

L1a) Nature, Science & Mathematics Education: From Human, Animal and Plant Studies to Geography & the Quest for the Natural Whole. By Dr Robert Rose

This module focuses on Steiner's philosophy of Nature, Science and Mathematics Education. To begin with we will concentrate on Nature & Science Education which plays another significant role in Steiner / Waldorf Education. In this case, it locates the human being within its natural wholeness together with the other "Kingdoms of Nature" (Animal, Plant and Mineral).

Also known as Natural History Education, as a teaching sequence, this **begins** with the nature of the human being, proceeds to animals, plants and then the mineral realm **in that order**. The human being is presented as the **Whole** from out of which the other kingdoms are "analysed". Contrarily, it is that to which nature is "synthesised". Geography plays a vital role in this in that, beginning with its natural dimension, transcends to its economic, political and cultural dimensions (as we have seen in module 5, L4). In this sense, natural history education begins with the human whole, proceeds to its natural parts and then rises again to the human and geographic wholes in terms of the natural, economic, the political and the cultural. Mathematics is also taught from the beginning and accompanies all the nature and science topics and also enables a process to the global whole. We will return to this in L4 and focus here on Nature and Science Education. In this way, the human being becomes educated into this wholeness and the environmental responsibility that comes with it.

For the further study for this module it would be good to read: Aiston, K & Rawson, M (eds) (2014): *The Educational Tasks and Content of the Steiner Waldorf Curriculum*, Floris Books:

- 1) Human, Animal, Plant studies: Chapter 19, Life Sciences; Chapter 16, Gardening and Sustainable Living.
- 2) Geography, Biogeography, Mineralogy: Chapter 17, Geography.

Steiner on the Aim of Nature and Science Education

Usually in mainstream education the goal of teaching is the transmission of concepts and skills. Whilst this is also true of Steiner Education, there is another dimension to this education, namely the development of **character**, or one could say the inner psychological dispositions of the children:

“The goal of our educational work, therefore, is not merely to provide information about the plants and animals, but to **develop character**—in other words, *children's whole human nature*. When we teach about **plants**, we work toward the proper cultivation of *intelligence*, and we cultivate *volition* [will] by teaching about **animals**. In this way, we help children of nine to twelve relate to these other creatures of the earth, so that, through proper intelligence and self-confident will, they may find their way properly through the world”. Steiner R (1923): Modern Art of Education, Anthroposophic Press, p. 137. pdf version.

This particular type of educational aim directs itself to the cultivation of the intelligence and the will through teaching about plants and animals respectively:

“Above all, in education we must see that human beings develop in relation to both intelligence and volition. Out of feeling, which we have cultivated in children of seven to nine and a half, we develop **intelligence** and a strong **will**. **Thinking, feeling, and volition are thus *harmonized instead of being developed in the usual unnatural way***. Everything is rooted in feeling. We must begin with the feelings of children. From their feeling in relation to the world, we cultivate thinking through an understanding of plant, because the life of the plants never allows dead concepts. Out of feeling, we also develop the will by leading children to what connects them properly with the animal world, while raising children above them. Thus we work to nurture the appropriate intelligence and a strong volition in human beings. **This is in fact our *primary purpose in education, because only this can make children fully human, and such development is the goal of all education.***” Steiner, R (1923): *A Modern Art of Education*, Anthroposophic Press. p. 137/8. (My bold and italics)

Nature Education across the Sub-Phases

Nature education in Steiner / Waldorf settings has distinct aims and methods involved in accordance with the stages of child development.

In the first sub-phase, the methodological **process** is one of an **Awakening** to the natural environment. As will be seen, Steiner describes these early teaching years as helping the children become awake to the natural environment in terms of the meadows, plants and animals in the local vicinity. In class 3, the start of sub-phase 2, this then proceeds more towards a **Knowing** in that the first beginnings of a scientific approach can occur. For sub-phase 3, at the onset of class 6, this is developed further to reach an education of **Being** and **Doing** in nature. The question here is: how does the Human Being arise out of nature and what does it do there?

