

**15<sup>e</sup> CONGRÈS INTERNATIONAL  
DE  
CYBERNÉTIQUE**

***15<sup>th</sup> INTERNATIONAL CONGRESS  
ON  
CYBERNETICS***

**NAMUR 1998**

**ASSOCIATION INTERNATIONALE  
DE CYBERNÉTIQUE**

**15° CONGRES INTERNATIONAL  
DE CYBERNETIQUE**

Namur (Belgique), 24-28 août 1998

**15<sup>th</sup> INTERNATIONAL CONGRESS  
ON CYBERNETICS**

*Namur (Belgium), 24<sup>th</sup>-28<sup>th</sup> August 1998*

**ACTES  
PROCEEDINGS**

**Namur  
ASSOCIATION INTERNATIONALE DE CYBERNETIQUE  
1998**



# DANCE AND EVOLUTION: A NON-STOP COMBINATION OF BIOLOGY AND CULTURE

By Helena KATZ

---

Man is involved in an ongoing process of self-invention. Each of us has to invent eachself further out of what we have at our disposal.

Dance is an outstanding event or series of events of variegated ordinariness. Dance cannot be studied apart from a body and its surroundings. But to what extend do surroundings and body guide its behaviour?

This paper aims to consider the relation between a body and its surroundings as evolutive in the sense Charles Darwin presented on *On The Origin of Species* (1859) and will take two theoretical instruments: the Meme Thesis of Richard Dawkins (1976) and the Representational Thesis of Fred I. Dretske (1989). To go in this direction we have first to calibrate precisely the inflection of our thoughts. This calibration is the stepping stone to sites of reversible destiny of established thruths.

In Cambridge, at the Massachusetts Institute of Technology - MIT, Mriganga Sur and his researching crew rewired retinal neurons - which normally send sensory data from the eyes to the visual cortex - in 16 newborn ferrets so the data went instantly to the animal's auditory cortex. In a sense, the 16 ferrets began to hear things they would normally see. The ferrets heard visual inputs.

This means that the different outcomes depend mainly on putting different inputs in the brain. And means also that cortex does not perform basically the same operations as a programmed machine. If auditory cells transform raw data into patterned response to stimuli that has until now been clearly identified only in the visual cortex, there is nothing intrinsic about auditory cortex that makes it auditory. And if this is so, everything may depends on what kind of input we get early in life.

Hoffmeyer (1998) claims the membrane formation as the decisive step. Prebiotic systems reciprocally dragged each other into a communicative network and because of this they could master the creativity needed for the gradual construction of a true cell.

Then, locally conditions allowed outputs from one entity serve as inputs to other entity and so on. From this moment on one might say that the closed membrane systems had acquired a germ of other-reference or proto communication.

At this point the organism does not have self-referential dynamics. The system has to organize components spatially to be re-described in the digital alphabet of DNA or RNA. Hoffmeyer and Claus Emmeche (1991) call it code-duality: the analogly coded message of the organism itself and its re-description in the digital

code of DNA (organisms and DNA are both carriers of a message sent down through generations).

Now, DNA and environment have to establish a link so that events from outside become translated inside. The membrane has to turn into an interface. From this point on the system's understanding of its environment matter to the system and it has the capacity to make distintions. The *Umwelt* (Uexkull, 1992) arises. According to Hoffmeyer, this is the most decisive step for attaining semiotic competence: to make distinctions in space-time where formerly there were only differences.



In the Umwelt Theory of Jakob von Uexküll (1982), animals possess internal phenomenal worlds which they project out into their surroundings as «experienced external» guiding marks for activity. Nowadays, the notion has been broadened to an extent where all kinds of organisms, even bacteria, are said to possess some sort of specific Umwelt. According to Hoffmeyer, «it is the stable integration of self-reference and other-reference which establishes the minimum requirement for an Umwelt» (1998:12).

(Tens of thousands of receptor protein molecules at their surfaces bind to selected molecules in their environment thus mediating measurements of the outside chemistry to patterns of activity at the inside. Bacterium has evolved a capacity to make distinctions based on historically appropriated cyto-molecular habits built into the dynamic macromolecular architecture of the cell and its DNA (Hoffmeyer, 1998).

Brains are structured in an extremely subtle and complex way of wiring and our concepts are physically part of our brains because our conceptual systems are distributed over configurations of synaptic connections and they require a rewiring of our brains. Although massive rewiring is not really possible, much can still be done.

