Organology and Physiology of Learning
Aspects of an Educational Theory of the Body

by

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Physiological aspects of young children's drawings

The scribbly drawings of young children are very helpful if one wishes to study the interaction between physical development and the direction taken in inner activity. In spite of considerable individual differences, we see characteristic themes recurring at particular ages.[1,2]

The first drawings are uncontrolled vortices coming from the motor functions of a small hand moving in circles, the movement of life. (Fig. 1) Rocking hand movements produce tracks that move to and fro. The nature of the forms is partly determined by the structure of the joints and the degree to which hand and arm muscles have matured. The many variations seen in the second and third years of life, soon with highly expressive forms, will not be covered here.

Fig. 1
Vortical glomus drawn by a girl aged 22 months

The middle or end of the third year is of vital importance. Let us consider what happens when a young child stands at a small table, breathing hard, and awkwardly draws a curve on the paper (Fig. 2). Using every ounce of concentration available, the child endeavors to make the line, however, uneven, close up in a circle. Now the breath is let go, indicating deep satisfaction, for something has been achieved. An enclosed space has been set apart from the world of infinite possibilities. The child will try again, and yet again, as if to

confirm the achievement. For some days circles are drawn on one sheet of paper after another. This is also the time when a child begins to say "I" to her- himself with meaning, discovering him- herself to be something that does not exist again in the same way and stands out from the whole world around it. The child has been an "I" for some time, but only now becomes conscious of this.

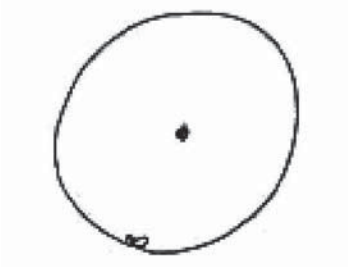

Fig. 2
Circle tied with a knot, drawn by a girl aged 3 years, 3 months

The cerebrum increasingly matures at this time, with the development especially of myelin sheaths in the cortex.[3] The skull bones are progressively uniting. The fontanelles finally close in the first year, and at 2 $^{1}/_{2}$ to 3 years the frontal suture closes,[4] and from then on there is a single frontal bone, a bulwark to the outside. The young child's consciousness, still identifying with the environment, feeling secure in it, withdraws behind the closing bulwark of the frontal bone. The first phase of defiance begins. The closure is a desired result that clearly also shows in the drawings. After the third year, the chest organs mature increasingly. Breathing, which until then has been diaphragmatic, gradually involves the whole chest going up and down as thoracic breathing develops. The thorax, more rounded and barrel-shaped in babyhood, changes, until it is greater in width than depth. The trunk flattens frontally, and this actually gives it a frontal aspect. At the back, changes occur in which the spinal column is fully developed. We need not go into its fairly complex embryology.[5] It is merely important to note that individual vertebrae do not—as one might assume—derive from a single somite but always from parts of two different somites (Fig. 3). The anterior vertebral body derives from the upper part of the lower somite, the posterior vertebral arch from the lower part of the upper somite. The body extends upwards; the arch, enclosing the spinal marrow, comes to be at a slightly lower level. At birth, the two parts that will be one in future have already reached the same level, though calcification is still separate. Body and arch only unite firmly and finally between the third and the end of the fifth year, with a single vertebra produced from two separate structures, one of the many that make up the spinal column.

