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Robots in our Midst: An Ethnographer in the New World of Work[1]

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ABSTRACT[1]
What do robots mean for the future of work? While images of evermore capable robots capture much of our public fascination, situated accounts of robots at work paint a radically different picture. Drawing on theories of inseparability between human and machine agencies and ethnographies of robots in surgery, hospitality, and elderly care, I trace how, instead of automation, robots result in subtle reconfigurations of work that change how bodies move, practices are performed, and values are enacted. I argue that following "robots in the wild" and abandoning preconceived assumptions of what technology "is" or "should be" allows us to appreciate how robots become an inseparable part of the ongoing flow of practice. The reality of contemporary workplaces is thus one where robots are less glamorous but paradoxically no less consequential, as the ways in which work gets reconfigured remain unnoticed and unaccounted for.

KEY WORDS
Robots, Artificial Intelligence, Actor-Network Theory, Science and Technology Studies, ethnography.

ROBOTS EN NUESTRA NIEBLA: UNA ETNÓGRAFA EN EL NUEVO MUNDO LABORAL

RESUMEN
¿Qué significan los robots en el futuro del trabajo? Si bien las imágenes de unos robots cada vez más capacitados nos fascinan una y otra vez, los relatos situados de robots en funcionamiento ilustran un panorama radicalmente diferente. Basándome en las teorías de la inseparabilidad entre las agencias humanas y las máquinas y en las etnografías de los robots en la cirugía, la hostelería y el cuidado de personas mayores, analizo cómo, en lugar de automatización, los robots dan como resultado reconfiguraciones sutiles del trabajo que cambian la forma en que se mueven los cuerpos, se realizan las prácticas y se muestran los valores. Sostengo que observar a los «robots en estado natural» y abandonar las suposiciones preconcebidas sobre lo que «es» o «debería ser» la tecnología nos permite apreciar cómo los robots se convierten en una parte inseparable del flujo continuo del trabajo. En la realidad de los lugares laborales contemporáneos los robots son menos glamurosos de lo que pensamos, pero paradójicamente no menos trascendentales, ya que las formas en que el trabajo se reconfigura pasan desapercibidas y acaban quedando asumidas.

PALABRAS CLAVE
Robots, Inteligencia Artificial, Teoría del Actor-Red, Estudios de Ciencia y Tecnología, etnografía.

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Imaginaries of Robotics

The question of robots and jobs captures public fascination and makes for great newspaper headlines. In what follows, I start by arguing that the first way to even approach this question is to get a sense of the so-called sociotechnical imaginaries of robotics that permeate public discourse. After outlining three of such imaginaries, I explain how they inform the ethnography of robots: serving as an inspiration to dig deeper and as misconceptions to demystify.

Imaginaries refer to "interpretation of the present connected with a vision of the future" (Sorenson, Zawieska, Vermeulen, Madsen, Trentemøller, Pyka, Bulgheroni, Richardson and Hasse, 2019). These are "affectively laden images by means of which we experience the world" and ourselves in the present, but also imagine its future, speculating on where things are heading (Lennon, 2015). When speaking about robotics, such imaginaries include stories of robots conveyed in film, art, media, and more broadly, in popular culture. Thus, conversations around robotics often contain a mixture of the present-day capabilities of robots and the apprehensions, uncertainties, and fears of what they could or should do in the future. While these imaginaries are fictional, we nonetheless need to be sensitive to them as they are often exactly such imaginaries that guide contemporary engineering efforts or managerial expectations, accompanying the robots on their journey from the "lab" to the "work floor." They, therefore, can serve as a starting point for the field research on robotics "in the wild" in order to deconstruct and transform the imaginaries into a more realistic and productive understanding of robotics.