Nervous systems and brains never developed in plants or fungi because these structures were connected from the beginning to the need of flight or foraging. Nerve cells became specialized for the «long distance» communication. The determinacy of body structure was compensated with the indeterminacy of their movements. Neurones can be in direct contact with many cells that are located quite apart from one another by virtue of their long output (axons) and input (dendritic) branches (morphogenesis tends to be guided by local cell to cell interactions).

The indeterminacy of the brain is its strength. Each developing brain adapts to each body it finds itself in. There is no preestablished harmony of brain mutations to match body mutations. Developing brain can develop a corresponding organization «on line» during development (Deacon, 1997: 205).

The indeterminacy of growing brain, the indeterminacy of synaptic connections, the indeterminacy of global activity pattern formation, the indeterminacy of language. If brain has co-evolved with respect to language we have in our bodies all the connections we need to understand the intrinsic relations between nature and culture.

Biology and Physics are also largely responsible for our system of concepts, besides Culture. Culture cannot be taken apart as exclusively an action of man upon Nature because man does not stay as an observer of Nature. Man is absolutely implicated in what he observes. Prigogine had already explained that matter behaves in Nature as a constant transit between Nature-Culture-Nature (1984).

Fred I. Dretske, chairman and professor in the philosophy department of Stanford University, developed a naturalistic theory of mind under the banner of Representational Thesis. It states that «all mental facts are representational facts, and all representational facts are facts about informational functions»(1989).

The proposition here is to take dance as information that comes to the brain and to the body in the sense of a sign. The notion of sign here is that postulated by Charles Sanders Peirce. This American philosopher made clear that every sign, even a prediction of a future event, has a «physical connection» to the object it represents. Signs have three characters: material quality, pure demonstrative application and appeal to a mind.

In being a special type of «physical connection» to an object, the sign accommodates all the memory of the past that is needed to be stored in the current state of the system and manipulates it to produce the system's future behavior. And it goes further. It slips from the traditionalistic point of view of causality when it offers the notion of *semiosis* for replacing the search for a causal structure that makes the information flow.

For him, thinking is not an immaterial perception in a mind or spirit, it is a bodily, physiological process. His logic or semiotic is explained in terms of «consciousness» or



psychological phenomena, and psychological phenomena in terms of cognition, and cognition in terms of neurology. So, cognition is rooted in the body.

Introspection, self-knowledge, desire, imagination, belief, intuition, consciousness, sensing affairs in general - all these are themes for cognitive science, which means, all are themes for investigations outside the anthropocentric discussions about them that usually begin with a person pointing to his diaphragm and beginning a sentence with a »For me...«.

If we can assume dance as an experience, we are configuring dance as a representational fact about an informational function - so to say, as a sign. Or, for anyone who wishes, we can present dance as a conscious mental state. And conscious mental states are not states we are conscious of but conscious with (Dretske, 1995: 101; Dennet, 1991). That is the meaning of consciousness that is being taken under consideration in this paper.

One gets «privileged information about the character of one's own experiences not by looking inwards», by experiencing one's experience, but by simply having the experience, «usually an experience of external objects which carries all the information one needs to know the experience is like» (1995:149).

The brain has co-evolved with respect to language (nature+culture). Hoffmeyer (1998) had already explained how membranes found the means for a non-local association with other membranes, claiming that they created the «societies of brains» described by Freeman (1995).

Objectivity is rooted in this social nature of human knowledge: membranes communicate with membranes directly to construct the world in the image of the collective - a view from nowhere.

## DANCE AND QUALIA

Daniel Dennett (1995) had already explained that there is not any homunculus as an host to the experiences that happen and also as a translator of them to us. We are not persons that know what is happening because we have this «interior voice» that speaks silently to us. There is no ghost in the machine.

Introspection is not a process by which one looks inwards, a voice that can be heard inside our brains (the voice of the homunculus) Introspection is an instance of displaced perception - knowledge of internal (mental) facts via an awareness of external (physical) facts. (Dretske, 1995: 40-1)

The mind's awareness of internal objects or qualities is an idealistic fallacy that confuses what we experience with the experience of experiencing it (1995:149). For Dretske, experience is something that is externally constituted and «external» includes bodily states.

Uexküll's Umwelt Theory is still an externalistic discourse even though it is an attempt to deal with the world as seen from the animal's point of view. This externalistic discourse is «the view from nowhere» approach to which Hoffmeyer refers when he defends that «there is no way to escape externalism in science» (1998: 11).

According to Hanna and Antonio Damasio (1994), there is a neural basis for consciousness. A real nervous system operates on many levels of significant dynamic activity from patches of active membrane to cell assemblies.

