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Engineering Cheerful Robots: An Ethical Consideration

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Abstract: Socially interactive robots in a variety of forms and function are quickly becoming part of everyday life and bring with them a host of applied ethical issues. This paper concerns meta-ethical implications at the interface among robotics, ethics, psychology, and the social sciences. While guidelines for the ethical design and use of robots are necessary and urgent, meeting this exigency opens up the issue of whose values and vision of the ideal society inform public policies. The paper is organized as a sequence of questions: Can robots be agents of cultural transmission? Is a cultural shift an issue for roboethics? Should roboethics be an instrument of (political) social engineering? How could biases of the technological imagination be avoided? Does technological determinism compromise the possibility of moral action? The answers to these questions are not straightforwardly affirmative or negative, but their contemplation leads to heeding C. Wright Mills' metaphor of the cheerful robot.

Keywords: social robots; ethics; cultural shift; technological determinism; child–robot interaction

1. Introduction

We inhabit a world in which 'social' gadgets cheerfully interact with humans. This paper's title, however, alludes also to the metaphorical sense in which sociologist C. Wright Mills spoke of robots in the 1950s: 'We know of course that man can be turned into a robot ... But can he be made to want to become a cheerful and willing robot?' [1] (p. 171). His metaphor denotes individuals who passively accept their social position, content with their allotted niche, for they are incapable of questioning the normative order. 'The ultimate problem of freedom is the problem of the cheerful robot,' stated Mills—for this phenomenon implies that not everyone wishes to be free—and considered the likelihood that the human mind 'might be deteriorating in quality and cultural level, and yet not many would notice it because of the overwhelming accumulation of technological gadgets' [1] (p. 175).

A characterization of life in the 1950s as an overwhelming accumulation of gadgets may bring a smile in the 2010s, but the issues raised by Mills remain pertinent, if not more urgent, in this era of unprecedented acceleration of new technologies that are transforming not only our lifestyles but also our self-understanding and possibly human nature itself. We are told that a technological singularity—when as a species we will either transcend our biology (to paraphrase Kurzweil [2]) or become extinct—is imminent. Across the academia, scholars engaged with discourses of posthumanism and transhumanism comment on how 'the posthuman view configures human being so that it can be seamlessly articulated with intelligent machines' [3] (p. 3). Meanwhile, the new technologies pose new social, political and ethical challenges. Announcing the birth of roboethics in 2005, Veruggio provoked his audience to consider whether ethical issues with respect to robots should remain a matter for stakeholders' own consciences or be construed as 'a social problem to be addressed at institutional level' [4] (p. 2). In a follow-up paper [5], averring that soon 'humanity will coexist with the first alien intelligence we have ever come into contact with—robots' (p. 5), Veruggio articulated a roadmap for roboethics with the caveat that its target is 'not the robot and its artificial ethics, but the human ethics of the robots' designers, manufacturers and users' (p. 7). Since 2005, the march of robots into our midst has been increasingly recognized as a social problem to be addressed at the institutional level.

This opens up the axiological issue of whose values and vision of the ideal society inform public policies. The empirical question can be answered by observing the increasing dominance of technology-led positions (but should this vision determine ethics?). The rise of 'robot culture' is a phenomenon of social scientific interest, but should this phenomenon, or some aspects of it, be construed as deserving an ethical consideration? The answer is not straightforwardly affirmative or negative, and this paper is not aimed at arriving at a categorical answer. The following is organized as a sequence of questions that signpost a few salient issues that emerge at the interface among robotics, ethics, psychology, and the social sciences.

2. Can Robots Be Agents of Cultural Transmission?

The concept of cultural transmission originated in sociobiology, in which context it is distinguished from genetic transmission of traits. In humans, it denotes socialization and enculturation processes whereby beliefs, values, and norms of conduct are transmitted across and within generations [6]. At the level of interpersonal interactions, especially within the family, cultural transmission occurs when adults impart their own values, beliefs, and attitudes to children ('direct vertical' transmission). Cultural transmission occurs also within the peer group ('direct horizontal'). The process operates at the societal level without direct interpersonal interaction ('oblique' transmission); for instance, when mass media and popular culture induce imitation and learning.

While cultural transmission is a universal process, the mechanisms and contents involved in the process are not necessarily universal, since childrearing practices and normative expectations vary across cultures. Such differences can already be seen in infancy. In a cross-cultural study that investigated infant behavioral inhibition, Australian, Canadian, Chinese, Italian, and South Korean toddlers were presented with a toy robot that moved, made noises, and emitted smoke [7]. Toddlers from Western cultures (especially Italian and Australian) were quicker to touch the robot than their counterparts from Eastern cultures, with Chinese and South Korean toddlers being the shiest (many of whom did not touch the robot). Towards an explanation, the researchers speculated that Asian parents tend to reward cautious and reserved behavior in their children.

