

# ANTHROPOLOGY AND THE THEORY OF MEDICINE

THURE VON UEXKÜLL

*University of Ulm,  
Germany*

**ABSTRACT.** Instead of presupposing reality as the “realists” do, a genetic theory of knowledge attempts to understand scientific knowledge through the psychological origins of both the concepts, and the operations on which these concepts are based. Adopting the viewpoint of genetic epistemology, the envisaged theory of medicine will have to perform a threefold task: (1) A revision and reformulation of the psycho–physical problem and the development of a model for the living body; (2) A revision of our views concerning the relationship between humans and the inanimate and animate environment; and (3) The development of a concept for the construction of individual reality and its consequences for the patient–physician relationship.

*Key words:* genetic theory of knowledge, living body, patient–physician relationship, relationship humans and (in)animate environment, the psycho–physical problem, theory of medicine

I would say the following about a scientist: if he comes across a gap in our knowledge he will not flee into the supernatural. That would in fact mean panic, fear of the unknown, which we do not recognize as scientific.<sup>1</sup>

## 1. THE QUESTION OF THE STARTING POINT

The question whether the sciences have brought us closer to a solution of the great mysteries of life and human existence cannot be answered unambiguously. On the one hand, the sciences have given us insights which were hidden from mankind in earlier times. On the other hand, the question of man’s nature and the meaning of life still pose more problems now than when religion provided answers that satisfied mankind.

The uncertainty about ourselves, in turn, affects the value of our scientific knowledge, for it is we who invented science and it is we who pursue it. In order to answer the question concerning the validity of our scientific knowledge we must first answer the question as to the validity of the framework in which science was created.

The origins of science promise an answer to this question, for the beginning, as Winnicott puts it, is our home. Since the beginnings of human history are known to us only in fragments, we must look to and question the early stages of childhood in order to gain knowledge about the devel-

opment of our questions and the methods we use to provide those answers. Only then can we avoid that we leap into the supernatural used to circumvent our fear of the unknown.

A “genetic theory of knowledge” attempts to understand scientific knowledge through its history, and more notably through the psychological origins of both the concepts, and the operations on which these concepts are based.<sup>2</sup> Instead of presupposing reality as the “realists” do, a genetic theory of knowledge begins with the question: How do we arrive at what we call reality?

## 2. FREUD’S GENETIC ANSWER<sup>3</sup>

An answer to the question above is given in Freud’s *Formulations on the Two Principles of Mental Functioning*, published in 1911. He writes:

We are now confronted with the task of examining the development of the relationship between the neurotic and the human being in general, with that of the real outer world, and thus integrate the psychological meaning of the real outer world into the framework of our theory. In a psychology which is based on psychoanalysis we have become accustomed to accepting unconscious mental activities as the starting point. . . . The highest tendency to which these primary processes obey is easy to recognize; it is called the pleasure–pain principle (or for short, the pleasure principle). These processes strive to acquire pleasure; mental activity avoids actions which may cause pain.<sup>4</sup>

Freud then expands his theory. In the early stages of humankind, both rational thinking and the idea of “reality” emerged from this primary psychic state:

I maintain that the state of psychic peace was originally disturbed by the commanding demands of inner needs. In this case, what was imagined (desired) was simply pronounced hallucinatory, as it still happens every night in our dream thoughts. However, since the expected gratification fails to appear, the ‘psychic apparatus’ had to decide to imagine the real state of the external world and to strive for real change. Thus a new principle of mental activity was introduced.<sup>5</sup>

In 1911, at the height of an age dominated by belief in human progress through science and technology, the deeper meaning of these words was – even for Freud – simply “unthinkable:” it was suppressed by the unrelenting censorship of “a socially produced unconscious.”<sup>6</sup> After the discovery of quantum mechanics and the insight that we cannot make statements about objects and processes that are unobservable,<sup>7</sup> our naive trust in science underwent a sober awakening. It was only after this awakening that the far-reaching implications of these words could be understood. They are as follows.

There is no reality. The real state of the outside world must be constructed, under pressure from the pleasure principle, by our imagination, which borrows its creativity from the dream. Unknown in the rest of nature, the power of imagination appears to be a specific human ability. Piaget has shown that a child does not, until some time between its sixteenth and twentieth month, learn to construe mental images of objects and events. In the early life of the child this ability gives rise to something of a "Copernican revolution:"

One last essential consequence of the development of the imagination is, . . . that the child finally and totally reverses its initial world, its moving images (till this point), being focused around its own unconscious (motor) activities, re-arranging them into a solid world of coordinated objects which includes, as an element, its own body. This concludes the process of constructing objects in the sensory-motor field. The development of reflection and abstract thinking will continue this elaboration on other, newer levels.<sup>8</sup>

### 3. THE CONSEQUENCES FOR THE THEORY OF MEDICINE

These insights have far-reaching consequences for the theory of medicine. They will become progressively clear in the following discussion on the three primary tasks that a theory of medicine (as envisaged by us) will have to perform:

- (1) A revision and reformulation of the psycho-physical problem and the development of a model for the living body.
- (2) A revision of our views concerning the relationship between humans and the inanimate and animate environment; and
- (3) The development of a concept for the construction of individual reality and its consequences for the patient-physician relationship.