Consciousness is a muscularly active process rather than a passive one like that common sensation that consciousness is what I can feel right now about myself speaking in front of you. Consciousness can be present also during periods of muscular inactivity - like when we just sit and think - because it does not depend on inward lookings.

We also know that almost all experiences have a «what-is-like» quality accompanying



them. A quality hard to describe that most prefer to maintain as mysterious and pervasive. Nevertheless, it can be described, explained and understood.

We do have a proprioceptive awareness of bodily states and processes. That is the reason why when you see, you do not just see, as Damasio explains, but you feel you are seeing something with your eyes (1994). It is not spiritual, it is material; it is a bodily occurrence.

General discussions about dance try to maintain as a «fact» that dance is non-reducible to what a body is producing because it is «evident» that it carries much more than this «poor material thing».

Those who agree think on dance as wonderful mainly because it has an evanescent flavour and produces a kind of pervasive sensation that cannot be described in its entirety through words. For them, this is «the real dance», the sum of what the body does (movements) with what this doing produces by itself (the qualia) and cannot be caught by rationality. Those who follow this assumption are proud of the aura - in Walter Benjamin's sense - they put on dance.

This «real dance», absolutely auratic, takes us to an area where progress is most difficult in Cognitive Science: the quality of perceptual experience or qualia. People who are reluctant in accepting qualia as «phenomenal properties that an object is sensuously represented by the organism's sensory system as having» (Dretske, 1995: 73) need to maintain dance beyond any plausible explanation of its nature. When we accept Dretske's proposition we understand that the evanescent thing turns immediately to be physical also - as Peirce had already warned with his claim about the physical connections between signs and objects. And without being impoverished, as the aura/qualia's believers tend to accuse.

These are concepts that can guide us in an investigation of dance as a bodily experience in a semiotic approach. And that can make clear that everytime we think on dance as an experience we are taking two senses together: Biology and Culture.

If dance is an information that can be put in a body but it is not an encoded instruction in its DNA, it is something that this body must learn. Strands of DNA encode instructions for building and maintaining living organisms. Ideas seem to undergo an analogous process. If we agree that dance happens as ideas that have been embodied, we come to a starting point where movements that a body learn how to perform can be understood as instructions (informations) that this body begins to replicate. As anything else that can be replicated this information - dance - must obey the laws that regulate replication.

## **DANCE AND EXPERIENCE: LEARNING AS INFORMATION BEING REPLICATED**

Now we came to Richard Dawkins' explanation of how ideas replicate. Dawkins introduced the notion of a *meme* - a replicator of cultural information analogous to a gene (1976). «Just as genes propagate themselves in the gene pool by leaping from body to body via sperm or eggs, so do memes propagate themselves in the pool of memes by leaping from brain to brain».

In Dawkins' view, Culture, as Biology, can be thought as a space where occurs exploration and transformation of information through variation, selection and replication. In other words, Culture can be thought as an evolutive environment analogous to Biology but with its private characteristics.

We will take the Meme Hypothesis to trace what can be taken as experience in a dancing body. And it will be also helpful in the understanding of how mental representations are generated, organized, stored, retrieved and expressed by an individual.

To be replicated the meme has to held a pattern. Explanations about pattern in



information vary. All pattern in the information, according to Gabora (1997), can be traced to three principles: the physical constraints and self-organizing properties of matter, biological evolution and cultural evolution.

This understanding points that Culture is grounded in Biology and Biology in Physics. This biologically-inspired model of culture supports a connection to Charles Darwin's theory of evolution: memes arise through combinations and transformations of old memes. Ideas and emotions are encoded as informations in memes.

As Damasio had already demonstrated, neurons process reason and emotion simultaneously (1995). Maybe we can take this as a response to old questions as those that separate form and content or those that refuse to accept dance as a material phenomena - an experience -where emotion and thinking are melted. The body is not a physical space limited by the neck and the feet. Almost everything that occurs in the body begins in the brain.

A meme crystallizes from the world of ideas (genotype) into words or body language or objects in the physical world (phenotype). When ideas get embodiment they are genotypes that extend themselves into phenotypes.

Culture is the only system comparable to Biology because it exhibits the imperative of evolution - adaptative exploration and transformation of an information space through variation, selection and transmission.

«Since memes do not come packaged with instructions for their replication, they must rely on the pattern-evolving machinery of our brains to do it for them. This is a state of dependence that enhances their proliferative potential, because the machinery constructs and continually updates mental models of its worldview to enhance the assimilation and implementation of the memes and their offspring» (Gabora, 1997: 20).