The significance of the robot in [7] was the fact that it was an unfamiliar toy introduced by a stranger; i.e., not necessarily its appearance as a robot. Real robots increasingly enter environments of child development in a variety of forms and functions. Examples of direct vertical transmission can be glimpsed in reports from a longitudinal study in the University of California San Diego, which has involved placing humanoid robots in a crèche. When QRIO (a bipedal robot created by Sony) was first introduced, some toddlers cried when it fell [8]. The investigators advised the teachers to tell the children not to worry since the robot could not be damaged, but the teachers, ignoring the advice, 'taught the children to be careful; otherwise, children could learn that it is acceptable to push each other down' [8] (p. 17956). Later on, children seldom cried when QRIO fell, but instead helped it to stand up. Separately, an ethnographic study of the same project described how a teacher seized the opportunity to foster the etiquette of saying 'Thank you' when a toddler spontaneously offered a toy to RUBI (a plump robot, clad in yellow cloth, with a head and arms, created for the project) [9]. There were likely opportunities also for horizontal transmission. Supplementary videos for [8] include a clip (movie 5) that shows QRIO suddenly falling over, and children rushing over, and one boy persistently tries to raise the robot; other children observed, and may potentially imitate their peer's helping behavior (see also an analysis of the episode in [10] pp. 181–182).

In the above examples, the robot served as a fulcrum for human-human interactions within which cultural transmission took place, but it did not function as a socializing agent in its own right. Robot Tega exemplifies an effort to build a robot that could 'socialize' children into doing their homework [11,12]. Arguably, an advantage of educational robots is that, as an intelligent tutoring system, the robot can customize its tutoring to suit individuals' pace and style of learning (at least when it works smoothly; see [13] on breakdowns in child–robot interactions). The creators of Tega have gone a step further in taking into account the fact that emotional states can affect a child's motivation. Interacting with an enthusiastic cartoon-like robot can make learning fun, and encourage children to try harder. Tega was successfully tested with 3–5-year-old English-speaking children learning Spanish [11].

If something helps to improve learning, it makes pedagogic common-sense to use it, but curricular learning (such as mastering a foreign language) should not be confused for socialization. Children's long-term exposure to robots could have unintended consequences. This concern is insinuated in the heading of the New Scientist report on Tega (a new platform designed by Personal Robots Group at MIT Media Lab), 'Kids can pick up attitude from robots they play and learn with' [12]. The thread is followed in an MIT Technology Review article [14] raising concerns about what might happen when robots become role models for children. In a convergent vein, a blog article [15] claims that 'parents are worried that Amazon Echo is conditioning their kids to be rude'. At present, only a minority of children experience interactions with robots such as Tega, but 'smart' gadgets are increasingly part of the home environment. Unlike educationally assistive robots, gadgets such as Amazon's Echo do not require the child to learn new skills. The gadget is 'child-friendly' only because of the impoverishment of the interaction. The functional reduction of human dialogue does away with courtesies such as saying 'please', and rewards brusque interaction style—an outcome that could frustrate parents trying to instill good manners in their children [15].

Currently, any evidence for that effect is at best anecdotal. Nevertheless, this speculative instance evinces a theoretical distinction between cultural transmission of behavioral norms (e.g., parents teaching their children not to be rude) and a change at societal level, such as a cultural shift in what people consider as rudeness. For better or worse, new affordances are created as gadgets are becoming both more sophisticated and affordable. In contrast with the worries expressed in [15], a leading headteacher in Britain has recently suggested that Alexa or Siri-type virtual assistants could help timid children become more confident in lessons: 'Children can be reluctant to put their hands up and answer questions in class, especially if they think they might be ridiculed. That won't come from a machine.' [16]. It could be argued that helping timid children overcome their shyness in the classroom could give them a better foundation for life than providing them with technological crutches.

The specific ethical issue arising at this juncture pertains to ameliorative responsibility; that is, 'an obligation to improve a situation, no matter whether one is the causally responsible for it' [17] (p. 110). People may agree about this obligation in principle, but opinions are polarized as to whether using robots will improve or worsen given situations. In general, the answer to whether robots can be agents of cultural transmission is affirmative, but we cannot assume that any direct transmission by means of robots would have the intended effect (or only that specific effect) on developmental and learning outcomes. Furthermore, as can be observed in the case of migrant families, the transmission of values from parents to offspring might be less effective in the host country insofar as children might be reluctant to accept the parents' tradition whilst parents may hesitate to impose attitudes that might be nonadaptive in the new environment [18]. A similar 'generation gap' might exist between adults and children or youth, as digital migrants and digital natives respectively (cf. [19]), with the qualification that (unlike migrants to an existing society) the digital world is rapidly evolving ahead of all of us, old and young.