Accompanying this **process** is a gradual shift in the curriculum **content** covered. In the first stage, all the kingdoms of nature are approached in a very experiential way. The educational awakening is to the nature of those plants, animals, land and soil that can be a direct experience by the children. Normally, this means experiences of nature in the proximity of a school, hence this subject is sometimes called “Home Surroundings”. These experiences could then become a rich memory tapestry from which the teacher could create imaginative stories whilst at the same time remaining true to the beings themselves. From this, the child develops an awareness of the whole of nature within the imaginative milieu within their possible experience.

By the second sub-phase, after the first Rubicon of 91/3, a deeper more “scientific” approach may begin. This would be in the form of an imaginative approach to the **facts** of Human – Animal studies as well as Plant studies. The latter of which is done in connection with land and soil.

By the third sub-phase, starting with class 6, the scientific process proceeds to an imaginative presentation of **causes** and **effects**. It is here then that, consequently, mineralogy is introduced in connection with geography as it is the minerals that show the first type of cause and effect relationships. This is then followed up in physics and chemistry. From this point, towards class 8, a kind of ascent begins showing how the different aspects of the whole human being come into existence from out of the kingdoms of nature. Consequently, nutrition then becomes an important part of the education as it is that through which the Human Being maintains itself and grows. This is done in connection with agriculture. More details will follow.

The First Sub-Phase

In the **first sub-phase** of the lower school, nature education is tied in with learning through the deep psychological connection children have with the world. We have encountered this approach before under the heading of “imaginative anthropomorphisms” (human centred modes of teaching / learning):

“We might indeed say that from the seventh year to about nine-and-a-half or nine-and-one-third children take everything in with their **soul**. There is nothing that a child would not take in with its soul. The trees, the stars, the clouds, the stones, everything is absorbed by the child’s soul life.” Steiner, R (1924): The Kingdom of Childhood, Anthroposophic Press, p. 110. (My bold)

If we recall, Steiner’s concept of the “soul” today may be looked at in terms of “the psychological”, i.e. the inner life of the person. In this instance, the learning process is more of an imaginative – feeling experience than that of “intellectual” or more broadly “thinking” experience (this not to say that this is wholly absent). Clearly then, this quote indicates Steiner’s intention that children are educated about the completeness of the World’s beings and phenomena from this type of imaginative method.

This has a particular influence on the way nature studies are taught in Steiner / Waldorf schools. For this particular age period, Steiner made the case that teachers should preferably create curricula and specialised modes of teaching from out of their own experience and creative imagination rather than being directly copied from books:

“After the change of teeth... those whose task is to teach children of this age need an **artistic ability** that will imbue everything they bring with life; everything must be alive. Teachers must let plants speak, and they must let animals act as moral beings. Teachers must be able to turn the whole world into fairy tales, fables, and legends... teachers would prepare themselves so well for this task - which does require thorough preparation - that a conversation between plants, or a fairy tale about a lily and a rose, comes to children as the teacher’s own creation. And ideally, a conversation between the sun and moon should be a **product of the teacher’s unique imagination**. Until the **end of the ninth year**, everything children learn about plants, animals, and stones, about the sun, moon, and stars, or about clouds, mountains, and rivers should be clothed in pictures, **because children will feel at one with the world**. In those young days, a child and the world are one whole.” Steiner, R (1921): Soul Economy, Anthroposophic Press, pp 161-63. (My Bold)

Steiner was not against the use of books as such, the problem for him was the mere replicating of their contents in teaching. For Steiner, the children have a distinct sense when a teacher knows and creates something from out of themselves and this affects how they learn. For him, learning occurs at best when teaching is alive; replicating books does not do this. It is the teacher’s creativity that brings life to learning.