Since concepts are physically encoded in the brain as memes and grounded in the body as its extended phenotypes, our brains and bodies can change - memes are evolutive. And dance can contribute as one possible moral force in presenting the disruption of our normal ways of functioning as being an aesthetic experience.

If our memes arise from the way our bodies interact in the world we can change them by changing how we interact. This is valid for understanding transformations inside or outside dance.

Since bodily experience is continuously being disrupted because it happens always as part of an ongoing process that is evolutive, freshness becomes a need and also one of the most prominent characteristics of Culture. What was put in a body does not remain there in the sense of a kantian *noumenon*.

As soon as it has been brought inside, it locates itself by rearranging all the environment. The previous inhabitants begin immediately to respond to this need of accommodation by transforming themselves by the pressure of the new income.

As these continuous incomes are what make us living bodies, they do not silence. Their non-stop ingoing and outgoing can be understood as an evolutive process because it operates using the evolutive principles of selection, preservation and replication.

When your body learns a movement it practices a very complex task. It must be able: 1) to decode which is the pattern that there is in that movement; 2) to select other similar patterns; and 3) to aggregate it with others it may combine.

Like when a child sees for the first time his mother in a blue dress and sees her again, in the next day, in a red dress. She decomposes «mother -in-the-blue-dress» and «mother-in-the-red-dress» to an extend where «mother» appears as a regularity.

In the sense it is being taken in this paper, the experiences a body can have is considered under the Darwinian's evolutionary law. In this view, the body does not have past experiences that can be recovered as past in its entirety. What a body can have is experience. Basically, because time is not reversible in the body, as Prigogine had already explained.



Experience is a stream, a flux that gives form to living processes. As a living process, this is the matter dance is made of. And if this is the matter dance is made of, dance can be also considered as an evolutionary process of bodily experiences.

As life itself, dance is made of this ever surprising and non-stop combination of Biology and Culture. As a pool of dancing memes dance is a privileged place to understand evolutionary processes and to be understood as one evolutionary process by itself.

In understanding dance experience as an ongoing present where past is continuously being re-located, we come again to Cognitive Science, the area where science explains what cognition is in a living body and to Peirce's notion of the sign.

## REFERENCES

- CHALMERS, D. (1996). *The Conscious Mind. In Search of a Fundamental Theory*. New York: W.H. Freeman and Company.
- CHALMERS, D. (1995). «Facing up to the problem of consciousness», *Journal of Cognitive Studies*, 2(3), pp.200-19. UK and USA: Imprint Academic.
- DAMASIO, A. (1994). *Descartes's Error*. New York: Putnam.
- DAWKINS, R. (1976). *The Selfish Gene*. Oxford: Oxford University Press.
- DEACON, T. (1997). *The Symbolic Species*. New York: Norton.
- DRETSKE, Fred I. (1995). *Naturalizing the Mind*. Cambridge, MA and London: The MIT Press.
- DRETSKE, Fred I. (1989). *Explaining Behaviour*. Cambridge, MA: The MIT Press.
- FREEMAN, Walter J. (1995). *Societies of Brains. A study in the Neuroscience of Love and Hate*. New Jersey: Lawrence Erlbaum.
- HOFFMEYER, Jesper (1996). *Signs of Meaning in the Universe*. Bloomington, IN: Indiana University Press.
- HOFFMEYER, Jesper (1998). «Semiosis and Living Membranes». In *1º Seminário Avançado de Comunicação e Semiótica, Fundamentos Biocognitivos da Comunicação: Biossemiótica e Semiótica Cognitiva*. São Paulo: PUC-SP.
- HOFFMEYER, Jesper and C. Emmeche (1991). «Code-Duality and the Semiotics of Nature». In *On Semiotic Modeling*, Myrdene Anderson and Floyd Merrell (eds.). New York: Mouton de Gruyter, pps. 117-166.
- NAGEL, Thomas (1986). *The View from Nowhere*. Oxford, New York: Oxford University Press.
- NÖETH, W. (1990). *Handbook of Semiotics*. Bloomington, IN: Indiana, University Press.
- PRIGOGINE, I. & I. Stengers (1986). *Order out of Chaos: Man's New Dialogue with Nature*. Toronto: Bantam Books.
- UEXKULL, T. (1992). «A Stroll Through the Worlds of Animals and Men». In *Semiotica* (Special Issue), Berlim, 89-4.