A comparison of naturalist and antinaturalist explanations for why people consider robots animate and experience emotions towards them

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Abstract. An interesting aspect of love and sex (and other types of interactions) with robots is that human beings often treat robots as animate and express emotions towards them. In this paper, we discuss two interpretations of why people experience emotions towards robots and tend to treat them as animate: naturalistic and antinaturalistic. We first provide a set of examples that illustrate human beings considering robots animate and experiencing emotions towards them. We then identify, reconstruct and compare naturalist and antinaturalist accounts of these attitudes and point out the functions and limitations of these accounts. Finally, we argue that in the case of emotional and 'animating' human–robot interactions, naturalist and antinaturalist accounts should be – as they most often are – considered complementary rather than competitive or contradictory.

Keywords: Robots, HRI, naturalism, antinaturalism

0. INTRODUCTION

Although most people are fully aware that robots are inanimate and do not experience emotions, they nonetheless often think of them and treat them as if they were alive and express emotions typical of interactions between human beings towards them. This fact is one of the many philosophically interesting issues concerning human interactions with robots and devices that have recently (in the form of toys, automatic vacuum cleaners, military robots, and diverse social robots) become a part of our everyday experience. In theory, robots are tools and should be treated as such; this view is one of the principles of robotics formulated by the Engineering and Physical Sciences Research Council (2010). In reality, however, people often establish emotional ties with robots and 'animate' them by considering and/or treating them more as living entities (or as something between animate and inanimate) than as ordinary objects. Although this issue has multiple aspects, such as the ethical problem of whether it is morally good or bad to treat robots as animate organisms, in this paper, we focus on the epistemological and methodological questions arising from the fact that how we experience robots is incompatible with our conscious knowledge of them; this incompatibility is particularly reflected in the tension between our affective impression of robots as animate beings and our intellectual awareness that they are inanimate objects. In this paper, we discuss and compare naturalist and antinaturalist accounts of considering robots as animate. However, we are arguing in favor of neither of these accounts. We also do not present very detailed descriptions of these accounts. Rather, we want to present a certain range of interpretative possibilities for animating robots and entering into emotional relations with them.

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The 'naturalist' approach here refers to methodological naturalism, which holds that the only valid research methods are the methods of the natural sciences; these methods explain human behavior mostly by referring to biological evolution and biological features of the human brain and organism.[1] Methodological naturalism often correlates with ontological naturalism, which assumes that only natural entities exist (occur). The term 'natural' extends to macrophysical objects and/or processes that may be subject to scientific analysis; what is 'natural' must exist in a given time and space (Armstrong 1989: 76) and enter into causal relations (Goldman 1994: 302).[2] From this perspective, the interactions of robots and humans have a natural character and should be studied only by the tools and terminology of neuroscience, social psychology, evolutionary biology, etc. The 'antinaturalist' approach is methodological antinaturalism, which assumes that adequately analyzing cultural or social phenomena requires more than the tools of the natural sciences; these tools must be supplemented (or even replaced) by a methodology specific to the humanities. This methodology allows the reconstruction of subjective and intersubjective (e.g., cultural) values and beliefs that provide interpretations that refer to individual experiences and individual development and/or cultural interactions and cultural evolution by offering contingent narratives instead of causal laws and holistic structures instead of isolated objects (Bevir and Blakely 2018).

In this paper, we argue that in regard to explaining the issue of 'animating' robots and experiencing emotional attitudes towards them, both naturalist and antinaturalist approaches are largely complementary, rather than competitive or contradictory. We also argue that due to the specific nature of interactions between humans and robots, the naturalist account often appeals to cultural categories, such as values, and therefore should be supplemented with an antinaturalist analysis. We do not think that human culture and its products are somehow supernatural. However, although they are conditioned by the biological and psychological constitution of humans, they possess characteristic properties whose development goes beyond biological evolution. Therefore, taken by itself, neither naturalism nor antinaturalism is sufficient to describe and explain the human tendency to consider robots animate and experience emotions towards them. Instead, both approaches should complement each other, like two pieces of the same puzzle.

The paper is divided into three main parts. The first presents cross-sectional examples of situations in which people treat robots as animate. In Section 2, we reconstruct the naturalist and antinaturalist accounts of this phenomenon and postulate that they are largely complementary instead of competitive or contradictory. Section 2.1 is devoted to an antinaturalist interpretation of animism in human–robot interaction and identifies the function and shortcomings of this interpretation. Section 2.2 presents naturalist research on this subject and emphasizes the kind of questions this research can answer and the problems it faces. In the final section, we offer our conclusions and some final thoughts.