From this it can be seen that the content of the nature curriculum is very broad. It not only includes those things which would normally fall under “natural science” (Plants, Animals, Stones, Rivers, Mountains, etc) but also the first beginnings of “astronomy” (Sun, Moon, Stars). The intent here is to bring a first awakening to the nature of these beings and phenomena in imaginative form.

It is within this context that the teacher will need to find a balance between the pure imaginative story form and the factual reality of the World. To begin with, a teacher strives to make their own observations of the Kingdoms of nature, this then lead to the imaginative element which becomes a kind of clothing for the true nature of the World. This, for Steiner, enables the child to absorb its experiences of nature and reaffirm a feeling of oneness.

The Second Sub-Phase

In the **second sub-phase** of the lower school, when the child is between the 10th and the 13th year, Steiner recommended that **facts** about nature are presented to the children in the form of “**living pictures**” or “**imaginatively**”:

“When children reach the ninth or tenth year they begin to differentiate themselves from the environment. **For the first time there is a difference between subject and object; subject is what belongs to oneself, object is what belongs to another person or thing.** Now you can begin to speak of external things as such, whereas before this time you needed to treat them as though these external objects formed one whole together with the child’s own body. I showed yesterday how you could speak of animals and plants, for instance, as though they were human beings who speak and act. The children thereby could have the feeling that the outside world is simply a continuation of their own being.” Steiner, R: *The Kingdom of Childhood*, Anthroposophic Press, p 36. (My bold)

In this second sub-phase of the lower school (classes 3 to 6), the child undergoes a development of consciousness from anthropomorphic awareness to that of the consciousness of the “**living fact**” or “**imaginative fact**” (cf module 3). Consequently, it is at this time that nature studies proper are introduced in Steiner Schools in the form of human, plant and animal studies and leading over to natural geography (see also module 5):

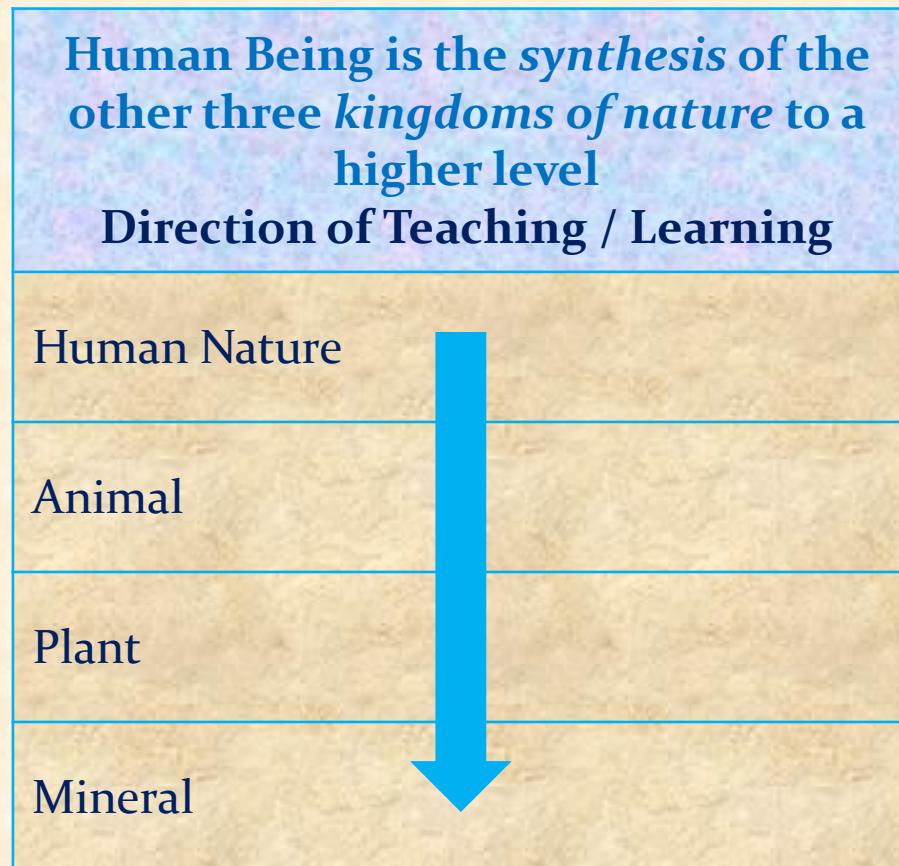
“When this period in the children’s lives draws near, it will be necessary to introduce the subjects of natural history into the lessons. Before this time, natural history is presented in a narrative form, as I described yesterday in our seminar when I spoke about the relationship of the animal and plant worlds to the human being. We use a **narrative, descriptive** form when we introduce natural history to the children early on. But we cannot start giving proper lessons on natural history before they have reached the age of nine.” Steiner, R (1919): Practical Advice to Teachers, Anthroposophic Press, p. 91/2. (My bold).

