and more generalized in that it can be used to explore and know objects other than the breast. In Piaget's words, "The schema... is not limited to functioning under compulsion by a fixed excitant, external or internal, but functions... for itself. ...the child does not only suck in order to eat but also to elude hunger, to prolong the excitation of the meal, and lastly he sucks for the sake of sucking." (Origins of Intelligence in Children, pg. 35) In other words, the object sucked primarily nurtures the sucking schema more than it is sucked for nourishment itself. The increasing complexity of the organization of the reflex provides the rudiments of meaning for the child. Specific sucking actions will vary according to whether or not the child is hungry. Thus the meaning to the child of sucking will differ depending on circumstances.

Acquisition of the ability to discern one's circumstances plus development of actions not directly related to reflex action become the basis for a differentiation of the subjective and objective poles of experience. In learning the actions that enable one to distinguish different objects and different contexts one's self is progressively differentiated also. Sucking the thumb precedes more complex hand to mouth or hand and eye coordinations. Progressing from simply grasping to intentionally exploring with its hands the child distinguishes means, the hands, from the ends, to bring something to its mouth, to shake something to make sound, etc. As the child develops it passes through various 'egocentric' stages. In Piaget's use egocentric refers to an infant's uncritical identification of its perceptions with the world. Its actions produce its perceptions and, unable to distinguish action from its consequences, those perceptions are for the child 'real.' Maturation consists in 'decentering' the perceptual world, that is, in acquiring the means to recognize that different actions lead to different perceptions. Such a recognition, implying the sensori-motorically constructed basis of the real, makes different action and different perceptions of the real possible.

Let's look at the acquisition of the child's concept of time to see how this decentering takes place. In an experiment children of various ages are shown two connected glass containers: one is long and cylindrical and the other broader at its base and narrowing towards its top. Colored liquid is drained from one to the other resulting in two simple motions: a drop of level in one and a rise in level of the other. "The time operations involved are: (1) fitting the various levels into the series A+B+C, etc. by means of 'before' and 'after' relationships (seriation is impossible if the relations are 'simultaneous'); and (2) fitting together the respective intervals (terms) AB, AC, etc. (AB is of shorter duration than AC, etc. and A1 and B1 or A2 and B2 are synchronous)." (The Child's Conception of Time, pg. 3) An adult has no difficulty in realizing that it is the same liquid and the same amount of liquid that starts out in one container and ends up in the other, change of shape notwithstanding. Children have all kinds of difficulties in linking what happens in one container with what is happening in the other. There are many seeming misperceptions: that the two events

are unrelated, that is, that they are 'two'; that the amount of liquid is unequal, that is, volume is not conserved; that one is happening faster or slower than the other and so on. Children at the 'intuitive' level are able to eventually see that at successive moments one of the containers is getting emptied by recognizing that a moment before it was fuller. Intuitive perceptions of succession and duration being egocentric do not lead to a coordination of events in the two containers. Only when some schema is arrived at that generalizes and coordinates the 'two' events into an organized whole can there be said to be an understanding of time. Once constructed the time conception, action schema really, is used as the means for new actions. For Piaget, a mature understanding of time occurs when there is a shift from intuitive, egocentric irreversible interpretations of the motions of displacement to operational, reversible interpretations.

Reversibility means that at any given moment in an action one can imagine a previous moment or an initial moment as well as the next moment or the final moment. What creates the perception of the conservation of volume of liquid or the simultaneity of one level falling as the other rises is the 'operational' level of action with its implied notion of reversibility. Because there is at this stage true conception of time one can distinguish an action from its outcome. One can pay attention to the action itself. One can 'interiorise' action, that is, perform it in thought or through a model or analogue showing operational reversibility. (Think about that in relation to some ATMs you might have done.) The real is just one example of the possible. With reversibility one can modify one's action, that is, one can slow down or speed up and one can change direction. Reversibility is not simply a matter of 'playing the movie' backwards. It organizes into a coherent whole and makes intelligible co-displacements of ones' self, objects and others in the world. Reversibility is a construct that allows one to judge and modify the quality of the action as it is being performed as well as evaluating its consequences.

For Piaget, maturity is decentered behavior. To simultaneously differentiate ones' self, objects and others in the world brings about a better integration of self into the world and the world into the self. What the experiment mentioned above so beautifully demonstrates is that to perceive any thing one must act a certain way so as to make it appear. The action of perception is learned and is dependent on a number of prior stages of learning. In thinking about Feldenkrais' use of the term reversibility one can glean much of value from a reading of Piaget. It is also very informative to compare and contrast Moshe's definition and use of terms like organization, function, differentiation, integration, learning and habit with Piaget's. I recommend just about anything by Piaget but especially The Origins of Intelligence in Children. Piaget has his critics and an excellent critique and contemporary interpretation of Piaget can be found in Barbara Rogoff's Apprenticeship in Thinking. Also the work of Esther Thelen is particularly provocative.

Mental Furniture #5

Feldenkrais and Judo

"... it is bad in Judo to try for anything with such determination as not to be able to change your mind if necessary..." (M. Feldenkrais, Higher Judo, pg. 94)

"From my perspective, which is of course as a martial artist, in the Feldenkrais Method you take my balance and I have to find a new balance." Chiba Sensei, 8th Dan Aikido, after receiving an FI lesson from Elizabeth Beringer, 4th Dan.

The questions arise, how to change one's mind? by what means? in what direction? to what end? We may wonder if a person whose balance is taken is the same person who finds a new balance? Questions which can seem academic in ordinary life become vital in the martial arts where one is thrust into conflict, confrontation and harm's way. The question of survival possesses us: Whether it is on the mat in the dojo, in the ring, or out on the street or wherever and whenever we find ourselves engaged in a conflict or a struggle from which we dearly want to disengage. Here and now, is it to be life or death? Any study of the martial arts must play itself out against the background question of life or death. Martial (mar- from the Greek god of war and strife Mars) arts training may focus on mortal combat but the struggle with an opponent is secondary to the struggle within one's self. Winning the inner battle is knowing how to play the game. It is not 'what' we do but 'how' we do it that matters. "It is correct to say that Judo teaches coordination of quite a different order from any other discipline. It is clearly defined and methodically taught as a concrete thing. The movements are, therefore more or less incidental and determined by a secondary consideration; they are a means of learning the 'way,' the correct physiological human way of doing." (M. Feldenkrais, Higher Judo, pg. 37.)

We all know that Moshe Feldenkrais was an accomplished Judoka, that is, Judo practitioner. We mention it in our brochures. In the second issue of The Feldenkrais Journal one can find an interview I conducted with Moshe in 1977. There, in his own words, he tells how he was swept up into the inner world of Judo. The founder of Judo, Prof. Jigaro Kano, chose Moshe Feldenkrais to be one of the doors through which the East attempts to meet the West. Moshe Feldenkrais, "The Judo way is to action, as the scientific method is to thought. Both are not 'new,' not in the sense that our ancestors have never used them, or that they are foreign to the human nervous system, but because they use methodically what was formerly left uncultivated and therefore a matter of chance or luck." (Higher Judo, pg. 37) Feldenkrais methodology, while not reducible to either Judo or science, is clearly informed and indebted to both the aims of science and of Judo. In previous columns I have pointed to some of what constitutes the aim and the means of science.

How does Judo achieve its aim? What is the aim of Judo? The answers to those questions can be divided into two complementary views: 1) everybody else's and 2) Moshe's. Judo means "the gentle way" or "the gentle principle." Ju- means gentle and -do(Japanese for the Chinese Tao) means way or principle. Koizumi Sensei, 7th Dan Judo, "The principle of Judo is like the nature of water. Water flows to a balanced level. It has no shape of its own but molds itself to the receptacle that contains it. It has existed and will exist as long as time and space. When heated to the state of steam it is invisible, but has enough power to split the earth itself. When frozen it crystallizes into a mighty rock. Its services are boundless and its uses endless. First it turbulent like the mighty Niagara Falls, and then calm like a still pond, fearful like a torrent, and refreshing like a spring on a hot summer's day. So is the principle of Judo."(Higher Judo, pg. vii) And, "As an art and a philosophy, the ultimate object of Judo is the attainment of harmonious unity of opposites in tune with life's realities; in short unity of Man and God or Nature."(Higher Judo, viii) Koizumi Sensei has this to say about Moshe Feldenkrais, "Dr. Feldenkrais explains how Judo training educates one to be 'independent of heritage.' This phrase is the keynote and hallmark of the standard of his treatise. It is universally recognized that Judo practice promotes the sense of balance and self-confidence, cultivates the ability to overcome brute force, inherited weaknesses or shortcomings, but the logical and scientific reasons for these effects were left unexplored. Dr. Feldenkrais ... clarifies the interrelation and intermingled working of gravitation, body, bones, muscles, nerves,

consciousness, subconscious, and unconsciousness and opens the way for better understanding."(Higher Judo, viii)

Judo practice and its pedagogical analogies when scrutinized by Moshe provide us with the "logical and scientific reasons" for Judo's effectiveness. Let's look at how. The Higher Judo book provides guidance for Judo practice when both practitioners are on the ground. The person on top, "top dog," or the person on bottom, "underdog," has no advantage as far as winning the contest. The great difference between them is in the "attitude and control of the body." If one is in the down position lying on the back only two movements are possible: rolling forward and backwards or from side to side. The position that is assumed to accomplish the rolling is one familiar to all Feldenkrais practitioners: knees to elbows, head off the floor. "For this position the body is very nearly a spherical cap lying on a flat surface. To keep the body motionless by pressing on it, pressure must be normally applied vertically downwards, just above the point of contact with the floor. If we press at any other point, the cap will roll or rock, so as to bring the point of contact with the ground vertically below the point of pressure. Were there no friction, the cap would shoot out, away from the pressed spot. Another way of holding down such a cap, is to spread over it, so as to produce pressure at the centre by the bulk of our weight, and to use the four members as props preventing the cap from rocking in any direction.