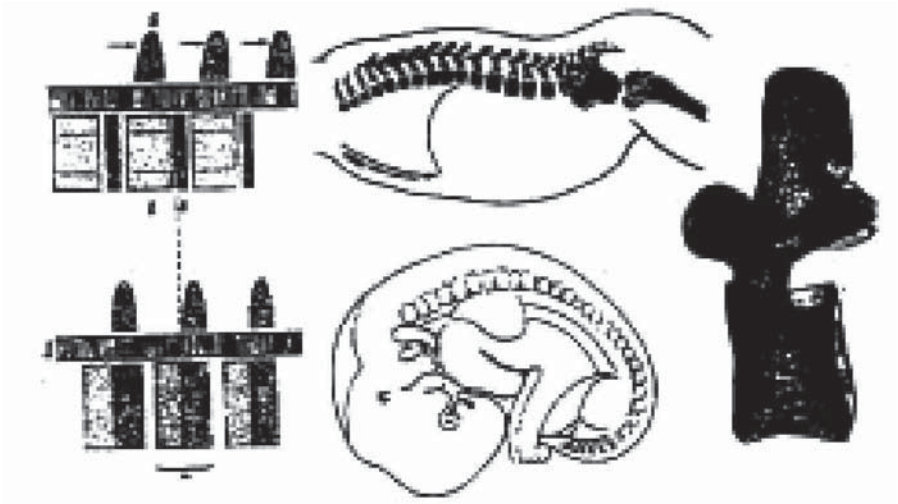

Fig 3

Development of spinal column. Left center: Human embryo in week five with 33 somites along trunk, top left: Every somite (S) has elements from which the body of a vertebra (Wk), the vertebral arch (ft) and the intervertebral disk (Rs) develops; Rm spinal marrow. Body and arch always come from different somites. Top right: Displacement of elements. Right center: In the spine of a boy aged 18 months, vertebral bodies and arches have been at the same level for some time but not yet fused. Below: Upper lumbar vertebra, fully fused. X-ray showing trabecular structure in adult. [6,7]

The child knows nothing of this, of course. It is remarkable, however, that the drawings made at this age often include “ladder people”. (Fig. 4) The trunk shows a sequence of rungs, or looks like a tall tower. The head at the top indicates that this is definitely a human form. By far the greater number of all pre-school drawings show more or less recognizable human figures. The human form is the main theme. They always have a head, even if it comes right on top of the legs. In the fourth and fifth years it becomes increasingly important to draw the trunk as well. The “ladder trunks” seem to indicate that the child unconsciously draws the ossification of the spinal column which has just come to its conclusion in physical development. Initially utterly unconscious, a process brought to completion in the body, this clearly rises up spontaneously in the images that live in the child’s mind and soul. This physiology of learning is not learned from adult culture but from the essential nature of the child’s own body, with the psyche clearly still closely connected with it.

Fig. 4
Two "ladder people" drawn by a boy aged 4 years, 5 months

This connection still seems to persist during the later pre-school age. Somatically we have massive restructuring of the whole form and figure, something Zeller called the "first change of form." Where do we see the indications of this?

Let us again consider physical and organ development. Approximately after the child's fifth birthday, in the sixth and even more rapidly in the seventh year, the limbs catch up on their delayed early childhood development. Active growth may begin in the feet or hands, and soon involve the arms and legs as well. The shape of the trunk also shows obvious changes. The round infant's belly disappears as the waist develops. The fat layer generally decreases with intensified metabolism, the muscle profile and angular forms of joints become visible under the skin. The whole form grows more slender. The lower thoracic line, until now an obtuse angle, grows acute, the neck gets longer and thicker. When these processes begin to involve the head, the physiognomy changes, with the rounded forehead flattening out, no longer forming an overhang above the face. The mouth region grows more actively, creating space for the permanent teeth in the jaws, which now take on more definite shape. In this final phase of early childhood, the young child is creating a new form of existence for itself by restructuring matter and form.

Children seem to reflect this restructuring phase in drawings that are like snapshots. Still monistic, it appears that organotropic elements slip into pictures reflecting the outer form. The scribbled people now often have extremely long legs and arms, feet, and hands with gigantic fingers.

The relationship to the environment also changes. Drawings now show a scene, a story. Sun, trees, houses, and so forth, may still have a great deal of hidden human configuration with face-like physiognomy at this transition stage, but the theme gradually comes away from unconsciously reflecting the self. The environment becomes a statement for its own sake (Fig. 5). This also indicates that the child is beginning to be ready for school.

It has frequently been noted that creative productivity, so richly imaginative until then, tends to lessen between the sixth and the end of the seventh year. Something of the bubbling freshness has gone. Children will then more often become silent onlookers, rather than be constant activists in their world. This was interpreted as lack of stimulus in nursery school and at home by people who lacked insight into physical development, and they would ask for the children to start school early. Yet the situation is usually different. The child's activity aspect continues without a break but it is temporarily addressing the physiological restructuring of the physical form and is less available for extrovert fantasy production.

