Towards a post-materialist understanding of science – lessons learnt form the interface of biodynamic agriculture and research

Paper for the Compas panel in the conference: Bridging Scales and Epistemologies: Linking Local Knowledge with Global Science in Multi-Scale Assessments

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Abstract

Sustainability-oriented development research aims to contribute to reshaping current relations between ecology, society and economy as part of a social learning process. This requires that the role of science be redefined as part of a societal form of knowledge production. This means to integrate science and so-called 'local knowledge'. Local forms of knowledge cover a wide range of issues related to organic and biodynamic agriculture, complementary medicine, solidarity based economy and currency systems. Science and scientists are playing an important role in these movements. But by bringing science into a process of social change science becomes transformed form a disciplinary towards a transdisciplinarity framework of orientation.

A major feature of this transformation is represented by openness towards the revision of materialist theory of cognition. There is growing strain of research done in the context of alternative movements, which directly and indirectly show that excluding 'a priory' a mind-matter relationship is not more then one option among others. Analysing examples from organic agriculture, complementary medicine, alternative economics, biology, physics and philosophy are allowing to devise a new understanding of the role and content of science in society. It can be labelled as an emerging post-materialist science; main features in regard to its epistemology, methodology and integration into processes of social change will be discussed.

Introduction

Alternative forms of practicing and understanding agriculture are becoming increasingly important on a global level. Among those in Europe biodynamic agriculture is representing the oldest form of 'alternative' agriculture, which from the beginning on was challenging theory and practice of conventional agriculture. Biodynamic agriculture is based on non-materialist philosophy, known as 'anthroposophy', created by Rudolf Steiner. It represents a 'local' knowledge emerging at the beginning of the 20. Century and was further developed by close interaction of farmers willing to apply the new methods and scientists which were recognising the limitations of conventional science and the interpretations associated to it. Biodynamic Agriculture was one of the most prominent opponents of conventinal agriculture until the rising of the environmental movement at the beginning of the 70-ies.

Biodynamic agriculture was participating in COMPAS from the beginning on because many roots of this farming concept are connected to wisdom coming from other cultures all along human evolution. Re-encountering with traditional forms of agriculture could create room for mutual learning and synergies of all partners involved. The way in which Biodynamic Agriculture dealt and still deals with science as taught in Universities will be presented in this paper because we think that this is an important aspect for sharing with other forms of local knowledge.

Biodynamic agriculture studies natural phenomena on a non materialistic background, expressed in a theory of cognition as developed in anthroposophy. It starts by recognising that concepts always have a generic character, which by relating them to perceived phenomena (demand for concepts) become individualised making that phenomena which are at first incomprehensible become freed from their lack of context through putting the concepts back in their proper context. Only through this last step is reality attained. Reality is therefore the conceptually or spiritually permeated world of phenomena (Witzenmann, 1977/78). It follows from this that in reality there is no spiritless matter. But there is certainly a matterless spirituality in the form of thinking. Based on this a new understanding of plants and animals farmers and researchers had to create a specific form of biodynamic animal and plant breeding.

What these concepts mean in prac tice will be exemplified by presenting main stages and outcomes of the process through which local knowledge and experiences of a group of biodynamic farmers and researchers were creating their own understanding of biodynamic plant and animal breeding. The role played by the small group of scientists involved in this process allowed to identify main challenges that had to be faced when trying to transform materialist science into a new form of science which is post-materialist; in stead of giving the solution to the farmers it aims to support them in the systematisation of their own experiences and knowledge, based on a social learning process of all actors involved. Main lessons of this process will be presented.

Starting points

The building of the group of farmers and researchers was motivated by the need for getting to a better understanding of the epistemological background which is framing the concretely defined standards for biodynamic farming that in turn are the basis for the yearly certification of the farms made by independent external specialists. The certification verifies the fulfilment of the standards on behalf of the farmers, which in turn guaranties high quality food products to the consumers. This is rewarded by paying a higher price for food certifies with the "Demeter" label ranging from 10-30 % at an average (DEMETER, 2003).

