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 its 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. 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 excitement 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 'interiorize' 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 anything 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.