3. Is a Cultural Shift an Issue for Roboethics?

Describing cultural shifts in highly industrialized societies in the 1980s, Inglehart proposed that a change in values is mostly an automatic consequence of increased prosperity [20]. He urged attention to 'substantial and enduring cross-cultural differences in certain basic attitudes and habits,' differences that are stable but not immutable, and are susceptible to gradual changes that are traceable to specific causes [20] (p. 22). He further commented that changes due to industrialization may interact differently with religion, as a political factor, in the Confucian-influenced Far East, the Islamic world, and Catholic countries. Similar assertions could be extended to the technologized societies of the 2010s.

The existence of cross-cultural differences in attitudes to robots is well documented. For example, a 2012 Eurobarometer survey [21] in 24 European countries revealed considerable cross-national differences, notably in public objections to using robots in the care of children, the elderly and the disabled; negative attitudes were strongest in Cyprus (85%) and weakest in Portugal (35%). A 2016 survey of attitudes to robots in healthcare [22] in 12 countries across Europe, the Middle East and Africa found that the British sample on the whole was least receptive to the idea of healthcare robots. However, 55% of 18- to 24-year-old Britons were receptive to the idea, in contrast with only 33% of older Britons. As technological realities change, attitudes to robots change across generations. Whereas in the early 1980s an Arab journalist reportedly described the creation of androids as a travesty against Allah (cited in [23]), in October 2017, Saudi Arabia granted citizenship to a female-looking robot [24]. This gesture might well be a publicity stunt, but nonetheless it indicates the possibility of shifts in acceptance of humanlike artefacts among Muslims.

At the level of the individual person, cultural shifts translate into developmental outcomes through an interplay of proximal and distal processes. Bronfenbrenner's bioecological paradigm [25] and his earlier ecological systems model [26] describe human development as happening within hierarchically nested systems. Proximal processes are the 'progressively more complex reciprocal interaction' of a child with the people, objects, and symbolic resources that constitute the child's immediate environment (microsystem)—an interaction that 'must occur on a fairly regular basis over extended periods of time' in order to be effective [25] (p. 620). By implication, robots can play a role in proximal processes only when they enter the child's world on a regular basis [27]. Furthermore, children's everyday contact with robots is likely to occur within family and school settings already replete with hi-tech, settings that reflect adults' beliefs about the technologies they make available to the child. Adults' beliefs are formed against the backdrop of the particular society's characteristic belief systems, resources, hazards, life styles, life-course options, patterns of social interchange, and so forth (the macrosystem). Bronfenbrenner's model thus posits distal processes that impact, top-down, proximal processes. This treats 'culture' as if it were operating externally to everyday activities within microsystems. Recent revisions (e.g., [28]) tend to integrate Bronfenbrenner's bioecological paradigm with Vygotskian and neo-Vygotskian approaches, sometimes under the label 'ecocultural'. Endorsing Bronfenbrenner's view of the human being as 'a growing, dynamic entity that progressively moves into and restructures the milieu in which it resides' [26] (p. 21), bioecological and ecocultural models generally describe processes that shape the person one becomes.

A technology-related cultural shift may manifest in a variety of ways. For instance, by age 4, most children categorize prototypical living and non-living kinds, and typically designate robots to the inanimate category; but findings that children tend to attribute aliveness to robot pets with which they interact may indicate the emergence of a new ontological category that disrupts current animate/inanimate distinctions [29–32]. Commentators may comment on the desirability (or otherwise) of inevitable consequences of a technologized social reality. In this vein, Turkle opines that disembodied interpersonal interactions through social media, mobile phones and the internet, have led to the emergence of a new state of selfhood—human subjects wired into social existence through technology—at the cost of youth's capacity for authentic relationships [33]. As a consequence, society has arrived at a 'robotic moment', a situation marked by readiness to accept robots as relationship partners, according to Turkle.

If a cultural shift is inevitable, ethical appraisals may at best provide pragmatic agendas for minimizing risks. However, even modest agendas of limited application are imbued with their authors' notions of the kind of society we want to live in, and are underpinned by the belief that it is possible to influence the direction of societal change.

