Computing a Reality

Heinz von Foerster's Lecture at the A.U.M Conference in 1973
Edited by Albert Müller

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► **Purpose:** Commenting on the transcript of a lecture. ► **Findings:** The document reconstructs the development of the original 1973 lecture by Heinz von Foerster into his best-known paper, *On Constructing a Reality.* Many aspects of that paper can be identified as being shaped through interaction with the audience. ► **Implications:** The lecture documented here was a forerunner of a central paper in constructivism. ► **Key words:** Heinz von Foerster, early constructivism, A.U.M. conference, Esalen, computing a reality.

Editor's introduction

The Viennese Heinz von Foerster Archive (see Müller 2003, 2006) not only contains written and printed material, it also includes a small number of audio records and video tapes, most of them documenting lectures by von Foerster. A small part of the collection has already been published (Grössing et al. 2005). The oldest audio recording stored in the archive goes back to 1973. It is a cassette tape of the lecture Heinz von Foerster gave on the occasion of the so-called A.U.M conference (A.U.M. stands for "American University of Masters"). The cassette in the Heinz von Foerster Archive's audio collection bears the inscription: "Heinz von Foerster 'Computing a Reality' at A.U.M. conference, Esalen, March 1973. Recorded by Kurt von Meier."

The A.U.M. conference took place from 18-25 March 1973 at the Esalen Institute, Big Sur, California. The central theme of the conference was George Spencer Brown's *Laws of Form*. (Spencer Brown 1969; On the history of the several editions of Laws of Form cf. Schönwälder, Wille & Hölscher 2004) The British mathematician, George Spencer Brown, had come all the way from England to present and explain the *Laws of Form* to a small audience at Esalen. Heinz von Foerster had been invited to this conference because he had reviewed the *Laws of Form* as early as in 1969 in the *Whole Earth Catalogue* (Foerster 1969). This special publication (*The Whole Earth Catalogue*, edited at the time by Stewart Brand (see Turner 2006) was one of the most influential journals within U.S. hippie culture) aroused great interest in Spencer Brown's book, which was devoted to fundamental questions of logic and mathematics. The circumstances of this influential review of 1969 are well documented in the University archives at Urbana, Illinois. It is also worth mentioning that Heinz von Foerster, together with Stewart Brand, had already given an introduction to the *Laws of Form* at the Esalen Institute in 1971.

Parts of the A.U.M. conference of 1973 were recorded. One part of this acoustic documentation, four lectures by George Spencer Brown, has been transcribed and is now accessible at http://www.lawsofform.org. This most interesting transcript not only contains an authentic interpretation of the *Laws of Form* by its author, but is also a document of some of the communication problems that emerged between the lecturer and his audience. Only a small portion of the audience had sufficient formal scientific training. But it was not just the cognitive gap that accounted for difficulties in communication; there was also what we might call a cultural dimension. Spencer Brown, a very British gentleman with all his own sensitivities, lectured in front of a group of people who for the most part had committed themselves to hippie culture. Even so, many of them had been deeply influenced by utilitarian thinking, as can be deducted from the type of questions (what do we need this and that for?) directed to the lecturer. However, George Spencer Brown left the conference unexpectedly after two days of lecturing and returned back to Europe. The audience was left to itself, part of the group maybe feeling a bit embarrassed but almost all of the participants fascinated by the four lectures and possibly even more impressed by the appearance of the lecturer.

According to documents in the HvF Archive, the list of participants included names such as G. Spencer Brown, Bruce Badenoch, Gregory Bateson, Stewart Brand, John Brockman, Baba Ram Dass, George Gallagher, Theodore Guinn, Joseph Hart, Douglas Kelley, Luanne P. King, John Lilly, Antoinette Oshman, Brendan O'Regan, Karl Pribram, Richard Price, Robert Shapiro, Charles Tart, Jean Taupin, Heinz von Foerster, Kurt von Maier, Alan Watts and Mary Jane Watts.