Farmers and researches placed special interest in some basic questions on which the standards are stressing and that are representing mayor concerns for both farmers and researchers, because they signify additional investments in time, money and efforts for understanding the complex interrelations between cosmos, earth, animals, plants and humans. Among the most discussed issued we find the following aspects of biodynamic agriculture:

The stable type and the internal arrangement and fittings must meet the following requirements (cited according to DEMETER, 2003):

- The sleeping stalls for cattle are to have appropriate bedding.
- Fully slatted floors (more than 50%) are not permitted and the slatted area may not be calculated as resting-place.
- Cow trainers are not permitted.
- Sufficient area to be provided, and the herd managed to allow the expression of social behaviour and unhindered feeding.
- There must be at least as many feeding/sleeping stalls as there are animals in the stable. In stables with ad lib feeding, fewer feeding stations may be offered.

Dairy cattle and cows suckling calves are to have **access to pasture** during the summer half-year. Where this is not possible, access to the open air must be available all year round. Young stock (breeding replacements) have the same requirement for freedom of movement reasons. To tie up young replacement or fattening stock in housing all year round is not allowed. Cows should be given freedom of movement at calving. A calving bay should be provided for if stable renovations occur.

The **horns of ruminants have significance for the development of life forces**. They provide an opposing balance of forces to the intensive digestion and absorption processes. They are a part of the total being of the cow. In comparison to other animal types, cattle manure has a particularly stimulating effect on soil fertility. The horns also have a large significance as a sheath in the production of the Biodynamic preparations.

The fodder must be appropriate and contain as high a **content of roughage** (greenfeed e.g. pasture, hay, silage) as possible, but **at least 60% DM** throughout the entire year. The majority of summer feeds must be green material, preferably grazed from pasture.

The **animals should be born and reared on a certified Biodynamic farm** , if possible as part of a permanent herd. Poultry chickens should hatch after natural incubation. A principle of the Biodynamic method is the keeping of male sires on the farm, and is therefore highly recommended. **Artificial insemination** cannot fully replace the effect of the male influence in the farm herd, and is **not recommended** It is not permitted to produce animals using genetic manipulation, or by the use of biotechnology (embryo transfer, sperm separation for sex determination).

All this in terms of farm management highly relevant practices are closely related to a specific understanding on what an animal is and how one must care for it. The objective of the group was therefore to engage in a social learning process that allows to deepen the understanding of what an animal is considering the experiences and knowledge of the practitioners and researchers as equally valid.

A post-materialist Epistemology

In a first step the epistemological basis of biodynamic agriculture had to be clarified for all members of the group. The researchers engaged in the field of ethology, biology and agronomy supported this first phase of reflection.

The assumed subjectivity of thinking (KANT, 1877) contradicts the engineer's and also farmers experience who -by thinking and understanding and acting- can effectively influence the inorganic sphere of the world. To overcome this contradiction, a cognitive theory is required that shows how man can understand the world. This epistemology was successfully established and implemented by STEINER (1921). In trying to observe one's own cognition processes, one can easily apply and modify FURRER's (1980) arguments-. "it is not enough for us to think, act and perceive. Experiments can only be carried out if nature itself is thinkable, treatable and perceivable. Yet we can only find out by experiment whether nature has these qualities."

However, nature's essential quality is not its questionability but its mental conceivability and its functionality. One could even say that any science is the science of behaviour i.e. ethology, since all thinkable expectations of behaviour (hypotheses) are observed in the experiment as nature's actual behaviour.

The cognition process can be followed up by anyone who observes his or her own efforts to understand. This can be illustrated as shown in Fig. 1.

The perceivable and questionable world phenomena, - which needs explanations - draws on human concepts created through thinking. Experiments show whether or not the expectations concerning behaviour are confirmed by world behaviour. If this is the case, the world of phenomena is no longer questionable, its functionality and its laws will be recognised and understood. In other words, the world becomes real; we can realise the world. By linking conception and perception our concepts -which always have a generic character- become individualised, e.g. a generic concept becomes an individual representation (WITZENMANN, 1983). The generic concept of an injury, for example, becomes individualised to a laceration on the femur (see Fig. 1).

