Romancing the Robots: Social Robots and Society

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Preface

By the very nature of what they do as scientists, sociologists and anthropologists are necessarily always in the midst of other people. They are in the midst of other people the way physicists are in the midst of electrons and detectors, the way chemists are in the midst of chemicals and test tubes, the way biologists are in the midst of cells and frogs. Very often now, on account of developments in social studies of science since the late 1960s, sociologists and anthropologists find – or rather plant – themselves in the midst of other researchers. Sometimes, and sometimes annoyingly, they plant themselves in the midst of other researchers while they are engaged in their research or related professional activities. Sometimes the sociologists and anthropologists are participants who contribute to the research agenda of their subjects; sometimes they observe and interview as non-participants. Given this reality of their work, sociologists and anthropologists can or must appear at least on occasion intruders, pricks of conscience, or moral entrepreneurs, and obstacles rather than facilitators of research. This role of ethnographer of science, however, has proven itself over and over to be a source of important new insights and understandings about the nature of scientific practice. They can,

of course, at the same time serve as the consciousness as well as the conscience of the research group. I have planted myself in your midst in part to continue my empirical studies of scientific and engineering practice.

The other reasons I am here have to do with my interests in social robotics per se as a sociologist of mind and thinking.

Introduction

I begin by addressing some questions I have been asked about social robotics by Illah Nourbaksh, Kerstin Dautenhahn, and Terry Fong. The questions in their survey are as follows:

1. How would you define "social robot"? Do you feel that "sociable robot" is a better term for this type of human-robot interaction?
2. What features/characteristics distinguish "social robots" from other robots and from other social interaction systems (e.g., software agents)?
3. What do you think are the most significant social robot systems? Who are the most significant researchers and organizations?
4. What do you consider to be the most important references to "social robots" (please list 3 or more papers, books, etc.)?
5. What do you think is the most significant problem (technical, ethical, etc.) in "social robots" today?

They go on to point out that the term "social robot" is used in at least two ways. It means (1) "robots that socially interact with humans," and (2) collective robots inspired by social animals."

I have been using the term "social robot" to refer to a robot designed for social interaction with humans and in principle – in the short or long run – capable of expressing emotions, demonstrating consciousness, and thinking and moving about autonomously (Restivo, 2001; Restivo and Steinhauer, 2000). More than this, such a robot would be able to move rhythmically in conversations, both in terms of speech and in terms of body. Such robots would be important from the perspective of a social theory of mind. They could be used in experiments testing fundamental ideas in the social theory of mind. The more "social" the robot, the more humanoid it would be. In this regard, then, the term "sociable robot" is not appropriate. "Sociable" in ordinary dictionary terms means "fond of company," or "characterized by friendly companionship." Cynthia Breazeal (2002: 1) writes:

…a sociable robot is able to communicate and interact with us, understand and even relate to us, in a personal way. It should be able to understand itself and us in social terms. We, in turn, should be able to understand it in the same social terms – to be able to relate to it and to empathize with it. Such a robot must be able to adapt and learn throughout its lifetime, incorporating shared experiences with other individuals into its understanding of self, of others, and of the relationships they share. In short, a sociable robot is socially intelligent in a human-like way, and interacting with it is like interacting with another person. At the pinnacle of achievement, they could befriend us, as we could them.

Breazeal immediately goes on to point out that science fiction has demonstrated how such technologies "could enhance our lives and benefit society." There are, however, cautionary tales (she refers, for example, to Philip K. Dick's (1990) *Do Androids Dream of Electric Sheep*, which raise issues about approaching dreams of robots (sociable or otherwise) responsibly and ethically. Cute and adorable robots like Kismet, interestingly enough, have already provoked worried reactions (e.g., Nightline, 2002). I also have some evidence from on-going studies of similarly worried and cautious reactions to My Baby Robot by children and adults. One of my questions is then what is the counter-reaction to such views by social robotics engineers?