4. Should Roboethics Be an Instrument of (Political) Social Engineering?

The term 'social engineering' has two meanings. Recently it has entered the field of computer and information security as an umbrella term for a variety of techniques that are used to manipulate people into divulging confidential information (e.g., deception by phone) or compromise people's security and privacy in cyberspace (e.g., phishing emails) [34–36]. Social engineering in this sense is clearly relevant here since robots can be hacked for criminal or malicious purposes. The question raised in this section, however, refers to the older and more general sense of the term. As used chiefly in political science and sociology, social engineering denotes any planned attempt by governing bodies to manage social change and in this way to regulate the future of a society.

The first occurrence of the analogy between engineers and policymakers is traceable to an 1842 book by the British socialist economist John Gray [37]. Gray contrasted a situation in which a steam engine malfunctions with the situation in which some social or economic problem requires remedy. If several engineers were separately to examine the malfunctioning steam engine, they likely would arrive at similar conclusions about the problem and how to fix it; but in the political arena there is little agreement among separate committees regarding the nature of the problem, its cause and remedy: 'the political and social engineers of the present day . . . seem to agree in nothing, except that evils do exist' [37] (p. 117). A similar observation could be made about the present-day proliferation of advisory bodies and initiatives that produce guidelines for ethical design and use of artificial intelligence (AI) and robots.

At the close of the nineteenth century, the metaphor acquired positive connotations of public service, defining social engineers as specialists appointed to handle problems of human or social nature. For instance, the American Christian sociologist Edwin Earp introduced his 1911 book (titled The Social Engineer) with the claim, 'Social engineering means not merely charities and philanthropies that care for victims of vice and poverty, but also intelligent organized effort to eliminate the cause that make these philanthropies necessary' [38] (p. xv). He further defined social engineering as 'the art of making social machinery move with the least friction and with the best result in work done.' [38] (p. 33). Throughout the twentieth century, the usage of the term became associated with centralized organizations that deploy preventative and ameliorative measures towards fixing society's ills.

Extrapolating the above usage to the field of roboethics, the would-be social engineers are experts in a variety of fields who may be called upon to identify risks and plan ways to minimize these. Individuals may contribute through membership in organizational sections; e.g., the Institute of Electrical and Electronics Engineers' (IEEE) Global Initiative on Ethics of Autonomous and Intelligent Systems. They may participate in workshops that could inform policymaking. For example, the principles of ethical design and use of robots outlined in [39] originated in a 2010 workshop, and subsequently were incorporated into the British Standards Institution's 'Guide to the Ethical Design and Application of Robots and Robotic Systems' published in 2016 [40]. The spirit of the social engineer is implicit in the mission statement of the Foundation for Responsible Robotics, a Netherlands-based initiative with an international cast of academics. The Foundation's mission, as its website states, is 'to shape a future of responsible robotics design, development, use, regulation, and implementation' [41].

A modicum of utopianism is perhaps inevitable in any ambition to better the future of society. In accordance with Karl Popper's [42] distinction between utopian and 'piecemeal' social engineering, however, initiatives such as the aforementioned may fall under the rubric of piecemeal. In Volume I of his political science book, first published in 1945, Popper regarded the piecemeal approach as preferable to the utopian, for this approach tackles problems as they arise, seeking 'a reasonable method of improving the lot of man,' a method that can be readily applied and 'has so far been really successful, at any time, and in any place' [43] (p. 148). However, his recommendation to rely on tried-and-tested methods might be difficult to implement in a world that is itself rapidly changing due to technological advances. This challenge is insinuated in a rider to the mission statement of the Foundation for Responsible Robotics: 'We see both the definition of responsible robotics and the means of achieving it as ongoing tasks that will evolve alongside the technology' [41]. Viewed pessimistically, the possibility of pre-empting irresponsible robotics might become moot if technological innovations constantly change the terrain at a pace and in ways that are difficult to anticipate.

A case in point is cybersecurity. Technological innovations create new affordances for social engineering in the term's negative meaning; 'the social engineer is a skilled human manipulator who preys on human vulnerabilities' [36] (p. 115). This characterization could not be more diametrically opposed to Earp's, in whose view the 'social engineer is one who can help the religious leader to establish a desired working force in any field of need' [38] (p. xviii). As a response to a specific 'field of need', roboethics undertakes tasks of piecemeal social engineering by virtue of advising public policies. An affirmative answer to the question of whether roboethics should contribute to the engineering of a better society, however, presupposes a consensus about what constitutes a better society. The absence of consensus raises the question of whose vision of the ideal society is being served.