#### 3.1. *A Revision and Reformulation of the Psycho-Physical Problem and the Development of a Model for the Living Body*

*The body-mind problem as a corpse-mind problem.* It is our belief that a metaphysical dualism which separates the spiritual from the material world is in fact (as all metaphysics) a flight from the disturbing reality of our ignorance – it tries to bridge the gaps in our knowledge by leaping to the supernatural. On this assumption, it becomes possible to discuss the body-mind problem in a meaningful manner. We have been taught that Descartes was responsible for the dualistic theory. However, if we look more closely at the ideas Descartes had about his own body, we find that we were obviously misinformed. In his *Meditations* we read:

I assume not without reason, that my body, which due to some special authority I call my own, belongs closer to me than any other body. I could never separate from it like I could separate from other bodies, all desires and emotion I felt within it, and for it, and finally, I felt pain and the thrill of lust within its limbs, which I have not felt in other external objects.<sup>9</sup>

Another passage reads:

Furthermore, Nature teaches me . . . that not only am I present in my body like a sailor in his ship, but that I am closely connected with it, intermingled as it were, so that we constitute a unit.

Weiner<sup>10</sup> believes that medical dualism – the dualism of corpse and mind – was fashioned by physicians (beginning with Galen, then Virchow, and including those of today) who developed their concept of the human body by dissecting corpses. This knowledge, carried to its proper conclusion, shows that the body–mind problem of dualistic medicine is in reality a corpse–mind problem. As physicians usually only consider the criteria which are relevant to filling out a death certificate, it was to be expected that they would turn a blind eye to the distinction between a corpse and a living body.<sup>11</sup>

A practical model for the living body is a prerequisite for both a practical theory of medicine and a practical concept of humanity. Such a model should not adhere to a preconceived scheme that separates the physical and the mental. Rather, it should help us to understand both concepts – “body” and “mind” – as concepts which derive their meaning from the whole, that is, the integrating concept of which they are part.

By upholding such an integrating concept or model I do not mean to suggest that we compile the contents of various disciplines, such as internal medicine, psychiatry, and sociology, into a compendium of knowledge of various fields required of physicians. Such compendiums undoubtedly fulfill an important role for students, either in a curriculum or in further academic courses. As a rule, however, they do not contain an integrating concept in the sense I envisage.

True, within the somatic disciplines we find integrating concepts for anatomy and physiology. The contents of these disciplines are, so to speak, drawn together, summarized in an integrating picture – namely, that of an organism which consists of spatially connected organs, the functions of which are interconnected according to the principle of the division of labor. Thus a common framework is achieved. The effect of this framework is twofold: First, it determines the limits of responsibility in both research and the care of patients; second, it provides a set of rules for cooperation. Which specialist should treat a patient, when his/her condition is primarily cardiac related, orthopedic, or neurological, poses no greater difficulties

than those that a technical company confronts when deciding whether the plumber, electrician, or precision engineer is responsible for appropriate repairs. In both cases there exists an integrating conception of the whole – more precisely put – a picture in which both the spatial and functional coherence of the parts is clearly displayed.

The weak side of such quasi-integrative conceptions, however, usually becomes manifest when one is confronted with questions of an interdisciplinary nature, that is, questions which presuppose a level of conceptual integration in medical thought surpassing that of the more superficial, “pictorial,” quasi-integration referred to above. For example: Is the patient’s condition primarily somatic, psychological, or social; how are these problems related and how do they influence each other? This is the sort of integration that concerns us. For some time now the notion of a “bio–psycho–social model” has been used in psychosomatic literature. As long as this model’s achievement is nothing more than admonishing the physician to observe, apart from the somatic, the patient’s psychological and social problems, it does not answer the question of how these heterogeneous problems can be meaningfully related. It is wrongly called an “integrating model” – for it offers no basis for real, that is, interdisciplinary, conceptual integration. Moreover, the call for interdisciplinary cooperation is of little use as long as it offers no alternative other than stringing together the knowledge available to experts in biology, psychology, and sociology. An integrating concept must answer the questions: how biology, psychology, and sociology are related and how their relevance for medicine is to be conceived.

### 3.2. *Medical-History as Access to the Concept of a Living Body*

We are spared the search for theoretical considerations about how such a model should look, if we look to the past. One hundred and fifty years ago medicine included an integrating concept of the living body. But the memory as well as the entire era in which this concept was conceived has been repressed by “modern” physicians.

In 1840, the second volume of the *Handbook of Human Physiology* was published. Its author, Johannes Müller (1801–1858)<sup>12</sup> was one of the most celebrated physiologists of the time, a founding father of physiological medicine in the 1840s. In the handbook, Müller argues that the use of physical, chemical, thermal, or electrical stimuli have very similar effects on the dead body. Yet, this phenomenon does not apply to the living body. Here these stimuli are transformed into psychologically experienced sensory qualities that differ according to the sensory organ involved. Consequently,

the living body does not respond to physical stimuli but, rather, to the sensory qualities produced by the stimulation.

Taking these observations to their logical conclusion, it becomes clear that what is called for is a revision, not only of our concept of the living body and its relations to the environment, but – even more radically – the idea of the world that surrounds us or, rather, our reality. Müller summarizes this in a short and concise manner:

A sensory impression is not a transmission of a quality or the transmission of a condition of the outside world to consciousness. It is rather the transmitted quality of a condition in the sensory nerves to consciousness, induced by an external cause. Additionally, these qualities (sensory energies) differ from each other in the various sensory nerves.<sup>13</sup>

This statement implies that our sensory organs provide perceptual qualities which, being assumed to be causally related to objects and processes in the outside world, are naturally interpreted by us as signs of the outside world. In a sense these acts of interpretation can be said to be acts of creation which bring into existence the world we perceive.