"The mechanical analogy presented is very useful in figuring out correct action, whether we are on top of the opponent or under him. Another mental picture, ... used by Kano, is to regard the person on the ground as a thick wooden board, roughly the shape of the human body, floated on the water. Here too, there are only two ways of holding the board motionless when pressing it under the water. Firstly, to press down vertically, just in the centre, and secondly, to spread the body squarely over it, with the four members in water and throw it over yourself most of the time.

"These analogies are not perfect, for in reality there is friction in the first and no buoyancy in the second. Their usefulness lies in that they provide a general principle for action of the combatants on the ground: the one attempting the immobilization should behave as if the opponent on the ground were a frictionless spherical cap or a floated wooden object. The one immobilized should behave so as to reduce friction between himself and the ground, moving away from the point where pressure is exerted, transforming sliding friction into rolling; or he should attempt to produce conditions as near as possible to buoyancy, by lifting off the ground the hips or one corner of the body. During the short period of lowering back to the ground, conditions that can be regarded as buoyancy prevail, and frictionless 'sidestepping' is nearly ideally achieved.

"The most important principle is to move your own body before attempting to move the opponent. There is almost always a solution to any situation, whereby swiveling, rolling, moving out of the way, etc., achieves easily, rapidly and effectively, what can be performed only with great effort and slowly by moving the opponent primarily. When in doubt what to do, the analogies suggesting movement to 'remove' oneself in the direction where there is no restraint will generally solve your problem.

"... One should always remember that the words 'immobilization' and 'holding' do not describe a the actual state of affairs - they convey the idea of finality and fixity that do not exist in action. An immobilization is dynamic and constantly changing all the time. The opponent generally frees himself as soon as you stop forestalling and checking his next move." Higher Judo, pgs. 54-55

The quote above illustrates how Moshe derives a general principle of action from a dual "reading" of Judo practice, that is a reading employing Eastern metaphor and Western scientific explanation. Judo practice is not diminished by being drawn into a dual exposition. Moshe's characterization of being locked in a struggle on the ground clarifies the situation as well as elucidating the means of escape or of capture. We have more rather than less to actually aid us in the realization of our intentions. Moshe does not offer his insights in lieu of experience but rather as guide to more fully experience. To perceive differently one must act differently and to act differently one must know how to do so, that is, one needs principles. Moshe's 'principle of no principles' so often misunderstood as an admonition to eschew principles is rather, as Larry Goldfarb has pointed out, one principle amongst many to invoke when needed. As cited above, the task of immobilizing an opponent or of freeing oneself, is given a richer presentation by playing scientific insight off naturalistic analogies. It is left up to the person to find for herself or himself how to actually realize their ends. The image and the explanation offer not a picture of the end result but more of a "quick graph" of the means. The result is not either a merging with an image or the construction of a scientific theory, but rather progress along the path of Judo practice.

In the second part of the article I will examine Judo's orientation to the development of a person who can live "independent of heritage." I will show that the Feldenkrais Method is a continuation and generalization of Judo practice. Furthermore, it will be seen that surprising consequences for the practice of our method can be drawn from examining how one goes from learning Judo to learning how to learn.

Mental Furniture #6

Independent of Heritage: Feldenkrais & Judo: Part 2

"Dr. Feldenkrais explains how Judo training educates one to be 'independent of heritage'." (G. Koizumi, Higher Judo, viii)

To be 'independent of heritage' means that for at least one moment we can know life in a way not dependent upon our size, weight, strength, form, age, gender, personal history, ethnic or religious background. Strictly speaking, Feldenkrais seemed to say that through proper training and education we can create an identity not founded on activity, passivity or indifference. For Feldenkrais the basis for such a training was Judo, the Gentle Way.

The Judo Path, as Feldenkrais describes it, differs from other disciplines in a number of ways. "What a man can do now is mostly determined by his personal experience, the habits of thought, feeling and action that he has formed.... Incapacity to do is produced by fear, imagination and otherwise distorted appreciation of the outside world. We teach an unemotional, objective activity which has nothing to do with what the person is or feels and we show that the result depends entirely on when, what and how a thing is done, and on nothing else. The result is that a small, sometimes insignificant physical body, of sixty years of age or over can control a powerful youth as if the latter has no will of his own. This is possible only by the impersonal, unemotional and purely mechanistic habits of thought and action inculcated by Judo practice." (My emphasis - DL, Higher Judo 17-18) In Judo practice nothing is or should be taken on faith. Judo evolved a specific regimen to fulfill the goals of Judo practice.

According to Feldenkrais, Judo employs distinctive means to transform someone. First, Judo is practiced with bare feet. Immature development of the use of one's feet means "one is capable of only pre-selected acts resulting in arrested development, decreased vitality, and withdrawal from attempting many activities with a corresponding effect on behavior." Second, Feldenkrais discusses why Judo develops the art of falling: "With great perseverance it is possible to achieve...the state where one works not from necessity but enjoys the pleasure of creative work.... (The state) is never achieved before adult independence from gravitation." (Higher Judo, 20-21)

Third, from his first lesson the pupil is taught a fundamentally different way of using his body. "Our way of action is formed in a society where organized security and the belief that inherited personal qualities are things to be proud of and defects to be ashamed of and hidden. Habits of thought and action formed this way are of little avail when we are confronted with tasks in which our social standing cannot influence the outcome of the act. The proper activity is such that the aim set to ourselves can be achieved in most circumstances. This demands flexibility of attitude of mind and body quite beyond that which we form in the present social environment.... In Judo we teach a functional stability, precarious for any other purpose or for any length of time, but solving the immediate problem in front of us or the act to be performed. We seek to mobilize on the present situation all we have, throwing away all that is useless for the immediate purpose.... If you examine Fig. 1 you will see that the person who has produced the throw is himself on the brink of falling. The falling body is the only thing that provides the balancing force and maintains the thrower in the upright position. The two bodies are balanced on one big toe. The thrower has learned to dispense with all rigid ideas of stability, security and force. He uses all the properties of his body to the finest degree of perfection and to the limit of independence from gravitation to achieve his aim... Dynamic stability is stability acquired through movement, such as that of a top or bicycle. A top or bicycle is so shaped that it is impossible to make them stand unsupported, but once set moving, there is little difficulty in maintaining their centre of gravity above the point of contact with the ground. In Fig. 1 the man balancing on one big toe is neither quite motionless nor quite moving. Before a movement is completely arrested, there is obviously an instant where the stability passes from dynamic to static stability. The figure is taken a fraction of a second before that instant; this position could not be maintained for any but a transitory instant." (Higher Judo,18-28, my emphasis - DL)

The static and the dynamic to be lived in and through ecstasy. "The performance of any act while we are in motion is exhilarating.... The thrilling feeling is quite common in most methods imparting body skills.... In Judo it is the essence of the training; training is not complete until the pupils can produce these states at will and in spite of the opponent's resistance... The Judoka is free to attend to the act he is performing, while the untrained man has his attention burdened with the business of keeping balance on two feet -- a laborious and slow task.... Adult erect standing is therefore not derived from static principles. It is essentially a continuous regaining of unstable equilibrium from which the centre of gravity is constantly drifting away, even while standing still." (Higher Judo, 18-28)

Fourth, adjustment to and of space is considered. "All the organs through which we control our relations to space, are located in the head. Space can, therefore, be viewed conveniently as a sphere, the centre of which is carried in the head.... Our space function is made through individual experience and is...a learning process having infantile, childish, adolescent and adult stages like most of our functions.... The scientist would say that we carry with us the origin of co-ordinates, and that we gradually learn to control our activity in different parts of the system.... We may picture

space in front of us...as a cone with its apex in our head. Gradually, we acquire independence in one cone after another until we have covered the entire solid angle of all the cones that compose it.... The infantile stage is present so long as we cannot move the origin of our space co-ordinate system.... Judo furthers the development of our space adjustment in all directions from the origin of our moveable co-ordinate system, and it stands alone in that it teaches orientation in all possible positions of rotation and displacement of that centre itself." Gradually, through increased refinement the center of one's self is located in the lower torso in the abdomen. From there all actions are originated.

Fifth, "Outstanding excellency in any activity is impossible without generalized co-ordinated control.... Those men that we incorrectly call 'great' are simply better co-ordinated in most of their being.... Perhaps the most important feature of co-ordinated movement, as we teach it, is that in the correct act there is no muscle of the body which is contracted with greater intensity than the rest.... Where change of position, or rate of motion masses is involved, force is, by definition of the word, the cause. The sensation of effortless action...is because we teach to perform voluntary acts by such attitudes and in a manner similar to the reflex movements of the body. This sensation of lack of resistance is pleasant, as are all acts where the voluntary control only directs the involuntary functions but does not contradict any of the lower nervous centres. When co-ordination is achieved...the breath is even and unhampered throughout any act.... Evenness of breath is one of the means by which the master judges whether the pupil complies with his instructions or not." (Higher Judo, 32-36)

Finally, there arises the question of motivation. "There can be no smooth co-ordinated action of the executive organs without smooth mental processes, i.e. motivation.... The expert Judo teacher can detect very slight deviations from the correct procedure, because he has a very delicate gauge -- the minimum energy principle. He eliminates all components in any movement that do not actively cooperate towards the purpose at hand. He is concerned with the 'way' the purpose is achieved perhaps more than with the act.... To train motivation control, we have to train the resolution of emotions and habits. The strongest emotions arise in connection with security and self-preservation.... It is enough to see what (people) do when...their security is threatened, or when other strong emotions are set up in them, to see that there is room for further growth and development. Many seem to believe, with gratuitous assurance, that the control of emotions on a verbal plane or that intellectual understanding is emotional control in fact. There is no such thing as emotion without a body, a body without a nervous system, or a mind without a brain. There can, therefore be no training of the body without mental training, or training of emotional control without arousing emotions in the body." (Higher Judo, 43-45, my emphasis - DL)

Feldenkrais acknowledged the necessity and the effects of familial and cultural conditioning. But his experience as a Judo teacher proved to him that one can diminish to zero their burden upon us. Poor education in general, and in particular haphazard somatic education, has given us less than optimal behavioral dynamics. More to the point it has also formed our habits of attention which are really habits of inattention. Employing the means of Judo one can unlearn limiting habits while learning the principles enabling full and mature use of one's self. Judo is fundamentally educational in nature; its founder Jigaro Kano was Minister of Education for the Japanese government. We, of course, see its traces in the aims, style and content of the Feldenkrais Method. I would argue that our method is a more general approach to learning than is Judo. Judo uses the vehicle of trial by

fire, the warrior's way. The Feldenkrais Method recognizes that while one need not be a warrior, everyone desires to fulfill themselves.