The reference to “yesterday” is the “Sixth Discussion” in “Discussions with Teachers, 1919” which ran concurrently with “Practical Advice to Teachers” as well as the “Study of the Human Being” (Allgemeine Menschenkunde als Grundlage der Pedagogik)(GA 293)”. **Together, these are now unified in the publication of “The First Teachers Course” in English.**

For Steiner, the starting point for nature education is the human being. In fact, he made the case that the “**Human Being is the synthesis of the other three kingdoms of nature to a higher level**”. The Education needs to be organised around this principle:

“I have made this preliminary observation because today I want to speak to you about the transition in **teaching method** that must be made particularly carefully when the children approach their ninth year... I would like to show you as teachers what you will have to apply in your lessons at the point when the children reach the age of nine to ten years... It is enormously important to know that the aim in teaching the children about natural history will be completely subverted if we do not **start** these natural history lessons by describing the **human being**. You may say quite rightly that there is not much you can tell nine-year-old children about the natural history of the human being. But however little it may be, you must present it to them as a **preparation for all your other natural history lessons**. When you give such lessons, you must be clear that the human being represents a **synthesis**, a bringing together of the **three kingdoms of nature**, that the three kingdoms of nature are united in the human being at a **higher level**. **You will not have to say this explicitly to the children**, but during the course of your lessons you must give them a feeling for how the human being is a synthesis of all the other kingdoms of nature. You will achieve this aim if, in the way you treat the subject of the human being, you awaken in the children the impression of the human being’s importance within the scheme of universal order... By letting the concept arise out of the form, we teach the children as much as possible about the natural history of the human being. And **only then** do we continue with the rest of natural history, **first** to the animal kingdom.” Steiner, R (1919): Practical Advice to Teachers, Anthroposophic Press, p. 92. (My bold and italics)

Clearly, Steiner presents a particular order to the teaching here. The study of the human being is to be first, then animals, followed by plants, then rocks and minerals. In light of this, we could represent the teaching sequence in the following way:

