

Encounter with prof. Kalevi Kull on a Biosemiotics view on life, cognition, consciousness
Tartu University, Oct. 9, 2015
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Legend: KK: Kalevi Kull – Btk: Bartaku

KK

So, you have shown an interest in biosemiotic approach. Just a little clarification from the outset. It is important to distinguish between semiotic approach and the gene-deterministic approach - known under the names of sociobiology or evolutionary psychology or egoistic gene approach. Why do I say that? Because the latter has introduced a certain “pseudo-intentionality”, or pseudo-teleology into the explanations of biological phenomena and organisms’ behaviour. Just an example: one of the consequences or interpretations of that Dawkinsian approach implies that cultural plants use humans in order to distribute themselves around the world. Funny, you could use it nicely in some fiction on plant consciousness. But I would say it is not serious, although it seems to be serious for some scientists. Particularly if we apply it to humans then there appear additional mistakes.

The biologists of biosemiotic approach have argued quite fundamentally that the same phenomena have a much better explanation. We can point to some logical mistakes in the application of that earlier model.

When speaking about communication on the level of plants — organisms that do not yet have a nervous system in a true sense — then you have to make clear what type of communication it is; what it can access and what not; what type of distinctions there are made and what cannot be done by vegetative life. Of course different species of organisms are connected via meaning making and communicational means. But how the evolution is going on, what are the driving forces... That is a little bit more sophisticated.

Now, have you seen this book? (book hisses whilst being taken out of the book shelf; Btk) Hans Werner Ingensiep: *Die Geschichte der Pflanzenseele*. This is absolutely great. It is the whole history from Aristotle onwards up to the 20th century, up to Biosemiotics; the idea of vegetative soul, plant intelligence in a way. Done as a good German scientist does it, using many, many references. He is a very nice person, working in Germany on Environmental issues.

Btk

So it ranges from plant cognition to plant consciousness?

KK

There is a problem of definition of terms: What is mind, what is consciousness. We could use the concept of mind very broadly, like C.S. Peirce did – a certain type of simple mind that characterizes everybody alive. Because of meaning making that is characteristic to life. Indeed like H. Maturana’s and F. Varela’s autopoiesis-based (self-making; Bvdp) vision on life and cognition. All living organisms cognize. Cognition is a

general feature. But the notion of consciousness should be more narrow, one that we would not use for all organisms. Either it is related to self-awareness which is maybe even more narrow, or just referring to the existence of feelings in terms of emotions and in that case it is broader, characteristic to vertebrates.

Btk

Future thinking ?

KK

Phenomena like prediction or anticipation are more general, again belonging to all living organisms in a certain aspect. Terminology about these is not yet stabilised at all, though. Semiotics can certainly help here, but there is a long way to go still.



Another book:

G. Witzany, F. Baluška (Eds.) *Biocommunication of Plants. Signalling & Communication in Plants.* Witzany and Baluška are somehow related to biosemiotics. Baluška's main idea is that there is a type of primitive nervous system in plants, the connections between leaves and roots, where some signals go through. And the organs that participate there include a type of very primitive synapses...

Speaking about literature and a biosemiotic approach to plant communication: This book you probably know (book slaps whilst hitting the cover of another one; Bvdp): 'What a Plant Knows. A Field Guide to the Senses', by Daniel Chamovitz.

Martin Krampen coined the term phytosemiotics. He worked at Berlin Art University, on environmental perception, architecture, visual semiotics, drawings of children... In 1981 he wrote an article in *Semiotica* (vol. 36): "Phytosemiotics" – on the semiotics of plants. Very useful. Later I wrote the paper "An introduction to phytosemiotics: Semiotic botany and vegetative sign systems" (in *Sign Systems Studies* vol. 28, 2000), where I reviewed and discussed Kampen's paper and several other approaches, somehow trying to make a clear difference between animal and vegetative semiotics, animal and vegetative meaning making.

What is the major difference? Meaning making is related to the capacity to learn. At vegetative level there is a certain capacity to learn to recognize particular single qualities; a certain type of molecule and another type molecule; meaning making on the basis of recognition only is what is available for plants, for cells, for vegetative life.