In creating the Feldenkrais Method Moshe did something that we should never overlook. He did not ask us to imitate him or to enact his particular saga. Rather, out of his extensive experience working with himself and others he abstracted the impersonal, general structure of learning. He invented accessible lesson schemas in the form of ATM and FI lessons. Being impersonal, we find in the lessons plenty of room for our personal experiences. And that is so by design. Each of us locates ourselves differently relative to those lessons. If we are to do Feldenkrais work it is not enough to hold onto our personal experiences. We too must forge general schemas accessible to any number of people like or unlike ourselves. The products of our labors may or may not look like what we have to recognize as the Feldenkrais Method. In creating lessons we establish a context as well as provide the means for a person to realize and rearrange the particulars of their life.

In doing the Feldenkrais Method we must be careful not to bow to what's culturally trendy and fashionable or pander to the cult of victimization. If we for an instant realize that our lives could be different and if we further realize the means to make it so, then we know it can be so for others also. Make no mistake about it, to achieve even a brief independence from our heritage is to realize the fruits of learning how to learn. Even a fleeting severance of ourselves from our conditioning can mark a stunning passage from ungrounded delusion or drowsy disillusionment to one of unadorned worldly engagement. "You can lead a horse to water but you can't make 'em drink." In leading a horse to water one needs to know how to lead and how to recognize water. Our Feldenkrais heritage, dedicated as it is to providing for independence of heritage, can with clarity of intention both recognize water and lead one to it.

Mental Furniture #7

G.I. Gurdjieff

"If a man could understand all the horror of the lives of ordinary people who are turning round in a circle of insignificant aims, if he could understand what they are losing, he would understand that there can only be one thing that is serious for him - to escape from the general law, to be free. What can be serious for a man in prison who is condemned to death? Only one thing: How to save himself, how to escape: nothing else is serious." - G.I. Gurdjieff

It was late in the morning or perhaps it was late in the afternoon and Moshe was concluding an interview with a writer for *Psychology Today:*

Writer: "It would seem that your ideas and your methods have much in common with the work of Milton Erickson."

Moshe: "Oh yes, that's true. I have a tremendous degree of respect for his work. And I met him. Margaret Mead introduced us. But, you know, while one can see similarities in my work to Milton Erickson's, the person I feel I have the most kinship with is (G.I.) Gurdjieff."

The interview was never published. The writer moved on to the NY Times. Maybe someone, say Franz Wurm, can shed light on Moshe's relationship to the Gurdjieff "Work" and the Gurdjieff

community. Was it direct or indirect? Historical fact: Moshe met Ida Rolf at a conference put on by the noted student of Gurdjieff, J.G. Bennett.

George Ivanovich Gurdjieff was born 1872? 1877? in the Caucasus region of what is now Russia. The so called "rascal sage" heralded the coming of ancient and esoteric Eastern teachings to the West. Neither a modernist nor a purveyor of any "isms," he rather proclaimed there to be eternal Truths (with a capital T), that there are people who know and live those Truths and that Objective knowledge of the Real is possible. His work lives on in various guises amongst groups that are not so much secret as private. Much has been written about Gurdjieff. If you choose, you can find Gurdjieffian books in almost any esoteric bookstore or in regular bookstore in their religion or spiritual sections. Moshe recommended reading A.R. Orage's *Psychological Exercises* and P.D. Ouspensky's, *In Search of the Miraculous.* Perhaps some of the flavor will come through. But, knowing how difficult it would be to fully comprehend the Feldenkrais Method by reading our books, you can be assured it would be much more difficult to understand Gurdjieff's work through books alone. And as a flavor it DID figure into Moshe's stew.

"...we must examine the *fundamental law* that creates all phenomena in all the diversity or unity of all the universes. "This is the 'Law of Three' or the law of the *three principles*or the *three forces.* It consists of the fact that every phenomenon, on whatever scale and in whatever world it may take place, from molecular to cosmic phenomena, is the result of the combination or the meeting of three different and opposing forces. Contemporary thought realizes the existence of two forces for the production of a phenomenon: force and resistance, positive and negative electricity, male and female cells and so on. No question has ever been raised as to the third, or if it has been raised it has scarcely been heard.

"According to real, exact knowledge one force, or two forces, can never produce a phenomenon. The presence of a third force is necessary, for it is only with the help of the a third force that the first two can produce what may be called a phenomenon, no matter in what sphere.

"The teaching of the three forces is at the root of all ancient systems. The first force may be called active or positive; the second, passive or negative; the third, neutralizing. But these are *merely names*, for in reality all three forces are equally active and appear as active, passive, and neutralizing only at their meeting points, that is to say, *only in relation to one another at a given moment.*" (G.I. Gurdjieff quoted in P.D. Ouspensky, *In Search of the Miraculous*, pg. 75)

In one's life the Law of Three can be seen to be operative in any number of situations. One undertakes to accomplish something. One encounters resistance or inertia. Lacking both a reason and the will to continue one gives up or attempts something else. If we don't have the resolve, if our aim is not to persevere, the world provides us with the reasons to quit. But, it is the aim provided by "the Work" that sustains one's efforts. To counter the vicious circularity of the dyadic action-reaction dynamic a third force is needed. The third force neutralizes not by eliminating the other two so much as providing a neutral way of observing, of attending, of sustaining participation. Habits of attention and one's consequent identification *of* and *to* what one attends to are insidious and not easily discerned. And why bother anyway? Yet, somehow and in some way we sense there must be something other than either our individual or our collective subjective cognitions and perceptions. Maybe the very modes of attentional habits can be examined? Is the active man or woman really active? Maybe their activity is merely an habitual and therefore *passive* response to the world. And it can be asked of the passive person what kind of *active* dis-stance must be effected

to not engage? To undertake an examination of our habits a third force must be brought in that allows us to see, to bear witness to the other two.

Gurdjieff said that in undertaking to do "the Work," that is, to deliberately intend to realize one's full humanity, three components are required: that we work for ourselves; that we work for others; and that we work for "the Work" itself. One usually works for one's self or for others. But echoing Rabbi Hillel, "If I am not for myself who am I, and if I am only for myself what am I?" there can be a context in which one can work for one's self, for and with others and for "the Work." In assessing how people work, 'teach,' or 'train' in a Feldenkrais training program I have noticed something similar. Some people are full of themselves or perhaps they are out for themselves. In those cases attention to the individuals within the group suffers and the Method doesn't reach them. Some people put their focus almost completely outside themselves, they live only for other individuals. In those cases attention to their own needs, to the long term needs of the group and to the Method are diminished. What kind of example are they providing? And with some others who work primarily for the Method alone, the teaching seems sterile and abstract. But there are those work for themselves, for others and who also work for the Feldenkrais Method. The consequences of coordinating all three can be very different than can be predicted from any one stance considered alone or in dyadic relationship.

Working earnestly to sustain and recreate the Method allows one to attend to one's needs, the needs of others and gives the Method its due. To practice the Feldenkrais Method, or perhaps to view the Feldenkrais Method as a practice means one cannot develop one's self and not work to develop others. Neither does it mean one can develop others while not developing one's self. The Feldenkrais Method must simultaneously lead to the development of others, one's self, and the Method itself. But the Law of Three is subtle and not obviously obvious: "at a given moment" the practitioner can be active and initiating relative to the passive student and the sustaining or neutralizing Method. Or the practitioner could be passive or denying while the student is active and the Method sustaining. Or the Method could be active while the student is sustaining and the practitioner passive. And so on. Each member of the practitioner-student-Method triad can play a positive, negative, or neutral role relative to the others. The role of the practitioner needs to be played by one who can remember themselves "at a given moment" as a student, as a living reference library of the Method, or as a 'teacher.'

It was a hot summer Training Program afternoon and Moshe on an Amherst video had made an allusion to the work of Gurdjieff. During a Q&A session it was asked what Moshe had meant by that remark. The answer given was, "Oh, he is only telling you to take it easy." But what was he saying? And why? And to whom? Moshe knew that to Gurdjieff human beings have two aspects: 1) essence, or that which is innate, which is a person's own, which is what is true in a human being, which develops into one's individuality and which is controlled by Fate; and 2) personality, or that which is acquired, which is not one's own, which is what is false in a human being, which provides the information necessary to work on the self and which is controlled by Accident. To be true to one's essence and to manifest it fully one must bring a human's three centers - head, heart, moving - under the control and coordination of the will. An aside from Moshe, "...at this point we are speaking of ...the training of will power and self control, but not for the purpose of gaining power over ourselves or other people. Correction of the self, improvement, training of awareness, and other concepts have been used here to describe various aspects of the idea of development. Development stresses the harmonious coordination between structure, function, and achievement.