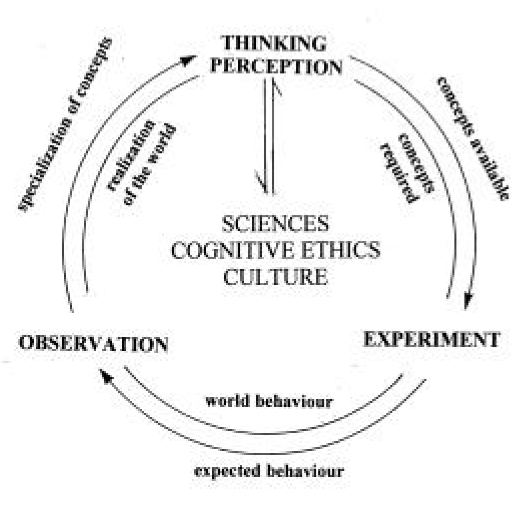

Fig. 1: Diagram of the process and evolution of sciences, cognitive ethics and culture.

By carrying out this cognition process in all the different spheres of conception - corresponding to the different spheres of being (inorganic, physiological, psychological and spiritual)- mankind recognizes the world and thus creates the different sciences (physics, biology, psychology and the humanities). Cognitive ethics derives from the links between scientific understanding of the world and of human nature. Implementing these ethics by acting according to reason and understanding leads to cultural progress in the form of a metamorphosis of natural evolution.

Ethology of Farm Animals

By applying this cognition process to animal behaviour, it becomes apparent that animal behaviour cannot be understood without the concept of autonomous activity, because this behaviour is not simply the causal effect of the environment, but an expression of the animal actively coming to terms with its surroundings (SOMMER et al., 1976). The animal applies its species-typical behaviour in order to satisfy its wants and to avoid suffering. This has given rise to the "prerequisites to meet the animal's wants and to avoid suffering' theory (RIST et. al., 1989). The satisfaction of wants and the avoidance of suffering leads to self-organisation and self-preservation of the animal physis, corresponding to the "theory of the prerequisites to meet needs and to avoid injuries" by TSCHANZ (1987). Housing systems that do not comply with the behaviour patterns of a species can impair or even prevent species-typical behaviour. Fig. 2 shows how inadequate housing systems are leading to produce injuries of the anatomical sphere; cause diseases, illness and pain in the physiological sphere; and, in the animal's psychological sphere, bring about suffering and anxiety, resulting in stress and the reduction of well-being.

<table>
<tr><td colspan="3">SPECIES-TYPICAL BEHAVIOUR
WELLBEING</td></tr>
<tr><td>in the anatomical sphere
↓
disharmony
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injuries</td><td>in the physiological sphere
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disharmony
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diseases</td><td>in the psychological sphere
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disharmony
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suffering</td></tr>
<tr><td colspan="3">STRESS
REDUCTION OF WELLBEING</td></tr>
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Fig. 2: The impairment or prevention of species-typical behaviour in the anatomical, physiological or psychological sphere can lead to injuries, illness and suffering

In positive terms we have:

- Absence of injuries as the successful interaction between animal and environment in the inorganic sphere
- Health as the successful interaction between animal and environment in the physiological sphere
- Wellbeing as the successful interaction between animal and environment in the psychological sphere

By recognising and understanding the qualitative inter-relations between animal and environment, it is possible to deduce quantitative and measurable parameters for the assessment of housing systems and housing equipment. They can be classified and differentiated into pathological, physiological and behavioural parameters.

Pathological parameters:

-Injuries, contusions and abrasions due to inadequate housing

-Losses

Fig. 3 shows the locations of injuries which -according to KÄMMER et al. (1 975) result from cubicles in loose-housing systems for dairy cows unsuitable for the motion sequences of getting up and lying down.