FIGURE 5
Early drawing showing a scene. Mothers going for a walk with children and push chair. Drawn by a girl aged 5 years, 2 months.

A similar, even greater degree of introversion is seen in puberty when a major growth phase occurs. Again, periods of disharmony are a necessary precondition for greater autonomy later on.

The artistic pause in late infancy is anything but a pause in the maturation of activities directed towards the living body. It is evident that energies for this are withdrawn from the sphere of inner activity. If too much is demanded in the realm of the psyche, this interferes with physiological development. If we ask too early for one-sided progress in cognitive ability or the like, we endanger physiological stability. The period of transition does not end until the rounded body of the young child has changed to the much more slender form of the schoolchild. It then gives way to a qualitatively new desire to learn that is distinctly more focused.

Physiological basis of different forms of thinking

The massive growth phase for the whole skeleton thus also appears to be a specific physiological precondition for upper school learning achievements that

are increasingly based on perception and understanding. Until now, thinking capacity has been far too often considered to be solely bound to brain physiology, which certainly contributes. But apart from the brain the skeleton is also an important basis. Its supportive function has fully developed between 20 and 25 years of age, when the epiphyses finally unite with the shafts of long bones. Full body size is achieved; we are "grown up."

In this paper we are constantly going against the accepted view concerning body and soul, which is that the res extensa and the res cogitans are essentially incommensurable. To the modern mind, quantifiable and qualitative aspects do not go together. Yet in reality they are two aspects. The conscious mind needs the split to stand apart from world reality. Development of primary consciousness is indeed always connected with alienation from the world at large. It is, however, fruitful in science when this hiatus is bridged at moments of insight where things are consistent. In our experience insight happens in our own conscious mind, giving it more than it would be capable of achieving on its own, without encountering the world. In fruitful insight, the primary alienation from the world is canceled out, at least for a moment. Fruitful thinking is one of the most important remedies enabling humans to heal the great divide between subject and object. In the pre-knowledge state, human beings are monistic, at one with things. Knowledge comes with the subject-object divide. It finds its central goal in overcoming the division with a monism that has become aware of itself through dualism.

Linguistic syntax does, at least in Western cultures, call for division into subject and predicate, usually with an object as well. The monistic experience is then immediately put in a context where the subject-object hiatus applies. Exactly the same happens, though more so, when systems, schemes, models, or even a formula become the end product of the process. If we consider not so much the content but the process, the discovery made at a moment of insight is soon deprived of its potential richness of references, reducing reference to known thought masses. These are enriched, but the discovery itself is limited to something fixed; it has been reduced to a formula. It is evident that this involves a necessary process of diminishing vitality, subduing dynamics that may well come as a shock in the first moment of original thought, so that something can be safely said to be unchangeable and made a "law." This death process going towards neutral values for dynamic mental contents has two advantages for the conscious mind. A kind of selective process has reduced the overabundant dynamics of the discovery to manageable proportions, and it is in fact only because of this that the content can be remembered.

On the basis of this experience, which without reflection is often felt to be painful, the death process will often only be gone through reluctantly or not at

all. Nietzsche described this psychological and emotional aspect of dealing with his own thought discoveries as follows: A matter which resolves itself no longer concerns us."[8] Thus it happens that many people have an abundance of intuitions, but generally are not aware of them, because they do not enter into the process of "fixing" them in words, concepts, and memory, so that they are soon forgotten.

The brain is considered the physical organ of thought, especially the cerebral cortex. This is borne out not only by specific losses sustained when the cortex is diseased or injured, but by the above characteristics of the relevant thinking processes if the physiological nature of the thought organ is considered in this respect. Cell division in the brain ceases completely at approximately the end of the first year of life. From then on there is no further division, but only the daily death of nerve cells throughout life. Nerve cells have a rapid metabolism and depend on a good blood supply. Glial cells in nerve tissue also have a supply function. Yet ultimately nerve cells die quickly once their blood supply has been cut. A limb can be tied off for an hour without permanent damage, the brain only for a maximum of three minutes. After that, corpse development is irreversible. Physiologically, the cerebrum is thus always on the border of becoming a corpse, and the same happens in homeopathic doses, as it were, in the daily cell deaths.