The next major type of learning which we see in animals and probably not at all in vegetative life is to make associations. If there are two things that happen to appear together at the same time or at the same place and you learn that they often appear together, you connect them and remember this association. This is conditional or associative learning what Pavlov described on the basis of his experiments with dogs as conditioned reflexes. We cannot assume that plants can do this. On that basis we can have a certain key on how to approach plant intelligence. How much they can and what they can not.

Btk

Or maybe they associate in a 'different way'? For instance they have some 'knowledge' at the end of a rhizomatic cell, at the same time there is information at the end of a leaf, and somehow the hormones respond to it, e.g. by producing more tannins...

KK

Ok, This should be studied, but I doubt that this is an associative learning. They can — so to say — create sequences, paths of recognition of course: perceive something, and this is remembered, then recognize what is remembered...

But what interestingly is really different as a result is their picture of the world. If you can associate as animals do, with different sensors, or just watch, move your sight, then you can associate what you see there, and you can construct from these different directions a picture. That means that you can construct space: for instance a two-dimensional spatial view. But if you do not have this capacity to associate, then in a sense your world, your *umwelt* has no space. Your world – the plant's world, the fungus' world — consists of separate qualities which are connected functionally — yes — if that quality, this action can be developed in evolution, why not. Learned functional relations are possible in non-animal life, but — these cannot be integrated into a picture, into something spatial.

So, then the question is why? Some people say plants have no *umwelt* in Uexküll's sense. *Umwelt* is usually assumed being something spatial – because for people it is hard to imagine something so different as a non-spatial representation of the world. The plant's *umwelt* consists of separate qualities, and that's it. It is an *umwelt* without pictures. This is how I interpret plants' *umwelten*.

One more element here is that plants very often are imagined as a tree, a flower, a bush — as a big organism. But plant is not really integrated within an organism the same way like in an animal. This means that when we speak about their capacity to recognize and communicate — that can be available to some parts of a plant, to its cells and not to the macroscopic individual. But to say that the plant as a whole would communicate... Maybe rather not. A plant is very often like a colony: their different organs communicate with each other; and different cells communicate with each other. Like a large coral colony where different *subindividuals* are communicating with each other. While the whole coral reef cannot communicate with other coral reef as a whole. They communicate piece by piece but not as a whole. A usual misunderstanding about communication of plants is seeing living beings as a compact body, which is an animal type model that we apply to all organisms. But that is wrong,

or at least misleading.

Here in biosemiotics we discover something important: all organisms are swarms — like bee swarms — or collectives. Like the brain, a collective. And different types of organisms create different umwelten. In case of the plant as a whole it may have even poorer umwelt than its separate parts: cells' umwelt might be more rich than that of the whole 'colony'.

Btk

Because the micro-conditions around the various cells of plant parts might be very different? The cells from the long roots from a tree vs. the top leaf cells f.i.

KK

If you indeed look at the informational or functional connections within the cells, there are so many, it is such a dense network.

Thus we distinguished plant and animal umwelt on the basis of spatial representation — which is inaccessible to plants. There we can find another important difference between humans and animals. Humans have the additional type of signs – symbols – that allow us to recombine the orders. Animals can associate, memorize the association, but cannot freely recombine what they have remembered, to make a new order, to play with sequencing. You cannot even train an animal to put balls of different sizes in an increasing order. For a child of 2 years this is quite simple. This is just after the child goes beyond this symbolic threshold, getting that basic linguistic capacity, then combining is possible. Which also means that you can memorize the spatial representation for further manipulation. And if you can reorder them, you can make a narrative; you have an additional dimension which is called time: temporal dimension. In your imagination you can reorder the events you remember in any combination and imagine about future representations. In this way you can make stories. This is specifically human capacity to create narratives. Or you can travel in time, you have a capacity for chronesthesia, as Endel Tulving has called it. That is what makes humans fundamentally different from others, this knowledge about history, or rather multiple histories. Not only memory, all organisms have memory in some sense. Human memory is more than memory: we can go through it back and forth in our imagination. We can leave the present. Other organisms are always in the present, they cannot travel away from the present.