And a basic condition for harmonious coordination is complete freedom from either self-compulsion or compulsion from others."(*Awareness Through Movement*, pg. 51) According to Gurdjieff, usually one of the centers predominates and supplanting the functioning of the others prevents us from living harmoniously. When all three are coordinated, when a person has acquired a "permanent center of gravity," then real progress can be made.

A human being is not born with a vibrant awakened soul but must through "the Work" create one. To create a soul a person must wake up and as a preliminary to that they must realize that they are asleep, that they are mechanical, that what for them goes by the name of human existence is only the movements of an automaton. Most everyone is adrift in the world because they have no direction and all that befalls them is simply accidental. What we take as our dreams, hopes, fears, desires, and our sense of right and wrong are simply things which befall us. Not understanding how it is that we do not and can not see, keeps us asleep. As Bob Dylan sung, "You got big dreams baby, but to dream you know you got to be asleep." But how to change things?

Gurdjieff spent his entire life in the constant creation of means to accomplish awakening. Accordingly, the Gurdjieffian tradition holds that one can learn through the proper use of attention that one is asleep. The first step is to begin by observing the mostly neurotic and aimless character of our every action, thought or feeling. With that observation we realize that there is little that we can lay claim to call our own life. Our attention is captured by inner and outer identifications that are almost exclusively a product of acculturation on the one hand and our primitive biology on the other. But attention, or more precisely attending, seems to neutralize 'sleep.' It is not unlike modern physics wherein the act of observation changes the experiment, in our lives attention to our mechanicalness 'wakes' it up. And it must be noted that the effects of moments of awakening, of 'shocks' to the sleeping individual can have effects upon them not predictable from their previous personal history. One's personal psychology can remain intact and unchanged. It doesn't matter. What matters is that one develop the wish to search for Truth.

To encounter Gurdjieff and to grapple with his ideas makes one able to more fully appreciate their import upon Moshe. Gurdjieff's voice can be heard in the following passages from *Awareness Through Movement*,: "If it is true that instincts come to us as a matter of inheritance, just as awareness is inherited, then it will be preferable to perfect our awareness rather than to suppress the animal that is in us. Awareness is the highest stage in man's development, and when it is complete it maintains a harmonious 'rule' over the body's activities. When an individual is strong, so are his passions, and his ability and vitality are on the same scale. It is impossible to suppress these prime movers without reducing his total potential. The improvement of awareness is preferable to any attempt to overcome instinctive drives. For the more nearly complete a man's awareness becomes, the more he will be able to satisfy his passions without infringing on the supremacy of awareness. And every action will have become more human."(*Awareness Through Movement*, pgs. 172-3) And, "...the degree of awareness differs greatly between different individuals, far more than the relative distribution of other faculties. Further, there are also great periodic variations in the individual's awareness and its value relative to other aspects of his personality. There may be a low point at which awareness may disappear momentarily or for a period. More rarely there may be a high point at which there is a harmonious unity, with all man's faculties fused into a single whole." In those moments one, "...grasps that his small world and the great world around are but one and that in this unity he is no longer alone."(*Awareness Through Movement*, pgs. 53-4)

To take to heart Moshe's reminder that ease of movement, gracefulness, better posture, etc., i.e., the effects of lessons, are trivial begs the question, "Trivial next to what?" By juxtaposing Moshe Feldenkrais and G.I. Gurdjieff we can get hints about the role of the non-trivial, or the miraculous in Gurdjieff's sense, in *our* Method.

Mental Furniture #8

Darwinian Evolution

In his introduction to Darwin's The Expression of Emotions in Man and Animals Konrad Lorenz has this to say: "...Jacob von Uexkull once said rather pessimistically that today's truth was, after all, nothing but the error of tomorrow. Thereupon... Otto Koehler answered, 'No the truth of today is the special case of tomorrow!'... This second statement contains a very much deeper truth. In science, and particularly in biology, the discoverer of a new explanatory principle is more than apt to overrate the range of its applicability. ...One may indulgently regard this little weakness as the well-merited prerogative of genius, because the great man's pupils, though lesser discovers, are apt to be better at verification than their inspired teacher and can be relied upon to clip the wings of his genius when it threatens to soar too high. It is only when the pupils degenerate into disciples who unquestioningly accept the far sweeping statements of their master that danger arises, and a newly born epistemophagus (knowledge-devouring) monster, another 'ism' rears its ugly head."

"However, the greatest of all discoverers in the field of biology did not commit the error just discussed: when Charles Darwin discovered natural selection, the explanatory principle that was destined to change our outlook on man and the world more than any other before it, he decidedly did not overestimate the number of phenomena that could be explained on its basis. If anything, he erred on the side of understatement.... Like all really great scientific discoverers, Darwin possessed an almost uncanny ability to reason on the basis of hypotheses which were not only provisional and vague but subconscious. He deduced correct consequences from facts more suspected than known, and verified both the theory and the facts by the obvious truth of the conclusions thus reached. In other words, a man like Darwin knows more than he thinks he knows, and it is not surprising that the consequences of his knowledge reach far and in different directions."

"Behavior patterns are just as conservatively and reliably characters of the species as are the forms of bones, teeth, or any other bodily structures. Similarities in inherited behavior unite the members of a species, of a genus, and of even the largest taxonomic units in exactly the same way in which bodily characters do so. The conservative persistence of behavior patterns, even after they have outlived, in the evolution of a species, their original function is exactly the same as that of organs... The adaptation of the behavior patterns of and organism to its environment is achieved in exactly the same manner as that of its organs, that is to say on the basis of information which the species has gained in the course of its evolution by the age-old method of mutation and selection. This is true not only for the relatively rigid patterns of form or behavior, but also for the complicated mechanisms of adaptive modification, among which are those generally assumed under the concept of learning."

One of the underpinnings of Moshe's concept of learning how to learn is the notion of organic learning. Essential to organic learning is the theory of evolution. Not just any old evolutionary theory but Darwin's. Evolution as conceived of by Darwin is one of the most powerful theories in the history of science and Western thought. It is also one of the most misunderstood theories. Take the phrase "survival of the fittest." Some suppose that it summarizes evolutionary theory. It does not. The phrase is both incomplete and misleading. The idea that evolution is progressive, that present life forms are improvements over earlier forms, is also a misinterpretation. Another

common error in characterizing evolutionary theory is that organisms can be arranged on an evolutionary ladder from bacteria to man.

The more orthodox definition of evolution is as a change in the gene pool of a population over time. The gene pool is the set of all genes in a species or population. The English moth, Biston betularia, is a frequently cited example of observed evolution. In 19th century industrial England, rare black variants spread through this moth population as a result of their habitat becoming darkened by soot from factories. Birds could see the lighter colored moths more readily and ate more of them. The moth population changed from mostly light colored moths to mostly dark colored moths. Since their color was determined by a single gene, the change in frequency of dark colored moths represented a change in the gene pool. This change was, by definition, evolution.

Evolution is often characterized as either 'microevolution' as with the moths above or "macroevolution" when referring to larger changes (such as the emergence of a new species) taking place over longer periods of time. Macroevolution is cumulative microevolution. In defining evolution as a change in the gene pool it means that evolution is a population level phenomena. Therefore, only groups of organisms evolve. Individual organisms do not evolve. Evolutionarily stated, it is necessary to view populations as collections of individuals with different traits. For example, as the frequency of black moths increased, the "average" moth did not get progressively darker. There were never any "average" half-white/half-black moths in the population.

Evolution is often equated with morphological change, i.e. organisms changing shape and/or size over time. An example would be a dinosaur species evolving into a species of bird. It is important to note that evolution is often accompanied by morphological change, but this need not be the case. Evolution can occur without morphological change; and morphological change can occur without evolution. That humans are larger now than in the past is not an example of evolutionary change. Better diet and medicine brought about this change. The gene pool did not change -- only its manifestation did.

An organism's phenotype -- comprised by its morphological, physiological, biochemical, behavioral and other properties -- is determined by its genes and its environment. Phenotypic changes induced solely by changes in environment do not count as evolution because they are not heritable; in other words, the change is not passed on to the organism's offspring. The fundamental error of Lamarckian evolution was to assume that learned characteristics could be passed on. Most changes due to environment are fairly subtle (e.g. size differences). Large scale phenotypic changes (such as dinosaur to bird) are obviously due to genetic changes, and therefore are evolution.

Evolution is not progress. Organisms simply adapt to their current surroundings and do not necessarily become "better" over time. Gregory Bateson called it survival of "the fit" rather than of "the fittest." A trait or strategy that is successful at one time may be deleterious at another. Studies in yeast have shown that "more evolved" strains of yeast can be competitively inferior to "less evolved" strains. An organism's success depends a great deal on the behavior of its contemporaries; for most traits or behaviors there is likely no optimal design or strategy, only contingent ones. Bio-epistemologist Francisco Varela prefers the notion 'viable' to that of 'optimal' when specifying the ongoing fit of organism to environment and environment to organism.

How does evolution work? If evolution is a change in the gene pool; what causes the gene pool to change? Several mechanisms can change a gene pool, among them: natural selection, genetic drift,

gene flow, mutation and recombination. It is important to understand the difference between evolution and the mechanisms that bring about this change. Why? Because while the fact of evolution is not in question, the processes bringing it about are not all clearly understood. Bringing about a change in the gene pool assumes that there is genetic variation in the population to begin with, or a way to generate it. Genetic variation is "grist for the evolutionary mill." For example, if there were no dark moths, the population could not have evolved from mostly light to mostly dark. In order for continuing evolution there must be mechanisms to increase or create genetic variation (e.g. mutation) and mechanisms to decrease it (e.g. natural selection and genetic drift).