The situation is different in the autonomic nervous system (visceral nerves), which functions at a wholly unconscious level. Here the capacity for cell division persists throughout life. These nerves lack the myelin sheaths that are important to us in the present context. Myelin sheaths develop in early childhood, initially in the nerves that innervate the organs we are able to use at will (sense organs, skeletal muscle, etc.). Neighbouring cells cause cytoplasm to spiral around the neurites and then become enriched with fat-like substances (neurolipoids).[9] These are known to be extremely passive metabolically, unlike other body fats persisting even in cases of malnutrition. Here, then, metabolism, the basic property of life, has largely come to a standstill, which is the demonstrable precondition for mentally conscious, will-determined ability to use one's own body.

The physiological nerve substance is the functional correlate of the form of thinking where living dynamics of mind and spirit are fixed in terminology and concept or in formula-like systematic fashion so that they will be essentially unchanging and can be recalled at will.

It is a characteristic of brain-bound consciousness that it is all the clearer the more it is based on ideas. With regard to content, ideas are the recapitulation of what we have perceived, not the percepts themselves. They create a second, inner world in addition to the real world we perceive, and we know very well that this second world does not hold percepts. This gives it both worth and un-

worth. An idea we have of something always causes alienation, but also frees us from the power of the reality perceived; we are thus only able to make free use of this world if we are aware of the limited nature of its relation to reality. All thinking based on models in the sciences depends on this.

The physiological correspondences are an interesting aspect. The alienation from the world immanent in such thinking is evident even in the biology of its organ, the brain. No other organ in the human body is topographically and functionally shut off from the surrounding world to the same extreme as the brain. The blood circulation with the substances it carries enters into all organs, but has to pass the highly selective blood-brain barrier before it passes into the brain, and this allows the brain to have only a selective share in the metabolism of the rest of the organism.[10] If non-physiological substances pass the barrier (alcohol, drugs) the autonomy of consciousness will break down as an immediate consequence.

The brain is shut off not only physiologically but also organologically. With its closest appendages (labyrinth of the ear, pituitary, etc.) it lies in a closed bone capsule surrounded by three meninges (pia, arachnoid and dura mater). The middle one, the arachnoid mater, holds the cerebrospinal fluid which causes the brains weight to be largely counterbalanced by buoyancy, particularly also because of its myelin fat content. The thick scalp covering the cranium, and the hair, also give somatic expression to the complete isolation of this central organ from the surrounding world.

The movement life of trunk and limbs relates much more directly to the surroundings, being actively involved in them. The head only has a minimal part in the motor functions of the postcranial organism. Even in sports, the head is kept as still as possible; otherwise one loses the necessary distance from events. Ultimately the actual topographical position of the head keeps it well away from contact with the ground, establishing maximum distance existentially. The organs of the distant senses, which are centered in the head make up for this to some extent. We shall come back to them later. They convey percepts, not concepts.

The structure of ideas as “reductive” recapitulation also exists at somatic level in the relation of the cerebral cortex to the body. The whole musculature serving locomotion is connected with the brain through sensory nerves. Specific nerves go to specific areas of the cortex. The areas are arranged in a way that the whole locomotor human being appears on a smaller scale on the posterior margin of the central sulcus (Fig. 6). Neurologists call this the “homunculus.” But there is more. In character with the nature of the feeling sphere—separate from the rest of the body—the head’s feeling sphere appears as a kind of potentized recapitulation of the self in a separate part of the cortex.

Fig. 6

Below: Central sulcus (black) between the temporal (left) and occipital poles. Its posterior aspect is the location of primary somatosensory areas of the cortex. The term primary is used for (congenital) functions that need not be learned. Above: Diagrammatic presentation of fields relating to different pails of the body in a section of the hemisphere particularly sensitive to touch need larger areas than those less sensitive.[11,12]

To sum up, the functions of the conscious mind that occur via the brain, specifically thinking that involves ideas and concepts, consistency of memory and systematization, show the qualitative gestures, which on introspection are seen to be reflected in the phenomena apparent in their physical instrument.