1. 'HOW ARE YOU, PLEO?' EXAMPLES OF SITUATIONS IN WHICH PEOPLE TREAT ROBOTS AS ANIMATE AND EXPERIENCE EMOTIONS TOWARDS THEM

Let us start by looking at examples of situations in which people treat robots as something more than mere machines. Although social media often mentions similar topics, we focus mainly on scientific

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[1]This claim is made by radical methodological naturalism. Moderate methodological naturalism assumes that in addition to the methodology of the natural sciences, it is also permissible to use other research methods, such as logical or conceptual analysis (Kornblith 1994: 7–8).

[2]This is the most common form of radical ontological naturalism and, more specifically, physicalism (or physicalist monism). Moderate naturalism may also, however, assume various forms of emergentism. In our paper, we assume that most empirical scientists more or less consciously adopt the perspective of the radical version of naturalism.

research because many studies in human–robot interaction (HRI) have been conducted on this problem (Goodrich and Schultz 2008). In this part of the paper, we do not intend to explain or analyze the phenomenon we are dealing with. We wish only to call attention to the fact that this phenomenon is relatively common (since these examples concern people of different sexes and from different age groups and various types of robots – less and more technically advanced, created for different purposes, etc.).

First, many people react emotionally to the sight of damaged robots and refuse to hurt them. Kate Darling, together with Hannes Gassert, conducted an experiment with the robo-dinosaur Pleo. Pleo has a charming, babyish physique and gives the impression of being fragile. When someone holds him upside down, he cries and tries to break free. In the study, Darling and Gassert (Darling 2016: 12-13) gathered several groups of people and handed one Pleo to each. Each group played with the robot for an hour, after which the participants were asked to attack the dinosaur with an axe. When no one would agree to carry out this task, Darling changed her tactics. She told each group that to protect its own Pleo from a miserable fate, the group had to destroy another group's robot. Again, in this variation, no one decided to reach for the axe. Darling then threatened that if no one hits a dinosaur, then *all* of the dinosaurs would be smashed. Finally, one person volunteered. After a long hesitation, the person 'killed' one Pleo, and everyone fell into meaningful silence for a short moment.

People also tend to hesitate and feel uncomfortable when they need to turn off a robot (Bartneck et al. 2007). They may even refuse to follow orders when the directives entail damaging the robot during a military mission, even when refusal means jeopardizing not only themselves but also other people (Carpenter 2016). Soldiers using the explosive disposal robot Packbot (which does not even move autonomously but is remotely controlled) often form such a strong emotional bond with the robot that when the robot breaks down, they do not agree to it being replaced with a newer model and insist on repairing the device they had been using. They also organize funerals with an honorary salvo for robots that have eventually broken down or been destroyed (Carpenter 2016; Garber 2013; Garreau 2007).

Beyond treating robots as if they can feel pain, people have affective and behavioral responses to the destruction of robots (both when people themselves are asked to destroy robots and when someone else destroys robots); these responses usually correlate with a tendency to think and speak of robots as living entities or to at least struggle to categorize them ontologically. Gail Melson, Peter H. Kahn, and colleagues conducted studies that show that children tend to ascribe mental states to robo-dog AIBO and refer to it as 'he' (Melson et al. 2009a; 2009b), even though most of them considered it to be inanimate. The behavior of the children was therefore inconsistent with their beliefs about the ontological status of robots. This may indicate that in this particular situation, the children had a problem with applying the usual ontological categories known to them. Similar results were obtained by Sherry Turkle and colleagues (Turkle et al. 2006a; 2006b), who studied the responses of children and elderly people, e.g., to the robots Kismet and Cog. In this case, the participants attached a specific ontological status to the robots and claimed that they were 'kind of alive' or 'alive enough'. In another study carried out by Peter H. Kahn and colleagues (Kahn et al. 2012) with the robot Robovie, one child tried to describe it by creating a new category: 'He's like, he's half living, half not', the child said. Kahn and his team (Kahn et al. 2007; 2011) argue that robots do not correspond to the ontological categories that we usually use and universally recognize. In this respect, he is also clearly demarcating the ontological and psychological perspectives, which are often contradictory (Kahn et al. 2007: 364-365): although people understand that a given object is not animate, they nevertheless react emotionally as if it were. Thus, in many cases, our responses to robots do not cohere with our beliefs about them. Moreover, Turkle and colleagues (Turkle et al. 2006a) discovered that children who are convinced that robots are a kind of nonhuman animate being show strong confirmation bias. The children who thought that

the humanoid robot Cog was animate showed strong resistance to attempts to falsify this belief. They ignored the robot's malfunctions and tried to rationalize them, saying, for example, that Cog is not moving because it is tired. They also did not change their beliefs after they had been shown how the robot works and had been allowed to control its movements. Moreover, after learning the secrets of Cog's actions and after controlling them themselves, some children thought of him as more alive than they did when the robot was moving autonomously (Turkle et al. 2006a).