The morning after George Spencer Brown's departure from the conference, von Foerster, a participant with a scientific background, was asked to help the audience understand George Spencer Brown's ideas better. According to a report on the conference published half a year later in the magazine *Pacific Sun* (Barney 1973), von Foerster took on the role of a teacher by transposing Spencer Brown's calculus into a musical dimension. Following this intervention, von Foerster gave his own paper, *Computing a Reality*, which has been transcribed from the cassette mentioned above and is now published here for the first time. Those familiar with the work of von Foerster may experience a kind of déjà vu on reading the title and the text. One of von Foerster's most famous articles *On Constructing a Reality*, which has been translated into several languages and often reprinted, is widely known and recognized as a key work in constructivism. There are striking parallels between the lecture *Computing a reality* and *On Constructing a Reality*.

The A.U.M. conference lecture seems so important to me because it represents a precursor of the later article that became so famous, and which was indeed a major step in the development of (radical) constructivism. Heinz von Foerster was not always a constructivist, he became one, step by step. But we should not forget that at the age of 86 he denied being a constructivist while insisting that he was an "anti-ist" – "this is my –ism" he used to say (see von Foerster 2001).

The year 1973 was essential for the breakthrough to what we might call "von Foerster's constructivism." Let us construct a sort of context for this development. The breakthrough to constructivism took place on the occasion of a multi-dimensional crisis. First, the institution founded and directed by von Foerster, the Biological Computer Laboratory (BCL) at the University of Illinois, Urbana, went through a financial crisis (Müller 2007a). From the beginning, large parts of the BCL's research activities were funded by military research agencies. Around 1970, military research agencies stopped supporting fundamental research and favored applied research, or to be more precise, research that was useful for the battlefield (Umpleby 2003, 2007). It was clear that the BCL could not contribute to such a type of research. At the same time there was increasing competition with rivaling research by groups that had grown out of the period of "classical" cybernetics of the 1940s and 1950s: artificial intelligence. Both factors – lack of military funds and rivalry with artificial intelligence – contributed to the material crisis of the BCL (Müller 2007a). Assuming this to be true, we should also be aware that the BCL contributed to AI research itself (see among others Weston & Foerster 1973).

The university could not or did not want to provide the funds now lacking. There may have been a role in this decision of the involvement of the BCL and its director, von Foerster, in certain controversies. The BCL had removed itself from the scientific mainstream during the 1960s (it would perhaps be more apt to say that it moved far ahead of the mainstream), not only regarding research activities, but also regarding teaching activities. Von Foerster, especially, developed and tested unconventional and alternative forms of teaching that aroused the suspicion of the university hierarchy as well as parents' organizations, while at the same time von Foerster was esteemed and loved as a charismatic teacher by a vast majority of students (Martin 2007). These teaching experiments started with a course in *heuristics* in 1968/69 and led up to a course on *cybernetics of cybernetics* in 1973/74 (cf. Foerster 1974).

Stewart Brand at the A.U.M. conference.

Furthermore, it appeared unconventional that von Foerster – basically a scientist at a department for electrical engineering and director of a laboratory for "biological computing" – turned more and more to the field of epistemology. This broad spectrum of von Foerster's shift became evident in 1969 and seemed to be the result of broad empirical and experimental research at the BCL on the one hand and von Foerster's exposure to Humberto Maturana's ideas on neurophysiology of cognition and his reading of Spencer Brown's *Laws of Form* on the other. In both concepts - Maturana's and Spencer Brown's - the category of the observer plays a prominent role. On the occasion of a conference devoted to "cognitive studies and artificial intelligence research" in 1969, sponsored by the Wenner Gren foundation, Maturana and von Foerster contributed papers (the list of contributors included – among others – Michael Arbib, Gordon Pask, and Paul Weston from the BCL). Prior to that, Maturana had been a guest research fellow with the BCL. In his paper *Neurophysiology of Cognition* (Maturana 1970), Maturana formulated a sentence that was to become a key phrase of constructivism and second order cybernetics as well: "Anything said is said by an observer." (Maturana 1970, p. 4) (Years later Heinz von Foerster would add the corollary, "Anything said is said to an observer." (Foerster 1979, p. 5)

But bringing the observer into the focus of discussion was only part of the process of reorientation. From 1970 onwards we can observe a turn to problems of society in the work of von Foerster and of the BCL. Another field was problems of language and semantics (Foerster 1971). These shifts in research interests became even more manifest in the research proposals of the time (Müller 2007a, 2007b). Also, the epistemological problem of cognition was radically re-formulated in the context of a political re-orientation, which meant moving civil rights to the foreground. Modern computer technologies were supposed to serve democracy and the political participation of citizens. It should also be noted that new computer-based forms of communication were used by students of Heinz von Foerster and the BCL to organize and strengthen the protest movement against the president of the United States, Richard Nixon (Umpleby 2007).