Social Robots

When I (as a social scientist) say that humans are social, I mean that they are constructed out of social interactions, that they *are* social structures. I also mean that their social nature must be constantly reinforced through social interactions. What we experience as and conceive of as individuals are from this perspective networks of social relationships. This is a given, whether we are sociable or sociopaths, likeable or not, normal or deviant. To be human means to have potentials for conflictful as well as companionable relationships, and the potential to make mistakes. In constructing sociable robots, especially based on the more psychologically grounded social theories, robotics engineers seem to be driven to program out aspects of being human that for one reason or another they don't like or that make them personally uncomfortable. Such robots might eventually have a place in our society, but they will not be *social* robots. Kismet could become Mr. or Mrs. Rogers, but Kismet could never become Nietzsche or Virginia Woolf. It is a short step to recognizing that not much – or perhaps not enough – is being done that acknowledges potential unintended consequences in this field.

We should be working up models and scenarios that explore unintended consequences. Articulating unintended consequences in a sense violates the principle of unintended consequences, but once we bring the principle into our sights, it will not be too difficult to play out some hypothetical stories. In this way, we may be able to lower the probabilities for the more disastrous unintended consequences, even if we cannot in principle avoid all such outcomes. Social robots should be distinguished from other socially interactive systems (e.g., software agents, swarms, distributed and collective intelligences). The mark of a social robot should be its capacity for rhythmic entrainment with the humans (and robots) it is interacting with. It should have many if not all of the characteristics Breazeal (2002: 229-242) outlines in her grand challenges (e.g., embodied discourse), but in the end it must be able to participate in interactive rituals and ritual chains. Without the possibility of building robots capable of participating in the rituals of everyday life robotics engineers will fall short of their most ambitious visions in this field. Their robots will be little more than coded complexes of mimicry, little more than toys with chips.

I am still learning about the scope and depth of research, development, and applications in social robotics. I am most familiar with the work at MIT's AI Lab, and especially with the KISMET project and to a lesser extent the COG project. For more on my answers to the survey questions, see Appendix B. For the moment, then, this is the background against which I develop the themes and claims in this paper. Meanwhile, my colleagues and students at the CSR&S at RPI are exploring and cataloguing the field of social robotics in all of its cross-national forms

Theories Of Mind

Traditionally, theories of mind, primarily coming out of philosophy and psychology, have been asocial. These theories include Hegelian mentalism, idealism, materialism, dualism, various forms of monism, and variations on these themes including Cartesian, bundle, interactionist, parallelist, behaviorist, logical behaviorist, functiionalist, phenomenological, central state or identity theories, and various attribute theories (Armstrong, 1968; Priest, 1991). One of the most intriguing features about how philosophers and psychologists think about minds is the effort to explore the nature of the human mind by imaginings about brains in vats. armadillo minds, thinking bats, and Martian brains. No wonder we can't find social human beings anywhere in these theories!

These traditional and prevailing approaches to mind and mentality in general center on the brain. Mentality is viewed as either caused by or identical with brain processes. Given this perspective, John Searle (1984:18) could argue that "Pains and all other mental phenomena are just features of the brain (and perhaps the rest of the central nervous system)." But Durkheim's analysis of different degrees of social solidarity and the social construction of individuality suggest a culturological conjecture on pain: the extent to which a person feels pain depends in part on the kind of culture s/he is a product of, and in particular the nature and levels of social solidarity in the social groups s/he belongs to. "Pain" has a context of use,

a grammar. Such a conjecture was indeed already formulated by Nietzsche (1956/1887: 199-200) in *The Genealogy of Morals.* Wittgenstein's (1953) writings on pain in his *Philosophical Investigations* provide additional ingredients for a social theory of mind based on the role of language in our pain narratives. But Searle, while he invokes the social, does not know how to mobilize it theoretically, and so argues that consciousness is <u>caused</u> by brain processes. We will see as we proceed why this claim that has seemed so reasonable for so long must be reconsidered in light of what we know about the relationship between social life and consciousness, and what we are learning about social life and the brain..