The obvious common denominator in all of the cases mentioned above is that they illustrate situations in which humans consider robots animate and experience relatively strong emotions towards them. Below, we will present naturalist and antinaturalist accounts of such cases.

2. TWO NARRATIVES: ANTINATURALIST AND NATURALIST ACCOUNTS OF THE HUMAN TENDENCY TO CONSIDER ROBOTS ANIMATE AND EXPERIENCE EMOTIONS TOWARDS THEM

Regardless of whether or to what degree animating and experiencing emotions towards robots are specific to robots and not to other inanimate objects, our main aim in this paper is to examine how these mechanisms are explained or how scholars try to understand them. In particular, we would like to focus on the relationships between naturalist and antinaturalist accounts. Most accounts, to make sense of the tendency to experience emotions towards robots and treat them as animate, use concepts such as animism, anthropomorphism, magical thinking and empathy. However, none of these concepts determine a specific kind of methodological perspective. In other words, none of them inevitably lead to either naturalist or antinaturalist accounts. For example, animism, anthropomorphism and magical thinking (sometimes labeled differently, e.g., as prelogical thinking or mythical thinking), understood as a specific mode of thought, can be explained in antinaturalist terms, as various philosophical and anthropological accounts do (Cassirer 1960 [1925]; 1972 [1944]; Lévy-Bruhl 1975 [1949]; 2015 [1910]; Greenwood 2009). However, the very same concepts can also be explained naturalistically, as is done, for example, in cognitive studies of religion (Guthrie 1993, Boyer 1996, Talmont-Kamiński 2013). An analogous situation makes reference to empathy. Regardless of which concept we choose to explain the consideration of robots as animate and experience of emotions towards them, neither a naturalist nor an antinaturalist account is sufficient. Additionally, neither of these explanations should be considered primary to the other. We consider both of them irreducible to each other since their main functions are different. The main function of naturalistic approaches is explaining the biological origins of some tendencies we can observe among human beings, while the main function of antinaturalistic approaches is explaining why these tendencies are more common among some groups of people than among others.

In the following paragraphs, we discuss a comparison between these naturalist and antinaturalist accounts. Particularly, we point out that they are complementary rather than substitutive, since neither of them offers a sufficient account of the human–robot interactions considered in the previous section. In other words, we will identify some of the inadequacies of both approaches or, to put it in more positive terms, the explanatory function they possess. We are aware that we are very close to opening Pandora's box with respect to the nature-or-nurture discussion and with respect to introducing a very broad discussion of naturalism and antinaturalism. We do not, however, wish to make any general claims concerning these discussions. Our aim is to compare naturalist and antinaturalist accounts of animistic and emotional interactions with robots, not to compare naturalism and antinaturalism as such. Moreover, in most cases, authors of the positions we discuss do not label them naturalist or antinaturalist; it is we who label these positions as such.

2.1. The antinaturalist approach

As mentioned, antinaturalist accounts of animating and emotional attitudes towards robots refer to the state of a particular culture and specific historical circumstances. For example, Yuji Sone (2017) and Jennifer Robertson (2018) are interested in examples of Japanese tendencies towards what Anne Allison (2006) and Casper Bruun Jensen with Anders Blok (2013) call "techno-animism", which refers to robots. Sone examines Japanese 'affinity for the robot', while Robertson analyzes 'human–robot coexistence', both of which in many regards involve treating robots as animate and experiencing emotional attitudes towards them. Both authors point to the specific character of Japanese culture: the strong presence of Shinto, pop-cultural narratives about robots and the 'technocentric' character of Japanese modernization.

Shinto, an indigenous Japanese religion deeply embedded in Japanese culture, revolves around a belief that everything that exists is inhabited by *kami*, supernatural spirits/gods (Inoue 2003). Due to the presence of *kami*, Shinto asserts, everything is in some sense animate, and because of this, Shinto is commonly regarded as an animistic religion. While Shinto's political aspect, which has legitimized Japanese nationalism since the Meiji period, has become neglected after World War II, the animistic component of Shinto remains a prevailing part of Japanese culture (Rambelli 2019); this component constitutes what can be called "animist unconscious" (Allison 2006). Both Robertson and Sone, and many others (see Kaplan 2004), point out the prevalence of Shinto as a reason for the relatively high amount of emotional and animating attitudes towards robots in Japan.