Let us look back at the year 1973. Heinz von Foerster's "Do-Books", calendars that he used to jot down his activities, inform us on a day-by-day basis of the chronology. The lecture on *Computing a Reality* presented here was part of series of papers to be given by von Foerster in the spring. Immediately following the A.U.M. conference, von Foerster traveled to Germany to present a guest paper at a conference of the German society for cybernetics. This paper was devoted to the *cybernetics of epistemology.* There he formulated again what he had proposed to the A.U.M. conference, the postulate of the epistemic homeostasis: "the nervous system as a whole is organized in such a way (organizes itself in such a way) that it computes a stable reality" (Foerster 2003, p. 244). On 10 April 1973, von Foerster reported on the A.U.M. conference and the conference in Germany at the BCL. One week later he gave a lecture on *On constructing a reality* in Blacksburg, Virginia, on the occasion of a conference that the architect Wolfgang Preiser organized for the Environmental Design Research Association.

Referring to the history of the printed version of the paper, von Foerster made the following comments: "This was Wolfgang Preiser. Occasionally, he made a call, very late, and asked, "Heinz, where is the paper?" "Which paper?" "You promised …" "I did not promise anything, you never told me …" "But you have to deliver it!" "There is almost no time left, how can I do it?" "We need it within eight days!" And Preiser said, "We have exactly twelve pages in the book ready for you, we need your thoughts on twelve pages. There is a certain format and certain typefaces." I said to my secretary, who was a very fine person, "I will work the whole night, and a second night. Then you will type it." She was an excellent secretary, able to read my handwriting. She typed it and got 14 pages. Horrible, what should I leave out now? She said, "We could use the following method. The paragraphs returns we have here, they take away two lines. If I threw out the paragraphs we would come out with twelve pages." – "But this is horrible, you can't read the piece without paragraphs, there is always a new idea coming." "No problem. I will produce a black dot where a new paragraph should be. If you look at the paper you will have all these dots." So I delivered it, exactly twelve pages. And the last pieces had to be very condensed. Therefore the last lines are only a principle. Now comes the principle of the ethical imperative. I would have liked to comment on it. No. There was no time, no space left. So these last remarks are very condensed." (From an interview with Albert Müller, translated by the interviewer).

At first glance, the twelve-page publication resembled any other publication. But within one year von Foerster regarded it as so important that he included a reprint in *Cybernetics of Cybernetics* (Foerster 1974). The article was reprinted ten times during von Foerster's lifetime and was translated into several foreign languages. It is the most popular paper that von Foerster ever published. It seems ironic that this central document of constructivism received its specific form of bringing arguments to a point, which undoubtedly contributed to the popularity of the paper and its author, just because of layout problems and a lack of space and time. And it is yet another irony that its author originally did not want to write it.

However, the key ideas and the central arguments of *On Constructing a Reality* had already appeared in *Computing a Reality.*

Heinz von Foerster at the A.U.M. conference.

Computing a reality

Heinz von Foerster: I will do a brief spiel at the moment, because the mailman is here at 12:30 and I would not like you to miss the opportunity to buy some cigarettes, matches, newspapers, etc. etc.

Voice from the audience:[1] Speak as long as you like.

HVF: I speak as long as *you* like. [Audience laughing]

I would like to give a brief spiel on this proposition "computing a reality." Each word is carefully chosen.