Müller's physiology of the senses, based as it is on the organicist ontology of the living body (that is, the body conceived as the creator of the world in which it breathes, moves, eats, lives), contains the most mature and consequential formulation of the earliest "epistemological model" (or paradigm) of humankind. Ginzburg describes the genesis of this paradigm in the following manner:

For thousands of years man was a hunter. In the course of countless hunts he learned to follow the trail left by tracks in the mud, broken branches, excrement, tufts of hair, tangled feathers, and lingering smells. From these he learned to reconstruct the size and direction of his prey. From clues as thin as cobwebs he learned to form ideas, observe, interpret, and classify. With lightning speed he learned to perform complex mental operations in the thick of the wood as well as in dangerous clearing.<sup>14</sup>

The hunters discovered the paradigm of the "sign." Its formula is astonishingly simple. Leibniz described it thus: "The sign is something perceived from which man can infer the existence of something which cannot be perceived."<sup>15</sup>

The knowledge about a hidden reality revealed by this method of reading signs is described by Ginzburg in more detail: "Characteristic of this knowledge is the ability to elicit a complex reality from apparently trivial empirical data, which otherwise is not directly inferable."<sup>16</sup>

From the paradigm of the "trial," "sign," and "circumstantial evidence" arose the paradigm of early medicine: the symptom. Symptoms are perceptible, apparently minor empirical data from which the physician elicits a complex reality which is not directly observable. Foucault expressed this in the following manner:

The symptom is the form in which the sickness presents itself. Consequently it plays an important role. Of all that is visible it is the closest thing to the intrinsic. It is the first depiction of the sickness's inaccessible nature. Coughing, fever, pain in the side, and breathing problems do not in themselves constitute the pleurisy – as pleurisy itself cannot be observed by the senses. It reveals itself only through the powers of the intellect.<sup>17</sup>

Both ideas – that of the living body (such as presupposed in Johannes Müller's doctrine of the specific energies of the senses) and that of the early hunter – present a striking parallel. The hunter constructs the world he perceives and to which he responds according to the needs and knowledge required of a hunter. Müller's model resembles basically the one that Jakob von Uexküll developed almost one hundred years later for understanding the interactive unity of the organism and its environment.<sup>18,19</sup> This model also contains the biological basis for a scientific anthropology and a theory of medicine. Yet, it also sets us a task: To determine (at least roughly) the difference between animals and humans, between biology and anthropology, between veterinary medicine and medicine. As was earlier indicated, the development of the power of imagination points us in the right direction. It is no accident then that the moment of a child's first words coincides with the development of the imagination.<sup>20</sup>

### 3.3. *The "Scientific Revolution" of the 19th Century, and the Expulsion of the Soul from the Body*

The close connection between paradigms,<sup>21</sup> scientific methods, anthropological ideas, and the theory of medicine becomes even clearer if we study the change of the nineteenth century paradigm which led to the dogma that medicine had to become science and that science was to be physics. For example, consider the paradigm established by Galileo, thousands of years after the early hunters.

Galileo derived a method of deduction in which a perceivable cause produced a perceivable effect, and vice versa. In mechanics, Newton discovered a formula which allowed humans to subject nature to their manipulations. However, the nature that was made subservient was an inanimate nature. Here we notice the crucial difference between the paradigm of the tracker and the paradigm of the "new science" founded by Galileo and Newton.

The signs read by a tracker reveal the history of a living being. These signs not only reveal its size, appearance, psychological condition, contentment or restlessness, and its agitation (which could endanger the hunter) but also its past and, more important, when and where the hunter could encounter the animal. To the adherents of Newton, a sign only reveals the

outcome of a mechanical cause, which may result from the influence of either a living being or something mechanical.

Early physicians, by reading symptoms, discovered the *history* of their patients. Symptoms revealed a patient's present health and psychological condition, which are important to the physician. Symptoms also revealed this history of the sickness, or how the illness came about, as well as the patient's future and how the illness would progress. For the "modern physician," the symptom is only the local effect due to physical or chemical causes, the origins of which are either bacterial, viral, or structural changes in the organism, such as those due to arthritis or arteriosclerosis.

Toellner<sup>22</sup> describes how physicians at the beginning of the eighteenth century were captivated by an idea (at that time totally unrealistic) which they hoped would lend certainty and reliability, as promised by physics to the art of healing. This idea was to be accomplished by adopting the principles of the "new science" as a basis for a theory of medicine. Consequently, the expulsion of both the soul from the body and the patient (as a subject) from medicine was inevitable. Under these circumstances, the short era of "Romantic medicine" and its sequel (which included the work of Johannes Müller) can be considered to have advanced the establishment of medicine as an independent science. This science did not consider Nature a hostile force to be subjugated, nor did it regard the subject as a disturbing element that had to be eliminated, but rather as the constitutive element of medical thought and practice.

The nineteenth century brought about the industrial age, and with it changes in the social climate. Now the physicians' dream of a comprehensive theory of medicine based on Newtonian mechanics could be realized. With it, the ideas of Romantic medicine drowned, as described by Erdheim, in a "collectively produced unconscious." The scientific revolution which led to the paradigm shift began in Germany with the revolt of Johannes Müller's followers against their master's teachings.