Natural selection is the only mechanism of adaptive evolution; it is defined as differential reproductive success of pre-existing classes of genetic variants in the gene pool. In other words, the genetic constitution of some individuals are (on average) better than others at contributing their genetic variations to the next generation's gene pool. Selection is not a force in the sense that gravity or magnetism is no matter how often some biologists speak of it that way. Selection is not a guided or cognizant entity; it is simply an effect. Darwin stated the case originally that it was 'as if there were a natural selection, comparable in its separating effect to the artificial selection a farmer makes of the varieties that interest him. Darwin himself was quite clear in his metaphoric use of the term selection. There is in the theory of evolution no need for the environment to play the role of 'selector.' When supplied with genetic variation, natural selection allows organisms to adapt to their current environment and their environments to them. It does not, however, have any foresight. Structures or behaviors do not evolve for future utility. An organism must be, to some degree, adapted to its environment at each stage of its evolution. As the environment changes, new traits (new combinations of genetic variation) may be selected for. As an organism changes it modifies its environment. Large changes in populations are the result of cumulative natural selection -- numerous small changes are introduced into the population by mutation; the small minority of these changes that result in a greater reproductive output of their bearers are amplified in frequency by selection.

Natural selection works at the level of the individual. In the example I gave earlier, dark colored moths had higher reproductive success because light colored moths suffered a higher predation rate. The decline of light colored genetic variants was caused by light colored individuals being removed from the gene pool (selected against). It is the individual organism that either reproduces or fails to reproduce. Genes are not the unit of selection (because their success depends on the organism's other genes as well); neither are groups of organisms a unit of selection. There are some exceptions to this 'rule.' The individual organism reproduces or fails to reproduce. It competes primarily with others of it own species for its reproductive success. Natural selection does not necessarily produce individually optimal structures or behaviors. Selection targets the organism as a whole, not individual traits. So, specific traits are not optimized, but rather combinations of traits. In addition, natural selection may not necessarily even select for the most optimal set of traits.

Other important mechanisms of evolution are genetic drift, mutation, recombination and gene flow. They are worth looking into. The main thing to remember is that evolution is not progress. Evolution should not be represented as a series of improvements from simple cells, through more complex life forms, to humans (the pinnacle of evolution). Modern biologists hold that all species have descended from a common ancestor. As time went on, different lineages of organisms were modified with descent to adapt to their environments. Thus, evolution is best viewed as a branching tree or bush, with the tips of each branch representing currently living species. No living organisms

today are our ancestors. Every living species is as fully modern as we are with its own unique evolutionary history. No extant species are "lower life forms," atavistic stepping stones paving the road to humanity. A related, and common, fallacy about evolution is that humans evolved from living species of apes. This is not the case -- humans and apes share a common ancestor. Both humans and living apes are fully modern species; the ancestor we evolved from is now extinct and was not the same as present day apes (or humans for that matter). Our closest relatives are the chimpanzee and the pygmy chimp. Evolution is still occurring through the mechanisms listed above; all organisms and their surroundings are co-evolving.

The theory of evolution is what unifies all of biology. Evolutionary biologists can provide an elegant answer to the question, "How did we human beings get here?" Evolutionary theory distinguishes and differentiates between an individual's personal history (ontogeny) and her or his impersonal species history (phylogeny). The difference between the ontogenetic and the phylogenetic is the difference that makes a difference in Feldenkrais' profound approach to learning. The very notion of 'function,' as used by Feldenkrais, binds together the biological means of organismic viability with new instances for a fuller realization of one's potential. We individuate in the time allotted to each of us against the backdrop of the broad expanse of evolutionary time. By utilizing the distinction between phylogenetic and ontogenetic patterns of behavior we can use the former to influence and change the latter. Borrowing from Lorenz's introduction we can say Moshe Feldenkrais did not overestimate the breadth of application of his ideas and, if anything, he erred on the side of understatement. Moshe knew more than he thought he knew, and it is not surprising that the consequences of his knowledge reach far and in different directions.

References: Mind and Nature & Steps to an Ecology of Mind-- Gregory Bateson; The Tree of Knowledge-- Maturana and Varela; What is Life?-- Margulis and Sagan; anything by Stephen J. Gould; Evolution sites on the Internet; and Darwin's own work.

Mental Furniture #9

Engineering

"There's no success like failure and failure is no success at all." Bob Dylan

"Life is trouble." Moshe Feldenkrais

There's probably no profession more misunderstood than engineering. The most general description of the profession of engineering is "a field of study or activity concerned with deliberate alteration or modification in some particular area." To engineer is to, "Arrange, contrive, or bring about, especially artfully." (The New Shorter Oxford English Dictionary) Moshe Feldenkrais was a very, very good engineer.

I recommend for your reading pleasure the book To Engineer Is Human: The Role of Failure in Successful Design by Henry Petroski. It's easy to read and you'll find yourself underlining sections of the book as well as quoting stories and anecdotes to your friends. Petroski says, "I believe...that the ideas of engineering are in fact in our bones and part of our human nature and experience." and, "The idea of design -- of making something that has not existed before -- is central to engineering, and I take design and engineering to be virtually synonymous..." (To Engineer, pg. xi) And then this, "I believe that the concept of failure... is central to understanding engineering, for engineering

design has as its first and foremost object the obviation of failure. ...To understand what engineering is and what engineers do is to understand how failures can happen and how they can contribute more than successes to advance technology."(To Engineer, pg. xii)

Engineering does not share the objective of science which seeks to understand and explain the given world. Nor is it that of art which, unfettered by the so-called Laws of Nature, creates worlds at the limits of the Imagination. Although engineering is most appreciated when science and art combine to make an aesthetically pleasing creation, the objective of engineering is to create new worlds out of the materials of this world and in obedience with its laws. While the honeybee's honeycomb has had a changeless design for eons, human structures are constantly changing and evolving. Human engineers develop new materials that lend themselves to new designs and all this leads inevitably to new ways that things can go wrong. Engineered things and systems (like irrigation canals) came into being long before the pyramids. Now, engineering is evidenced in virtually everything we know. The process of design differs greatly in its application, use of materials and how to arrange them.

The birth of design process begins with ourselves. Petroski, "Indeed, just as we all have experienced the rudiments of artistic creativity in the childhood masterpieces our parents were so proud of, so we all have experienced the essence of structural engineering in our learning to balance first our bodies and later our blocks in ever more ambitious positions. We have learned to endure the most boring of cocktail parties without accident of either our bodies or our glasses succumbing to the force of gravity, having long ago learned to crawl, to sit up, and toddle among our tottering towers of blocks. If we could remember our early efforts of ours to raise ourselves up among the towers of legs of our parents and their friends, then we can begin to appreciate the task and the achievement of engineers, whether they be called builders in Babylon or scientists in Los Alamos. For all their efforts are to one end: to reassemble Nature into something new, and above all to obviate failure in the effort." And, "...the history of engineering... may be told in its failures as well as its triumphs. Success may be grand, but disappointment can often teach us more." (To Engineer, pg. 8-9)

How can disappointment be a teacher? More directly, what means does an engineer employ to learn from mistakes and failures? Before going directly to those questions it will behoove us to consider them in the light of our own engineering training. In a beautiful chapter entitled Falling Down Is Part of Growing Up Petroski links together the elements of our apprenticeship with the material world. He begins with our own developmental movements and extends the consideration to all the things we have to bump up against, fall over, climb up on or through, lift up and put down, and so on. He ties it together with the implicit engineering education we get in fairy tales and nursery rhymes. There's: Jack and Jill went up the hill /To fetch a pail of water; Three wise men of Gotham/Went to sea in a bowl/If the vessel had been stronger/My song would have been longer; Ring around the rosie/A pocket full of posies/Ashes, ashes/We all fall down; and then there's Humpty Dumpty or The Story of the Three Pigs and the Wolf who huffed and puffed and blew down two of the pigs' ill conceived houses. And so many more. Petroski, "Our own bodies, the oral tradition of our language and our nursery rhymes, our experiences with blocks and sand, all serve to accustom us to the idea that structural failure is part of the human condition."(To Engineer, pg. 19) In later childhood through our play we learn that there are limits to the amount of abuse a toy can take. We learn how not to build a fortress. We learn what is necessary to burn something we would rather cook. We also learn how to improvise, to repair and to rebuild with a better idea as to the

requirements for greater success. Simply because we made them, we may even come to cherish our makeshift toys and buildings more than those provided to us.

The overarching principle of design is "less is more." But how much less is "less" and is it the reverse of "more" or is less something else? In other words, while economics dictates that cheaper is better, safety dictates that one should only take calculated risks. But when combining the ever changing characteristics of materials and the progressive improvement of engineering principles one must expect the unforeseen. So, engineers always overbuild. They do so to take into account most of what may be unforeseen. But accidents happen. And when they do engineers have incredible tools, actual and conceptual, at their disposal to analyze what went wrong. Failure analysis as it is called has as its aim to seek to assemble the whole into something greater than the sum of its broken parts. The investigators would cause Sherlock Holmes to be envious. "Finding the true causes of failure often take as much of a leap of the analytical imagination as original design concepts."(To Engineer, pg. 184) Recall physicist Richard Feynman's elegantly simple analysis and explanation of the Shuttle disaster. Feynman showed that while it was the rubber O-rings that were the material cause, the actual cause was poor design and lack of project oversight. While it may prove embarrassing to the designers of a failed project to have their failures open to such scrutiny, the integrity of the profession demands that if there is a cause (or causes) of failure then it must be found out and rectified in subsequent designs. I was in Israel in 1979 when the Three Mile Island nuclear plant nearly melted down. Moshe, who helped design Israel's nuclear power plants, said that when the Israeli's built their plant, it was a combination of the best of French, English, German, Russian and American designs. He said that there were numerous arguments as to how to best build a safe plant. The problem that occurred at Three Mile Island was predicted by the Israeli designers. They built theirs differently.