5. How Could Biases of the Technological Imagination Be Avoided?

Social issues have been recognized as among the 'problems' defining the engineering field for more than a decade. While social scientists typically investigate the impact of technologies on society and persons, roboticists tend to ask what needs to be done to make robots desirable for society and persons. The term 'technological imagination' paraphrases Mills' definition of the sociological imagination. The sociological imagination is a stance that construes social phenomena in terms of what these may reveal about the workings of a society [1], whereas the technological imagination is a stance predisposed towards construing social issues in terms of their implications for technology [10,43]. This is the engineering field's default stance, understandably, since making robots is its raison d'être. Furthermore, since it is in the manufacturers' interest to avoid marketing products that might make them liable to lawsuits, the industry may self-regulate in the long run. Pragmatically, ethical appraisals pivot on assessments of risks associated with technological innovations, and policy recommendations center on how these risks could be realistically minimized.

The focus on the technological artefact, although necessary, results in a kind of tunnel vision. For example, in an interview with the IEEE online newsletter [44], the vice president of the IEEE Society on Social Implications of Technology has identified important ethical and legal concerns related to marketing home robots to families with young children, including information security, safety, and safeguarding children: the gadget could be hacked, enabling strangers to watch the child; it might be used unscrupulously to sell products to children; a robot might accidently hurt a child; and the robot might witnesses child abuse. Nevertheless, technology-driven ethical appraisals are not child-centered, and seldom take into consideration the possibility of detrimental effects on child development or the wider social context (e.g., the home or the school). In contrast, psychology-driven ethical appraisals such as outlined by Amanda and Noel Sharkey [45,46] do highlight issues of emotional attachment, deception of the child, and loss of human contact (see also [33]). Apropos teachers' attitudes to robots in the classroom, research reported in [47] demonstrates the exigency of taking the consideration of ethics beyond design issues and toward engagement with stakeholders' views on how robots may affect their current practices. The point made here, however, concerns biases located in one side of a schism within the discourse of social robotics [10,43,48]. Representing the stance identified by the present author as the technological imagination [10,43], the writers of [48] maintain that the world is 'run by technological developments, and that robots are here for further enhancements and new applications' and are critical of the opposite stance, the 'society-driven side [which] opines that the world is driven and run by social aspects' (p. 107).

The technological imagination informs policies not only via a pragmatic 'damage limitation' approach to regulating uses of technological products, but also via a narrative of moral commitment to improving the quality of life by means of robots. In this vein, Movellan has stressed 'our responsibility to explore technologies that have a good chance to change the world in a positive manner' [49] (p. 239). The claim that robots will help children to become 'better people: stronger, smarter, happier, more sociable and more affective,' as he put it in an interview with Wired [50], insinuates that children who are denied robots—either because parents cannot afford the gadgets or conscientiously refrain from giving them to their children—will grow up worse people: weaker, duller, sadder, less sociable and less affective. The rhetoric thus places the onus on policymakers to allocate resources to the development and promotion of educational robots.

The benefits of socially assistive robots (SAR) should not be overlooked or understated. For example, there is robust evidence in support of robot interventions for promoting social skills among children with autism [51,52]. A potential pitfall of technology-led morality, in this specific instance, would be a naïve belief that providing non-autistic children with robot companions can enhance their social skills, a belief resting on a simplistic 'engineering logic':

- The social skills of autistic child A are impaired.
- Intervention using robot R raises A's skills to age-average level.
- The social skills of non-autistic child B are already at age-average level.
- Therefore, R will raise B's skills to above-average.

However, autistic children might respond better to robots than to people because of their symptomatic impairments (as noted in [51]). Non-autistic infants are innately attuned to human beings, and children ultimately prefer people to robots (see [27] for a related discussion). The engineering logic can be contrasted with a 'psychological logic'; namely, an approach that seeks to explain phenomena of human mind and behavior by reference to biopsychosocial factors impacting on the individual:

- The social skills of autistic child A are impaired. Explanation: Deficits in the mirror neurons system (which facilitates imitation and empathy).
- Intervention using robot R raises A's skills to age-average level. Explanation: Robots are less complex than people are.
- The social skills of non-autistic child B are already at age-average level. Explanation: innate orientation to people and personal history of social interactions.
- Therefore, since robots are less complex than people, R might be detrimental to B's further development.

Indeed, some psychologists investigating human-robot interaction (HRI) have expressed concerns that children might accept robotic companionship without fostering the moral responsibilities that human companionships entail [53]. Findings that children who had higher involvements with technological artefacts were less likely to view living dogs as having a right to just treatment and to be free of harm may signal the possibility that human adaptation to interacting with robots will 'dilute the "I–thou" relationship of humans to other living beings' [54] (p. 231).