Perhaps the most emotionally laden imaginary is that of a *humanoid robot,* reflecting an anthropomorphic design with human-like features as well as social interaction abilities. For example, the humanoid robot Sofia

developed by the Hong Kong start-up Hanson Robotics left quite an impression on the world in 2016 when it was first released. This impression was almost fully due to its anthropomorphic appearance, specifically its sophisticated facial setup, which included lifelike skin, the ability to emulate more than 60 facial expressions, and the capacity to recognize and respond to basic questions. Sofia the robot, who made it on many magazines and newspaper covers, such as *National Geographic*, *Forbes*, and *The Wall Street Journal*, made an appearance at the United Nations Event, and was even granted citizenship in Saudi Arabia (Stone, 2017). It is less known that Sofia also generated many skeptical reactions in the engineering community, who deconstructed and critiqued the extent of her intelligent capabilities (e.g., Vincent, 2018). Despite its limitations, the hype around Sofia also gave ground to philosophical debates on the personhood of robots (Pagallo, 2018) as well as serious calls for regulatory oversight and explicit frameworks acknowledging the nonsensical nature of granting legal responsibility and actorhood to robots (Robotics Open-Letter, 2017).

Another quirky and cinematic example is Hiroshi Ishiguro, professor of robotics in Osaka, who created a humanoid robotic twin of himself. The duo are often interviewed and featured in movies, serving as the paradigmatic example of engineering fantasies (Pluta, 2016). The humanoid twin looks exactly like the professor and is teleoperated and fully controllable by Hiroshi Ishiguro himself. It is thus far away from an independently functioning robot, but the challenge that Hiroshi Ishiguro sets is representative of the fundamental question of robotics — how to create a truly humanoid robot, which would, according to the professor, help us better understand human nature (Paré, 2015).

The second imaginary is more pragmatic but no less emotional. This is the imagery of *robots taking over jobs*. This topic also makes for frequent newspaper headlines as well as serious research in labor economics and labor sociology. Will there be more or fewer jobs in the future due to robots? What kinds of jobs are likely to disappear? What kinds of jobs will emerge? What will become of the notion of a job? These questions lead to diverse assessments and scenarios. One of the most famous numbers came from a study by Oxford economists, Carl Benedikt Frey and Michael Osborne, who claimed that 47% of jobs are likely to be automated within the next 20 years (Frey and Osborne, 2013). Although there has been critique of Frey and Osborn's (2013) study and its underlying methodology since then, the questions of what will happen to jobs are continuously raised, with considerations of universal basic income to compensate for the loss of jobs seriously discussed by journalists, technological enthusiasts from Silicon Valley and governments (Dries, Luyckx and Rogiers, 2023). It is

quite telling that within this debate, the notion of a robot itself becomes much broader than a material object or a machine with a body and instead includes many other classes of technologies with the potential to automate work — technologies, such as conversational agents or any other software tools with the capability to automate human decision-making.

Finally, the third imaginary of robotics revolves around the notion of *robot agency* or the capacity of machines for independent or autonomous action. Here, the impressive videos of Boston Dynamics dogs that are capable of running often serve as examples (Evans, 2024). The Tesla laboratory frequently publishes its progress on developing a general-purpose robot called Optimus that is currently able to fold laundry and load a dishwasher. Elon Musk continues to make bold claims that his companies will create a market for affordable, independently functioning robots to help with everyday chores (Sweeney, 2024). While these high-profile releases of new models by leading roboticists capture widespread attention, they are often thoroughly deconstructed by experts (Hays, 2024), whose voices tend to be less pronounced in the public discourse and thus are unable to dispel the myths of robots being close to replicating the agency and human capabilities.

The imaginaries of robotic agency, therefore, continue to persist, detached from the limits of the current technological frontier, and instead are fueled by speculations about robot autonomous action as a looming future possibility. This imaginary thus invites philosophical debate on questions that often have little to do with the issues on the ground — questions concerning the ethicality, governance, and human values for robots capable of acting on their own: What would autonomous driving mean in terms of accidents, safety, and human responsibility? What would robot dogs mean for the ethicality of military operations? How could social robots dehumanize or otherwise change the values of care for the elderly?

An ethnographer of technology is trained to be sensitive to such imaginaries and take them as a starting point for investigation. However, in the ethnography of technology, the visions themselves remain a myth — however, powerful — that contrast with the materiality of robots as they exist and function on the work floors today. This implies that in ethnography we start by explicitly abandoning any preconceived assumptions or notions of what technology "is" or "should be," or what "impact" may be desirable or dangerous. Instead, we trace where and when robotic technologies appear on the ground, observing how technology is imagined, developed, enrolled, how it is defined, what material qualities it acquires, and what meanings emerge with technology as it enters a certain social world. This is a shift from the questions of "impact" and the future,

toward the question of "practices" and the present. It takes an ontological stance where robots stop being a separate actor or an entity, but appear as something emergent, to be discovered, as something intertwined with the webs of actors and meanings, implicated in the practicing and in the flow of the work itself.