Engineering design shares certain characteristics with the positing of scientific theories. Scientists hypothesize about the behavior of our given universe, whether atoms, honeybees or planets, while engineers hypothesize about assemblages of concrete and steel that they arrange into a world of their own making. Although we may not realize it, our belief that all honeycombs have a hexagonal shape, or that the Sun will rise every morning in the East are not incontrovertible facts but hypotheses. While much is made of the notion of scientific hypothesis, at its heart it is guessing. It may be very educated guessing but it is guessing nevertheless. Hypotheses in engineering, rather than testable conjectures about the Universe, are constructions testable by how well they perform the functions they were designed for. While we point to buildings, bridges, electronic gadgets and jets as obvious products of the engineering mind virtually everything in our human world has some amount of design science in it.

Bridges are amongst the most beautiful and recognizable of human creations. They are designed to span a river, a gorge, some sort of gap. They connect something not previously connected. Or, they connect in new ways some things already connected. They allow movement usually in two directions. As beautiful as the Golden Gate bridge is in itself, of equal beauty is the view it allows while serving its function to connect San Francisco to Marin County. And since they establish new connections or reconnect old things in new ways, why not think of an ATM lesson as a bridge? As design structures ATM lessons fulfill the criterion of less is more. And the process one enters into doing an ATM lesson gives us a very tangible experience of less is more. By design, lesson structure and function contribute to an understanding of human structure and function. Our interpretations of a lesson instruction are our best guesses, our own hypotheses, as how to best

proceed. Embedded in the lesson, and in fact one to the things to be rediscovered by the student, is how to 'remember' the best guesses of our ancestors or our own personal history. Through a recollection and a reshuffling of our impersonal phylogenetic adaptations and our own personal ontogenetic learnings we can recreate ourselves. ATM lessons are designed to give us a sense of the narrowness of our understanding while at the same time putting that narrowness on a very broad species specific sensory motoric base. Our 'narrowness' and our sense of limitation are learned and as such they can be relearned or unlearned. When our guesses fail us we are provided with the impetus to learn. But that impetus must be given direction through the careful design that underlies the best ATM and FI lessons. Our self generated constructions act as our bridge from old outworn habits to new behaviors. Disappointment can be a profound teacher if we have the means to reassemble our experience in new and fresh ways.

Someday someone will recognize Feldenkrais for the genius of his design science. In the pursuit of human development, understanding and awareness certainly Moshe Feldenkrais and his method are well recognized. But recognition for how a lesson "lessons" is still long overdue. For example, the reversal of proximal and distal, so ubiquitous in lessons is an idea or intuition that would occur to an engineer but not to a biologist, psychologist, or anthropologist. The bridge that supports us as we travel over it can be used without understanding how it was built. But, while we can use a bridge or a lesson and not know who built or how, it never-the-less was engineered by an engineer. If design is making something that has never existed before to exist and given that ATM and FI lessons never existed before, then certainly Moshe was a designer.

Mental Furniture #10

The Fechner Weber Principle

WEBER-FECHNER PRINCIPLE: An approximate psychological law relating the degree of response or sensation of a sense organ and the intensity of the stimulus. The law asserts that equal increments of sensation are associated with equal increments of the logarithm of the stimulus, or that the just noticeable difference in any sensation results from a change in the stimulus which bears a constant ratio to the value of the stimulus.

In the bright midday sun you light a candle. Does anyone notice it getting brighter? Will you identify my voice if I call you on your cellular phone at a rock concert? You're carrying the downside of a refrigerator up a flight of stairs and someone puts a hammer on the fridge, do you sense the difference? Mostly, the Fechner Weber Principle or Law holds that you won't notice a difference. Moshe Feldenkrais invoked the Fechner Weber Law in discussing the necessity of reducing effort while learning. The Fechner Weber principle marked the beginning of the science of psychophysiology and yet all its implications have not been played out in that field.

Ernst Heinrich Weber (1795-1878) was the German anatomist and physiologist who first introduced the concept of the just-noticeable difference, that is, the smallest difference perceivable between two similar stimuli. Weber was a professor at the University of Leipzig from 1818 until 1871. He is known chiefly for his work on sensory response to weight, temperature, and pressure; he described a number of his experiments in this area in De Tactu (1834;"Concerning Touch"). Weber determined that there was a threshold of sensation that must be passed before an increase in the intensity of any stimulus could be detected; the amount of increase necessary to create sensation

was the just-noticeable difference. He further observed that the difference was a ratio of the total intensity of sensation, rather than an absolute figure; thus, a greater weight must be added to a 100-pound load than to a 10-pound load for a man carrying the load to notice the change. Similar observations were made on other senses, including sight and hearing. Weber also described a terminal threshold for all senses, the maximum stimulus beyond which no further sensation could be registered.

Weber's findings were elaborated in Der Tastsinn und das Gemeingefühl (1851; "The Sense of Touch and the Common Sensibility"), which was considered to be "the foundation stone of experimental psychology." Weber's empirical observations were expressed mathematically by Gustav Theodor Fechner, who called his formulation Weber's law.

Gustav Theodor Fechner (1801-1887) was a German physicist and philosopher and a key figure in the founding of psychophysics, the science concerned with quantitative relations between sensations and the stimuli producing them. At the age of 16 he enrolled in medicine at the University of Leipzig where he studied anatomy under

Weber. No sooner had he received his medical degree, however, than his interest began to shift toward physics and mathematics.

Fechner's psychological interests began to manifest themselves toward the end of the 1830's in papers on the perception of complementary and subjective colors. In 1840, the year in which an article on subjective afterimages appeared, Fechner suffered a nervous collapse. Exacerbated by a painful injury to the eyes sustained while gazing at the sun during his research, Fechner's ailment manifested itself in temporary blindness and prostration. He resigned his position at Leipzig and went into a lengthy period of virtual seclusion during which his interests turned increasingly toward metaphysics. In 1848, the year of his return to the University as Professor of Philosophy, he completed Nanna, a metaphysical treatise that contains his first explicit, philosophical treatment of the problem of the relationship of mind to body.

In Nanna, and in the more important Zend-Avesta (1851), Fechner sketched out a dual-aspect, monistic, pan-psychical mind/body view. In a famous metaphor Fechner likened the universe, which is at one and the same time both active consciousness and inert matter, to a curve that can be regarded from one point of view as convex and from another as concave yet still retains its essential integrity. In line with this approach to mind/body, Fechner laid out a future program for psychophysics -- to demonstrate the unity of mind and body empirically by relating increase in bodily energy to corresponding increase in mental intensity.

Between 1851 and 1860, Fechner worked out the rationale for measuring sensation indirectly in terms of the unit of just noticeable difference between two sensations, developed his three basic psychophysical methods (just noticeable differences, right and wrong cases, and average error) and carried out the classical experiments on tactual and visual distance, visual brightness, and lifted weights that formed a large part of the first of the two volumes of the Elemente der Psychophysik. Fechner's aim in the Elemente was to establish an exact science of the functional relationship between physical and mental phenomena. Distinguishing between inner (the relation between sensation and nerve excitation) and outer (the relation between sensation and physical stimulation) psychophysics, Fechner formulated his famous principle that the intensity of a sensation increases as the log of the stimulus ($S = k \log R$) to characterize outer psychophysical relations. In doing so,

he believed that he had arrived at a way of demonstrating a fundamental philosophical truth: mind and matter are simply different ways of conceiving of one and the same reality.

While the philosophical message of the Elemente was largely ignored, its methodological and empirical contributions were not. Fechner may have set out to counter materialist metaphysics; but he was a well-trained, systematic experimentalist and a competent mathematician and the impact of his work on scientists was scientific rather than metaphysical. He combined methodological innovation in measurement with careful experimentation. Mental events could, Fechner showed, not only be measured, but measured in terms of their relationship to physical events. In achieving this milestone, Fechner demonstrated the potential for quantitative, experimental exploration of the phenomenology of sensory experience and established psychophysics as one of the core methods of the newly emerging scientific psychology. Later research has shown, however, that Fechner's equation is applicable within the mid range of stimulus intensity and then holds only approximately true.

He later delved into experimental aesthetics and sought to determine by actual measurements which shapes and dimensions are most aesthetically pleasing. He was also a proponent of panpsychism (from Greek pan, 'all'; psyche, 'soul'), a philosophical theory asserting that a plurality of separate and distinct psychic beings or minds constitute reality. Panpsychism is distinguished from hylozoism (all matter is living) and pantheism (everything is God). For Gottfried Wilhelm Leibniz, the 17th-century German philosopher and a typical panpsychist, the world is composed of atoms of energy that are psychic. These monads have different levels of consciousness: in inorganic reality they are sleeping, in animals they are dreaming, in human beings they are waking; God is the fully conscious monad.

In 19th-century Germany, Arthur Schopenhauer asserted that the inner nature of all things is will -- a panpsychistic thesis. And Gustav Theodor Fechner, the founder of experimental psychology and an ardent defender of panpsychism, contended that even trees are sentient and conscious. In the United States, Josiah Royce, an absolute idealist, not only followed Fechner in affirming that heavenly bodies have souls but also adopted a unique theory that each species of animal is a single conscious individual -- incorporating into itself the individual souls of each of its members.

So, now we are able to place the Fechner Weber Principle in its proper historical context. While the metaphysical implications of the principle were important to Fechner, its impact on his contemporaries was decidedly methodological. We can appreciate it as the first attempt to scientifically coalesce or imbricate the material and the mental. Specifying just noticeable differences in any sensation, that is, heavier, brighter, louder to be the result of a change in a stimulus bearing a constant ratio to the value of the stimulus the Fechner Weber Principle relates quantities to qualities. The Feldenkrais Method raises the question, when contemplating the Fechner Weber principle, just how is it that we can lower the background stimulation to enable us to detect just noticeable differences at lower thresholds. While learning with reduced effort is its own reward, somehow the different strata of our experience are reconfigured via a Feldenkrais lesson. In reconfiguring previous configurations we are face to face, so to speak, with the most intimate dynamical machinations of habit.