The whole works and caboodle "computing a reality" I would put into a bag which I call cognition. You may say my view of cognition is a different one. Absolutely perfectly alright. In my humble ignorance I will use at the moment the term cognition for representing something which is computing a reality. Now I am not speaking here to physicists and to chemists and to people from the natural sciences, therefore I have not yet gotten a revolution whereby everybody would jump up from his chair and would say: What do you mean by *a* reality, you mean *the* reality.

By using this indefinite article – I have been very careful in using the indefinite article because it allows me at every time of the discourse to flip back into the mono-logic, where everybody has a different reality. But "a" is of course a special case, [the speaker corrects himself] a general case of "the." "The" is a special case of "a." So I am addressing myself to the more general problem of: computing a reality. I would like…

Voice from the audience: what about any?

HVF: I am not a native English speaker. In German I would have said "eine" und nicht "die." Now I have tried to translate the "eine" into "a." I have to leave it to the native English speakers to aid me in making such formulations, because I am wrestling of course with vocabulary and notation and connotation and things like that. If you think I am hitting my thesis, which you may feel I am trying to grapple with better with "any", then I would adopt "any." At the moment I have adopted "a" because I think the "a" leaves it a little bit more loose. I am not too sure. But any comment on that thing I will be greatly appreciative. I am talking about a man who is constantly looking for something. I am not telling you anything, I am telling you what I am looking for. Ok. Computing a reality.

Briefly let me make the really fundamental distinction of whether using the "a" or the "any" or the "the." There are two concepts associated with these. The one is that we may say: Ok, here's a table, you see, the next thing I try it out (knocks on table), aha, yeah, really, mhm, works. I could interpret this now as (knocks on table) confirmations. I confirm my first hypothesis that there is indeed something rigid and I can sit on the whole thing and if I speak of confirmations then I may say, aha, you may also sit here and things like that. It is the concept of the witness, that different sensory modalities are witnessing the experiences being obtained by one sensory modality. I have seen that table and I am touching it and I am sitting on it and so and so. That means the table or the desk here is confirmed by my other sensory experiences. This would. … The confirmation, the confirmation concept on that thing would fall into the "the"-category because we say there is a table, this is the table, and everybody confirms this hypothesis and therefore the table becomes more table because more confirmations are coming in through the various senses. So my doubts about the existence of the table begin to vanish.

The other thing is that I am not talking about a confirmation but I am saying ok, mhm (knocking), aha. I am generating correlations between various sensory modality inputs or sensations and I am correlating that all the time that generate for me in their correlation always something new. That means when I looked at that thing – that's one thing (knocks), that's another thing, that's again another thing – I am generating these correlations which compute for me a reality.

So I would like to have now these two distinctions: confirmation and correlation: CONF and CORR [writing on the board].

Both operations are computations, in my language. So we have both cases covered. We have the correlation and we have the confirmation case covered by the concept of computing. The argument which can immediately be given to this statement "computing a reality", maybe that you say: Look, for heaven's sake, you are not computing this table. For heaven's sake, no not this table, I can sit on that table, ha ha, what about that, it's not 15 or 36 or something like that.

There's indeed something here. Alright, alright, can we expand on it and become a little bit more precise. One may as the first thing say, all right, we are not talking about computing a reality, we are a little bit more careful in this whole thing and say we compute a description of a reality. Why don't we glue that in, and I am very happy that Karl [Pribram] is around here, because he might expand on that, computing a description of a description of a reality.

Karl Pribram at the A.U.M. conference.

Voice from the audience: Are you going to talk about simulations?

HVF: At the moment I am avoiding simulations as much as I can. Because this is quick sand. One can of course go on quick sand, one can become a quick sand swimmer. (Audience laughs) We have so much quick sand around us, you don't know how much. What I am proposing here is: I am offering a couple of flippers in which we can proceed according to some of it. I am offering quick sand flippers here, this is what I am constructing here. They are not for all limbs yet and giving you a flipper for the left foot or something like that.

A description. Now, … why do I use the term description. I use the term description because it can be very well used by neurophysiologists, for instance, you may say alright, if I am looking out and as we have learnt so very intelligently that we have an image projected on the retina which happened to be funnily enough upside down – *from whose point of view?* – now, anyway, they are upside down. And so there is a description.