Btk

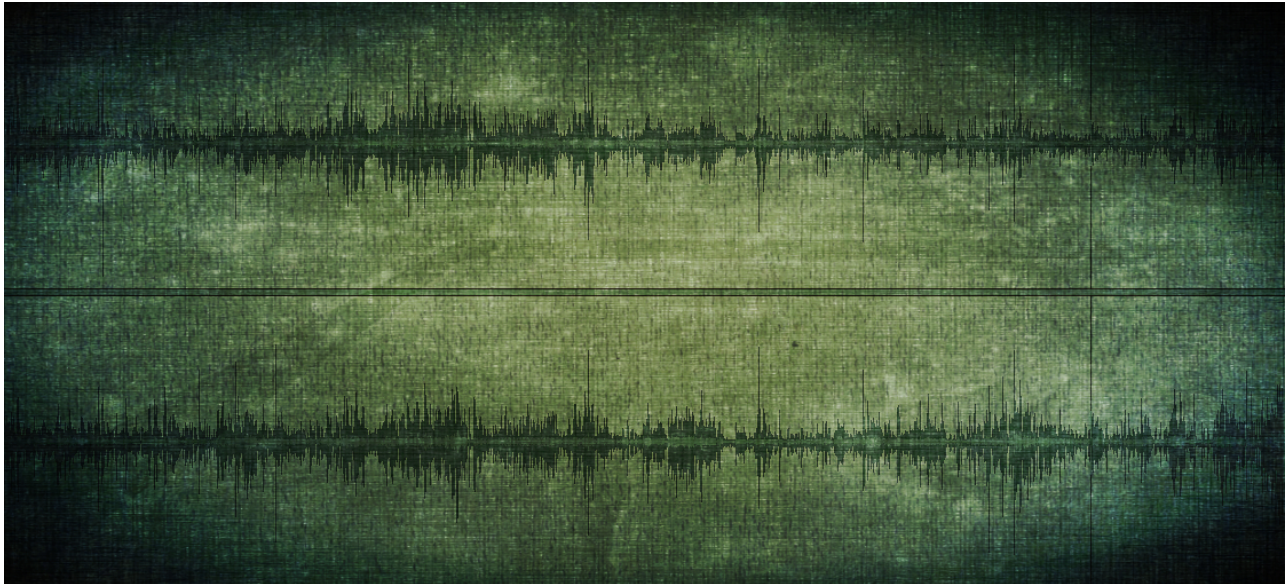
We have the difficulty to be in the present.

KK

Yes! That is our human tragedy. That we can go away from the present where we are. And most of our troubles come from that, like our worries for instance.

This is a general and simple picture, but as a starting point I think it is important to make these distinctions. And in that way we somehow position plant intelligence. In this framework we will not assign too much to them, on the basis of basic informational or meaning making capacities they possess. Now we can try to go further on that basis on which we try to construct possible hypothesis and models. Of course, it is possible they can do some of their thing better than we can. Something like birds that do not have the temporal dimension in their umwelt but at the same time having

much better space orientation (and memory) than we do. Also, birds make distinction between many more colors, and their space is richer. That also means that purely vegetative life in plants might be richer in certain aspects; this needs to be studied further.



Sound file (graphic edit) of interview

Btk

One plant I work with is the *Agave* — there is a biosemiotics paper esp. on the *Agave* — and what is so fascinating is that — as soon as it has its flowers up in the air — it attracts pollinators with its spreading airborne scent. And in case they sense that there are not enough pollinators visiting the flowers, methyl jasmonate compounds are sent out to the neighboring plants. Some of the *Agave* plants of the same genus respond to the chemical trigger by also starting their flowering process, even if they are too young. As a result of more blossoming flowers a bigger field of ‘perfume’ might attract more bats, bees, moths and other pollinators.

KK

This type of collective phenomena certainly happen. A little bit of warning here is appropriate — it would not be a proper way to say ‘they do it in order to...’. Because they may not have a capacity to represent their goals. We should be careful with this wording. Indeed, their processes are functional, but in a bit simpler way than how we express it with our human words.

