LOUIS BOLK INSTITUTE

Physiology

Organphysiology from a Phenomenological Point of View

Christina van Tellingen MD

BOLK'S COMPANIONS FOR THE STUDT OF MEDICINE

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About the Author

Christina van Tellingen MD (1949) has been a general practitioner since 1982. She has educated medical students, physicians, and therapists in the United States, Canada, and Europe. She teaches medical students and physicians at the University of Witten/Herdecke, Germany. She is a member of the Medical Section of the School of Spiritual Science at the Goetheanum, Dornach, Switzerland.

About the Project

The project *Renewal of Medical Education* aims to produce Companions that demonstrate how the insights of current biomedical science can be broadened by using the Goethean phenomenological method. This method innovates current concepts and expands the understanding of biochemical, physiological, psychological, and morphological factors in living organisms and their development in time and space, and in health, illness, and therapy. The project is commissioned by the Kingfisher Foundation, which aspires the development, application, and publication of the Goethean phenomenological research method in the widest sense, to complement and innovate the accepted scientific view and research method.

BOLK'S COMPANIONS FOR THE STUDY OF MEDICINE complement current medical education, specifically disclosing human qualities in the fundamental biomedical sciences of today.

BOLK'S COMPANIONS FOR THE PRACTICE OF MEDICINE contribute to a scientific phenomenological basis for integrative medicine and integral psychiatry.

6. Review and Conclusion

6.1. Characteristic Features of the Organs

The four organ systems we have discussed so far each have their own characteristic features. Characteristic features of each organ system are an expression of the forces or formative principles working in them. The formative principles that express themselves morphologically and physiologically in these four organ systems can be recognized to also work in nature as a whole.

6.1.1. The Lung and Respiratory Tract

The lung and respiratory tract are an overall *passive organ* system. They have a characteristic *membrane-like structure*. They fulfill their task by making diffusion of gases possible. To this end, the surface area of the respiratory tract becomes many times enlarged in the alveoli. The respiratory tract is a tubular organ and has little or no parenchyme. The respiratory tract membranous structure is supported by bone and cartilage to hold its form.

The following diagram could represent the lung and respiratory tract with its membrane-like structure and its capacity of diffusion (fig. 6.1.).

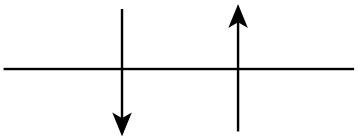

Fig. 6.1.

The physiology of the lung and respiratory tract is based on principles that have a **physical** character: the warming and humidifying of air; the elasticity of the tissue; the dependence of the flow of air on a positive or negative pressure in the lungs; the large surface area that is created; the diffusion of gases; the activity of surfactant as a surface tension active compound. The respiratory tract in the organism gets its form and is suspended from mineralized substance (cartilage and bone).

The Working of the Lungs' Formative Principle in Nature as a Whole

The characteristic formative principle working in the lung and respiratory tract can be found in nature where physical forces are mainly active. This is in *stones and minerals* that are not alive. Minerals passively allow the *physical* forces in the environment to shape them and work on them.

*The formative principle active in the lung and respiratory tract has **physical** characteristics. In nature its field of activity is in mineral substance.*

6.1.2. The Liver and Digestive Tract

The digestive tract is tubular in shape like the respiratory tract. In addition to the tubular intestines, a parenchymatous organ develops in the digestive tract. The liver is a homogenous parenchymatous organ, with the hepatocyte as the main cell type. Physiologically, the liver and digestive tract display *great activity*. The cyclic activity of liver physiology is expressed in its ability to convert substrates to active metabolites or to storage forms, and vice versa. The metabolic cycles concern anabolic (growth) and catabolic (breakdown and decay) processes in the liver itself as well as the cycles in the organism between liver and muscles, and liver and fat cells. The liver plays a major role in carbohydrate metabolism, which is the main source of direct metabolic energy for the organism. Liver activity adapts itself to the needs of the organism. In the digestive tract, passive diffusion is joined by active absorption. In other aspects (morphology, function and regulation) liver and digestive tract are mainly passive like the lung. In spite of their differences in consistency and activity, the lower respiratory tract, the digestive tract, and the liver all arise from the same embryological organ, the primitive foregut, which arises from the yolk sac. *The forces that model the digestive tract and the liver have an added quality compared to those of the respiratory tract.*

The following diagram (fig. 6.2.) may represent the physiological activity of liver and digestive tract.