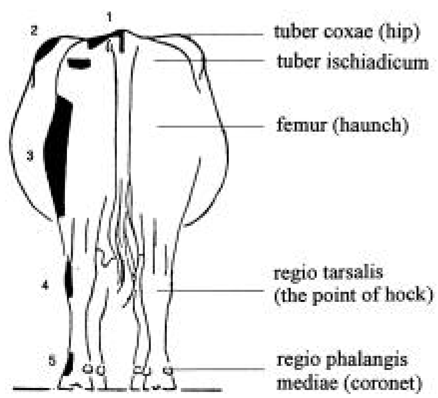

Fig. 3: Location of contusions, abrasions and lacerations on the animal body in loose-housing systems for dairy cows with cubicles unsuitable to their behavioural needs. Contusions at 1, 2, 6; Abrasions at 1, 2, 4, 5; Lacerations at 3

Physiological parameters:

- Changes in respiratory and pulse rate
- Changes in blood pressure
- Changes in blood parameters (haemoglobin, hormone and enzyme levels)
- Deviations in the digestion process
- Deviations in the reproduction process

By simultaneously analysing the state of Agitation and hormone levels in young bulls, UNSHELM et al. (1978) were able to prove that different levels of psychological Agitation clearly influence the hormone levels. As shown in Tab. 1, there is a difference in adrenaline blood-levels of up to 10.4 ng/ml between resting bulls and those moving evasively after antagonistic clashes.

These and similar surveys disprove the commonly-held materialistic view that anatomy determines physiology which, in turn, determines the psyche. In reality, it is the other way round: psychological processes are expressed in physiological processes and thus, in the course of time, the physiological structures (e.g. the immune-system) are also influenced. Hence psychological well-being is the determining factor for an animal's health or illness.

Table 1: Different levels of adrenaline in the blood samples of young bulls in various states of excitement or agitation (after Unshelm et al., 1978)

Activities	Number of Observations	Adrenaline in ng/ml
Lying and ruminating	54	-2.17
Lying	60	-2.30
standing, ruminating and feeding	25	-1.44
sniffing, social grooming, looking around, turning towards others	21	-1.52
rubbing, pushing, playful head-pushing	16	+6.07**
attentive waiting, walking around, head forward	9	-1.65
evasive movement, restlessness	10	+8.10**
defence reaction	2	-2.08
**highly significant		

Quintessence for Animal Husbandry

Now that the limitations of species-typical behaviour patterns of farm animals have been brought to light through farm-animal ethology over the past 2 decades, it is evident that animals must be given an environment in which they can live according to their type. For example, it has been shown that year-round indoor keeping cannot be justified for any animal species. Cattle as well as pigs and poultry need adequate space to run about in. lf meadow and grazing areas can be made available -the ideal species-typical situation - this should also be provided for pigs and poultry along the lines already established for cattle

Autonomous beings and causality

From the above point of view it follows that for *autonomous* beings - including human beings in their knowing and doing - outer circumstances are not the causes of what results from this autonomous activity, but they are more or less favourable conditions under which the autonomous being produces these activities. And, vice versa, it follows that physical causality, the principle of outer cause and stimulus, always presupposes that the factors under consideration manifest no autonomous activity, that they are passive. This applies to non-living things (RIST, 1985).

In his introductions to Goethe's scientific writings on the distinction between the phenomena of inorganic and organic nature Rudolf STEINER commented as follows: 'An example of the former kind, for instance, is the collision between two elastic balls. [...] We have *comprehended* this phenomenon when we are able to state the velocity and direction of the second ball on the basis of the mass, direction and velocity of the first and the mass of the second; when we see that, under the given conditions, that phenomenon must occur as a matter of *necessity*. But this means only that what is presented to our senses must appear as a necessary result of what we have to postulate in the idea. If such is the case we have to say that concept and phenomenon coincide. There is nothing in the concept which is not also in the phenomenon, and nothing in the phenomenon which is not also in the concept. [...]'