Now there are sitting certain lots of neurons, they are sitting behind and make *didelidelip* and it goes a little bit further on and they do something to whatever has been up on the surface of the ganglion's rods. If you look already on the second or the third level, which are the third level of the ganglion cells which start to pump something into the deeper regions of the brain. Then you find something that has absolutely nothing to do with this charming group sitting around here. And here is *beep beep beep*, as he will tell us tomorrow, these are electric pulses rattle along these fibers, etc. etc.

Okay, now, in desperation, because there are no people running around here any more, you see there are no carpets, no microphone stands around here, nothing of that sort.

So you may call back a description. So you have a description one, then a description of this description of then it goes a little bit deeper into, let's say utero-genicular body on which certain operations are carried on again, you see, and a new description on a description and so on and so forth. So what we do here, we have not only say to have a description but we have to say a description of a description and so on and so forth. So let's say: computation of a description of a description of a description (writing to the board) I am sorry I am running out of space, since I am lazy you see [draws on the board].

Voice from the audience: What happens if you take the arrow over to your computation?

HVF: He is always ahead of me (Audience laughs) Of course with this big truck it's no problem, but anyway. Let me do this in the next step, permit me please, allow me to this, to talk about that

Voice from the audience: Jawohl.

HVF: Jawohl. Computation of a description of a description of a description of a description of a description of a description and so on.

Recursion coming in right there. You see a very charming aspect of this recursion. This [pointing at the term reality] has already disappeared. You have not to worry about reality anymore.

Voice from the audience: Except the thing that's doing it is in reality

HVF: Explicit – implicit. Sitting right in that thing. Good, we follow the suggestion by Professor [John] Lilly, and recognize the following situation. We compute a description, we compute a description, we do certainly a computation, yeah. Therefore we can say, we can translate that into a computation of computation of computation of computation and things like that. (draws on the board)

The whole problem of cognition is now re represented here as recursive computations. Recursive computations.

Voice from the audience: Of what?

HVF: Of the previous computation, of course. You've come out with what. You've come out with a computation, compute on that computation, of that you had computed, and then you come back to the computation.

Voice from the audience: So that is …

HVF: Of what, of course, of what, of what. Would be a problem of everything, anything. What is the main goal of these computations? The essential features of this computation?

This gives us a clue of what these computations are all about. And this is what I would call the Principle of epistemic homeostasis. *Ladies and gentlemen, the principle epistemic homeostasis.* (Audience laughs) So it's good to have all these names, it's good to remember them … What does it say? The principle of epistemic homeostasis says that the computations are devised in such a fashion, or organized in such a fashion, or now to be very tricky, organizing themselves into such a fashion that the reality that is computed is stable. The system operates in such a way or operates in such a way, or generates its own organization in such a way that it computes a stable reality.

Voice from the audience: If I didn't, it wouldn't survive

HVF: Therefore it organizes itself in such a way. All those who compute instable realities fall to the wayside.

Voice from the audience: Right

HVF: That's right ok

Voice from the audience: That's the cause of tautologies, because its another way of saying it survived

HVF: Correct, sure, mhm

Voice from the audience: Is that why tautologies are preferred to contradictions in school?

HVF: Hm?

Heinz von Foerster.

Voice from the audience: Is that why tautologies are preferred to contradictions in school?

HVF: You know more about education than I. I have no idea.

Voice from the audience: [not understandable]

HVF: Well you made a very good point. I think this preference of tautology over contradiction has something to do with a cultural aspect. I don't know. This is an interesting aspect. OK

Voice from the audience: He's giving us permission to love paradox.

HVF: That's great. We should not only have a permission, but we should have a kind of invitation to generate as many paradoxes that we are capable of to generating, because whenever we have generated a paradox we have generated a new dimension.

Voice from the audience: Now what does epistemic mean?