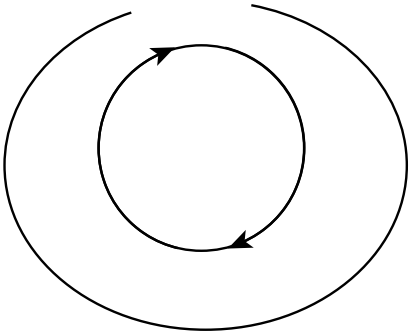

Fig. 6.2.

The physiology of the liver and digestive tract is based on principles that have a **vegetative** character: it concerns itself with growth and decay; it is involved in metabolic energy storage and production; it is cyclic in nature, and the activity of physiological processes adapts itself to the environment.

The Working of the Liver's Formative Principle in Nature as a Whole

The characteristic formative principle working in the liver and digestive tract can be found in nature where vegetative forces are mainly active. This is in living *plants*. Plants go through cycles of growth and decay in the yearly rhythm of growth in the spring and summer, and decay in the fall and winter. They are an important source of metabolic energy for animals and humans. They have a more passive relation to their environment, adapting to high altitudes and hot summers morphologically and physiologically.

*The formative principle active in the digestive tract and liver is characterized by additional **vegetative**, cycle creating forces. Its field of activity in nature is where growth (anabolic metabolism) and decay (catabolic metabolism) take place. These cyclic forces of growth and decay are characteristically active in plants.*

6.1.3. The Kidneys and Urinary Tract

The kidneys and urinary tract are morphologically "foreign" to the abdomen, as are the related adrenals and genitals. Embryologically, the kidneys and urinary tract develop from mesoderm (mesenchyme) rather than endoderm like the lungs and intestinal organs. They first arise in the cervical region close to the developing nervous system and go through an embryological "descent" into the lumbosacral region, and later through a partial "ascent" to arrive in the dorsal upper abdomen. The kidneys are *active organs* on many levels, morphologically, physiologically, and also in their function for the organism. The kidneys are parenchymatous organs that are not homogenous like the liver. They have, morphologically and functionally, two different and physiologically opposite areas, *cortex and medulla*, each of which consists of various different cell types. The kidneys actively *regulate* the volume and pH of extracellular fluids. For that purpose they have developed, in addition to the diffusion such as takes place in the respiratory tract and the absorption in the digestive tract, an ingenious system of filtration and *active reabsorption*. Protein metabolism plays an important

role in this process. The juxtaglomerular apparatus in the kidneys has a perceptive and regulating task. These are not cyclic processes but they lead from one (old) situation to another (new) situation. *The forces that model the kidneys and urinary tract have an added formative quality compared to those of the digestive and respiratory tract.*

The following diagram (fig. 6.3.) may represent the regulatory activity of the kidneys in the organism. It represents going from an old situation to a new situation.

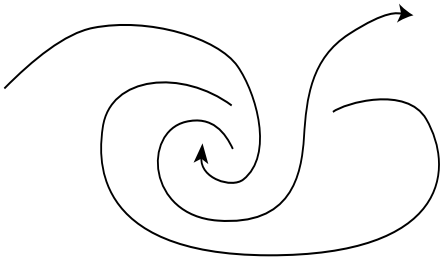

Fig. 6.3.

The characteristic physiology and morphology of the kidneys reminds us of their embryological, morphological, and physiological relation to the **interactive** forces of the central nervous system that perceive and react, regulating processes in the whole organism. The kidneys perceive and react, and have a regulating function for the organism; they specialize and differentiate; they are hormonally related to many other organs in the body, specifically also the central nervous system.

The Working of the Kidney's Formative Principle in Nature as a Whole

The formative principle that is characteristically active in the kidneys and urinary tract can be found in nature where the nervous system starts to play a role in interactive processes of perception and reaction. This is in *animals*. Animals, in their specialized ways, actively interact with their environment. They eat it, walk around, fertilize it (the insects through their contact with the plants, the mammals through their excretions), transform it (for instance nectar into honey). In doing so they have a regulating function in their environment. Perception plays an important role in their active relation to the environment.

