# Can Robotic Brains be Social?
# Scientists Caught Back-peddling

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### Abstract

*The year 2001 was a "fast year" for research in Natural Computation and Robotics. In that year, the author of an article in* Minds & Machines *asks two highly pertinent questions for robotics: 1) If a robot is able to participate in simple language games as adequately as a child, should we concede true meaning and intelligence to it? and 2) How would we go about developing a robot which could possibly live up to a positive answer to the first question? My approach is straightforward: a) refute the first question, so as to b) forget the last. I then argue in favour of supporting another well-known sub-domain of AI/HCI/Robotics thought in order to stimulate research in the artificial sciences.*

## I.    PREAMBLE ON ROBOTIC BRAINS

I herein address an issue that has a 50-year and more history in the Sciences of the Artificial. Important research being carried out at top-notch scientific institutions like MIT, Carnegie Mellon University and still yet many others seem to be having difficulty with the mind-body problem in creating robots that think. Weng, McClelland, Pentland, Sporns, Stockman, Sur & Thelen teamed up to confirm this in their *Science* article a few years back (2001) with discussion on "automous mental development" that was limited to brain and body building[1]. Whether their intention included outright occultation of the mind or not, *reductionism* cannot account for mind as it cuts this latter off from its socio-communicative dimension (i.e. relations with other minds), the very features that *make a mind a mind and not a brain* to state things in a 'folkish' manner. A few months later in that same year, Brian Scassellati (at MIT AI Lab. at the time) used the following citation from Turing's famous article presumably in order to sum up his Doctoral Dissertation (first citation, placed top centre-page, Chapter 1).

> Instead of trying to produce a program to simulate the adult mind, why not rather try to produce one which simulates the child's? (A. Turing 1950, p. 456)[2].

I do not have the impression that exponential progress in the area or "humanoid robotics" has since overcome this philosophical hurdle to capture the *dialogical* essence of mind.

With his "embodied theory of mind" Scassellati may have been referring to —or taking inspiration from— Jordan Zlatev's 1997 work on *Situated Embodiment.*

Whatever the relation, academics working in Robotics and related fields like Human-Machine Interaction and Artificial Intelligence often seem to undergo an out-of-proportion positivistic enthusiasm for their 'babies'. Why is this? Do not any of them have the liberty to *really* express their doubts? There surely must be some conceptual hesitation in their mind when the action implied by their work constitutes replacing human beings. It is a good thing that when they do replace a human being with a machine, it is quite often in the context of repetitive task handling that the human being no longer likes to do. But there are a few academics that work on technological challenges that remain purely technological in nature (i.e. not that useful since man does not want to give up the action concerned —examples involving speaking come to mind). Their technological audacity does not stem from usability reports or interviews with users. Simply defying physical laws is what they seek to do.

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[1] WENG J., MCCLELLAND J., PENTLAND A., SPORNS O., STOCKMAN I., SUR M. & THELEN E. (2001), "Automous Mental Development by Robots and Animals", *Science Magazine,* Vol. 291 N° 5504, The American Association for the Advancement of Science (AAAS), pp. 599-600.

[2] *Cf.* SCASSELLATI B. (2001). *Foundations for a Theory of Mind for a Humanoid Robot*, Ph.D. Dissertation, May 6: Massachussetts Institute of Technology.

Scassellati gets his expectations about *machine intentionality* the wrong way around when he writes about the "Implications to Social Robotics" of his work: "Rather than requiring users to learn some esoteric and exact programming language or interface, more and more systems are beginning to use the natural social interfaces that people use with each other. People continuously use this extremely rich and complex communication mechanism with seemingly little effort. The desire to have technologies that are responsive to these same social cues will continue to drive the development of systems [...] Theory of mind skills will be central to any technology that interacts with people. People attribute beliefs, goals, and desires to other agents so readily and naturally that it is extremely difficult for them to interact without using these skills. They will expect technology to do the same".[3]

But interlocutors in human-resembling communication like to be reassured that their interlocutor is human. In fact, if one wishes to escape from the Electrical Engineering and Computer Science point of view, one has to read for example the works of D. Norman, a cognitivist who addressed the DARPA/NSF Conference on Human-Robot Interaction in... yes, the year 2001. He then gave an analogy to persuade any human being to understand why *machine speech should not be flawless* in the human sense[4]. And he is not the only one that argues in this direction (*cf. infra*).

Brain-child projects are fine, but may they ever lead to "mind-childs"? Perhaps. Let us now turn to the further specialised field of Natural Computation. At least one influential author has caught my eye.