HVF: Epistemics, epistemology and gnosis: The Greeks of course were very good in making good distinctions. And they distinguished between *gignosko*, which is very closely related to *gignomai*. *Gignomai* means: to grow out, to come about, to become, to be generated. Genesis, and so forth, *gignomai*. *Gignosko* on the other hand means to perceive with the senses. To perceive with the senses. You wish to generate a picture of something, yeah, to perceive with the senses. To produce inside a description. So Gnosis is associated with the knowledge which is perceived through the senses – by contemplation and by reflection. However, there is another way of knowing, and this is described by the Greek as *epistemein* and this is when you have a skill, when you know by doing it. And what I could see here from time to time was, for instance, constantly a big flip back and forth between gnosis and epistemics. *Epistemein* is to know by doing it. That means what Doc wants to know he is an epistemic. He wants to know by doing it. He says I know that stuff, when I can do all the crosses[2] and when I can make all these operations, and then I will begin to understand. Now what is this *epistemein* being generated? By *epi* and *histemai*. "Histemai" means "stand" and "epi" means "above." And as distinct from English where you understand when you stand under, the Greeks understand when they stand above. They call it *epistemein*. You stand above the thing, you can handle it, you can rack it, you have the skill of doing something. Somebody says what is a pot, ah, come in I will show you how to do it. He makes a pot before his very eyes and says now try yourself. He can't do it, he can't do it, the pot falls to pieces until he can do it. Now you know what a pot is.

So it is the *epistemein*-side where you by doing know and it is the gnosis-side where by contemplation you know. It would be very nice and I think it is possible to show that knowledge cannot be acquired by either one of the operations. You have to have both.

There is one of these other circles where you can only understand by doing it and when you can only understand your doing by looking at it or by sensing it. So that means your sensorium, everything that goes to your senses is interpretable only by your motor system. And everything your motor system is only interpretable through your sensorium, your sensor system. So the whole thing is a complete closed system of action and perception. Perception and action. No perception without action, no action without perception. The point now is. Now I think, did I explain? – The problem is to set up a system which computes a stable reality.

We have seven minutes. Now I hope Karl will do something in this direction. Because what we have now to turn to is in fact the computational elements that are doing the computing and these are, of course, the neurons, the nerve cells.

And perhaps to begin with, to make now the problem indeed profound, I would like to present a shocker, a shocker to everyone. Although one may afterwards say this shocker is trivial in the tri-vial sense, but nevertheless I like to shock my friends with a theorem! [writing on the board]

This is the theorem for every nerve cell, every nerve cell, every nerve cell, of which we have ten billions in the brain, and have a hundred millions on the surface. Funnily enough, we have all on the surface distributed nerve cells, which do something, which apparently sense something, we call them the sensors. So from there go the fibers inside and they act on the other neurons which are inside, cortex and so on and so forth and the whole thing through all of these fellows. 10 to the 10, this is ten billion and only hundred million on the surface. So with these hundred million inputs on the surface we start computing with the other ten billion nerve cells a stable reality. Now, how do these elements look like and what is the essential feature of these elements and in which way do they give us conceptually a real problem, or if you wish, a clue of how to look at the whole systems how it computes.

The first theorem for a nerve cell is the theorem of the undifferentiated coding. The theorem of the undifferentiated coding. A nerve that responds to a nerve cell – I will now utter the theorem of the undifferentiated coding – A response of a nerve cell will not encode, will not encode, the nature of the physical agent which made it respond. Let me give you an example, then I will repeat the thing, and then we close for lunch and then you have a nice riddle to think about it.