Bernfeld describes this revolt of Müller's followers. It is a striking example of the connection between *Zeitgeist* and the fate of scientific ideas. The astonishing success story of this revolt:

began with the friendship between Emil Dubois-Reymond (1818–1896) and Ernst von Brücke (1819–1892). Shortly after, they were joined by Herrmann von Helmholtz (1821–1894) and Carl Ludwig (1816–1895). From the very beginning this group was inspired by a true crusader's spirit. In 1842, Dubois wrote: "Brücke and I have devoted ourselves to one aim, to make the truth known that in an organism there are no other processes at work than the common physical-chemical ones . . ."

These men formed a small private club, which in 1853 was enlarged and named: "The Berlin Society of Physics." Most of the members were young disciples of Johannes Müller, physicists and physiologists, united by one common aim: to do away with vitalism, which is what they called their venerated master's theory . . .



Within twenty-five years their ideas came to dominate the thinking of German physiologists and physicians . . . As for vitalism, they lived long enough to witness its revival.<sup>23</sup>

This theory – that in an organism there are no processes other than the common physical–chemical ones – became the dogma of modern medicine. With it, the soul’s expulsion from the body was scientifically sanctioned. No one showed further interest in questions concerning the difference between a living body and a corpse, in which there are, in fact, no other processes at work.

### 3.4. *The Rise of an “Actual Dualism.” Freud’s Definition of the “Soul”*<sup>24</sup>

Bernfeld’s remark about the “revival of vitalism” refers to the teachings of Freud. For a theory of medicine that acknowledged no processes in the body other than those of the common physical–chemical kind, Freud’s ideas must have been construed as pure vitalism. Freud (as, incidentally, also his contemporary Pavlov) tried to reconcile this dilemma by viewing psychology as a preliminary stage of physics. Both Freud and Pavlov believed that psychology would eventually discover the formulas governing physical processes which were said to be hidden in all mental processes.

This conviction reflects the power of the *Zeitgeist* to which even Freud, in spite of his astute analyses of society’s influence, succumbed. It therefore did not occur to him that his discovery of the psychoanalytic method was in reality a rediscovery of an old paradigm (now suppressed by modern medicine) of “tracking,” circumstantial evidence, or more specifically, the sign.

Ginzburg describes how at the end of the nineteenth century, almost unnoticed, a new paradigm appeared. In art history it presented itself as a new method for identifying the works of old masters; in literature it was the detective novel; in medicine it was psychoanalysis. In all these cases it was a method by which a *hidden reality* could be identified by non-descript, apparently trivial empirical data.

Ginzburg concludes that medicine has always been a “science of circumstantial evidence.”

Circumstantial-evidence sciences are . . . to a great extent qualitative sciences, dealing with the *individual aspects* of cases, situations, and documents. Therefore they cannot avoid a degree of uncertainty in their results. . . . Conversely, [Galilean sciences] imply, by applying mathematics and experimental methods . . . that the results achieved can be repeated. Sciences dealing with individual aspects, however, have by definition excluded the possibility of repetition, and quantification is only acceptable as a functional aid.<sup>25</sup>

It is no surprise then that the method of circumstantial evidence developed by Freud to define the “soul” and soul-related processes could not

approach the body (as interpreted by modern medicine) according to the Galilean paradigm. It is also no surprise that the meeting of these two methods resulted in “actual dualism” in our health care system, in which there was a medicine for both soul-less bodies and bodiless souls.

#### 4. A REVISION OF OUR VIEW CONCERNING THE RELATIONSHIP BETWEEN HUMANS AND THE ANIMATE/INANIMATE ENVIRONMENT

The idea of a living body that creates its own environment compels us to answer the following questions: How are we to imagine an objective external world? (in which we all live); what is the relationship between this objective external world and the subjective environment of a living organism? The misconception of solipsistically interpreting the body’s creativity as omnipotent (as we did in an earlier phase of our development) is fraught with serious consequences.

Jakob von Uexküll considered the objective “external world” to be the creation of the human imagination. In imagination there is room for both the animate and inanimate nature of our planet. Astronomers can inflate it into an infinite cosmos encompassing billions of light years. Thus our imagination has created a common framework for individual realities. Within this framework, we can orient ourselves towards our common needs and the needs of our common enterprise – “science.” Von Uexküll was a biologist, whose central concern was to distinguish between the “objective external world” of the human observer and subjective environments [*Umwelten*] of observed animals – be they earthworms or mammals – environments which had to be tailored to the specific subjective needs of the animals concerned if they were to live and survive.

Not only does this distinction address the question of the relationship between subjective environments and an objective external world, it also, interestingly enough for medicine, addresses the question, How should “health” be defined? A theory of medicine which adopted the Galilean paradigm could define health only as a distribution curve of characteristic biochemical values with sickness as its tail end. Such a definition can hardly be used to derive guidelines for our contemporary attitude towards health. On the other hand, a theory of medicine which, based on the concept that a living body (if it is to live and survive) has to transform the external world into a subjective environment, provides a more realistic definition of health. Writing almost sixty years ago, Viktor von Weizsäcker pointed the way to such a definition: “Health is not an asset which we can consume. Health

is only present where it is continually produced. If health is not produced, the person is already sick."<sup>26</sup>

Antonowski<sup>27</sup> coined the term "salutogenesis," i.e. "production of health" which is, contrary to the notion of "pathogenesis," rooted in nineteenth century science. Pathogenesis implies that health is something static which can be lost and regained.