Cognitive psychologists tend to view the mind as a set of mental representations. These representations are then posited to be causes behind an individual's ability to "plan, remember and respond flexibly to the environment" (Byrne, 1991: 46). Cognitivists also have a tendency to equate cognition and consciousness. But Nietzsche long ago had the insight that consciousness is a social phenomenon. He was one of a number of classical social theorists who had pioneering insights into the social nature of mentality.

We can approach the history of discourse on mind in terms of (1) the conflict between rationalists (intellectual descendants of Descartes and Leibniz) and empiricists (followers of Locke, Berkeley, and Hume); (2) the behaviorist challenge to the radical empiricists by Watson and others, and the challenge in turn to the behaviorists by the ethologists (Lorenz, Tinbergen, and von Frisch); and (3) the Kantian counterpoint to empiricism, represented in our own time, for example, by Jerry Fodor's (1983)

conception of the mind as an entity possessing organizing capacities and an innate "language of thought."

Why is it we "locate" mind, thinking, and consciousness "inside" heads? Certainly in the West, mentalities and the emotions have been associated with the brain and the heart since at least the time of the ancient Greeks. More recently, localizationalist physicians and neuroscientists have reinforced the idea the mentalities are "in the head" (Star, 1989). On the other hand, in sociological perspective, mentalities are not produced out of or in states of consciousness; they are not products, certainly not simple products of the evolution of the brain and brain states. Rather, they are by-products or correlates of social interactions and social situations. This implies that the "unconscious" and the "subconscious" are misnomers for the generative power of social life for our mentalities – and our emotions. There is no more an unconscious than there is a God, but there are cultural mechanisms for translation and transference that point us to referents that do not exist. The thesis here is that social activities are translated into primitive thought "acts," and must meet some filter test in order to pass through into our awareness (cf. Wertsch, 1991: 26-27; and see Vygotsky, 1978, 1986; and Bakhtin, 1981, 1986). Vygotsky and Bakhtin should be considered independent inventors of the modern social theory of mind alongside their contemporary, G.H. Mead. Wertsch (1991: 14) stresses that mind is mediated action, and that the resources or devices of mediation are semiotic. Mind, he argues, is socially distributed mediated action.

Getting To The Beginning Of Our Story

In 1939, C. Wright Mills (1963) argued that the sociological materials relevant to an understanding of mind had not been exploited by sociologists. Mills had in mind in particular the work of the American philosopher and social theorist, George Herbert Mead. Fifty years later, Randall Collins (1988) could still write that Mead's writings on the sociology of mind were underdeveloped and unexploited. And as I write these words more than a decade later, the same claim can be made. Indeed, the failure of sociologists to pick up the track of Mead's social theory of mind was underscored by the publication of a social theory of mind guided by Mead's work written not by a sociologist but by a neuroscientist/psychiatrist (Brothers, 1997).

Resources For A Sociological Theory Of Mind

The basic resources I draw on for constructing a sociological theory of mind include but are not limited to the following: the concepts of *collective representations* (Durkheim) and *generalized other* (Mead); Goffman's (1974) *theory of frames* (cf. Wertsch, 1991 on *recontextualization*); the literature on *culture and thought* (Levy-Bruhl, 1985/1926; Levi-Strauss, 1966; Goody, 1977; Cole and Means, 1981); studies of the evolution of *human language and its social context* (Caporael et al., 1989), and studies *on the relationship between social relations and rule-governed systems such as language* (Caporael, 1990: 10-11). Researchers in artificial intelligence have been increasingly incorporating into their work the idea that *AI machines have to be programmed with "cultures"* (e.g., Normal and Rumelhart, 1975; Keesing, 1987: 381).

It is also important to register in these early moments of this effort in theory construction that sociology has something to say about the brain. Clifford Geertz (1973: 76) has pointed out that the brain is "thoroughly dependent upon cultural resources for its very operation; and those resources are, consequently, not adjuncts to but constituents of, mental activity…" Indeed, DeVore (Geetz, 1973: 68) has argued that primates literally have "social brains." The evidence for this conjecture in humans has been accumulating in recent years along with a breakdown of the brain/mind/body divisions (e.g., Brothers, 1997; Pert, 1997).