We know from our reading of Piaget that as we act so we sense, or even that action is cognition. Our experience, being grounded in the sensory motor substrate, is plastic and amenable to great variation. Sensory motoric operations are grounded in evolutionary processes. The habits of the

species, the so called phylogenetic learnings and learning processes, make it possible to sequence and stratify our actions so that we can maintain sentience and participate in acculturation. The habits of a culture as enacted by each of us are the so called ontogenetic learnings. All the contingencies of life -- diet, locale, ancestors, etc. -- impact our personal history. Our personal history is encoded in the temporalizations and spatializations signified by what we attend to and what we can attend to. We live in the textures of the upsurge of phenomenal existence. The generic possibilities of bright or dark, hot or cold, wet or dry, smooth or rough, sudden or slow and so on are instantiated in the unexpected reflection of the sun in a window, the coolness of the morning fog, the dryness of the flour diminishing as it changes to dough and so on. Sensing differences is a function of the intensity of a stimulus relative to the intensity of the ongoing level of stimulation. Interpreting those differences makes them meaningful. No differences, no meaning.

By design, a Feldenkrais lesson evokes the archaic phylogenetic dynamics of organic learning. Those species specific processes are, in our personal history, often poorly integrated and socialized. Lessons resocialize them. By intelligently reshuffling the phylogenetic and the ontogenetic we can do more with less effort. We reset the change point at which we can detect just noticeable differences. New distinctions can be drawn because of newly differentiated sensory motoric operations. Our attention is drawn to different differences. Thresholds below which we perceive nothing and above which perceive something are shifted.

If philosophers forever ponder the question "Why is there something rather than nothing?" thinkers and researchers from Weber to Fechner to Moshe Feldenkrais have begun to ask and answer the question "How there is something rather than nothing?" In-habiting the world means living in it. A habitat is a house. The Fechner Weber Principle is a habit our species uses to live in this world. The various set points of background stimulation to emergent percept are established by us as learned habits. As Feldenkrais practitioners we can, through the means at our disposal, use our species specific set of habits to reorganize our socially acquired habits. Learning is habit forming.

Mental Furniture #11

The Last Scientist and ...

"All the King's horses and all the King's men could not put Humpty-Dumpty back together again."

In the Mental Furniture articles I've endeavored to portray Moshe as a thinker as well as a doer. Our own studies of the Feldenkrais Method can be furthered by some familiarity with those domains and disciplines Moshe studied *and* mastered. In Moshe's writings and talks we find him mixing together practical, concrete lessons with broad claims for their benefits to humanity. Not mentioned are the strata sandwiched between the practical lessons and the universal claims. In our investigations into Moshe's professional and avocational pursuits, his "mental furniture," we encounter the kinds of generalizations, abstractions, logics of reasoning that are the "scaffolding" used to create "learning how to learn" situations. We can only marvel at the leap of imagination it took to go from what was known and believed about learning and human functioning to the artifacts we now call ATM and FI lessons. In no way will a thorough critical look at the underpinnings of the Feldenkrais Method, at Moshe's influences, and at the work itself not reward the person undertaking it. The path of inquiry is laid down by following one's own interest.

We are poised to enter the next millennium. We can predict, with no fear of being proved wrong, that whatever this century has seen in terms of change will pale in comparison to what's in store for the next hundred years. For our own tumultuous era, the image of an Einstein can be taken to represent *the* personification of genius. In the future maybe Moshe Feldenkrais will come to have a similar stature, not as a scientist, but as the last of that breed and the first of another. Before I make that case, I want to begin with the first scientist: Galileo.

While many great thinkers preceded Galileo, he was the first modern scientist. To Galileo, the book of Nature was written in the language of mathematics. Many before him had used mathematics, especially geometry, to investigate the natural world. Galileo made the unseen world of mathematics the means of investigating, measuring and interpreting the sensible world. He also brought something new and different to the table: thought experiments. The elegance of his thought experiments plus an ability to charm and persuade made him compelling. Galileo convinced others of a way to organize thought and perform experiments that yielded truths at once both universal and amenable to change and further generalization. His persuasiveness got him convicted of heresy while his charm kept him from getting executed.

The popular image of Galileo is of his dropping objects from the Leaning Tower of Pisa to prove objects fall at the same rate of acceleration. It probably never happened. His actual experimentation was brilliantly conceived and executed. More important was his utilization of thought experiment. Galileo, in a thought experiment, imagined two objects falling through a vacuum at the same rate. No such vacuum existed until some sixty to eighty years after Galileo thought it into existence. And, of course, when put to the actual test objects fell as Galileo imagined. By his own admission, the thought experiments Einstein constructed to develop his notion of Relativity owe much to Galileo.

In imagining objects falling through empty space Galileo had to disregard the world as he and others knew and intuited it. Neither he, nor anyone else, has ever experienced on this Earth a feather and a cannonball falling at the same rate except in a carefully constructed environment. Galileo had to factor out the persuasive evidence of his senses which were part and parcel with the sensibilities of the then prevalent world view. The doubting of appearances is the basis for the notion that science is counter-intuitive. Color, temperature, smell, taste and texture have no relationship to considerations of mass and motion as mathematical and theoretical constructs. They are irrelevant. After factoring out the evidence before us and by considering the laws of motion, the motion of objects can be reconsidered. Knowing that objects are drawn to the Earth (as an example of gravitational attraction) at the same rate allows one to account for why in our observations they do not: wind resistance, friction, etc. Newton formalized Galileo ideas and actually to some degree limited them. Einstein gives credit to Galileo for the idea of Relativity, a possibility Newton missed. Galileo reduced the explanation of so much of the phenomenal world to principles that the notion of reductionism began with him and flourished with Newton.

Jump ahead a few hundred years and look in on a young Russian born Jew -- Palestine emigrant, French university educated, Judo trained, lab assistant to Joilet-Curie -- living in London working for the British Admiralty during WWII. Picture Galileo as the bookend at the beginning of science and Moshe the bookend at science's end. At the end, that is, of a certain, pervasive, dominant reductionistic practice of science. Moshe realized that for human life to come to life it must regain it's senses. Moshe was fond of saying that any abstract thought deserving of the name thought could be shown to have it's basis in the phenomenal world. There should be 'instances,' that is, specific

embodiments of thoughts for every general notion. When he personally really needed it, all his scientific understanding and all his practical experience in Judo and other domains did not enable him to place himself fully in the human world. Something else was needed.

Rene Thom, the mathematician, biologist and inventor of Catastrophe Theory, has proposed that a Galilean world view is not appropriate to biological organisms. In fact, he says, responsiveness to differentials of heat and cold, light and dark, wet and dry, smooth and rough, quickness and slowness, to name a few, are essential to understanding how organisms work. Qualities are as essential to biology as quantities are to physics. Qualities are potential and generic. That is, the general possibility of experiencing hotness or coolness is actualized in a particular incident of *this* coolness. What this coolness may *mean* for me is how I *use* it to navigate my world. By again bringing in qualities we situate the living being. Living beings, as they are sentient and seem to want to remain so, require the ability to discriminate between relevant and irrelevant qualities. Moshe used thought experiment to reverse the hundreds of years of devaluation of the senses. His thought experiments reveal the limitations of thought. Those limitations can be lifted by using the senses to flesh out the thought. To steer one's actions by using the senses paradoxically one must first inhibit an action. To hold back from action, to rehearse, to imagine, to do an experiment mentally and then to observe the consequence in action: this is the Feldenkrais Method on many levels at once.

How does one form an image of action to be performed? How does one "remember" an action just done? How can one modify or alter the course of an action while in it? How does an alterable action relate to or impact our behavior? How can we question are own ignorance and not simply add to it? Why bother? Knowing 'that' I do something is entirely different than knowing 'how' I do something. Or is it? To know 'how' implies that I know the 'what' that I am doing. How the 'what' is implicated in the 'how' is at the heart of the clarifying the notion of awareness. Feldenkrais deconstructs the order of scientific reasoning. He uses the thought experiment to end thought. That is, he uses thought experiments to link thought with action and action with thought. Thought and action, both alterable, both linked, are put at the service of constructing a life. Historically, much of the linking of scientific thought to action has been in the service of warfare. Galileo helped develop cannons. In Moshe's linking of thought with action we have the means whereby we can stop waging war against ourselves.

In what Heinz von Foerster has called the shift from "observed systems" to "observing systems" questions about the observer as well as the thing observed get bumped into a whole new world of inquiry. 'Observing' is not a thing but a way of acting. And now, at the end of the millennia, it is respectable to hypothesize enactment as knowing, cognition as action. Moshe anticipated this development and left hundreds of constructs, i.e., ATM lessons, to deconstruct 'observing.' But, in the end Moshe Feldenkrais was undone and redone by his realization that human behavior is not only action, only thought, only feelings, or only sensations. The very idea and image of a self is, when thoroughly reconnected to thought, action, sensation and feeling, not a solid thing or an ephemeral nothing. It is but the realization that, "In those moments when awareness succeeds... He grasps that his small world and the great world around are but one and that in that unity he is no longer alone." (pg. 54 Awareness Through Movement)

If there is to be any Grand Unified Theory of Everything then there must be some way to test those theories. I suggest that the tests already exist and that we are waiting for the theory. Top thinkers from within science have asserted that the current paradigm of science is at an end. When science

turns the corner, transforms itself, gives itself another name then perhaps the new Book of Nature will be written in the language of sentient movement and enacted ways of knowing. The science of "brute facts" discovered by a detached observer is giving way to artifacts of knowing invented by the participation of engaged observers

Mental Furniture #12

Speransky: A Basis for the Theory of Medicine

From Body and Mature Behaviour. "The most fundamental property of the scientific method is that it always leads up to a point where only experiment, i.e., confronting theory with reality, gives weight to the true argument and then discards the others that may have seemed equally or more plausible. It generally brings to light phenomena that were considered trifling and unimportant.