The term "salutogenesis" conveys the view that living systems are "autopoietic," i.e., self-constructing and self-organizing systems<sup>28</sup> that continually absorb elements from the environment and, in return, eliminate those elements that are no longer useful. This coheres with the view that a body constructs its own subjective world. However, a more precise understanding of the body's relationship to the external world is still required.

For this, it is important to understand that health (and sickness) are not concerns of the solitary organism or the individual. They are, rather, the outcome of constant interactions between the individual and his/her environment on biological, psychological, and social levels. If for health to be produced interaction is to take place, the organism's actions and the roles assumed by an individual must be *reciprocated by complementary action and complementary influence by the environment on all levels*. For example, on a somatic level of integration, breathing and metabolism presuppose a supply of air and a supply of food from the environment. On a psychological and social level of integration, roles like speaking and receiving, call for complementary roles like listening and giving, which need to be supplied by interacting partners in the environment.

One decisive criterion for health is a sense of autonomy. At the same time, this feeling is, in a "self-concealed" manner, a social regulator. Christian and Haas have developed a model of "bipersonality" which clearly forges a link between the somatic, psychological, and social processes in salutogenesis. Their subtle analysis of the behavior and the experiences of two people working with a two-handed saw shows that a harmonious reciprocity of action and complementary action is needed in order to experience autonomy. They write:

At the height of cooperation, both partners experience a sense of maximum independence. The analysis (of the objective parts of the operations) shows that they are objectively related to each other through strict reciprocity of action. A sense of complete independence can therefore only be achieved when there is complete reciprocity of action. This complete independence of the individual is based on a complementary, yet concealed, relationship between them.

Conversely, any disharmony, any disturbance of the quality of together, is perceived as a disturbance of one's autonomous control over one's own energies; the complete absence of the expected complementary action may even be perceived as paralysis.<sup>29</sup>

The model derived from this quotation not only clarifies health, but also the epistemological aspects of the relationship between the subjective environment (or individual reality) and the objective environment. It shows that health is experienced as a feeling of autonomy and efficiency. At the same time, this feeling is an indicator of being integrated with the environment, i.e. that one interprets it (as a source of complementary action and complementary roles) "correctly." This explains why the chronically handicapped can, despite the restrictions associated with their illness, regain a sense of autonomy and health if the environment reciprocates appropriately.

For medical ethics this gives meaning to the principle of a supportive community for the sick and needy. This has been illustrated by convincing studies that show, for example, how disrupted social integration caused by the loss of vital reciprocal actions from the environment, e.g. through object loss (death of spouse, social decline, etc.) hinders salutogenesis and leads to increased morbidity and mortality.

## 5. THE DEVELOPMENT OF A CONCEPT FOR THE CONSTRUCTION OF INDIVIDUAL REALITY AND ITS CONSEQUENCES FOR THE PATIENT-PHYSICIAN RELATIONSHIP

### 5.1. *Sign-Processes as Feedback-Circuits*

As an alternative to the mechanism-model of modern medicine, I now suggest a "living body" model. As a general biological model it describes living objects (whether they are cells or organs in an organism, or organisms in the environment) as being systems which, under the influence of the environment, do not react mechanically with mechanical results. They are, instead, described as systems which, with the aid of their receptors, encode environmental influences into signs that indicate the biological quality of that system's environment. Living systems are not passively altered by external influences; rather, they respond actively to the signs produced by those influences. This model should replace the two-dimensional and linear causal formula of cause and effect with a three-part formula: the sign, the interpretant (or code), and the significate (Peirce: See W. Nöth<sup>30</sup>) The simplest of these formulas is the feedback circuit.

I shall illustrate this in a model for the cell which is shown in Figure 1.

The cell's receptors measure (like the feelers in the feedback circuit-model) deviations between the environment's actual value and a target value

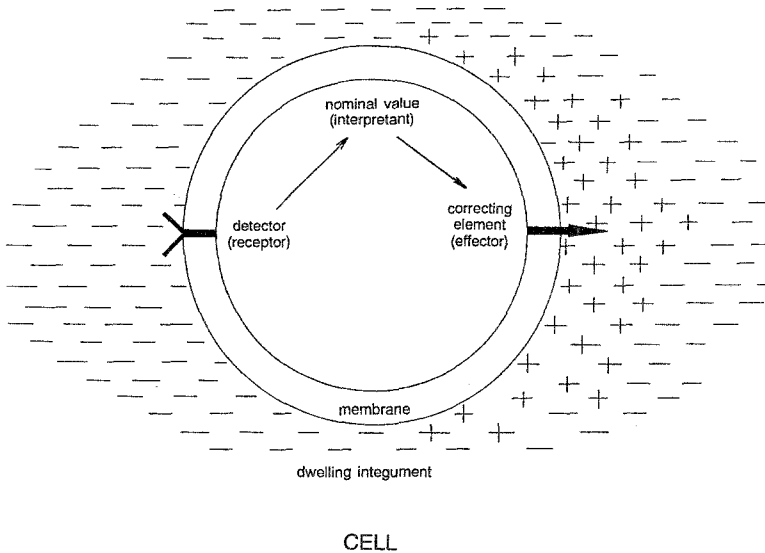


Fig. 1. The cell's membrane has at its disposal receptors and effectors for its behavioral response. These facilities correspond to the feeler and the signal box of the feedback circuit-model. Representing the cell's "biological need" is the feedback circuit's "target value" symbolized in the three-part formula by the "interpretant" (or code).