## II.  "ARTIFICIAL PROBLEMS"

Some  authors like to delve into "thought experiments" using such examples to study the possibilities of resolving some of the problems of the Artificial Sciences. Let us try to understand in simple terms what J. Zlatev meant in his (yes!) 2001 article in *Minds and Machines*[5]. His goal was to use one of these "thought experiments" in order to up-grade the

position of the Artificial —robots— on the social status scale, or perhaps quite possibly, to argument in favour taking robotic technology even further ahead. Or was it only to test the plausibility of lifting them up to our level?

In any event, he devises a fictive situation for this purpose. A two-year old child is sitting on the floor and interacting with his father through eye contact as they pass things likes balls and blocks back and forth. The child gestures towards an object that is out of reach and says "*train*". Dad says "Oh, you want the *train-engine*". In receiving it, the child repeats "*train-engine*", thereby indicating that the adult's slight correction concerning the proper of term of reference has not passed unnoticed; etc. etc (*cf.* p. 155). Zlatev then tells us that, when it comes to playing simple language games like this, you can remove the two-year old and put a robot in the very same spot on the floor to occupy Dad; he says that today we can build a robot that would have the same physical and intellectual capacities as this person's son or daughter. I agree with him so far.

My endeavour is to focus on the communication part of his proposal as I believe this is where genetics-based robotics would stand to gain the most from my critique.

As communication is a social activity that does not have anything really to do with genes themselves, I am sure the author pointed out here will have no objection: he does in fact carry his point of view well outside of the materialistic topics spoken about traditionally in robotics.

One does not really have to read beyond the Introduction of Zlatev's rather lengthy article (though it does read quite nicely) to find out whether his version of "Epigenetic Robotics" will not be able to defy the tormenting philosophical questions that Strong AI has been battling with since the days of R. Schank in the 70s, Herbert Simon and A. Newell at Rand Corporation and CMU in the early and mid 50s, A. de Groot (1946) and still yet others, questions namely such as "is it possible for Man to build a machine to think?". As Zlatev (p. 157), I do not have the philosophical wherewithal, but I esteem myself to be in a position to be able to bring a certain number of issues to his attention, though perhaps only really in point form. A glance over my notes would nevertheless seem to indicate that what I have to say could be somewhat important for specialists in Natural Computation (*cf. infra*, Conclusive Remarks).

I understand epigenetics to be a field of study that involves mainly the "physicalist options" of the Cognitive Sciences; the work of Zlatev and Dennett are encouraging as they do endeavour to look into the other options possible under this banner, even if the latter author mentioned here has confused the notions of *mind* and *brain* in the past (*cf.* D. Dennett 1996).

## III.  MY APPROACH

My vision of the way things are for the sciences of the Artificial in general, and thus Natural Computation and

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[3] *Cf. ibidem* p. 159.

[4] After exposing a version of the Asimovian laws of robotics, he states the following: "while speech input is still imperfect, the robot must make this clear [...]." He them gives the maxims the first of which is: "Don't have flawless, complex speech output at a level far more sophisticated than can be understood. If the robot wants people to realise it has imperfect understanding of language, it should exhibit these imperfections in the way it speaks. (If a foreign speaking person could speak fluent English but only understand pidgin speech, the more it spoke flawlessly, the less other people would understand the need to speak in pidgin)". *Cf.* NORMAN D. (2001), "How Might Humans Interact with Robots? Human-Robot Interaction and the Laws of Robotology", keynote address, *The DARPA/NSF Conference on Human-Robot Interaction*, San Luis Obispo CA, September.

[5] *Cf.* ZLATEV J. (2001), "The Epigenesis of Meaning in Human Beings, and Possibly in Robots", *Minds and Machines* n° 11, Kluwer.

Robotics in particular, will quite simply be based on the two questions brought forth by the author:

If a robot is able to participate in simple language games as adequately as a child, should we concede true meaning and intelligence to it?

How would we go about developing a robot which could possibly live up to a positive answer to the first question?

My approach is straightforward: *a/*refute the first, *b/*forget the last. In order to not leave specialists in robotics following the example targeted here in the dark, I will *c/*deploy a prospective epistemology which will introduce discussion leading to the reinforcement of another well-known sub-domain of AI/HCI/Robotics thought (*cf.* the last section): Weak machine intelligence.

## IV.   ZLATEV'S HOW-TO'S

If I understand correctly, what the author means by "reverse engineering" is that in recreating the behaviour of communicative intelligence, while working with the smaller units of behaviour to form the larger ones of the robot language acquisition process, the robot builder must situate his action within a long set of implications enunciated in the exact opposite order: "linguistic meaning presupposes shared conventions, as a form of mutual knowledge. Conventions presuppose reflexive consciousness, allowing them to be learned and followed. Self-consciousness presupposes the perception of oneself as an intentional agent. Perception of oneself as an intentional being presupposes the perception of others similarly. Hence, other-intentionality, self-intentionality, self-consciousness and language form a possibly necessary developmental progression and an artificial system aiming at real —as opposed to simulated— language use …" (p. 189). This does appear to give a more pragmatic aspect to the 'usual implementation technique' in the artificial technologies fields, but is there not something very paradoxical here?