The 'quick' answer to the question of how to avoid biases of the technological imagination is to widen the pool of expertise so as to encompass a spectrum of dispositions to robots as well as knowledge. This is already done in at least some cases (advisory bodies tend to be multidisciplinary; robots for autism are developed in collaboration with clinicians). The potential dilution of the 'I–thou' relationship, however, signals a deeper, longer-term problem.

6. Does Technological Determinism Compromise the Possibility of Moral Action?

Identifying technological determinism as the dominant narrative in social robotics, Šabanović commented that, in this narrative, social problems are typically construed as something in need of technological 'fixes', and the users of robotic products are often treated 'as objects of study, rather than active subjects and participants in the construction of the future uses of robots' [55] (p. 440). This is not a peculiarity of robotics, for it reproduces the dominant mechanistic worldview of modern psychology [10]. The mechanistic worldview has made it possible to translate human qualities onto machines. As Rodney Brooks put it, 'Humans, after all, are machines made up of organic molecules whose interactions can all be aped (we think) by sufficiently powerful computers' [56] (p. 86).

There lingers the technological dream of 'the *Universal Automaton* ... the creation of the perfect citizen,' which could be augmented with an emphasis on 'the amount of diversity it is capable of handling' as a benchmark in the creation of truly social robots [57] (p. 86). The infamous case of Tay evinces some pitfalls of machine learning. Tay was a chatbot developed by Microsoft, targeting 18–24 year-olds in the USA [58]. It was launched via Twitter on 23 March, 2016, but Microsoft removed it only 16 hours later because Tay started to post inflammatory and offensive tweets, having quickly picked up antisemitism from the social media. Microsoft attributed it to 'trolls' who attacked Tay, since the bot customized its replies to them by searching the internet for suitable source material [59]. From the standpoint of applied ethics, issues that immediately come to mind apropos this instance of technology-gone-awry include the exigency of regulating AIs by means of censorship, perhaps through installing a moral code in the machine. From the standpoint of metaethics, the case of Tay calls into question the nature of morality itself. In the present context, the moral of the story lies in the demonstration of an AI's capability of handling diversity of information compounded with the incapability of locating its own self in a space of moral actions. Like Mills' cheerful robots—and unlike those trolls, whose mischief was deliberate—Tay lacked freedom of thought to reason about what it was finding on the internet.

The mechanistic worldview enables a functional reduction of the complexity of social interaction to algorithms enacted by a machine; in effect, as [57] put it, minimizing the 'human' in HRI. However, this squeezes out of the minimal 'human' the very quality that makes us human—the aspect of selfhood that Charles Taylor regarded as 'perennial in human life'; namely, the fact that 'a human being exists inescapably in a space of ethical questions; she cannot avoid assessing herself in relation to some standards' [60] (p. 58). It is not the possession of some standards, a moral code, but the capacity (and freedom) to dialogue with these standards, that constitutes the human subject as 'an articulate identity defined by its position in the space of dialogical action' [60] (p. 64). The existence of roboethics indeed attests to dialogical action at both individual and collective levels.

7. Conclusions

Above the silver lining of technological progress, there is a cloud of worries about privacy, human safety, using robots for crime, and more. Veruggio and cowriters provide a comprehensive list of global social and ethical problems that the introduction of intelligent machines into everyday life brings about: dual-use technology (having civilian and military applications); anthropomorphizing lifelike machines; cognitive and affective bonds toward machines; technology addiction; digital divide across age groups, social class, and/or world regions; fair access to technological resources; effects of technology on the global distribution of wealth and power; and the impact on the environment [61] (p. 2143). The discourse is by default oriented towards matters of applied ethics that arise from existing technology, as well as matters arising in anticipation of futuristic robots (such as robot rights and robot personhood). The possibility that human–robot coexistence might result in the engineering of human subjects who, in Mills' words, will 'want to become a cheerful and willing robot' [1] (p. 171) is not usually flagged as an issue for roboethics. The focus remains on what technology can do for us and shouldn't do to us; and yet this technology might be changing us, our human nature.

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References

1. Mills, C.W. *The Sociological Imagination*; Oxford University Press: New York, NY, USA, 1959.
2. Kurzweil, R. *The Singularity is Near*; Penguin Books: London, UK, 2005.
3. Hayles, K. *How We Became Posthuman*; University of Chicago Press: Chicago, IL, USA, 2008.
4. Veruggio, G. The birth of roboethics. In Proceedings of the IEEE International Conference on Robotics and Automation Workshop on Robo-Ethics, Barcelona, Spain, 18 April 2005; pp. 1–4.