If you look, for instance, at a corner rod, very nice to look let's say into retinal sensory neurons, the rods are tiny cells which we understand will respond, that means produce an electrical discharge, will be conducted into the deeper region of the brain. Whenever it is hit by photons, that means if a photon comes in, a electromagnetic radiation is coming in and interacts at that point where that rod sits, this rod will start to be electrically charged. And will discharge this charge along further fibers which go deeper into the brain. However – and this is the interesting thing – it will not tell you that it was light which produced the thing. It will not tell you it was electromagnetic radiation which caused its response. Same thing, if you squeeze this thing here, it will not tell you that it was pressure that discharged you. If it's hot or if it's cold, it will not tell you about the mean velocity of molecules which generated this discharge. It will only say: I have been tickled. That's all it can say. And the other thing it may say: I have been tickled so and so much. But not by what. It will not tell you it was electro-magnetic radiation. It will not tell you it was the mean velocity of molecules. It will not tell you it was the fast vibration of the pressure wave going onto, let's say, your eardrum. All this it will not tell you. It will only tell you: There was so and so much of something I did not know. But it says another little thing: There was so and so much on this place of my body. So the two clues the nerve cell has that it says: Here is so and so much. That's all. And it is also perfectly clear, you see, that if you look around here in this thing, you see light, you see color, you hear sounds. But you must be perfectly aware that there are no lights and there is no sound and there is not even cold. There is just electromagnetic radiation of different frequencies, there are vibrations of the air pressure, there are mean velocities of molecules. This is not what the nervous system is giving you: It is giving you another universe. The one that is computed on the two data: So and so much here. That's all we have gotten. That means all the apparitions of colour and shape and sound and heat and touch and smell are results of computations. And the computations have to be carried out in such a fashion that the stability of these computations is assured.

We may talk about this probably here, we may pick up on that, things like that, but this is the morning session, we have three minutes for questions.

Voice from the audience: Why is it that when philosophers are talking they are always use tables as a part of demonstration … I would personally use the rainbow instead.

Voice from the audience: [acoustically not understandable]

Voice from the audience: Why is it that the primary coding system of the nervous system is not detectable by the observer?

HVF: Wittgenstein, page number 59, where do we have it? A beautiful thing. (Drawing on the board) The visual field does not look like that. Here is the eye. The eye doesn't see itself. And the visual field doesn't look like that, the visual field is the it.

Voice from the audience: Right, Well, then you are deserving a mirror

HVF: There is no doubt about that. That's all. Now we leave it to the neurophysiologist to design a computer which is computing color, shape and all that things, which are new dimensions generated, and I would propose by a series of wired-in paradoxes which resolve them in such a fashion that these dimensions are created.

Voice from the audience: Not only paradoxes, you got tautologies all over the place. And contradictions.

HVF: I am not sure. They are there. But they are all within the dimension. When the dimension is created you may have the paradox and the contradiction. But within … Before you have the dimension you have to come up with the paradox. This is of course of because the paradox is the first injunction. And so on and so forth. I mean all these things come about directly by taking the paradoxes seriously and using them as a generating principle.

Voice from the audience: What your spiel explains is stability …

HVF: HVF: Yes but this would be another spiel. You see the problem is it would be a longer spiel. I am sorry it would be a bit a longer spiel. The reason for that is the following thing. What we have to do now is that we have to contemplate the logic of descriptions. In the moment you come to the logic of descriptions you have to deal with two paradoxes which arise immediately. One paradox is that of invariance and the other one is that of change. You see, because you …

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How can you say that this is a cup? And this is associated with the name. This is a cup, although you see always it is a different something. How come that now you talk about invariance that the different is the same? Because it is, the different is the same. It is a cup, I am always holding a cup.

Voice from the audience: As you compute.

HVF: As you compute, yeah. But this is an interesting question now: How can you produce stability for that difference, which is now going giving you the possibility to name me anything? Because only a thing that is invariant can be named. How would you say that something is changing? What happens if this becomes a canary or an elephant? Suddenly I have an elephant in my hand. Hear you, missy. Wow, Heinz made an elephant out of a cup! Or – this is very crass – you may say or somebody may say: Why do you say he made an elephant out of your cup? There is an elephant and there was a cup. How would you say this cup became an elephant? This is closely associated with many conversational things I have heard amongst us here. After that discussion Joe changed, I have heard that. Four times. He really changed. When you look at Joe. And here is Joe. And it is the same name. What induces the observer to consider Joe having undergone a change?

So that means, the sameness is now,… the same is now different and these are the fundamental difficulties out of whose resolutions we can generate computations of invariance, computations of changes, computations of a stable reality and other things.

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Notes

The audio document of the lecture can be downloaded from http://www.univie.ac.at/constructivism/journal/data/4.1.foerster.mp3.

1. There are several different voices from the audience; speakers generally could not be identified.
2. The term "crosses" refers to George Spencer Brown's (1969) Law of Crossing.

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