If these are presuppositions proper, they would indicate rather that one should start by building a robot by taking the larger chunks on and then the smaller ones. In his initial *explanation* of the thought experiment involving a child playing with toys and talking with Dad (p. 155-156), Zlatev starts off with intentions, goes through meaning and understanding to get to the grammar part. In fact this type of discourse is typical of positivistic science that has, so to speak, bit off too much to chew and then wonders what to do.

At this point in the game one may ask if robotics really does have a set methodology and direction to follow… or is it just heuristically (or hysterically) shooting in the dark? I could even say that the (almost not) implicit goal being chased after here, recreating man in behaviour as well as social role, is so difficult that, however big the steps robotic technology is taking towards this goal (excuse the pun!), we do have a very long way to go.  As I see it, a more plausible way of seeing things would be to take the larger components for the smaller ones: simple intentionality features of members of the human race put end-to-end to build very complex grammatical constructions. *Why should the linguistic utterances of language users be considered any less complex then human intentionality?* It would seem obvious that —after saying over the last 25 years that utterances lacking their intentions-driven component cannot have meaning— we could and should be able to imagine positive responses to this epistemological question. Zlatev seems to be going in the right direction but shows here the sentiment that the Robotics community will have trouble following his initiative; hence the need for an adjective on the banner, (i.e. "epigenetics").

## V.   DIALOGICAL COMMUNICATION

In Section 4.2, it becomes clear that Zlatev's approach is based on a rather dated account of interpersonal communication. Although Grice inaugurated the discursive study of ordinary language use with his studies on "implicatures" —a welcomed advance from the area between Philosophy and 'plain linguistics'—, his (and Gazar's) results are not sufficient for what we are expecting of robotics intelligence today. Whatever we may expect, it is entirely clear that Zlatev's model of intersubjectivity is not able to escape that of Grice's presentation pattern of intentional layering: A knows X, B knows that A knows X, A knows that B knows that A knows X, etc. (cf. p. 182). Communication theory has come a long way since then (cf. Vernant, Vanderveken, Jacques, Shotter and my own work in the 90's). It has come to fully accept asymmetry as the basic nature of the communicative link. The layering of intentions performed by Grice would suggest that a symmetric alibi was still necessary.

The progress that has been made in communication theory could quite simply be stated as follows, though I run the risk of being accused of over-simplification:

A cannot do with B what B does with A, whatever the communicative activity is (i.e. discussing explicitly or implicitly about knowing X).

So if the authors means to speak about a Robot that participates in simple language games, how can his analysis of the situation be water tight if the pragmatic nature of the relation in question here is not solid? *Who is speaking to whom?* is a simple question that resumes what I mean by the pragmatic nature of the relation and this is important as the father in the thought experiment here, as Zlatev pointed out, does not know who or what he is interacting with. Is that really his daughter on the floor in front of him? Is that not his daughter?

One of the most relevant things I have to say in this article is that it would appear that the field of robotics is too materialist to succeed in tackling the myth of humanity. Its endeavours only represent reproducing/replacing the mere *manifestation* of communicative intelligence; the dialogical

profundity of human cognition and communication skills are hard to replace over and above the toddler level. This is why the AI project has been reduced. What level of dialogism can robotics-embedded AI produce? At the outset, Turing and post-Turing discussion was about adult dialogical capacities, Zlatev tackles two-year olds (behaviour only?), and in relation to this, Scassellati drastically gears the argumentation down once again in his work: "The systems presented here will not begin to approach some of the complex social skills that children master even in the first year of life".[6] In fact, there exists a logical impossibility for a robot to participate in dialogical activities because of the *primium relationalis* in human communication as defined by F. Jacques as early as in the beginning of the 80s. This means that for any propositional content flow to obtain success, it is dependent on the relationship between interlocutors *that must exist prior to it*. AI *tries* things the other way around if it even considers the pre-imminence of the relation at all.

## VI. SOCIAL STATUS

I would have to add a few itilicised characters to Zlatev's first question:

If a robot is able to participate in simple language games as adequately as a child *at least in appearance*, should we concede true meaning and intelligence to it?

P. Bourdieu[7] would say that mechanical 'objects' like *Robot Sapiens* are only simple artefacts, whatever that species may be capable of: it is so-to-speak Made in the Republic of Human Society and is thus subjected to the rules therein, rules that go beyond the boundaries of mechanics, genes, synthetic flesh and other physical paraphernalia.