Living beings such as plants and animals are different in that in the constant metabolism, change of shape and behaviour, the autonomous activity of the animal or plant *species* comes to expression. It is characteristic that throughout the life history organisms of the species remained the same, whereas the material composition constantly changed. Because of this, the modern geneticist is forced to speak of a genetic 'program'. He must have some sort of constant in the change of appearances and cannot find it in the matter. Rudolf STEINER (1884 - 1887) expressed it thus: "For instance, it cannot be said of the plant that size, form, position, etc. of the roots determine the sense perceptible characteristics of the leaves or the flowers. A body in which such would be the case would not be an organism but a machine. It must be admitted, rather, that sensible characteristics in a living entity do not appear as effects of other sense perceptible conditions, as is the case in inorganic nature. All sensible qualities appear here rather as a result of something which is not perceptible to the senses. [...] We must go beyond the sense world. What is perceived does not any longer suffice; if we are to explain the phenomena we must conceptually grasp the unity.' GOETHE described this higher ideal unity whence all animal and plant species come as the 'type' or as Rudolf STEINER (1886) put it: 'The type is the true primal organism; either primal plant or primal animal according as it specialises ideally. It cannot be any single sensibly real living entity.

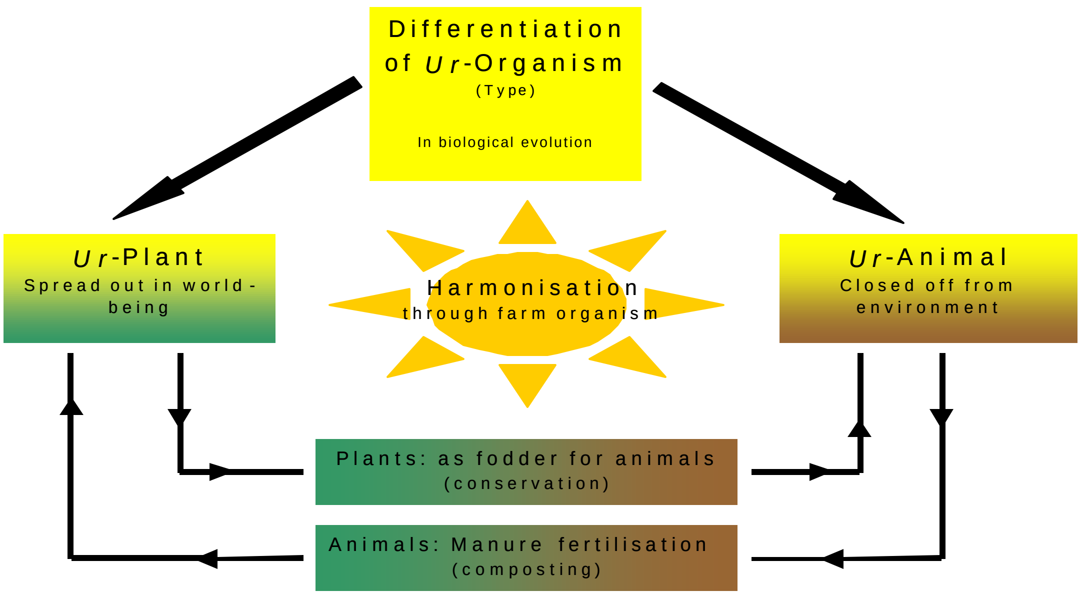

Fig. 4. Differentiation of Ur-organism in Ur-palnt and Ur-animal and its relation to farm-organism in biodynamic agriculture.

This ideal differentiation of the primal organism is based on two formative tendencies (see fig. 4): plants are organisms which both functionally and morphologically - from seed, through seedling and green leaf to flower - open out more and more to the environment, and indeed lose themselves in it as pollen. In fertilisation this abandonment to the *environment* reverses and in fruit and seed formation leads back once again to the closed form of *autonomy*. This counteracting form-tendency prevails in the animal organism. Animals increasingly close themselves off from the outer world with their skin (fur, feathers, shell etc.) thus emphasising their autonomy (RIST, 1993). This gives only the main tendencies, the ultimate form depending on two aspects:

1. How the environment or autonomy of particular plant or animal species metamorphoses, specialises: "The type is the revelation of the principle in the organism, its idea, the animality in the animal, which out of the life that unfolds from it, has the power and ability to develop a multiplicity of outer forms (species, genera) out of its inner potential." (STEINER, R. 1884 - 1897)
2. How the outer conditions are formed, amongst which the individualisation of the type take place.