Our understanding of mentalities has been obstructed by some deeply ingrained assumptions about human beings. One is that affect and cognition are separate and separated phenomena. This division is breaking down (e.g., Zajonc, 1980, 1984; Gordon, 1985; Damasio, 1994 ; and Pert, 1997), and will have to be eliminated as part of the process of constructing a sociology of mind. Another assumption is that learning and cognition can be decontextualized. I argue with other social scientists, by contrast, that learning and cognition are linked to specific settings and contexts, that is, they are indexical. Their long-term efficacies are in fact dependent on contextual recurrence, contextual continuity, and recursive contextualizing. The latter process helps explain the process of generalization without recourse to epistemological mysteries or philosophical conundrums.

Theory of Mind

Breazeal (2002: 8-9) assumes a theory of mind is necessary for us to "correctly attribute beliefs, goals, perceptions, feelings, and desires to the self and to others." One of the grand challenges she puts forward is giving a robot a theory of mind. What kind of a theory of mind is Breazeal working with? According to Astington (1996: 184), Gopnik (1996) claims there are only "three games in town" when it comes to theory of mind: theory-theory, simulation theory, and modularity theory. But Gopnik (1996: 169, 182) distinguishes "theory-formation theory" from "theory-theory." Nonetheless, the psychologism in these theories fits the necessarily "give to" rhetoric of mechanisms at this stage in the development of social robots. There is another game in town, however, and it goes with the sociological resources I have sketched. The alternative to children deriving their theories of mind from their direct experiences of such states, of developing such theories the ways scientists supposedly derive their theories, or of giving rise to them innately as they mature is an enculturation theory. The prevailing theories of theory of mind emphasize development within the individual. From a sociological or anthropological perspective, theory of mind and mind itself are cultural inventions (Astington, 1996: 188). Social construction of mind has not been ignored, but it has not been as centrally represented in either mind studies or social robotics. The reason is a problem in the sociology of knowledge. It may be, for instance, that it is easier to link psychology and engineering because psychology appeals to the illusion or fallacy of introspective transparency. The problem with sociology is that while it holds unparalleled promise for social and sociable robots engineering, it is by comparison with the psychological sciences introspectively counter-intuitive and technologically sterile. These are not failures of sociology but rather failures of the sociological imagination in robot science and engineering.

The Social Mind

The sociology of mind and thinking has a long and distinguished pedigree, yet it has until recently been virtually invisible in contemporary theories of mind (Valsiner and van der Veer, 2000). A renewed interest in mind, brain, consciousness and thinking (along with the new life evident in the search for God – the two quests are indeed related in sociology's program for the rejection of transcendence) is evident in the steady stream of books, articles, lectures, news stories, and television programs crossing today's intellectual landscapes. One of the main features of this literature is that one can see some evidence of a sociological orientation emerging, albeit timidly and fearfully, out of the shadows.

An archaeology of these developments would reveal a "journey to the social" across the entire landscape of intellectual labor. Virtually without exception, those who undertake this journey are not sociologists or anthropologists (or more generally, social scientists) and so they stop short of their mark or otherwise abort the trip. This is, indeed, a much more treacherous journey than the Westerners' journeys to the east which have captivated (and captured) so many Western seekers. But the very fact of the journey to the social reveals the emergence of a new discursive formation, a new episteme.

This episteme is new in the sense of a birth or an originating activity, but absolutely new in the scope of its impact. Beginning in the 1840s, the West entered the Age of the Social, an era of worldview changes that will carry well into the 21st century and likely beyond before it begins to embody itself in the everyday ecologies and technologies of mind in new global civilizations.

Nothing captures the spirit of this renewal better than philosopher John Searle's *The Rediscovery of the Mind*. Searle(1992: 128), for example, writes:

> I am convinced that the category of "other people" plays a special role in the structure of our conscious experiences, a role unlike that of objects and states of affairs...But I do not yet know how to demonstrate these claims, nor how to analyze the structure of the social element in individual consciousness.