Conceptual Foundations

A few words are in order here about the conceptual and theoretical foundations of such ethnographies. The practice of suspending assumptions about what "technology is" and rejecting the notion of "impact" has its roots in several research traditions that have concerned themselves with the ontology of technology. I will briefly point here to three streams that have informed my own ethnographies, namely Science and Technology Studies (STS), posthumanism, and postphenomenology.

The field of STS informs the study of robotics, as it is one of the key traditions that has critiqued the absence of materiality in social sciences. One inspiration, in particular, is the work by Annemarie Mol, a Dutch philosopher and an Actor-Network Theory scholar, who in her book *The Body Multiple* has written extensively about the need to study material practices in order to get a sense of how materiality matters in what we typically consider social science questions (Mol, 2002). While her book focuses on what it means for a physical body to live and experience disease, her critique can be equally applied to how, when studying technology, we fail to recognize its materiality. Annemarie Mol critiques social sciences for studying what she calls "perspectives" on disease, while the disease itself becomes an "absent presence" and something only medical sciences can inform us about. She writes:

> In talk about meaning and interpretation the physical body stays untouched. All interpretations, whatever their number, are interpretations of. Of what? Of some matter that is projected somewhere. Of some nature that allows culture to attribute all these shapes to it. This is built into the very metaphor of "perspectives" itself. This multiplies the observers — but leaves the object observed alone. All alone. Untouched. It is only looked at. As if it were in the middle of a circle. A crowd of silent faces assembles around it. They seem to get to know the object by their eyes only. Maybe they have ears that listen. But no one ever touches the object. In a strange way that doesn't make it recede and fade away but makes it very solid. Intangibly strong. (Mol, 2002, p.12).

Building on the STS tradition are the ideas of posthumanist theorists, including Donna Haraway, Karen Barad, and recently Wanda Orlikowski

and Susan Scott in organization theory, who similarly critique existing perspectives on technology for ignoring its materiality. The starting point of posthumanist perspectives is denying the pre-existence of separate entities of humans or machines, but instead treating both as relational, produced in the course of practices that are at their core *sociomaterial*. They propose to think in terms of constitutive entanglement as an alternative to the metaphors of human-technology interaction or the impact of one on another:

> The notion of constitutive entanglement departs from that of mutual or reciprocal interaction common in a few dynamic social theories. Notions of mutuality or reciprocity presume the influence of distinct interacting entities on each other but presuppose some a priori independence of these entities from each other. Thus, for example, we have tended to speak of humans and technology as mutually shaping each other, recognizing that each is changed by its inter-action with the other, but maintaining, nevertheless, their ontological separation. In contrast, the notion of constitutive entanglement presumes that there are no independently existing entities with inherent characteristics (Barad, 2003, p.816). Humans are constituted through relations of materiality — bodies, clothes, food, devices, tools, which, in turn, are produced through human practices. The distinction of humans and artifacts, on this view, is analytical only; these entities relationally entail or enact each other in practice (Orlikowski, 2007, p.1438).

The final perspective that has informed my fieldwork is postphenomenology, a branch of philosophy, represented by scholars such as Don Ihde, Peter-Paul Verbeek, and their colleagues. Postphenomenology emerged as a critique of the classical phenomenologists and, specifically, the work of Martin Heidegger and his thesis on modern technology alienating us from the lifeworld and authentic being. As an alternative to Heidegger's thesis of "alienation," postphenomenology suggests instead to think in terms of "mediation": technologies do not appear in the flow of experience as separate but mediate our human lifeworld, constituting our experience and being instead a part of what makes us human.