Moreover, Japanese popular culture, particularly *manga* and *anime*, presents robots and other technological artifacts as friends and companions; in contrast, Western popular culture most often shows robots and technology as dangers or enemies. This aspect of Japanese popular culture is strictly connected with the prevailing presence of Shinto. In some cases, the influence of Shinto on the authors of manga and anime is direct, and the authors are aware of it, as in the case of Miyazaki Hayao (Bigelow 2009, Boyd and Nishimura 2004), while in other cases, more indirect expressions of sustaining and recreating "religious frames of mind" by *manga* and *anime* can be observed (Thomas 2012).

Finally, Japanese modernization is considered "technocentric": it focuses on achievements in developing new technologies, partially as an expression of the exceptionalism of Japanese culture (Najita, T. 1989). This is one of the reasons technology in general and robots in particular are such an integral part of Japanese pop culture and regarded as solutions to social problems; the latter case can be illustrated by the fact that the Japanese government decided to solve its demographic problems by developing care robots rather than by enlisting the help of immigrant care workers for the elderly. Such postulates are contained in the document "Innovation 25", which generally "promotes a robot-dependent society and lifestyle" (Robertson 2018: 20).[3] Hence, treating robots as animate and experiencing emotional attitudes towards them in Japan can be explained by the specific circumstances of Japanese culture.

Another example is provided by Maciej Musiał (2019), who antinaturalistically explains treating robots as animate and experiencing emotional attitudes towards them in Western culture by pointing to the presence of magical thinking in interactions with robots; these interactions, in turn, are part of a 're-enchanting' of the Western world in contemporary Western culture. This account states that people who animate and experience social emotions towards robots are engaging in magical thinking that – according to many cultural anthropologists and developmental psychologists – is typical of children and members of nonindustrial societies. Musiał interprets the presence of magical thinking

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[3]Robertson provides the English translation of some excerpts of Innovation 25 (2017: 50-57), while the whole document is available at the website of the Japanese government (Government of Japan 2007): japan.kantei.go.jp/innovation/innovation_final.pdf.

in interactions with robots as a symptom of a general increase in magical thinking in contemporary Western culture. He labels this a 're-enchanting of the world' and explains its presence by referring to other tendencies present in contemporary Western culture and to the functions of magical thinking. Musiał's account thus explains animation and experiencing emotions in interactions with robots by referring to a mode of thinking that is becoming increasingly common in contemporary Western culture due to other tendencies that concurrently take place within it.

Obviously, re-enchantment is discussed in response to Max Weber's famous statement about the disenchantment of the world. The most popular and most telling description of disenchantment is found in his "Science as a Vocation," where he writes that "there are no mysterious incalculable forces that come into play, but rather that one can, in principle, master all things by calculation. This means that the world is disenchanted. One need no longer have recourse to magical means to master or implore the spirits, as did the savage, for whom such mysterious powers existed. Technical means and calculations perform the service" (Weber 1991 [1919], p. 139). Weber's approach to disenchantment was ambivalent, and many of Weber's and some other doubts concerning disenchantment have been examined in the recently growing discussions on re-enchantment. On the one hand, some voices explicitly postulate re-enchantment as a way of reclaiming access to the meaningful experience of life. Such approaches have been offered by philosophers, who try "to make sense of the ways in which we are (and always have been) living in a world that speaks to us, moves us, disturbs us, and enchants us" (Meijer and De Vriese 2021: 12); or propose concepts that could stimulate re-enchantment, such as a process philosophy of religion (Griffin 2001). Such approaches are also popular among spiritual authors and cultural critics, who try to recover the sense of enchantment in everyday life (Moore 1997) and retrieve the meaningful connection with the surrounding reality (Berman 1981). On the other hand, various studies do not simply postulate re-enchantment but diagnose its presence. One of the best examples of such diagnoses and at the same time broadest accounts of the re-enhantment of the world in contemporary Western culture has been provided by Christopher Partridge (2004a; 2004b), whose diagnoses range from the increased presence of alternative spiritualities (such as occultism, neopaganism and neoshamanism) to examples of sacralization of some spheres of reality, such as psychedelics, nature or extraterrestrial. However, from the perspective of this paper, the most important diagnoses are those that show an increase in the presence of magical thinking. One such diagnosis has been provided by developmental psychologists Eugene Subbotsky (2010; 2014), who, in a series of experiments, shows that magical thinking is a prevailing part of the daily experience of many individuals who participate in contemporary Western culture, despite the explicit declarations that suggest the contrary. Subbotsky claims that the presence of magical culture in contemporary Western culture is not simply an irrational relic of the past and in that sense, performing magical thinking does not have to be either infantile or primitive. In contrast, Subbotsky suggests that magical thinking is a mode of thinking that can perform significant positive functions.