This raises another question. If devitalization is the essential relationship between thinking capacity and its physiology, organs other than those of the central nervous system may also be part of the physiology of thinking, i.e., all organs where physiologically catabolism is dominant. Consideration would have to be given to the degradation products, which may even be water-insoluble crystals, biominerals as we might call them.

The human organism contains metabolic products capable of crystallization and these crystallize to a considerable extent even within it. Bone substance is a case in point. Apart from calcium carbonate it mainly contains calcium hydroxyl phosphate as an inorganic compound. Structural x-ray analysis has shown that the lattice is the same as for inorganically developed crystals of the same compound. Once precipitated it has therefore dropped out of life. Its relationship to the surrounding metabolism is, however, very different from that of myelin sheaths in the brain's white matter. Their half life is relatively short, at least in the trunk and extremities. Individual trabeculae are consecutively resorbed into the blood, to crystallize out again in another site. The skeleton of the trunk is thus continually under reconstruction, with trabeculae not subject to pressure or tension always destroyed rather than created. As a result, the skeleton is always

in a state of best possible availability for a given situation (Fig. 7). Four weeks on a sickbed, when the supportive skeletal organ has been used relatively little, and trabecular structures, organized on static principles, will have been thrown into considerable chaos and become matted. Reuse will restore order within a few weeks, so that the minimum amount of material gives maximum static load capacity. The form and fine structure of the skeleton are thus continually created by its functions.

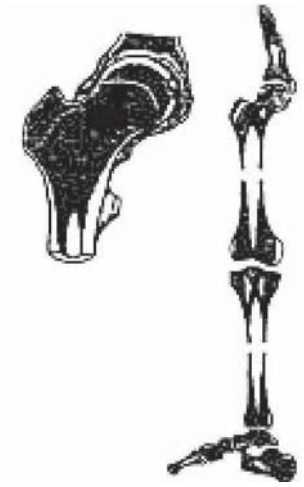

Fig. 7

Left: Section through hip joint. Trabecular structure of spongy bone tissue is arranged according to pressure and tension.
Right: Architecture of spongy tissue in lower extremity, pelvis to foot.[13]

Significantly, this applies above all to the appendicular skeleton and less to the head. The latter is not much subject to pressure throughout life but ossifies well in spite of this. Indeed the cranial vault ossifies while the developing child is still not subject to gravity, floating in the amniotic fluid before birth, and continues to do so rapidly during the first 18 months of life, so that the head will have reached 80% of its circumference by then. The axial, and especially the appendicular skeleton, is still largely cartilaginous at that time, catching up step by step on ossification with active use in the sphere of gravity. The last epiphyses only unite in the early twenties. Indeed, this skeleton is never finished. It continues to restructure, depending on use. The bones of the head, however, change very little.

It may seem strange to have such extensive somatic details presented in an educational context. Readers may have noted, however, that we have been considering something that bears the hallmarks of live, creative thinking. Let us return to this.

We have already described some characteristic aspects. This kind of thinking cannot be achieved at once, but needs an extended period of unceasing, often indeed tormenting, strenuous effort in working with the questions that arise. The fruitful moment of finding the new solution often comes as a surprise, taking one aback, because it comes quite suddenly from a totally different direction or is found at a completely unexpected level. It does not have to be like this, for the experience may also be of a dense fog lifting, when one has already had some idea that this might happen. In any case, the moment always involves the experience of things "clearing," with not only the problem area itself illuminated but also the surroundings. The fruitfulness of the new idea is seen in a panoramic view.

This cannot be the end of the process in which insight is gained. Two more steps must follow, otherwise the first two—effort and intuition—do not serve much of a purpose. The next step is to achieve the recall facility, which with this kind of thinking is distinctly more difficult. The individual concerned will often no longer know even a short time afterwards what had been so crystal clear just a moment earlier. As we said, people have more creative ideas than they think, it is only that they tend to forget them immediately. It is often necessary to retrace the whole route that led to the thought, doing so of one's own will in the soul sphere, before the crucial thought that had been discovered is found again.