For the studies of robotics, a specific focus that can be borrowed from postphenomenology (and that is less pronounced in other perspectives) is the analysis of human-technology relations, which starts from the bodily experience. Not only is technology not ontologically separate, but it is also something that shapes our sensing, experiencing, and perceiving of the world. We do not relate to technology as such, we do not have "attitudes" or "trust" toward technology itself (as e.g., human-computer interaction experiments would have it), rather we relate to the world, and technology mediates and is an inseparable part of this perception. Don Ihde analyzes

various forms of relations that emerge with technologies, the most basic example coming from using glasses when he writes: "My glasses become part of the way I ordinarily experience my surroundings; they "withdraw" and are barely noticed, if at all. I have then actively embodied the technics of vision. Technics is the symbiosis of artifact and use within a human action." (Ihde, 1990, p.73)

We enter embodiment relations with many technologies that by now are much more mundane than robotics. Driving a car allows us to transport our bodies at a distance and is associated with magnifying and overcoming the limits of our own capabilities of movement. Microscopes allow us to see details not possible with human vision. It might not seem intuitive why robots with an impressive machine presence and seemingly separate agency warrant the examination of human bodily action and bodily relations. However, as I will later show with an example of a surgical robot, it is precisely the embodiment relations, the way we perceive, act on, and relate to the world through technologies that are being affected and that should be examined in more detail. It is these theoretical foundations that inform my efforts in following robots on the work floor.

Robots in the Wild

I will now turn to the ethnographic accounts of real robots at work. When following action, the ethnography of robotics does not focus empirically on separate features of robots or human activities, it follows the *practices* that are sociomaterial and *relations* that are *embodied*. It is these practices and relations that are the center of analysis and that can provide informative insight into what robots mean for our work. I will give examples from three field studies of robotics, focusing on what changes in these sociomaterial practices and relations followed.

1. Surgical Robot

The first example comes from a study of a surgical robot Da Vinci (Sergeeva, Faraj and Huysman, 2020). Da Vinci is a robotic system that allows a surgeon to perform procedures at a distance by peeking into a so-called console sitting away from an operating table and manipulating joysticks that translate their movements into the movements of several robotic arms positioned above the patient. Figures 1 and 2 provide an illustration of how the machine and the constellation of the robot are set up in the operating room.

Figures 1 and 2. *The Robotic Console and the Operating Room Setup*. ©2024 Intuitive Surgical Operations, Inc.

Operating with the Da Vinci robot is a paradigmatic example of a "cyborgian" action. Quite literally, the surgeon embodies the machine, where the machine becomes the extension of many bodily capabilities of the surgeon. It augments the vision, it also increases the dexterity of manipulation, relieves the back pain and pressure of standing, and it allows the surgeon to act on the patient at a distance. The surgeons sometimes may comment, for example: "So [we] often say 'Ah, I wish I had a third hand' — and with the robot you have it! Because [in open operations] you have to hold some tissue away and then you have a good vision—but then you have to start working there and you need to let it go! So yeah, you say 'Oh, I wish I had a third hand!'"

Surgeons also appreciate the new way of operating, where they are not reliant on the surgical assistants surrounding them, where they can immerse and disappear in what they call is a "video game." In the words of one surgeon, I interviewed: "The thing is, you are very concentrated on what's happening, on what you are doing, because it's like you are looking into a 3–D box, and you are working there in this 3–D box, and the rest of the world is a bit away. It's like playing a video game a bit!" This immersion, however, results in surgeons being unable to participate in the action happening around the operating table and intervene when required.

Following a sociomaterial practice also means that we would not stop at examining the transformation of the surgeon's bodily actions, but also acknowledge that the practice of surgery is performed by a collective: an operating team. With the surgeon peeking into a robotic console, the rest of the team must adapt to the new "cyborgian action" as well. In the picture below, a surgical nurse is depicted surrounded by the robotic arms covered in plastic and who now, in the absence of a surgeon at the operating table, became the responsible party to monitor, understand, service the robot, and be able to intervene in the anatomy of the patient and acquire critical surgical skills to compensate for the absent surgeon. The

nurses also had to be able to make sure that the robotic arms did not interfere with other vital equipment as the surgeon lost the ability to oversee and lead the team, the role that they previously performed.