(as a symbol of the cell's biological need = interpretant). At the same time, the receptors encode the measured value into a sign. This sign informs the cell of the meaning the environment has in relation to its needs (target value).

As a response to these signs, the behavior of the cell's effectors (the signal box in the feedback circuit-model) corresponds to the significate. The response, for example, may be the release of a secretion which modifies the system's pH-level, thereby satisfying the system's needs (or brings the actual value in line with the target value). This is how the cell, responding to its needs, produces its "reality." This "reality" surrounds the cell as von Uexküll<sup>31</sup> puts it, like a "habitation capsule" or "dwelling integument" [*Wohnhülle*] as we shall now call it.

The principle of producing reality through "perception" and "action" is, albeit in a primitive form, already intimated if one takes into account two points:

1. Living systems have their own target value, whereas cybernetic machines are given their target value by an outside source (through its constructor).
2. Living systems modify their target value according to their behavior,

with the result that after a certain behavior (e.g. intake of food) the same input (e.g. supply of food) no longer results in the same output (intake of food).<sup>32</sup>

For the outside observer, the system appears to have changed. From the viewpoint of the system, however, it is the quality or meaning of the environment that has changed: an object which had the meaning “food” before feeding becomes, after the feeding, simply an object that is an obstacle.

A semiotic interpretation is always an interpretation which views the observed individual as being the interpreter of its environment. The observer takes the role of “meta-interpreter.” Von Uexküll makes this clear by depicting sign processes (semioses) as being circular processes in which the interaction between a living being and its environment is defined as: (1) the meaning assignment (encoding of the receptor’s changes through external influences into a sign); (2) the utilization of meaning (behavioral response); and (3) toleration of meaning or facilitation of meaning (through the environment).

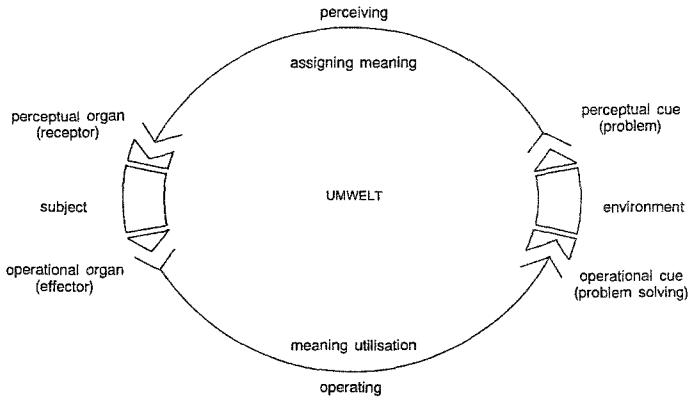
### 5.2. *The Sign Process as a Functional Cycle*

In multicellular organisms the individual cells are surrounded by an outer membrane. This membrane separates a *milieu intérieur* from a *milieu extérieur*. The former consists of an intercellular fluid which constitutes the medium for the stream of signs. The cells, surrounded by their dwelling integuments, are connected by this stream of signs.

The relationship of *milieu extérieur* requires a new organizational form. This form consists of specialized cells for receptor and effector organs as well as a nervous system that connects the two. This nervous system is endowed with a common “target value” which functions as “interpretant” (or code). This system allows for the occurrence of sign processes within the *milieu extérieur*. Now the acquisition of elements in the external world can take place, thereby satisfying the system’s needs.

The system’s receptors provide meaning regarding the influences produced by the environment. The meaning is then “utilized” through the effector’s response. That means that the functions of the receptors and effectors cooperate in the process of reality testing: The effector’s utilization of meaning controls the accuracy of the receptor’s meaning assignment. The functional cycle model<sup>33</sup> describes this connection and anticipates the feedback circuit-model with negative feedback – albeit without its mathematical formulation (Figure 2).

Both models (feedback circuit and functional cycle) describe how living



Functional cycle

Fig. 2. The functional cycle. Jakob von Uexküll<sup>34</sup> describes this model (in 1936) in the following manner: “Metaphorically speaking . . . each subject seizes its object with the two arms of a forceps – a receptor – arm and an effector-arm. With one arm it imparts to the object a distinct perceptual value, that is, it assigns to it a meaning as perceptual cue [*Merkmal*]; with the other arm it imparts a distinct operational value (in the sense of utilization of meaning) through which it becomes an operational cue [*Wirkmal*]. In other word, the operational cue {*Wirkmal*} deletes the perceptual cue, [*Merkmal*]. This sentence expresses the principle of negative feedback. This model shows how the subject and object fit into each other and together form a greater system.

systems temporarily incorporate segments of their environment which are meaningful to the system. When the utilization of meaning has ended, the environmental elements that have not been utilized return once more to the “meaningless nothing” of things and processes that do not exist for the system.

The difference between the two models is their degree of complexity. The feedback circuit describes sign processes in living systems which, like plants, belong to a vegetative level of organization. On this level there are no receptors specializing in long-distance perception, no effectors fit for “trapping” and, more notably, no nervous system connecting receptors and effectors. These living systems do not construct “environment;” rather, they are satisfied with their dwelling integuments. On the other hand, the functional cycle describes sign processes on an animal level. Living systems on this level, using perception and movement, construct spatio-temporal environments.