Moreover, Musiał is not the only one who examines the presence of magic in the experiences with and reflections on technology. William A. Stahl conducted a discourse analysis of Time Magazine articles on computer technology to show that a vast number of articles use terms directly and explicitly connected with magic as metaphors to describe technology, its developers and users (Stahl 1995). Erik Davis has shown that technology is also a fertile ground for actual magical experiences that are quite common among 'technopagans', 'technoshamans' and 'technowitches' (Davis 1998). Finally, Stef Aupers not only shows the presence of some features of magic – such as animism and blurring the distinction between the real and the fictional – among information and communications technology (ICT) experts (Aupers 2005; 2009) and massively multiplayer online role-playing game (MMORPG) players (Aupers 2007; 2012) but also explicitly interprets this presence as part of a re-enchantment of

the world and in that sense casts doubt on the claim about the progressive and no-alternative character of disenchantment.

Aupers makes particularly clear what is also implicitly suggested by other authors: that the re-enchantment of the world (and the increased presence of magical thinking in particular) has been caused – however paradoxically it may sound – by the disenchantment of the world (particularly by the tendency to progressively rationalize the world and glorify the purely intellectual perception of it). In other words, progressive disenchantment has led to some imbalances and shortcomings, and re-enchantment appears as compensation since, as Subbotsky has shown, magical thinking can perform positive functions in contemporary Western culture. According to Musiał, who summarizes the negative consequences of disenchantment and the positive functions of re-enchantment, the increased presence of magical thinking is a response to the growing lack of understanding, lack of security and lack of meaning.

There are also other antinaturalist accounts, some of which involve more local and specific circumstances than those associated with a country or a world region, as in the abovementioned cases. For example, Julie Carpenter studies animating and emotional attitudes towards military robots (Carpenter 2016). Carpenter claims that treating robots as animate and experiencing emotional attitudes towards them in general result from perceiving robots through the lens of mythopoetic thought (Carpenter 2016: 21). Carpenter borrows the concept of mythopoetic thought from Henri Frankfort and Henriette Groenewegen-Frankfort, who developed the concept in an introduction to the book "The Intellectual Adventure of Ancient Man" (Frankfort and Frankfort 1946). Mythopoetic thought, being concrete and personifying, is considered the opposite of modern rational thought (which is abstract and impersonal). Apparently, mythopoetic thought is a variant of the mode of thinking we herein call magical thinking. According to Carpenter, in contemporary Western culture, the presence of mythopoetic thought is particularly conditioned and stimulated by science fiction and popular representations of robots. Moreover, she believes that in the specific case of military robots, that soldiers extend emotional and animating attitudes to them is highly conditioned by the specific conditions of warfare; she labels these conditions a 'culture for survival', including the situation of being detached from families and friends or functioning under the permanent risk of death.

All these antinaturalist accounts provide a way of understanding why treating robots as animate and experiencing emotional attitudes towards them have become relatively common in particular cultures or under specific conditions and at the specific moment. These accounts also consider the conscious beliefs of human beings who interact with robots; such human beings consider robots to be intentional subjects who possess agency, not passive objects determined by mechanisms they are unaware of. These accounts do not show, however, how the mental mechanisms responsible for these animating and emotional attitudes towards robots developed in the first place. We know that Shinto developed in Japan and that magical thinking is typical of children and nonindustrial societies, but the antinaturalist perspective does not provide us any answer about the origin of the mental mechanisms that enable these attitudes. Antinaturalist accounts can tell how and why some mental mechanisms become more or less common in particular societies but most of the time cannot explain how and why these mental mechanisms developed in the first place. This is particularly true in the case of magical thinking and similar modes of thinking that, as discussed, are common in children and infants; this suggests that these modes of thinking do not have to be culturally transmitted and probably do not have cultural origins. Therefore, to return to the topic of interactions with robots, treating robots as animate and experiencing emotional attitudes towards them can be explained by antinaturalist accounts in terms of the causes of the modes of thinking responsible for these attitudes, but these accounts cannot explain the origins of these modes of thinking. That is the main but not the only task of naturalist accounts.