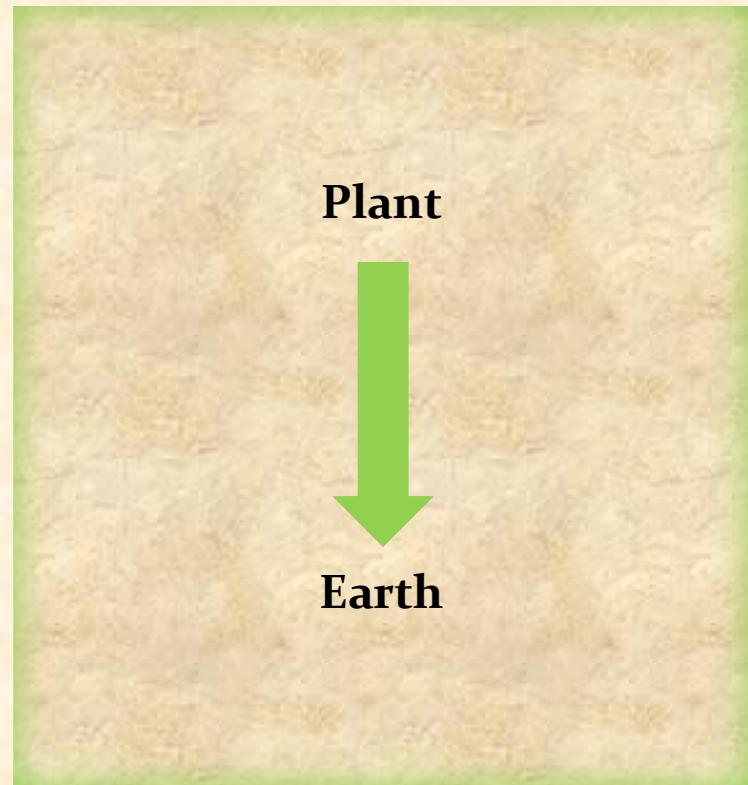
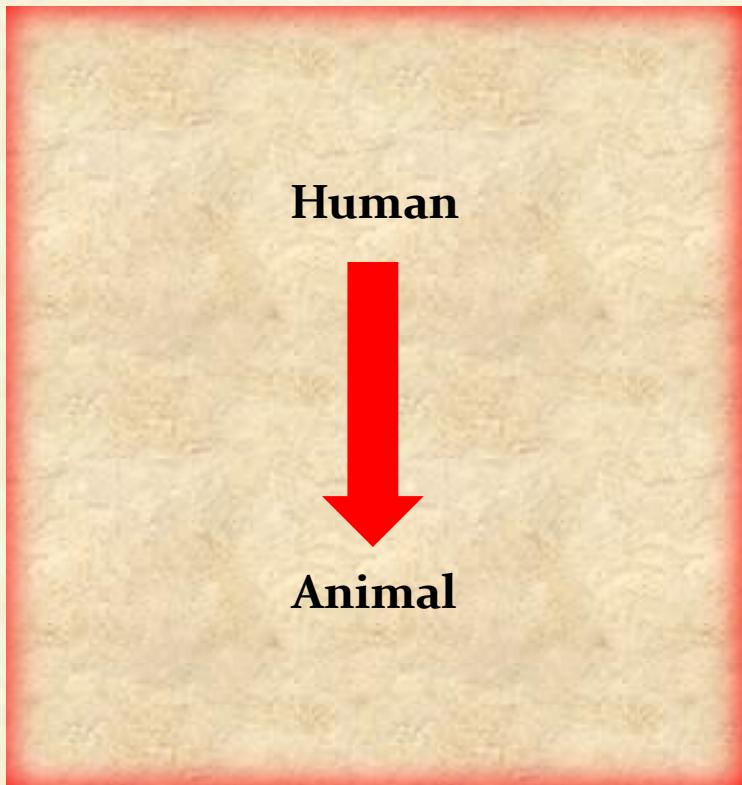


Nature's Polarities

Furthermore, Steiner presented nature studies in terms of two basic polarities:

“This will give the child a very beautiful and delicate feeling. For as I have pointed out to you, children come to know of the plant world as belonging to the earth, and the animals as belonging to themselves. The children grow with all the kingdoms of the earth. They no longer merely stand on the dead ground of the earth, but on the living ground, for they feel the earth as something living. They gradually come to think of themselves standing on the earth as though they were standing on some great living creature, like a whale. This is the right feeling. This alone can lead them to a really human feeling about the whole world... It is of very great importance that from the tenth year until toward the twelfth year you should awaken these thoughts of **plant-earth** and **animal-person**. Thereby the children can take their place in the world in a very definite way, with their whole life of body, soul, and spirit.” Steiner, R (1924): The Kingdom of Childhood, Anthroposophic Press, p. 48/9. (My bold)

We could represent this as:



We will return to this in later sections.