And the neuroscientist Antonio Damasio (1994: 260) writes:

> To understand in a satisfactory manner the brain that fabricates human mind and human behavior, it is necessary to take into account its social and cultural content. And that makes the endeavor truly daunting.

To give one more example, consider the following remarks by Stan Franklin ((1995: 10) at the beginning of his tour of mind studies. Franklin is a mathematician and computer scientist:

> Let's not leave our discussion…without pointing out its major deficiency. There's no mention of culture. How can one hope to understand mind while ignoring the cultural factors that influence it so profoundly? I certainly have no such hope. I clearly recognize that the study of culture is indispensable to an understanding of mind. I simply don't know how to gently include culture….Perhaps anthropology and sociology should share a corner with cognitive psychology.

More recently, this assessment of the situation was offered in the introduction to a conference on social agents, *Starting from Society - the application of social analogies to computational systems*:

> Understanding how societies work and the role they play in the construction and function of intelligence has turned out to be much more complex and important than most researchers in AI would have predicted.This is in marked contrast to sociology and social cognitive science where this has been common knowledge for some time. It is now time to pay attention to these social phenomena in their own right so that they can be analyzed and applied in AI.

The introduction went on as follows:

> This symposium is to consider how ideas and analogies drawn from observations of real societies might be applied to computational systems. Recently biology has been a source of inspiration for AI, e.g. spawning the field of evolutionary computation. Now ideas and analogies drawn from the social sciences are starting to be used in computational systems. This is partly because it is being recognized that controlling interacting societies of artificial agents is difficult – traditional methods cannot anticipate the emergent outcomes, so that some researchers are looking to real societies. Another strand is the increasing recognition that much of what we had labeled as individual intelligence derives from the society it inhabits. A third strand can be traced to the influence of social simulation techniques. This symposium will focus on these areas, welcoming especially interdisciplinary work and work grounded in observation of real societies and real problems [see Appendix A].

The case Randall Collins and I have been arguing since the early 1990s has without much direct effort on our part finally begun to emerge in the ranks of the social agent, social robotics, and social AI researchers themselves. The next step is to take seriously the problem of understanding human social life and the social life of the person in terms

familiar to sociologists and anthropologists. The advantage of this goes beyond the simple disciplinary transparency of the imperative. It moves us beyond social analogies to serious sociological theory. This social turn of the social turn would instantly eliminate certain types of unintended onsequences and dead ends. Of course, it will generate its own unintended consequences and dead ends, but they are more likely to lead to constructive and productive consequences. Once this strategy begins to be followed, it will be easier for social and sociable robot engineers and scientists to figure out how to build mechanisms related to specific sociological constructs than it apparently is now. In particular, I want to encourage thinking about mechanisms to implement interaction rituals and interaction ritual chains. This will become easier with the publication of Randall Collins' books on interaction rituals and ritual chains over the next year or two.

Technical problems have social, cultural, ethical, and historical contexts and consequences (immediate, long-term, intended and unintended) that are not always available to the engineer or designer focused on solving those problems. Those who walk in the footsteps of the Francis Bacons and Rene Descartes continue to promise riches for all "mankind" that will flow from our laboratories and workshops in science and technology. We have been dealt many harsh and in some cases perhaps irreversible lessons as the promises of one technology after another have turned into environmental and ecological disasters. The promises of social or sociable robots certainly have some of the flavor of the classic progressive claims for technologies of

the past. The problem here is that the potential targets of unintended consequences are no longer merely environmental ones but human ones. I mean "human ones" in a more profound sense than might be understood at first glance. For surely, humans have suffered from the unintended (and intended!) consequences of technologies before. Now, however, the specter is raised of new kinds of impacts on human cognitive and emotional, as well as social and cultural, states and processes.

I am not worried as some are about "post-human" futures, about humans being "replaced" by machines. Sooner or later we are going to be replaced by something (or nothingness); that shouldn't be the issue. The more immediate issue is what will happen to us if more and more of us spend increasing amounts of time with robots capable of becoming Mr. Rogers or Kate Smith and incapable of becoming Prof. Nietzsche or Virginia Woolf?