A characteristic of contents that are difficult to remember is that they were conceived in the wordless realm. Words have to be found to put a name to the new discovery, or we may even say that it cannot be put in words. It will therefore also be necessary to bring those contents into thinking in words. Approximately the right words must be found to express what initially was beyond words and seems beyond speech. This may be done in an inner thought dialogue, by talking to someone else, or by writing it down so that it is available for future reference.

This is not all, however. Such thoughts in particular tend to have a kind of life of their own as time goes on. I am the one who is thinking them. But the part of me that maintains a questioning, searching attitude will make it possible for the statements made available piecemeal in the previous step to be broken up and melted down again, restructured and extended, so that they gain in potential and relate more and more to reality. The form into which the thought was first poured is also recast again and again. It grows as the individual grows in mind and spirit. More than an axiomatically certified thought-cosmos arises, more than a system, more than a philosophy complete in itself—a life of thought that again and again seeks to approach the reality of a world that is in continual metamorphosis, and finds it, thus entering into the sphere of practical life.

It may then also be assumed that important parts of the qualities perceived—that long, slow evolution of the problems, followed by clear intuition, momentary stability of content, followed by earlier thought forms breaking up and becoming fluid—have their organic substrate not only in the cerebrum but also in the skeleton. It may be especially in the part of it connected with locomotor function, the extremities. These not only maintain maximum flexibility throughout life but also show the gesture in the anabolism and catabolism of their calcium salts, that reflects continuous processes of living thought and understanding for practical life. The thesis does, however, call for some elucidation.

The connection between rational thought and cortical differentiation has not been in dispute since its discovery by phrenologist Franz Joseph Gall in 1922.[14] Today, the left cerebral cortex is believed to be connected with it, the right cortex on the other hand with the capacity to feel and experience. This does, however, call for more careful differentiation. The right cerebral cortex is the organ for feelings becoming conscious, so that we may know we have them. This in itself means a capacity to gain distance from one's feelings; it is not unreflected living in one's feelings. Similarly, the right cerebral cortex is merely the instrument for conscious awareness, not the mediator of feelings as such.

A more difficult assumption is that a connection exists between dynamic, intuitive thinking and the extremities. Apart from the above reference to the physiological gesture in the appendicular skeleton, it may help to consider sensory perception relative to the extremities.

Sensory perception may be observed at a number of levels. Let us take two of these, the physical and the psychological. Physically speaking, perception through at least the distant sense organs (eye, ear, smell, etc.) involves the effect of stimuli originating outside the body having an effect on sensory tissues (retina, basilar membrane, olfactory epithelium). The physical process and the chemical process which follows it within the body are centripetal, from outside to inside. Psychologically we have the opposite and complementary gesture. The world of our own inner awareness addresses itself more actively to the world content the more intense the activity of perception. The physical process is receptive, and all the more successful the closer the organism allows it to stay to its inherent nature. The intentional process is centrifugal, and all the more effective the greater our personal activity in directing will, attention, and interest. This also intervenes in the world around us, but more in the realm of conscious awareness, just as human beings use their physical organization for personal activity when they use their limbs to a purpose.

A close connection exists between limb organization and sensory organism. What they have in common is that like no other organ they connect the human being as a whole with something he is not, the surrounding world. The act of will, mediated by muscle in locomotion and taking effect, has its counterpart in the physically reduced functional sphere of the sense organs through which we also reach out into the world around us. In this sense, the senses are limbs which are reduced at the level of the physical body but augmented at soul level.

The potential objection that the above thesis excludes children with handicaps affecting locomotion from a more mobile form of thinking now becomes a question, which we feel has real meaning. Might one not observe if children who are spastic, for example, intentionally bring their functioning senses more strongly into play, as a kind of limb extension, so that this actually makes them even more the psychological basis for flexible thinking?

The educational aspect is of interest here. If the cognitive faculties of pupils are to be deliberately influenced, teachers face the task of normalizing the way human beings use their thinking capacities. Exclusive use of essentially brain-bound thinking means that the life of thought proceeds largely separate from the sphere of experience and real actions taken. Anything formally perceived will not by itself result in actions being taken. Insight and day-by-day activity are then so far apart that self reproach for not doing what one considers to be right will prevail in adult life.