"We are not surprised to find that we know in fact very little of the properties of the nervous tissue, and discover with Speransky and his school many unexpected phenomena. For instance, the body reacts physiologically almost as a fundamentally new entity after certain irritations of the nervous tissue. (4-5)

"[Speransky] has built a theory of medicine on these premises, namely, that the reaction depends on the sum of irritations of the system preceding it; the nervous system reacts as a new entity after each irritation. (26)

"One thing seems to be established beyond doubt, namely, that the previous history of a particular nervous system, i.e., the kind of irritations it has actually undergone, has the most profound influence on its biological properties. ... Owing to the unique capacity of man to form new responses, the kind of irritations to which every nervous system is submitted, varies from individual to individual. The responses of each nervous system are therefore different even to identical physical, chemical, or any other stimuli. Closer scrutiny throws singular light on human nature and behaviour." (157)

New theories about the nature of life, the nature of the universe, and the nature of consciousness can be found everywhere. Each new theory proclaims itself to explain nearly everything and thereby to constitute a new world view or paradigm. New paradigms -- Buddy, can you paradigm? -- are de rigueur. The new paradigms rely on the mathematics of non-linear dynamics to describe the surprising, sudden and seemingly a-causal qualitative shifts in a system. Non-linear dynamics are the basis for Chaos theory, Catastrophe theory, complexity theory, fractals, strange attractors, neural darwinism, autopoiesis, etc. It is seen as the key to understanding the spontaneous emergence of qualitative different processes, properties and forms in living and non-living systems. The various theories deal with how life or some part of it came about and what it is. Some of the hottest new theories concern the notion of self-organizing systems. By appealing to the notion of self-organization the conditions for the emergence of life forms and their temporal existence can now be specified. For example, the Santiago School of NeuroEpistemology and its proponents Varela, Maturana and von Foerster have given us the notion of autopoiesis, self-making, to describe the realization of a living entity on its own terms. Autopoiesis specifies the way an organism is bounded and how that boundedness can maintain itself in relation to a medium (the milieu in which it appears). Their rigorous description of the character of any living entity and its relationship to

other entities has shifted the primary emphasis away from the species as the engine driving evolution and onto the individual. In older evolutionary theories individuals were seen as dispensable to the greater good of the species. In autopoietic theory, individuals are not dispensable but central to evolution.

If an individual and its behavior are so important then surely there must be some post-modern notion of what constitutes a state of health and a state of pathology for any individual. But, here we see that modernity and post-modernity are woefully deficient in producing such notions. Consciousness, normal or altered, is explained without reference to the well being of individuals. Edelman's neural darwinism, for example, explains the plumbing and wiring of consciousness and the importance of the nervous system in its particular relationship to the organism yet deals not at all with what it means to live a life, a particular life, your life or mine. But to find someone who poses questions related to defining health and pathology, who looks to study those actions constitutive of a healthy mind and body we must go to early part of the 20th century.

Moshe Feldenkrais often spoke with admiration about Russian researcher and theorist A.D. Speransky. When reading Speransky's book one is initially faced with grim, gruesome and grizzly accounts of experiments that nearly all have the same result: the test animal dies. Animals have their brains chopped up, frozen, and traumatized in all sorts of ingenious ways. Pages and pages of slightly differing experiments are catalogued. But, the grim task of reading becomes a sort of detective story of ever increasing interest. We travel back in time to Russia in the Twenties and Thirties. Hard questions about pathology and health were being asked and put to the test. Numerous twists and turns along the way led to some very startling propositions being put forth.

In one series of tests dogs are given morphine and after the morphine takes effect portions of their brains are frozen. After the morphine wears off the dogs' health cascades downwards in stages that mimic epilepsy. But, freeze the brain without morphine and the dogs pretty much recover just fine. Is the morphine a shock to the system? The animal recovers when morphine is given at the same time as the freezing or nearly so. Is time a factor? Give morphine long enough after the freezing to constitute it as a separate perturbation and the same results are obtained as when the morphine is given before the freezing: the animal falls into a horrible, seizure punctuated decline into coma and death. So, the system recovers from one shock but not two. And, the system that succumbs is a different system from the one that recovers. Smudgy Karma aside, the experiments give rise to serious questions about the nature of health, of pathology, and the role of the nervous system in all functions of an organism.

The question "What is pathology?" Speransky says, is as unanswered as the question "What is health?" Theories from physiology, biology and other sciences relating as they do to organismic functioning are not theories of health or pathology. Medicine has no theory, or rather it has many theories borrowed from other disciplines. Either way the result is the same. Ten years or so ago I heard an esteemed lecturer say the same thing at a U.C. Medical School lecture. Medicine as an art is a lot older than what we now call the scientific method. Empirically proven medical approaches whether allopathic, homeopathic, acupuncture or herbal, no matter how effective, have no theory in the modern sense. That is not to say they're not systematic or even logical, but only that the bases for their successes are without theoretical foundation.

From Speransky's A Basis for the Theory of Medicine: "..Disease was never looked upon as an independent quality, as a special form of biological processes; the starting point has always been

formed by conceptions of a contrary nature. Taking as an indicator one or more groups of complex reactions that go to make up the conception of normality, disease was conceived as a distortion or alteration of these conditions. From this, it was rightly concluded that to understand a disease, it is necessary to know what is normal.

"But we have also no suitable means of approaching the concept of normality. ... We cannot define disease as the antithesis of health, since neither side of such a medal bears any imprint.

"At the present stage of science, what has to be done is to look for the qualitative distinguishing features within each of these conceptions. It seems to me, that as far as disease in a complicated organism is concerned, we have succeeded in solving the task. The form in which the nervous component of the pathological processes makes its appearances does not occur under normal conditions. The pathological conditions are characterized by new reactions. The presence of the latter is evidence we are dealing with a real pathological process. Consequently, it is neither the disharmony of phenomena existing in normality, nor the disorganization of correlation in the functioning of separate parts of the organism, that defines its pathological state, but the emergence of new qualitatively distinct processes. The disorganization of correlations, disharmony, etc., are only a consequence of these last.

"There is no doubt, of course, that the basis for the development of neurodystrophic processes in the organism lies in the peculiarities of structure and function of the nervous system, i.e., in its physiological properties. But their distortion creates, as it were, a new type of nervous activity, the appearance of new reactions, not only unnecessary but directly harmful to the life of the individual. Hence, the question is one, not of degree, but of form, in other words, of qualitatively new biological phenomena."(198-9)

In Body and Mature BehaviourMoshe Feldenkrais takes Speransky's argument concerning the domain of pathologies relating to poisons, viruses, bacteria or physical trauma and extends it to the psycho-physical dynamics of human individuation. Cannot we assume, he hypothesizes, that the pathologies of everyday life, i.e., various neuroses, will follow the same dynamics laid out by Speransky. And those dynamics are that the nervous system is really and truly different in subsequent moments in time; that the same perturbation will affect the system differently at different moments; that different perturbations may yield the same response; that pathologies are not health plus some disturbing agents but self sustaining autonomous nervous system patterns; and that health being undefined needs some examples to study, e.g., Yogis and Judo masters. What means does Speransky employ that Feldenkrais builds upon?

For Speransky the problem begins with trying to find indicators of health or pathology more subtle than whether the animal is dead or alive. He has data galore but how is he to make sense of it? "... Analysis alone is not enough for setting the data in order, for systematizing them and creating a working hypothesis. Synthesis is required. ... Confusion in views does not depend on lack of details. ...We have to define the principles which at the given moment are best capable both of unifying the data..." (405, Theory of Medicine). To see the forrest above the trees, to seek a point of view from which to make evaluations Speransky seeks to make the case for a unifying view by generalizing from his data. How exactly are a black rabbit and a white rabbit different or a tall man and a short one different? Appeals to blood chemistry, morphology or whatever merely maintain the same statistical principles. At whatever scale there are indicators meaningful to some discipline. But, taken together what do they indicate about health or pathology? While there is no shortage of signs

signifying something to someone the essential nature and mechanisms of phenomena are elusive unless the search takes a different path. Speransky, having disabled answers and theories that lead nowhere new, finds hints in the questions he can now ask. All the indicators in all the allied disciplines whether formal like physiology and biology or methodological like clinical medicine intersect in being related to an emerging image and concept of the nervous system.

Speransky's conceptual leap was practically arrived at through thoughtful experiment. For a theory of medicine, to start with the central role of the nervous system "makes it possible to give suitable arrangement to all other facts, to find the proper place for each constituent and to determine the order of functioning of the separate parts." (401, Theory of Medicine) Speransky's characterization of health and pathology as emergent self-perpetuating states anticipated much theorizing now current. His thinking led to him being able to create pathological states mimicking certain diseases. He was also able to demonstrate that pathological states could be interrupted and health returned not fighting the irritant but by changing the state.

For Moshe Feldenkrais, Speransky's hints at the interdependence of all phenomenal indicators on nervous system functioning gave rise to his idea of mature behavior. Such behavior is not constituted by any of the many external indicators, e.g., societal or religious standards. Unique and dynamical patterns of neurophysical action whether neurotic or potent make up behavior. Mature behavior is that state of health that permits one to recover from the slings and arrows of outrageous fortune as well as to form and live a vision of life on one's own terms. A state of health is not achieved by treating parts of a system but by effecting a global change of state which connects the world around one to the world within one