The Third Sub-Phase

In the **third sub-phase**, Steiner recommended that the teaching method shifts to that of **imaginative** presentations of **causes** and **effects**. The step on is from the imaginative approach to **facts**. One may understand this change in that a **fact** simply points to the existence of something such as a blue sky, or a yellow daffodil. One could here simply proceed by showing factual sequences, such as the growth of a dandelion in its various forms over its lifetime without any reference to **causation**, or the **effects** of a cause. In the third sub-phase, the teacher's task then becomes one of imaginatively representing the causes of the facts (effects) as the underlying reason for the existence of certain types of things. This mode of learning is at its most clearest in physics, chemistry and mathematics.

Human & Nature Studies across the Sub-phases: Towards Synthesis

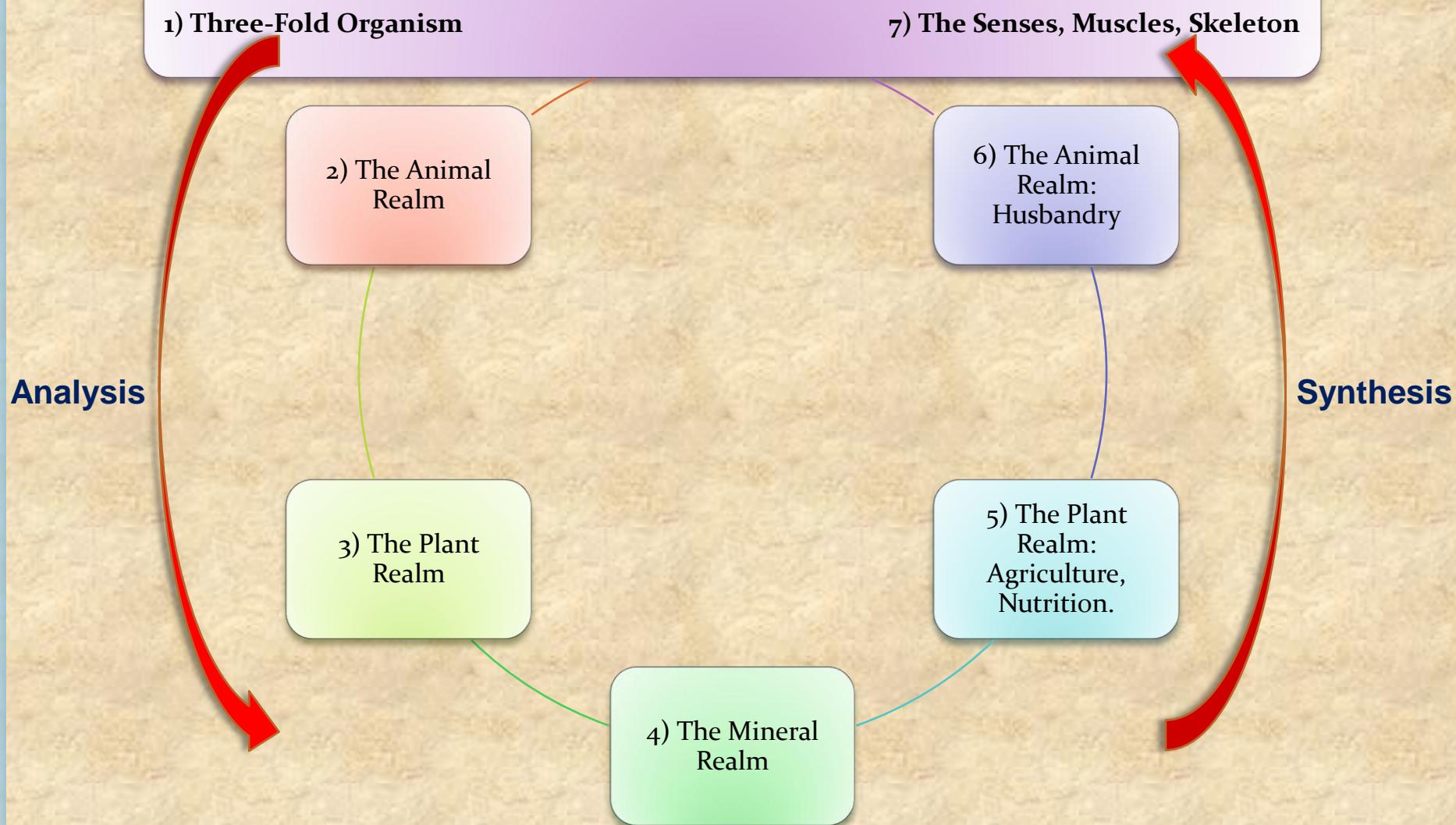
The process of teaching nature studies in relationship to human beings traverses a specific direction across the lower school. As has been indicated, the analytic process in this context begins sometime in class 3 on a very general level. Starting from the human being as the first wholeness, the pedagogy proceeds to gradually analyse out the other kingdoms of nature: from the human to the animal, then to the plant and onto the mineral. This latter becomes a turning point in class 6 with a geography based mineralogy main lesson. The ascent to the human being then begins, culminating in educating the children into how the nature part human being arises from the environment. A significant element of this is **nutrition** and related to that is the question of **health**. From the educational consideration of these, the whole human body can be considered in terms of the senses, the muscles and the skeleton, etc (see end slide here).