The I is only able to identify with its thoughts and indeed actions if it has had a part in developing concepts in direct encounter with the world. The logic developed through practice, in actively meeting the world is of prime importance in child-oriented methods. Pestalozzi developed the beginnings of this.[15]

The arms and hands are constituted in such a way that the proportion of muscle and hence the ability to act out one's will increases much more, vitalizing the sensory functions that go through fingers and hands in the characteristic, feeling-imbued way. We all know what it means to be able to touch a sculpture not only with the eyes but also the hands. Perception is more direct and therefore stronger. A handshake makes a human encounter more committed, giving it warmth, than greetings from a distance that go via eye and ear.

What happens inductively via the organization of legs and feet? Contact with the surrounding world is much more intense even at a purely physical level. Unless we are resting we are in continuous contact with the tactile qualities of the soil through our feet.

Hands have the potential for making contact, but we are also able to keep our distance. With the feet, our relationship to the real world is greatly

concentrated, usually without the distant head sphere of awareness taking real note of it. It is the lower extremities, which are in continuous active encounter with gravity. Through them, we actually merge functionally with the demands of the surrounding world. Seeing a landscape from a car and walking through it on one's own legs is known to give a very different intensity to our experience of its reality. Not only the limbs in general, but the lower extremities in particular are organic preconditions for moments of learning and mental effort when we are able to come closest to reality.

Helmholtz wrote on the basis of his own experience that good ideas "will often enough enter slyly into the sequence of thoughts, so that we do not immediately recognize their potential. . . . In my own experience they would never come when the brain was tired, or sitting at my desk. . . . They would often . . . be there when I woke in the morning, something Gauss has also noted. But they would be particularly apt to come . . . when I was taking a leisurely climb through wooded hills on a sunny day." Gauss once described the wonderful moment when the solution came by saying that he actually knew it beforehand, adding: If one only knew how to get there![16] Careful observation had thus shown him that the conclusion, which comes at the end of the logical construct, is already immanent at the fruitful moment. The judgment which bears it out, with the thinker making the idea positively his own, also tends to follow. Yet it still needs conceptual clarification and fixing of the idea before we arrive at insights we are able to recall and use.

Practice to intensify sensory perceptions has the limb quality, which was characterized earlier as access to develop living understanding. The "conclusion," here primary, as concept-free connection with reality leads to judgments, and only these then lead to naturally evolved concepts that are close to reality and filled with life.

The Aristotelian logic of "concept ⩾ judgment ⩾ conclusion" thus needs to be complemented with its opposite, "conclusion ⩾ judgment ⩾ concept," which otherwise remains unconscious and unreflected, and has to be clarified concerning the condition of prescience.[17]

If a child is merely given a concept of what is right, and is then asked to act on this, intellectual distance is evoked and the action performed without the child identifying with it. Observation and the above analysis show that alienation from one's own body is existentially encouraged by this. Deep layers of the inner life such as will and feeling do in the long term either normalize or disintegrate vital organ functions, as has been shown in depth psychology. In the mid-70s, "school is unhealthy" was a general topic considered at least for a short time.[18] According to a representative poll of young people in North Rhine

Westphalia,[19] it is doubtful if, and to what extent, discussion of the topic proved helpful. Four-fifths of the 13 to 16 year olds questioned had problems at school. Many presented with psychosomatic symptoms such as digestive disorders, allergies, headaches, nervous restlessness, back pain, vertigo and difficulties in concentrating. forty-five per cent said they took headache remedies. One out of ten was taking cardiovascular medication, sedatives, or hypnotics. School certainly cannot be made wholly (or perhaps even primarily) responsible for this, but in view of the above we might nevertheless consider provision of an education that is more relevant to the body and seek to determine potential measures to be taken. We suspect that mental operations are in many respects interacting with the physical body and their effects are serious because they set the constitution for life at a time when the body is still pliable, in a process of growth and differentiation.

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