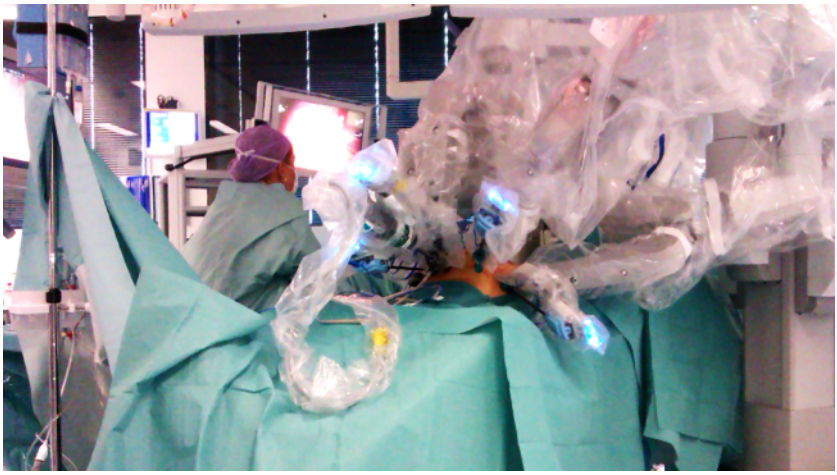

Figure 3. *The Scrub Nurse.* Note: The scrub nurse at the operating table is surrounded by robotic arms covered in protective plastic. Author's photo.

In the example of a surgical robot, we can appreciate how the surgical robot has nothing to do with a humanoid or independently functioning robot that we see debated in the newspapers; and yet, somehow paradoxically, the augmentation of bodily action and the unintended consequences following from that — are more than significant for the practice of surgery.

2. Care Robot

My second example comes from the study performed by Maura Soekijad and myself of a robot named Sonia (a pseudonym), a humanoid robot used as a companion in elderly care homes. The robot, which is still under development, was envisioned to address the persistent problem of shortages of employees and the heavy and demanding workload that permeates the care sector. One of the core promises and aims of the company developing the robot is to alleviate work pressure for already stretched care workers. They hope to be able to do it by having the Sonia robot stimulate social interaction and movement among the elderly. The Sonia robot is

also clearly positioned and perceived by both care workers and the elderly as an "agent," different from a "device" to be used, because of its anthropomorphic features, ability to perform basic movements, such as moving hands up and down and together with a little tablet screen offer a gymnastic session to a group of clients. In the future, the company aims to develop more "intelligent" capabilities for the robot, so that Sonia can recognize the profile of each client, remember their personal details, and perform a basic conversation. Despite still being quite limited in functionality, Sonia is actively used in several care locations and received enthusiastically by the care workers.

Figure 4. *Sonia Robot in a Care Facility.* Note: A care worker configuring the robot. Author's photo.

Once the Sonia robot is examined in the context of a sociomaterial practice, interesting patterns emerge. The two expectations — the support for care workers and the alleviation of loneliness for the elderly — appear elusive and almost impossible to reach once you examine the real use of

the robot in the care home. Regarding the first ambition, care workers quickly learnt that there are limits to how individual clients could, in fact, interact with the Sonia robot. Typical conversations between the care workers and clients are slow paced, fragile, and fine-tuned to the shifting moods of the clients. They also involve many repetitions and extra care with articulation, given that many clients suffer from cognitive impairments. Sonia's voice recognition software frequently had trouble understanding what the clients said, or asked, leading to deteriorating interactions and abandonment of the robot altogether. The emerging consensus among the nurses, after the initial periods of experimentation, was that, for an interaction to happen between a client and the robot, a care worker needs to fine-tune, correct, set up, and facilitate almost all the activities, acting as an emerging mediator in the delicate sociomaterial dance between the robot and the client, which eventually increased and contributed to a different workload for the workers.

Regarding the second ambition, after some try-outs and experiments with what Sonia robot could do, the care workers quickly learnt that despite the promise, it appeared almost impossible to do joint activities with Sonia robot in the group. The small size of the screen, the delays in machinic response, and the frequent freezes broke the fragile nature of the atmosphere among the group of the elderly. Also here, it turned out after the initial setbacks that the presence and active support of the care worker were necessary to maintain the essence of the group interaction.