It is not that outer circumstances shape the organism, but that these can provide more or less favourable conditions for the process of unfolding inherent to potentialities of the 'Ur-Organism'. What appear physically are only particular metamorphoses, individualisations of particular species that develop from the type. The species as such are not sense-perceptible, only their representatives in the form of individual organisms, which under particular conditions are not exactly, the same, but because they belong to the same species are similar. '...since it [the organism] is here subject, not only to its own formative principles, but also to the conditioning influences of the external world - since it is not such as it ought to be according to the nature of the self-determining entelechy Principle, but also such as it is through the influence of something else upon which it depends - it therefore appears as if never in full accord with itself, as if never heeding only its own nature. Here human reason now enters and forms in *idea* an organism not corresponding to the influences of the external world, but heeding only that principle." (STEINER, R. 1884-1897)

This shows that the species are ensoulde-spiritual beings, which stemming from the spiritual cosmos, enter into earthly events. That a plant or animal species is not an abstract concept, not even a subjective scheme for putting things in order, but soul-spiritual potential can be clarified with the following example: we know that soul-spiritual conditions affect our bodily functions, such as blushing, trembling with excitement or raised adrenaline levels with stronger stimuli. This is demonstrated experimentally in bullocks which have differing blood adrenaline level differs according to the level of psychological stimulus (UNSHELM et. al. 1978). The hormone production is the result of the stimulus and not the reverse. Hormones provide the conditions for our soul-spiritual state to affect our bodies. Hence we call them messenger substances. Interestingly, certain hormones can affect the genes and exert a regulatory influence in genetic processes (WEHNER & GEHRING, 1990). Thus information flows not only from DNA to protein, but also from immaterial, soul-spiritual potentiality of the species to the hormone and then to the DNA. Because of this we can answer the question raised above as to what life is in the following manner: *Life is the autonomous interaction of the respective plant or animal species or the human individuality with the prevailing environmental conditions.*

An alternative perspective on genes

Once we came to an understanding on the 'nature' of the animals and having understood as well the way through which we are connected to it, we had to address the question on the role of genetics – which are fundamental for breeding - in the context of the biodynamic understanding of animals.

A way of looking at genes that accords with post-materialism does not comprise the inadequate view that genetic substance builds up the organism in a physical causative way. The genetic substances are rather seen as the *condition* under which the omnipotence of the *species* individualises itself to a specific phenomenal form similar to its predecessors whence came the genetic substance (RIST, 2000). The genetic substance is the condition for getting a Fresian calf from the mating of a Fresian cow with a Fresian bull. That an organism of the cattle kind arises at all is not attributable to the genetic substance but to the psychological-spiritual 'information' embodied in the species of cattle.

Unbiased observation of gene *technology* or genetic *engineering* suggests that these designations are inappropriate because for one thing many experiments do not 'succeed', i.e. do not deliver confirmation of the materialistic theory (GOODWIN, 1984; HOLLIDAY, 1988; HEUSSER, 1989; REIBER, 1995; STROHMAN, 1997), or when they do 'succeed', malformations result or unexpected results are produced. It is less a matter of a mature 'technology', than an interesting field of scientific research. To this one might add that many experiments which have not succeeded according to the current theory have not been reported (FOX, 1991). If mechanical technology had a similarly uncertain outcome, hardly anyone would set foot in an aeroplane or even a train.

The most extensive proliferation of gene manipulation has been with bacteria. WIRZ (1995) explains this as being the result of the fact that bacteria can be easily cultured in millions, the few good examples easily isolated and multiplied. It is also worth noting that bacteria have a natural tendency to exchange genes. Furthermore, bacteria allow the introduction of genes from higher organisms, but even then the outcome is not at all certain as shown for example by the *Escherichia coli* bacterium which received a foreign gene for the oxidation of naphthalene to salicylate, but unexpectedly produced the dye indigo (ENSLEY et al, 1983). In addition we need to consider that in prokaryotes (organisms with no cell nucleus) which include the bacteria it is always the whole gene that is expressed whereas with eukaryotes (organisms with a proper cell nucleus) which include almost all plants and all animals, only a part of the gene is expressed. Here, even at the molecular level, lies a functional difference between the simpler and the more developed species.