2.2. The naturalist approach

A naturalistic attempt to answer the question about the origin and character of people's emotions in relation to robots is usually based in psychological (especially from the field of social psychology) and neuroscientific theories grounded in the theory of evolution. Such a perspective is rather pragmatic and focuses primarily on two aspects: the functionality of the robot and its user's experience. How people react to and what relationships they establish with robots are very often examined through the prism of phenomena such as empathy and anthropomorphization. This is because robots' functionality and reception by humans are co-shaped by the fact that people perceive robots as sentient beings (similar to themselves) (Malinowska 2021a).

The term "empathy" can be understood in many ways, e.g., as "feeling what someone else feels", "caring about someone else", "imagining oneself in another's situation" or "making inferences about another's mental states" (Coplan 2011: 4). Although there is no consensus on the meaning of empathy, there is some agreement in the scientific community that empathy helps establish and maintain emotional ties, provides an understanding of the perspective of others, and enables initiating actions and considering the situations of other people (Redmond 1989; Coplan 2011; Goldman 2011; Malinowska 2021a; 2021b). Joanna Malinowska argues that this is one of the reasons why the term "empathy" is regularly applied in analyzing and describing human–robot interactions (Malinowska 2020; 2021a; 2021b). Researchers often report that the behaviors towards robots presented in the first section of this paper (refraining from damaging robots, refusing to perform tasks in which robots may be destroyed or the way robots are talked about) result from empathizing with robots (Riek et al. 2009a; 2009b; Niculescu et al. 2013; Rosenthal-von der Putten et al. 2013; 2014). This finding is consistent with recent neuroscience studies showing that people's neuronal activities (correlated with empathy) when they watch other people being abused are similar to those when they watch robots being abused (Gazzola et al. 2007; Rosenthal-von der Putten et al. 2013; 2014).

An analysis of naturalist studies of interactions between humans and robots (in HRI research, specifically) indicates that people's empathy with robots is often linked with their anthropomorphization (Leite et al. 2013; 2014; Malinowska 2021a).[4] Anthropomorphization is defined as assigning human features and properties to inanimate objects and animals (Złotowski et al. 2015a) or interpreting their behavior in terms of human emotions and mental states (Airenti 2015). The human disposition to anthropomorphize robots can explain, to some extent, the human tendency to animate robots. This disposition can also help explain the problems of humans with the ontological categorization of these agents. We will now briefly focus on how naturalism explains the human anthropomorphization of robots by pointing to its biological, evolutionary origins.

Humans' strong tendency to anthropomorphize is often interpreted as a standard feature of *Homo sapiens sapiens* that fulfils essential adaptive functions, such as intergroup socialization, risk avoidance and quick recognition of allies and enemies/predators (Westh 2009; Timpano and Shaw 2013). Currently, anthropomorphization also plays a vital role in our everyday life by allowing people to recognize that they are in contact with another being and that this being has its own agency and set of goals (Damiano and Dumouchel 2018: 7). Moreover, researchers link anthropomorphization

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[4]At some level of human-likeness, anthropomorphism may result not in empathy but in eeriness and anxiety, as Masahiro Mori's uncanny valley hypothesis suggests (Mori 1970). However, it is still unclear whether this hypothesis is valid (Wang et al. 2015), and recently, some studies have suggested that the phenomenon described by it might be only temporary since the repeating interactions with a particular robot reduce the phenomenon (Złotowski et al. 2015b). However, even if the uncanny valley hypothesis is thoroughly valid, it, by definition, refers only to some levels of anthropomorphic similarity; in that sense, the hypothesis does not falsify the connection between anthropomorphism and empathy but only reduces the range of the connection's occurrence.

with the development of religions and magical thinking (Boyer 1997; 2008a; 2008b) and pathological attachment to objects (Timpano and Shaw 2013).

Anthropomorphization intensifies for objects with specific properties, such as exhibiting autonomous movement (Duffy 2003; Kupferberg et al. 2011) and having a human-like appearance (Riek et al. 2009a; 2009b; Duffy 2003; Fink 2012; Eyssel and Kuchenbrandt 2012). Studies have been conducted on the relation between autonomous movement and people's interactions with a Roomba vacuum cleaner (Riek et al. 2009a; 2009b), the robotic 'bug' HEXBUG (Darling, Nandy and Breazeal 2015) and Packbots, which are military robots deployed to defuse bombs (Carpenter 2016). In many cases, the more the robot's movements resemble biological movement (even in small gestures), the greater the robot's anthropomorphization (Salem et al. 2013). The second factor, which is the robot's human-like appearance, provokes people to automatically see robots more like humans than as mere mechanical objects. This is because people unconsciously treat entities that are physically similar to them as their group members (Eyssel and Kuchenbrandt 2012). Depending on the morphological features, robots trigger other feelings in the user; these feelings range from sympathy to dislike to fear (Bartneck et al. 2009; Fink 2012; Złotowski et al. 2015a).