3. Service Robot

My final ethnography example comes from a study by PhD researcher Melissa Sexton in the setting of a restaurant where a robot called Ludo (a pseudonym) has been introduced several years ago (Sexton, Sergeeva and Soekijad, 2024). Ludo is a mobile delivery robot, a one-meter-high cart with three shelves that can move autonomously through the environment. The robot navigates via reading the sensors installed on the ceiling. Ludo has several shelves where the restaurant workers are putting in the dishes and a digital screen where they input the numbers of the tables to where the dishes should be delivered. Our field study is performed in a large restaurant with three floors and employing over 70 workers. Like in the care facility, Ludo was introduced to make the work of the staff lighter, to reduce the amount of walking from the kitchen to the tables, and to save costs on employees, who are increasingly harder to find. The first trial of the Ludo robot was so successful that over the years, management bought six additional robots that communicate with each other using

Wi-Fi. Ludo functions well in a restaurant collective, mingling between the waiters, food runners, chefs, bartenders, and managers (Figure 5).

Figure 5. *An Autonomous Delivery Robot Operating in a Restaurant.* A photo by Melissa Sexton.

In contrast to the Sonia robot, Ludo is an example of a successfully integrated robot, achieving most of its promises in terms of increasing efficiency, reducing efforts, and alleviating some of the work perceived as too heavy by the employees. Ludo has basic anthropomorphic features: It is programmed to speak when encountering an obstacle and to smile and frown. In practice, we noticed that employees seemed to not notice or relate to Ludo's anthropomorphic design at all: They did not react to the voice or the changes in the "facial expressions" whenever the robot smiled or frowned. The workers continued to go about their job, coordinating with the autonomously moving cart, quite smoothly, incorporating it into the workflow.

However, our focus on practices allowed us to observe how the collective flow of practice changed when the robot was on the floor. In particular, it was not the tasks or jobs, but the patterns of movements that were significantly reconfigured. The work practice in the restaurants — the serving, delivering, cleaning — are all about uninterrupted movement around the environment, where the speed, directions, and postures are dynamically adjusted in relation to how busy the restaurant is, how quickly the food should be delivered to not get cold and how to navigate narrow passages to not bump into each other. Once we shifted our observations from individual reactions and interactions with the robot to understanding those patterns of movement, we noticed how the robot-in-action, in fact, occasionally interfered with and reconfigured this flow of collective "moving about." It was this contrast of movement — the slower mechanical pace, the stopping in front of obstacles, and following the only one path that the robot could take — that created frequent interruptions for the practice of delivering and serving food. Importantly, those interruptions reverberated across several groups of workers, changing the carefully orchestrated balance that otherwise existed in the restaurant. It is also at those moments of breakdown when the robot became foregrounded for workers, and when they oriented themselves more explicitly to it, they recognized that it was, in fact, not a human companion, but a machine.

Conclusion

In sum, I have discussed a few illustrations from what is happening now on the work floor in the places where we can follow, not the futuristic robots like the Boston Dynamics dogs, but the very real and much less glamorous robots that are already in use. Through the lens of sociomateriality and embodiment, an ethnography of robotics thus shifts the questions from separating technology and humans as polar opposites, toward recognizing our intertwining, our joint performance, our embodied experience with the robots, but also with many other technologies that are part of our ongoing doing and being in the world. Seeing this "doing and being" in both material and social terms allows us to foreground how the robots are already part of our every day, i.e., how they are domesticated, and thus retreat into the background.

I have also shown how — despite entirely different robots than we expected and the absence of their shine and glamour — the reality of the contemporary work is nevertheless entirely a new world of work. Robots augment what is possible with the human body, but also reduce and lim-

it the possibilities of action. With robots, the work of collectives is reconfigured, where the roles change and responsibilities have shifted, adjusting to incorporate the machine into existing arrangements. Ethnography thus reveals the unnoticed and unaccounted-for layers of work, the transformation of which is right in front of us but paradoxically still invisible. To demystify the imaginaries and change the conversation around robotics, we need more accounts of real robots in the wild, to identify and address the real questions that emerge from the ground rather than those that sell the headlines and feed into our collective existential fascinations and anxieties.

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