It can happen that some DNA sequences code for more than one protein or that genes overlap. Through varying the splicing (LEWIN, 1991) different proteins can be obtained from the same nucleotide sequence.

The more highly developed species are less able to fit themselves to different environmental conditions than universal organisms which can appear under various conditions and therefore from an experimenter's point of view are more easily manipulable.

In the transition from bacteria to higher organisms it is clear that genetic engineering experiments are most successful with plants that are more closely related to one another (POTRYKUS, 1991). Even here the boundaries are once again closely set, as for example with the 'tomato' which was a protoplast crossing between the two nightshade species tomato and potato. Although it grew, it resulted in neither an edible tomato nor an edible potato. Both species could still influence the genetic material but it led to corresponding disturbances in their species-specific formative tendencies, especially their assimilation into the corresponding fruit or root regions. In addition it should be noted that in plants genes foreign to the species are soon no longer expressed, i.e. brought to appearance, but through a molecular reaction (methylation) are inactivated (MEYER, 1996) - so called 'gene silencing': the transgene concerned poses an unfavourable condition for the plant *species* and can be silenced by it.

Stable expression of such transgenes is difficult to attain, especially when the environmental conditions vary a lot. Thus in an open air experiment petunias containing a so called colour gene from maize initially showed the desired colour. But when a period of hot weather arrived - i.e. a change in the environmental conditions - they lost the coloration once again showing that the gene had been inactivated (LINN, 1990). So called pleiotropic effects appeared, meaning that other features than pigmentation were affected. The transgenic petunias had more leaves and shoots per plant and were more resistant to pathogenic fungi. They showed greater vitality and lower fertility than the unmanipulated petunias (MEYER, 1995). During the hot weather the vitality of the transgenic petunias was suppressed. This illustrates clearly how the petunia *species* can more or less effectively influence its hereditary material depending on the environmental conditions.

Gene manipulation comes up against the greatest difficulties with mammals. So in the so called 'knockout experiments' on mice in which genes are switched off by a molecular technique, out of approximately a million treated cells only one with the desired effect could be found (CAPECCHI, 1994). In the 'production' of transgenic animals one can hardly fail to notice the enormous 'embryo consumption'. In a large experiment on pigs lasting three years only 8% of the manipulated egg cells gave rise to births. Of these 8% only 7% had in fact taken up the transgene. This corresponds to a success rate of only 0.6% (PURSEL et. al., 1989). In the animals that actually took up the foreign gene, its effect in most cases showed as deformations or functional disturbances. For instance, the pigs grew faster. But in the long run this was detrimental to health as the pigs showed a strong tendency to gastric ulcers, arthritis, cardiomegaly, dermatitis and kidney diseases. Through this intervention the conditions for the porcine species became so unfavourable that it could only imperfectly form its organism. The 'growth hormone' gene became - in the language of genetics - an arthritis gene.

In the aforementioned knockout experiments people hope to gain information on the function of the deleted gene in the organism. To the amazement of the experts a large number of these deletions were without visible consequences for the organism or quite other characteristics were affected from the ones predicted from theory (TAUTZ, 1992; BROOKFIELD, 1992). When the species is capable of forming a complete organism without a gene presupposed to be essential, it can only mean that genes are not the cause of the organism's existence, but only provide more or less favourable conditions and in some cases can be completely absent.

Consequences for livestock keeping and breeding

From these examples it is clear that the species, in its psychological-spiritual potentiality from the non-spatial and non-temporal, exerts its influence at all times and throughout the organism. It can manage this better the more favourable are the available conditions (RIST, 1997; RIST, 1998).