Naturalist accounts of people's tendency to animate robots thus interpret this phenomenon as an unconscious mental mechanism that appears to be an effect of a biological adaptation with the specific evolutionary history and modern social functions presented above. However, the naturalist perspective also considers the influence of sociocultural factors on people's development and behavior (Ramirez-Goicoechea 2006; Baltes et al. 2007). For example, some empirical research shows that the anthropomorphization of robots and (as a consequence) people's empathy towards them while being conditioned by evolutionary adaptations are also modulated by sociocultural factors, such as one's worldview; accepted ontology, values, goals, motivations and experiences; and one's knowledge of and superstitions about robots (Rakison 2003; Siegel et al. 2009; Wiese et al. 2017; Malinowska 2021a). By incorporating robots into social relations (e.g., due to their anthropomorphization or their functions), we begin to automatically treat them as either members of our group or the opposite, namely, representatives of other social groups. In these interactions, we unconsciously replicate mechanisms and cognitive biases specific to interpersonal and intergroup relations. Most of these mechanisms depend strongly on the social context and experiences, worldview and motivation (Devine et al. 2002; Malinowska 2016; Wheeler and Fiske 2005; Xu et al. 2009; Young et al. 2012; Young et al. 2015). For example, we know that how much one empathizes with a representative of another group (in human–robot interactions, this is usually a robot) is modulated by the individual's degree of motivation not to show xenophobic behavior (Van Bavel and Cunningam 2012). The degree of empathy can also be influenced by gender stereotypes (Siegel et al. 2009).

The use of cultural categories in research entails specific requirements, and not all empirical scientists have been able to cope with this challenge. First, there is a problem with the definitions of terms such as 'culture' and 'values'. These are particularly troublesome concepts that also cause problems for cultural scientists. However, our goal is not to analyze the definition of these terms or to reconstruct the debate on this topic. Instead, we are trying to draw attention to the ease with which some methodological issues are swept under the rug.

Returning to HRI, even if the terms 'culture' or 'values' do not usually appear in texts in this field, they are often 'lurking' somewhere in them under the cover of other concepts (we will return to this issue in the paragraphs below). Sometimes, however, researchers directly study cultural factors affecting human–robot interactions (together with people's emotional reactions to robots). Cultural terms are usually understood in such cases very reductionist way. Bartneck, Nomura, Kanda, Suzuki and Kato (2005), for example, published a paper entitled 'Cultural differences in attitudes towards

robots', in which they reduce culture to nationality. They asked Dutch, Chinese, German, Mexican, American (USA) and Japanese participants (most of whom were university students, although the Chinese group was living in the Netherlands) to complete questionnaires about their views on robots. In the conclusions, Bartneck and colleagues wrote:

> Participants from the USA were least negative towards robots, in particular on the aspect of interacting with them. A possible reason could be that they are used to technology and at the same time easy going when it comes to talking to new people. Another striking difference can be found when looking at the ratings of the Mexican participants. They were most negative towards robots, in particular towards interacting with them. This is surprising, since they are a neighbour state of the USA which were least concerned. (Bartneck et al. 2005: 3)

If we take cultural factors shaping human behavior seriously, we will quickly conclude that the methodology of the abovementioned study is highly underdeveloped. First, nationality is not synonymous with culture. Second, people living abroad are not typical representatives of a nation. Moreover, students are a particular social group. In the end, if we consider economic and historical factors, we are not surprised by the results concerning the participants from Mexico. The negative attitude towards robots could be associated, for example, with the fear of losing a job (being replaced by a robot) or the military use of robots against certain social groups.

Another example of using antinaturalist terms in empirical research in HRI is Kate Darling's 'Extending legal protection to social robots', where the author refers to social values in several places (Darling 2016: 13-14). Due to her studies on human empathy towards robots, Darling argues for the need to sanction robots' rights to protect and uphold human social values. Although we agree with this assumption, it still requires some clarification. We must ask 'What are these values?'; 'Are they universal?'; and 'Why should they be upheld?' Of course, we are not suggesting that every paper needs to offer an entire dissertation on ethics and axiology. However, in the long run, this issue requires a detailed analysis that goes beyond the possibilities of the empirical sciences.