5. Veruggio, G. The EURON roboethics roadmap. In Proceedings of the IEEE-RAS International Conference on Humanoid Robots, Genova, Italy, 4–6 December. 2006; pp. 612–617.
6. Bisin, A.; Thierry, V. Cultural transmission. In *The New Palgrave Dictionary of Economics Online*, 2nd ed.; Durlauf, S.N., Blume, L.E., Eds.; Palgrave Macmillan: London, UK, 2008; Volume 2, pp. 177–181.
7. Rubin, K.H.; Hemphill, S.A.; Chen, X.; Hastings, P.; Sanson, A.; Coco, A.L.; Zappulla, C.; Chung, O.-B.; Park, S.-Y.; Doh, H.S.; et al. A cross-cultural study of behavioral inhibition in toddlers: East–West–North–South. *Int. J. Behav. Dev.* **2006**, *30*, 219–226. [CrossRef]
8. Tanaka, F.; Cicourel, A.; Movellan, J.R. Socialization between toddlers and robots at an early childhood education center. *Proc. Natl. Acad. Sci. USA* **2007**, *104*, 17954–17958. [CrossRef] [PubMed]
9. Alač, M.; Movellan, J.; Tanaka, F. When a robot is social: spatial arrangements and multimodal semiotic engagement in the practice of social robotics. *Soc. Stud. Sci.* **2011**, *41*, 893–926. [CrossRef] [PubMed]
10. Jones, R.A. *Personhood and Social Robotics*; Routledge: London, UK, 2015.
11. Gordon, G.; Spaulding, S.; Kory, J.; Westlund, J.; Lee, J.; Plummer, L.; Martinez, M.; Das, M.; Breazeal, C. Affective personalization of a social robot tutor for children's second language skills. In Proceedings of the AAAI Conference on Artificial Intelligence, Phoenix, AZ, USA, 12–17 February 2016; pp. 3951–3957.
12. Revell, T. Kids can pick up attitude from robots they play and learn with. Available online: https://www.newscientist.com/article/2121801-kids-can-pick-up-attitude-from-robots-they-play-and-learn-with/ (accessed on 11 May 2018).
13. Serholt, S. Breakdowns in children's interactions with a robotic tutor: A longitudinal study. *Comput. Hum. Behav.* **2018**, *81*, 250–264. [CrossRef]
14. Condliffe, J. What happens when robots become role models. Available online: https://www.technologyreview.com/s/603708/what-happens-when-robots-become-role-models/ (accessed on 11 May 2018).
15. Truong, A. Parents are worried the Amazon Echo is conditioning their kids to be rude. Available online: https://qz.com/701521/parents-are-worried-the-amazon-echo-is-conditioning-their-kids-to-be-rude/ (accessed on 11 May 2018).
16. Davis, A. Alexa-style robots could 'help shy children put up their hands', says head. Available online: https://www.standard.co.uk/news/education/alexa-robots-could-help-shy-children-put-up-their-hands-says-head-a3829346.html (accessed on 14 May 2018).
17. Seibt, J. 'Integrative Social Robotics'—A new method paradigm to solve the description problem and the regulation problem? In *What Social Robots Can and Should Do*; Seibt, J., Nørskov, M., Schack Andersen, S., Eds.; IOS Press: Amsterdam, The Netherlands, 2016.
18. Schönpflug, U. Intergenerational transmission of values: The role of transmission belts. *J. Cross-Cultural Psychol.* **2001**, *32*, 174–185. [CrossRef]
19. Prensky, M. Digital natives, digital immigrants part 1. Available online: https://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf (accessed on 20 June 2018).
20. Inglehart, R. *Culture Shift in Advanced Industrial Society*; Princeton University Press: Princeton, NJ, USA, 1990.
21. Special Eurobarometer 382: Public attitudes towards robots, 2012. Available online: http://ec.europa.eu/public_opinion/archives/ebs/ebs_382_en.pdf (accessed on 3 March 2017).
22. Survey across EMEA, Britons most skeptical of robots, AI for healthcare. Available online: https://www.emarketer.com/Article/Survey-Across-EMEA-Britons-Most-Skeptical-of-Robots-AI-Healthcare/1015681 (accessed on 19 April 2017).
23. MacDorman, K.F.; Vasudevan, S.K.; Ho, C.-C. Does Japan really have robot mania? Comparing attitudes by implicit and explicit measures. *AI Soc.* **2009**, *23*, 485–510. [CrossRef]
24. Griffin, A. Saudi Arabia grants citizenship to a robot for the first time. Available online: https://www.independent.co.uk/life-style/gadgets-and-tech/news/saudi-arabia-robot-sophia-citizenship-android-riyadh-citizen-passport-future-a8021601.html (accessed on 13 May 2018).
25. Bronfenbrenner, U. Developmental ecology through space and time: A future perspective. In *Examining Lives in Context: Perspectives on the Ecology of Human Development*; Moen, P., Elder, G.H., Jr., Luscher, K., Eds.; American Psychological Association: Washington, DC, USA, 1995.
26. Bronfenbrenner, U. *The Ecology of Human Development*; Harvard University Press: Cambridge, MA, USA, 1979.