But what Zlatev does well in his article is point out that it is important for machines, if they are to have success in performing operations in a human way, to learn over a period of time, to have a history. They need to have the opportunity to acquire the skills to evolve their on knowledge. The programming-in method is, I think we are safe to say now, out since people working in robotic have started to take into account, as Zlatev, the more philosophical discourse on their subject (Dennett, Dreyfus, Turkle, Turing, etc.).

## VII. ROBOTIC "INTELLIGENCE" tWEAKed DOWN FOR PARENTS AND OTHER ADULTS

One of our main points today is that, other than for all the logico-philosophical and relational points exposed above, society is far from being in a position to accept the *advanced*

products to come of "robotology", even if robotics, epigenetic or otherwise, is making good progress now. These products *are* for our utilitarian society but, in order to be fully accepted by the Self —as is the Other in a dialogical setting (context which remains exclusively inter-human for the time being)—, without the proper *identity features* they will remain at the fringe of human communities. Zlatev finds it necessary to play with our emotions to get his point across and so speaks of the remembrance of persons dear to oneself while they are in a deceased state (*cf.* the second thought experiment at p. 160-161); I do not for the moment find it necessary to go this far, but it is a rather good idea to use strong emotions —they enhance argumentation. Think about a young boy, say in the 5-10 year-old range, who comes into the living room to alert his parents of some happening and, in the middle of their discussion, our eavesdropping reveals the following utterance:

"The robot is bothering my two-year old sister".

Would the adults react in the *usual manner*? That is to say in the same way as when another human sibling bothers the two-year old? Would the parent regularly "commissioned" to handle such a scenario go into the recreation room with the intent to, say, scold the robot?

The robot will not possess the proper *identity features* in our society for some time yet to receive the treatment that might habitually correspond to bothering, teasing, pushing, hitting and so forth. For example, I doubt that, even in ten years time, *sincerely* scolding (and I mean with authentic sincerity) robots would come into practice —oh, and taking one over one's knee, even less so.

By "proper identity features" for a robot to function in a normal way at a societal level, I quite simply refer to *social status, family-induced selfhood* and *moral existence*, features *perceived as so by humans*. Furthermore, purely logical reasons for artefacts like robots not being equipped for total integration into human society do exist in the literature in Human Sciences, such as those pertaining to the *pragmatic* aspects of communication (*cf. supra*, section V): I demonstrate this elsewhere in Italy at another time[8].

I will have to maintain the question I asked of the robotics community in 2002 "Can simulating Man's physical abilities meet up to the expectations we have of Robot Technology?" (*cf.* my Berlin Ro-Man paper). The fact that T. Watanabe (*et al*) "abandoned" his InterRobot (iRT) technology for a "lesser embodied" form of communicative interaction with humans —iRT's on-screen version called InterActor— is indicative of the difficulties of human speakers to interact with very similar-looking creatures[9], which I think is the intention of the Natural Computation

[6] SCASSELLATI B. (2001). *Foundations for a Theory of Mind for a Humanoid Robot*, Ph.D. Dissertation, May 6: Massachussetts Institute of Technology, p. 19.

[7] Cf. BOURDIEU, P., (1982). *Ce que parler veut dire : L'économie des échanges linguistiques*, Fayard.

[8] *Cf.* SCHMIDT C.T. (Forthcoming 2004), *"*A Relational Stance in the Philosophy of Artificial Intelligence", *European Conference on Computing and Philosophy,* E-CAP 2004, 3-5 June, University of Pavia, Italy: Kluwer.

[9] *Cf.* WATANABE T. (2002), "InterActor: Speech-Driven Embodied Interactive Actor", *Proceedings of the IEEE International Workshop on Robot and Human Interactive Communication* RO-MAN 2002, Sept. 25-27 2002, Berlin Germany: IEEE, p. 430-435.

Community. Of course, writers as influential as H. Dreyfus (1972) have strongly suggested that the lack of corporal extension was the hindrance computer programmers met up against in the project of simulating human intelligence, but it has been proven (both experimentally and argumentatively) that fully simulating natural language (D. Luzzati 1989) and full simulation of human features (C. Schmidt 2001, 2002) goes against all sensible logos to improve interaction (though at more advanced levels, i.e. adult interaction). This goes to confirm the well-fitting of D. Norman's 'law-like' advice for designers about the flawlessness of machines.

All in all, I argue in this article for the use of *Weak AI, Reduced Robotics* and *Invisible Interfaces* (a Cog/InterRobot/Kismit type of creature does get one's attention). This *is* necessary for producing useful robotics for adults too. Taking research in this area back up to the adult level is the main idea, is it not?

I would like to sum up with the words of a very active researcher in the Robotics field:

"[...] humanising technology does not necessarily require creation of humanoid technology, it could rather push forward to develop technology which meets the specifically human ways and strategies of (socially) living and surviving"[10].

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