<silence; 24 sec>

One additional important aspect is that via communication organisms are in symbiosis. This is the symbiotic network which is the basis of biological communities, of ecosystems, symbiotic network between different types of colonies, both within and between bodies. You either compete or you are in symbiosis and communicate. If you are already communicating some sort of understanding, then acceptance is there, so in some part this is biosemiotic. And this was Lynn Margulis’ good idea that all life basically is symbiosis and competition appears only occasionally when symbiosis breaks down or is not possible. But for a long term coexistence the only way is symbiosis. Competition is not stable between two organisms, for species similar to

one another; they would not coexist: sooner or later one competes the other one out if they have the same medium, same resources as explained in the 'competition exclusion principle' by ecologist Gause. Stabilization comes via a division of labor, via multifunctionality which means some sort of symbiosis: this task for one, another for the other, they co-operate. These are consortia, a whole structure in which ecosystems are thriving.

Btk

Is this related to Lotman's principle where two codes are required to have some 'tension' and 'non-translatibility'?

KK

Yes. This is on meaning making as such, the usual situation of learning, or problem-solving in a general sense. And each time you solve a problem, then you have built as a result a connection of what can be already quite automatic. In case of plants in particular, most of reactions go on an automatic basis. They have been earlier 'learnt', results of problem solving. But later, much of our body is working already very automatically. Where signal transfer is described via biophysical / biochemical descriptions, this is quite deterministic. However at a certain earlier moment that was constructed via the situation where some problems had to be solved. When a habit becomes automatic then it may go without any feeling anymore. A new meaning can appear in the situation of choice, which is a sort of confusion, and this is where primitive feeling also comes out; in this basic situation of meaning making always at least two codes are required. Only in that case the necessary incompatibility, the options, the possibility to choose appears. Interpretation is a process where at least a little bit of choice on how to interpret is there; otherwise it is machine computation – you have an algorithm and you do it. Never 'choice' appears in our computers. When there is choice, there is interpretation. That is the crucial issue, *whether in that sense plants have true interpretation when they really choose, with incompatibility between their codes...* That is not a simple question.

Do you know Andreas Weber. I really suggest his writings.

Btk

One important question is if biosemiotics can possibly offer a paradigm that can help to raise new – or re-articulate new ethical issues related to the fast developing fields of synthetic biology and bioengineering.

KK

Yes, I think so. This is particularly if we contrast the ethical explanations coming from sociobiology and from biosemiotic or semiotic approach. One example that is often discussed in ethics is altruism. In the neo-Darwinian / sociobiological approach they have had a hard time to make clear how altruism is possible at all. They found an explanation with Hamilton's model; a mathematical model with a genetic basis for altruism that was used in sociobiology later. Their basic approach is that each element fights for its own progeny. It's interpreted in terms of egoism.

But there is another approach and model where the basis is communication and symbiosis. Helping each other is the basis – this is functional differentiation that is everywhere in living world. There is no way to communicate if there is not at least

some trust. Or, *communication itself* is help. According to this approach, an excluding the other, doing something violent would be a very special case, it is rare. So in a way these approaches are really very different, almost opposite.

There are other approaches as well. Via the explanation of joy for instance. Why is there such a thing like joy. The neo-darwinian explanation would be that it attracts females; it would integrate you physiologically better in current or future sexual acts. So, for progeny, for survival — as it is commonly explained in neo-darwinism. I would say joy is something completely different. Joy is just Joy. It is in the present. In biosemiotics we say that you cannot explain what organisms do on the basis of survival because so general a thing as survival cannot be a sign for non-humans. They do things in order to solve the problems they face; they do what is attractive according to their experience. If it happens that you survive as a result, fine. But except humans no other organisms have a concept of future death. In a direct sense they cannot do anything because of avoiding dying or of being afraid of dying. They cannot know about the coming death. Humans can think about survival, but not the other living beings. They live in the present. That is real joy.

<Laughter with hand clap>

Bvdp

I heard about a research that says that humans due to less consulting of their memory — consulting instead when facing a question immediately electronic internet connected devices — are becoming more and more focused on the now.

...

<Cell phone ringing>

KK

One moment please... .. heh, isn't it paradoxical, even absurd, that we tend to give priority to what is not here, instead of being here and now...

Further Reading

Gause, Georgii F.: Competitive exclusion principle (Gause's Law) -

https://en.wikipedia.org/wiki/Competitive_exclusion_principle

See note on same wikipedia: "Recent studies addressing some of the assumptions made for the models predicting competitive exclusion have shown these assumptions need to be reconsidered."

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