Four categories of conditions can be distinguished: firstly the *terrestrial* conditions, which include the external environmental influences (e.g. warmth, light, moisture, soil composition with plants, husbandry and nutrition with animals); secondly the *cosmic* conditions, which include the relation of the sun, moon and planets to one another and to the fixed stars (STEINER 1924), as frequently shown experimentally by SPIESS (1990), ZÜRCHER (1992) and THUN (1993); and thirdly the *genetic* conditions. The latter stem from the ancestors and set more or less favourable *inner* prerequisites for the organism for it to develop in accord with its species. Breeders do their best to bring together the most favourable *outer* conditions with the most favourable hereditary material (inner conditions). Through getting all the conditions optimal it becomes possible for the species too - over several generations (STEINER, 1924) - to form its genetic material optimally. In conventional breeding it is always ensured that along with selection the optimal conditions for life for the desired goal of the breeding are made available - albeit with the justification that what is stored genetically can also manifest itself. It is therefore questionable whether the characteristics achieved arise through chance mutation and/or the *conditions* for life (for which 'chance' is not a scientific explanation, but rather shows that one does not know the reasons, conditions or inner activity at work which give rise to the appearances in question). Terrestrial, genetic and cosmic conditions are related to what animals perceive at the level of their psyche as different degrees of adequateness for the embodiment of their specific type; this represents a fourth condition deciding whether a certain form of breeding or animal housing is species typical or not (see figure 5).

One can even accept that through the intervention of gene manipulation of the hereditary material this too could be improved. But it is worthwhile first considering that by optimising the environmental conditions the species is not forced to do anything in particular, but is left to respond according to its own potential. As the species has self-referentially developed its whole organism - including its hereditary material - under *terrestrial* and *cosmic* conditions appropriate for the species, over a series of generations the hereditary material becomes increasingly characteristic for the species. In this way, through optimising the environmental conditions the *genetic* conditions become increasingly optimal, i.e. increasingly species specific, because the species itself knows best the optimal genetic make up needed for doing justice to the intentions characteristic of the species.

A result of this kind of reflections were the construction of an understanding of the animals taking into account that they are the materialisation or incarnation of the psychological-spiritual potentiality expressed in the 'type' of the different animals on earth (see Figure 5).

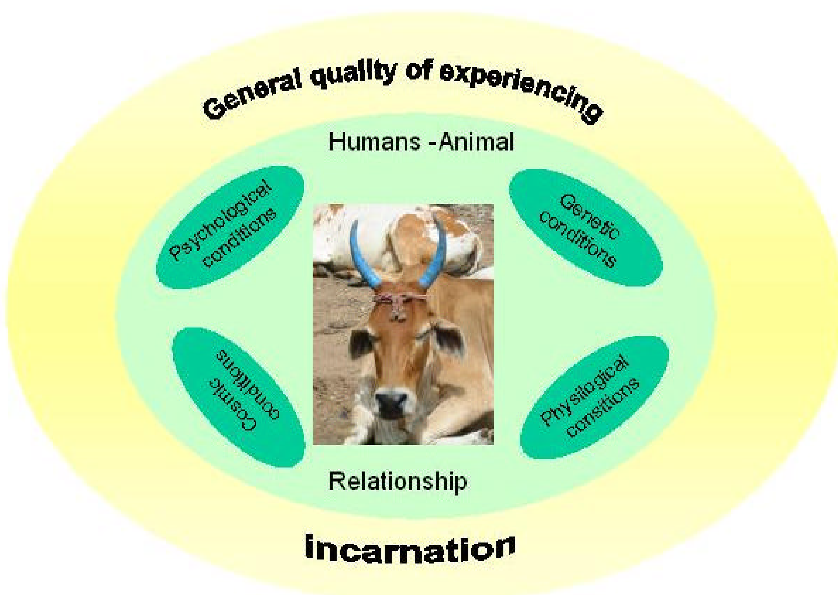

Figure 5: General vision of domesticated animals according to biodynamic farmers

In the case of domesticated animals the special feature is represented by the fact that most important conditions under which the 'type' can be materialised are depending from what humans e.g. farmers, breeders, veterinarians and also consumers are doing. This means that the embodiment of the 'type' becomes dependent from the concepts society has on animals. Based on those concepts the real conditions are defined e.g. in terms of what kind of feeding, dimensioning of stables, pasturing, medicine, production level, quality aspects are considered to be adequate; the concepts on animals are also deciding whether natural or artificial insemination are considered to be pertinent or if genetical manipulation are allowed or not.

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