This is a crucial moment in regard to the issues analyzed in this paper. How can we speak of motivation and worldview without reference to the cultural categories, such as values, which stand behind them? If a person does not want to behave xenophobically (or on the contrary, wants to behave that way), what social values are responsible for it? Eventually, suppose we can shape the course of interaction between robots and people to some extent (not only by modulating social factors in these relations but also by selecting the robot's appearance and behaviors, thereby possibly affecting the degree to which people anthropomorphize the robot). What values should determine the course and development of these interactions? These are all key questions and should be asked directly. How they are answered depends on how we ultimately interpret empirical research results in which these cultural categories (more or less directly) appear. Empirical research also determines how the interactions between people and robots should be developed. However, we think that this task goes beyond the limits of radical naturalism and needs to be enriched by antinaturalist analysis.

3. DISCUSSION

In the previous sections, we discussed antinaturalist and naturalist accounts of considering robots as animate and experiencing emotional attitudes towards them. We have shown the functions and limitations of both perspectives in this particular context and argued that both perspectives should be considered as complementary. Hence, radical versions of these perspectives fail to provide satisfying

accounts of the phenomenon we are examining. Therefore, we have applied the traditional philosophical and methodological distinction and the argument between naturalism and antinaturalism to the relatively recent issue of HRI, thereby, hopefully, shining some light on both of these areas. In this section, we briefly discuss the issue of the complementarity of these positions in contexts other than understanding emotional and animating attitudes towards robots.

There are already some concepts, such as systems theory (Luhmann et al. 2013) or biocultural co-constructivism (Ramirez-Goicoechea 2006; Baltes et al. 2007; Fenici and Garofoli 2017), according to which the complementarity of antinaturalist and naturalist positions may be not only worth considering but also necessary if we want to fully understand any social (or biosocial) phenomena. We will not discuss these proposals in detail here; we just want to point out an important assumption they share: considering that human development is conditioned by not only physical or biological factors but also sociocultural ones leaves plenty of room for moderately naturalistic, non-reductionist methodologies. For example, the scientific community already largely agrees that even human genetic expression is not completely fixed and biologically determined but depends on several other factors (Ramirez-Goicoechea 2006; 2013; Baltes et al. 2007; Lehrner & Yehuda 2018; Saldaña-Tejeda 2018; Leimert and Olson 2020). To analyze why people consider robots animate and experience emotions towards them, depending on the specific tasks we set for ourselves, we must therefore take into account different levels of complexity—molecular, biochemical, social, etc.—and different methods and tools designed to analyze them.

Additionally, in the study of HRI, the complementarity of naturalistic and antinaturalistic perspectives is highly relevant not only in regard to understanding the emotional and animistic attitudes towards robots but also in regard to axiological aspects of designing robots. This complementarity is starkly visible, e.g., in the recent article on value sensitive design (VSD) by Steven Umbrello and Roman V. Yampolskiy. The authors argue that technical and empirical investigations on robotics, particularly on autonomous systems, should always accompany conceptual (philosophical, ethical, etc.) investigations. However, according to Umbrello and Yampolskiy (2021), the conceptual questions should also cover issues such as "Who are the stakeholders? What are the values related to the technology in question? Where do certain parameters begin and end when discussing the bounds of usability versus conflicting values such as transparency and privacy or safety and efficacy? Who are the direct versus indirect stakeholders? When are the agreed methods and procedures no longer viable or in support of the values being sought? Why is one design supported and another excluded?" Introducing such discussions deeper into the process of developing new technological solutions seems to be a step in the right direction. This will probably help to develop technology more consciously and ethically. However, it requires representatives of science to be open to the methodologies of humanities researchers and vice versa. We believe that only the actual willingness to cooperate in this regard will allow researchers to successfully solve the problems we face.

Careful adoption of naturalist and antinaturalist accounts may enrich our knowledge of social robots—including those designed to participate in love and sex relationships—and make their implementation in human societies more effective,. The postulate of combining a naturalistic and antinaturalistic perspective or crossing the divisions between them is actually nothing new or original. However, our paper shows that this division can still be found, even in an interdisciplinary field such as HRI. Perhaps some theoretical assumptions, tools and terms used by HRI researchers are applied automatically due to the current paradigm accepted by the discipline they represent. Each of us unknowingly reproduces specific thought decals and dogmas functioning in our areas of expertise. Thus, while working on complex issues such as HRI, we must be cautious and maintain methodological and terminological awareness. We also need to be open to perspectives that go beyond our own research field. That is why only joint work, constructive criticism and seeking agreement above methodological divisions (such

as naturalism and antinaturalism) can allow for developing fully satisfactory, reliable and comprehensive scientific results in not only HRI but also other interdisciplinary fields.

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