This ascent through synthesis can occur in classes 7 & 8:

“In the seventh grade we return to the human being and attempt to teach what I pointed to yesterday with regard to what people need to learn about **health** and **nutrition**... In the eighth grade you will have to construct the human being by showing what is **built in from the outside**—the mechanics of the bones and muscles, the inner structure of the eye, and so on” Steiner, R (1919): Discussions with Teachers, Anthroposophic Press, p. 194/95.

The goal was to teach about as complete a picture of the whole human being as possible, particularly in relation to totality of nature. Health and nutrition play a vital role in this. The question of health studies has many aspects to it and Steiner regarded it very important element in the maintaining of human life. Nutrition is connected to this in that it is through this that the human body can grow and be maintained throughout life. Class 8 extends this towards a more general consideration of how the human body is related to the outer world of nature. The Steiner / Waldorf teacher has the task to create a meaningful curriculum which introduces the students to an understanding of the place of the human body in the world of nature, obviously at a level suitable to their age. The following picture gives some possibilities:

The Human Being:



As we will see in module 8, all of this feeds into how a series of main lessons could be designed. Assuming for now that the natural history main lessons are in the order of 6 weeks per year, the above could be a pattern for creating a sequence of natural history classes over this eight year period. More details will come later.

For now consider the following which gives an overview of the Natural Science curriculum originally given by Steiner at the end of “The First Teachers’ Course”:

Summary from “Discussions with Teachers”

| Sub-Phase 1 | | Sub-Phase 2 | | | | Sub-Phase 3 | |
|------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Class 1 6-7 yrs | Class 2 7-8 yrs | Class 3 8-9 yrs | Class 4 9-10 yrs | Class 5 10-11 yrs | Class 6 11-12 yrs | Class 7 12-13 yrs | Class 8 12-14 yrs |
| Awakening to the local environment: plants, animals, meadows, mountains, etc | Continuation of class 1. | Study of meadows & fields. Extension to business. Building Farming Animals in connection with the human being. Introducing Botany. | Recent Natural History and business. Human & animal study continuation. | Less familiar animals. Scientific study of botany. | Continuing botany. Mineralogy in connection with geography. | Human beings in relation to health and nutrition. Further geography and industry connection. | The human being: bones, muscles, etc. The inner structure of the senses, such as the eye. |

Exercises

- 1) Make some elementary observations of the four kingdoms of nature: human, animal, plant mineral. In this, see if you can characterise some essential differences as well as similarities. Make some drawings as a part of the exercise.
- 2) For class 1, create a story based on the four kingdoms of nature. In this, try to find a balance between the imaginative and factual elements.