*The formative principle that is active in the kidneys and urinary tract is characterized by additional **interactive** forces, such as are also active in the nervous system. These forces create the polarity of cortex and medulla. Their field of action in nature is where the nervous system starts to function as a regulatory organ. This is in animals.*

6.1.4. The Heart and Circulation

The heart and circulation are *active on all fronts*, like the kidneys. But they also *impart their activity to the organism,* through the blood. The blood is intimately related to heart and circulation, since it originates from the same embryological angioblast cells. Heart, vessels, and blood move in rhythmic pulsation, and the fluids of the whole organism move along with them. They also impart their warmth to the whole organism. Yet the activity of heart and vessels is directly dependent on the peripheral tissues, insofar as blood flow in the capillaries is dependent on local metabolic activity and cardiac output is determined by venous return from the periphery. Lipid metabolites, in the form of ketone bodies, provide for the energy supply of the heart.

The heart and circulation are tubular, with an expansion and differentiation in heart tissue. But the tubular structures arise *de novo*, unlike in the respiratory tract, the digestive tract, and the urinary tract. Unlike the liver and the kidneys, the heart and vessels are not parenchymatous organs. They consist of *rhythmically moving muscular* tissue. The heart and circulation are morphologically more like the digestive tract and physiologically simpler than the kidney tubular system. Yet, heart and circulation function on a higher level than the three other systems since they impart their rhythm and warmth to the whole body. Heart and circulation function *autonomously*, yet they *serve* the organism's needs.

The following diagram (fig. 6.4.) may represent this. The figure eight or lemniscate represents the mutual dependence of heart and periphery, and of capillary flow and local metabolism. The lemniscate shape is also a morphological feature of the circulation with the heart at its center. When we represent the activity in the periphery as arrows directing outwards in the lower loop of the lemniscate, then, if we continue the arrows going upwards along the lemniscate, the arrows will point inward in the upper part of the lemniscate, representing the activity of the heart.

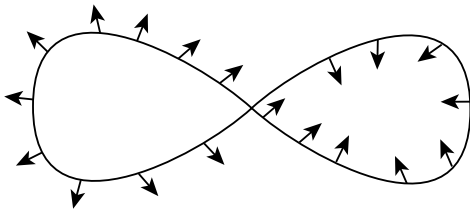

Fig. 6.4.

Embryologically, the circulation is first developed in the lateral periphery of the

embryo and "outside" the embryonic disc in the yolk sac. (Of course, the yolk sac also develops from the zygote.) The heart arises in the area above the central nervous system, and only arrives at its final location in the chest after the growth of the central nervous system has overtaken it. The heart "descends" into the embryological organism like the kidneys, but its origins are higher up than those of the kidneys, are even at the borders of the developing embryonic disc. *The heart and circulation have an additional quality of forces shaping them and working in them.*

The physiology of heart and circulation tract is based on principles that have an **integrating** character: heart and circulation penetrate everything with rhythm and warmth; they attend to the perfusion of tissues through the blood and make the organism an autonomous unity; their activity is dependent on the activity of the organs and organ activity is dependent on the heart and circulation.

The Working of the Heart and Circulation's Formative Principle in Nature as a Whole

The formative principle that is characteristically active in heart and circulation brings integrating forces into the organism. Its field of action is throughout nature where active integration plays a role. This is where *humans* may become active by cultivating nature such that they attend to and enhance the self-regulating forces of natural ecosystems, acting autonomously, but serving nature's needs.

The physical principle works in lifeless nature (minerals and stones), naturally. In plants, the vegetative principle works additionally, naturally. The principle of regulatory interaction, characteristic for the nervous system, works in animals in addition to that, also as a matter of fact. For us humans, ***bringing an integrating principle to nature is a task, not an accomplished fact****. Our interaction with nature often remains at the level of the forces that regulate and specialize, much like the nervous system does, without establishing the mutual, heartfelt connection serving nature that can be represented by the lemniscate.*

➔ *The four organ systems that were discussed have four different archetypal principles that work in them. These four formative principles can also be recognized in nature as a whole. The lung and respiratory tract are the characteristic expression of physical "mineral" forces in the organism, the liver and digestive tract of vegetative "plant" forces, the kidneys and urogenital tract of regulatory interactive "animal" forces, and in the heart and circulation the forces come to expression that we humans have to develop as heart forces.*

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Can physiology give more insight into the living human organism than the mere facts reveal at first? Is the level of activity the same for all organs? Are the vital qualities at work in organs unique for organisms and limited to biological activity? Can we find a scientific basis to research the coherence between organ systems?

By enhancing the current scientific method with phenomenological points of view we can find meaning in the facts and understand them as an expression of life itself. The phenomenological method makes the relation between organs visible and comprehensible. It approaches scientific facts from the point of view of their coherence and can give totally new insights this way.

What emerges is a grasp of the interrelations between biological processes, consciousness, and nature.