Conclusion

We can look forward to robots in "just like us" terms, robots that have human forms of mentalities and emotions. We could, on the other hand, look forward to robots in "robots as robots" terms, robots that have machine mentalities and emotions. In either case, humans are going to be the "likeness" against which we will measure the qualities and achievements of social or sociable robots.

Social robots in our midst will confront us with questions of what alternative forms of embodiment and semiomateriality mean for us as humans; as men, women, and children; as people of culture, ethnicity, class, sex, race, gender, and age. Who are social and sociable robots for? Are they for all of

us, or some of us? Are they for all of us or certain parts of us? What and who are they good for? There are invidious implications in these sorts of questions. But I have no doubt on the positive side that social and sociable robots will help us understand our dynamic and social selves and bodies. They will problematize our embodiment, our senses, our sensuo-erotics. And as these robots come into the world, we will come to be in the world differently, and we will matter differently.

Social and sociable robots should be understood in the context of specific and overlapping social locations, and not simply in terms of the ideas and practices of individual scientists and engineers. Attention to social locations means more broadly attention to historical locations and contemporary processes of glocalization. In the end, the limits of social and sociable robots are not in the limits of silicon and steel but in the limits of our interpretative courage and recklessness. We really have no more and nothing different to fear from these robots than we do from our fellow humans. When we meet these robots, we will meet ourselves.

Social robotics is an important vector in the movement of science and technology across the world. This movement is a multilinear, multicultural dialectic that heralds the creation/emergence of a new form(s) of social order. The story of this social order begins: "In the beginning was information…"

Appendix A.
The increasing interest in this area is indicated by the following illustrative list of workshops, issues, and paper titles:

"Socially Intelligent Agents";
Intelligence on "Socially Intelligent Agents";
"Simulation Models of Social Agents";
Mathematical Organization Theory on "Social Intelligence";
Research in Consciousness Research on "Human Cognition and Social Agent Technology"; International Conference on Artificial Intelligence on "Issues in Cross Cultural Communication: Towards Culturally Situated Agents";
"Agents in interaction - acquiring competencies through imitation" "Imitation in Animals Artefacts".

Rosario Conte "Intelligent Social Learning."

Kerstin Dautenhahn, "Engineering of Societies – A Biological Perspective."

Jim Doran, "Archeology of Artificial Societies."

Bruce Edmonds, "The Inconstructability of Artificial Intelligence by Design - the necessary social development of an agent that can pass the Turing Test."

Sven Heitsch, Daniela Hinck & Marcel Martens, "A New Look into Garbage Cans – Petri Nets and Organizational Choice."

Leslie Henrickson
Having a Sense of Ourselves: Technology and Personal Identity

Lindsay Marshall & Savas Parastatidis
Modeling Agents using the Hotel
Analogy: Sanitised for your Protection?"

Christopher Nehaniv, "The Making of Meaning in Societies: Semiotic & Information-Theoretic Background to the Evolution of Communication."

Bob Price & Craig Boutilier, "Imitation and Reinforcement Learning
with Heterogeneous Actions."

Michael Schillo, Steve Allen, Klaus Fischer & Christof Klein, "Socially Competent Business Agents with Attitude - Using Habitus-Field Theory to Design Agents with Social Competence."

Alexander Staller & Paolo Petta, "Introducing Emotions into the

Computational Study of Social Norms."

Ian Wright, "The Society of Mind Requires an Economy of Mind."

Appendix B
Cynthia Breazeal is perhaps the leading researcher in this area and the AI and Media Labs at MIT rank at or near the top on any list of organizations in this field. Dautenhahn is also on my radar screen. I am still working on digesting the list of social/sociable robotics laboratories and researchers generated at the Center for Social Robots and Society that I co-direct with Linnda Caporael at RPI. As for a list of references in the field of social robots, I would include Breazeal's *Designing Sociable Robots,* Brooks'*Flesh and Machines*, and Menzel and D'Aluisio's *Robo Sapiens*.

The heart of the matter at hand arises in considering the question of the most significant problem in social robotics today. No one has outlined the technical problems better than Breazeal.

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