The advantage of these two models is that they permit one to describe processes within the organism as vegetative, and processes between the organism and its environment as animalistic, without introducing the dif-

ference between the mental and physical realms. Instead of addressing the psycho-physical problem, these two models raise the question: How are sign systems at the vegetative level translated into sign systems at the animal level (e.g. electro-physiological signs of the brain translated into sensory-physiological signs of the environment), and vice versa? With this question, system theoretical problems come into play. Prior to addressing this problem, I shall respond to the problem of how humans construct their individual realities.

### 5.3. *The Situational Cycle*

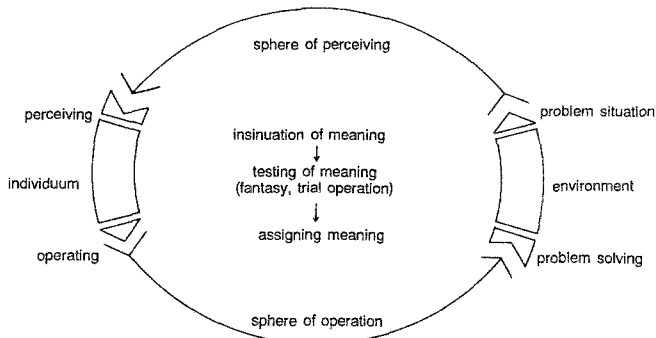
Both the feedback circuit and the functional cycle describe how living systems construct their realities as “dwelling integuments” or “subjective environments.” Alone they cannot explain how humans construct their individual realities; they can, however, lead the way to such a model.

Thus it is helpful to establish how closely the functional cycle model corresponds to Freud’s theory of instincts developed in his early work, *Psychology for Neurologists* (1895), better known as *Project*.<sup>35</sup> In *Instincts and Their Vicissitudes* (1915).<sup>36</sup> Freud elaborates on this model with a description of four aspects of instinct. This model outlines two levels of integration in a hierarchically structured system. On the more primitive level, cellular systems within the body satisfy their biological needs in a *milieu intérieur* consisting of “intercellular chemisms.”<sup>37</sup> These processes can be described in either physiological language or in the language of the living system’s model, in which sign processes function like those described in the feedback circuit.

If the needs of the cellular system at this level (“instinctual source”) cannot be satisfied, they are “translated” into an “instinctual drive” on a psychological level. At this level the instinct (or drive) constructs a subjective reality out of sensory signs with an “instinctual object” and an “instinctual aim.” In this reality, the resources which are unavailable in the *milieu intérieur* can be sought and found. The processes at this level of integration can be described in either psychological language or in the language of functional cycles.

As for humans, Freud has given us a detailed description of how, in the source of psychological development, these sign processes grow more sophisticated. He has also shown us a way in which to modify a functional cycle model into a “situational cycle” model (Figure 3).





Situational cycle

Fig. 3. One only needs to quote Freud to describe how a situational cycle model differs from a functional cycle model. In *An Outline of Psychoanalysis*<sup>38</sup> Freud writes: “Between instinctual demand and the act of gratification the ego activates intellectual activity. This intellectual activity then attempts, after evaluating the present situation as well as past experiences, to predict the success of the intended action through test actions: In this way the ego decides whether an attempt at gaining gratification should be carried out or postponed, or whether the instinctual demand should be considered too dangerous and therefore repressed.”

#### 5.4. *The Situational Cycle as an “Historical” Process*

Sign processes that run according to the feedback circuit or the functional cycle are innate. They have no history. On the other hand, sign processes described in the situational cycle scheme are not innate. They have a history which to a large extent is the history of an “intellectual activity” that, on the basis of the results acquired from “test actions,” decides whether or not the “utilization of meaning” activity is to be released.

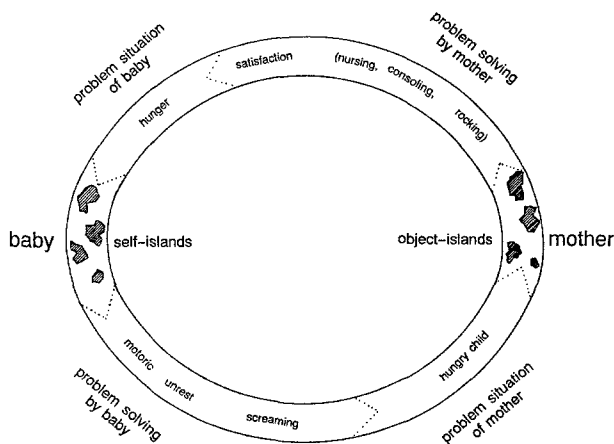
Test actions also produce a “reality” from “perception” and “action.” In this case, however, the “perception and action” belong to the realm of memories and imagination which produce an “inner reality.” Intervening between meaning assignment and the utilization of meaning, this “inner reality” transforms the “primary process of reaction” (as in the functional cycle mechanism) into a “secondary process of action” (as in the situational cycle). We consider this inner reality a product of our fantasy. Our fantasy, however, acquires the ability to produce an “inner reality” only in the course of psychological development in early childhood. The result is our imaginative faculty. The imagination produces a medium in which absent objects and past experiences remain current.

In the course of the last twenty years, developmental psychology has undergone revolutionary changes. Slow motion and video recordings have improved the methods of direct observation of mother (or caretaker) and child interaction.<sup>39,40</sup> As a result of these improvements, the focus of interest is no longer the isolated child but rather the “developing system”<sup>41</sup> in which the mother and child are – first through non-verbal and only later through verbal sign processes – connected to each other.

The results of these observations allow us broadly to outline the “history” of the situational cycle as a process of mutual interpretation of signs exchanged between mother and child. Here, the mother assumes for the child the role which the outer world will later occupy.

Figure 4 shows how a child in a “symbiotic functional cycle” gives to certain sensations (e.g. hunger) the meaning, “problem situation.” These sensations are then encoded into signs. The mother interprets the child’s signs, and in her response resolves the problem situation. The child’s signs are, so to speak, requests for the significate, to which the mother responds. Initially this “game” takes place within a certain framework in which the child does not perceive the mother or her gratifying roles as a phenomenon separate from itself.

In the course of time “self and object islands” begin to develop and eventually, if all goes well, grow into an independent subject and an independent object.



Symbiotic functional cycle

Fig. 4. Symbiotic functional cycle of the “mother–child system.” Note that this circular process both partners learn from each other. From the generation of a common semiotic system both gain a “semiotic competence.”

From the aspect of a theory of signs, the “intermediary space” (described by Winnicott<sup>42</sup> in the “mother–child system”) can be characterized as a reality for two partners which gradually grows more sophisticated. In the common medium of this reality, each partner answers the other’s questions and in this manner helps the other to construct his or her individual reality. Seen from this viewpoint, the model of the situational cycle can be considered a model for a living system that consists of two (or more) people.

#### 6. GENERAL SYSTEMS THEORY AND THE CONCEPTS OF “EMERGENCE” AND “HIERARCHY”

The three models – feedback circuit, functional cycle, and situational cycle – describe how, on a vegetative, animal, and human level, “reality” is produced from very different signs. But how do we visualize the relations between these levels? In order to answer this question, we must review concepts contained in the general systems theory.

A central feature of the general systems theory is located in the ancient formula rediscovered by Chr. von Ehrenfels, and after him, brought to life again by L. von Bertalanffy: “The whole is more than the sum of its parts.” With the integration of parts into the whole (or system), new, unforeseen features suddenly emerge. These features are “more” than the sum of the parts. This process is termed “emergence.”

This term also implies the presence of a hierarchical order. It describes, for example, how physical particles on a “higher level” are integrated with molecules, and molecules integrated on a still higher level with cell organelles. The cell organelles are then integrated with cells, the cells with organs, the organs with the organism and, finally, the organism with social systems. Consequently, different “levels of integration” can be discerned. From these levels other sign systems emerge which, if we are to “understand” them, must be translated into human language. It is understandable why so very different terminologies had to be used in our sciences. The relationship between the different levels of integration are reflected in the relationship between physics, chemistry, biology, psychology, and sociology.

How are these levels of integration related? The answer to this question must use “emergence” as its starting point. “Emergence” means the appearance of new signs along with new “meanings” as fresh systems are generated. With this aspect in mind, we can view the connection between different levels of integration as “translations,” that is, a “linking of

meaning” or, in psychoanalytical terminology, “hypercathexis.” As a biological phenomenon, the process of “linking of meaning” was first observed by Pavlov, which he described as “conditioning.”<sup>43</sup>

We have seen how electrochemical signs with which the cells of our brain “communicate” are, on a more complex level, “translated” into sensory signs from which our reality is created. The question of how the linking of meaning between the electrophysiological signs in our brain and the psychological signs of our perceived reality takes place is a neurophysiological concern. Furthermore, as we have seen, in the course of psychological development, perceived reality is involved in a constant exchange with the “inner reality.” This expresses a new “linking of meaning” or “hypercathexis,” and therefore it acquires a previously unknown dimension of depth. It is important to realize that this dimension of depth is a precondition for the integration of individual realities with social realities. It is in this social reality that human beings can communicate with one another and still acknowledge their individuality.

#### 7. CONCLUSION: TWO CONSEQUENCES FOR THE CONCEPT OF HEALTH

The model of living systems has two consequences for our concept of health. The first is obvious, and has already been discussed: Living systems are “autopoietic systems.”<sup>44</sup> Through constant self-generation, they generate and are able to maintain themselves.

The second consequence concerns illness as a reality of the patient–physician relationship. First, an analogy: In the scheme of the symbiotic functional cycle a common reality is produced in the mother–child system through the child’s encoding of incomprehensible body sensations into non-verbal signs in a problem situation which the mother, in turn, interprets (in a non-verbal manner) as she solves the problem. In this manner the mother interprets, for example, the non-verbal signs which the child communicates following sensations that it has when it is hungry; she provides nourishment as the significate. The mother interprets the non-verbal signs which the child communicates following sensations when it lacks warmth; she provides warmth, thereby showing the child what the signs signify.

In the physician–patient relationship, we can observe an analogous process, the only difference being that this process, to a certain extent, takes place on a verbal and cognitive level: The patient encodes sensations (e.g. pain), which are troubling and beyond his or her understanding, into signs which are posed as questions for the physician. The physician must inter-

pret these signs by informing the patient of their significance which is the source of the patient's enquiry. Anyone who believes that this is nothing more than a discourse on diagnosis fails to understand how "sickness" reveals itself as a reality in a "self-developing system." As formulated by Balint,<sup>45</sup> this system must consist of the patient, the physician, and the sickness.

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