27. Jones, R.A. 'If it's not broken, don't fix it?' An inquiry concerning the understanding of child-robot interaction. In *What Social Robots Can and Should Do*; Seibt, J., Nørskov, M., Schack Andersen, S., Eds.; IOS Press: Amsterdam, The Netherlands, 2016.
28. Vélezagosto, N.M.; Soto-Crespo, J.G.; Vizcarrond-ooppenheimer, M.; Vegamolina, S.; García Coll, C. Bronfenbrenner's bioecological theory revision: Moving culture from the macro into the micro. *Pers. Psych. Sci.* **2017**, *12*, 900–910. [CrossRef] [PubMed]
29. Kahn, P.H.; Friedman, B.; Pérezgranados, D.R.; Freier, N.G. Robotic pets in the lives of preschool children. *Interact. Stud.* **2006**, *7*, 405–436. [CrossRef]
30. Kahn, P.H.; Gary, H.E.; Shen, S. Children's social relationships with current and near future robots. *Child Dev. Pers.* **2013**, *7*, 32–37. [CrossRef]
31. Kahn, P.H.; Reichert, A.L.; Gary, H.E.; Kanda, K.; Ishiguro, H.; Shen, S.; Ruckert, J.H.; Gill, B. The new ontological category hypothesis in human–robot interaction. In Proceedings of the 6th ACM/IEEE International Conference on Human-Robot Interaction, New York, NY, USA, 6–9 March 2011; pp. 159–160.
32. Severson, R.L.; Carlson, S.M. Behaving as or behaving as if? Children's conceptions of personified robots and the emergence of a new ontological category. *Neural Netw.* **2010**, *23*, 1099–1103. [CrossRef] [PubMed]
33. Turkle, S. *Alone Together*; Basic Books: New York, NY, USA, 2011.
34. Hatfield, J.M. Social engineering in cybersecurity: The evolution of a concept. *Comput. Secur.* **2018**, *73*, 102–113. [CrossRef]
35. Luo, X.; Brody, R.; Seazzu, A.; Burd, S. Social engineering: The neglected human factor for information security management. *Inf. Resour. Manag. J.* **2011**, *24*, 1–8. [CrossRef]
36. Mouton, F.; Malan, M.M.; Kimppa, K.K.; Venter, H.S. Necessity for ethics in social engineering research. *Comput. Secur.* **2015**, *55*, 114–127. [CrossRef]
37. Gray, J. *An Efficient Remedy for the Distress of Nations*; Adam and Charles Black: Edinburgh, UK, 1842.
38. Earp, E.L. *The Social Engineer*; Eaton & Mains: New York, NY, USA, 1911.
39. Boden, M.; Bryson, J.; Caldwell, D.; Dautenhahn, K.; Edwards, L.; Kember, S.; Newman, P.; Parry, V.; Pegman, J.; Rodden, T.; et al. Principles of robotics: regulating robots in the real world. *Connect. Sci.* **2017**, *29*, 124–129. [CrossRef]
40. British Standards Institution. *Robots and Robotic Devices: Guide to The Ethical Design an Application of Robots and Robotic Systems*; British Standards Institution: London, UK, 2016.
41. Foundation for Responsible Robotics. Available online: https://responsiblerobotics.org/about-us/mission/ (accessed on 7 May 2018).
42. Popper, K.R. *The Open Society and Its Enemies*; Princeton University Press: Princeton, NJ, USA, 2013.
43. Jones, R.A. Concerning the apperception of robot-assisted childcare. *Philos. Technol.* **2018**. [CrossRef]
44. Chant, R. Robot nannies: Should gadgets raise your kids? *Available online:*. Available online: http://theinstitute.ieee.org/ieee-roundup/blogs/blog/robot-nannies-should-gadgets-raise-your-kids (accessed on 8 May 2018).
45. Sharkey, A. Should we welcome robot teachers? *Ethics Inf. Technol.* **2016**, *18*, 283–297. [CrossRef]
46. Sharkey, N.; Sharkey, A. The crying shame of robot nannies: An ethical appraisal. *Interaction Stud.* **2010**, *11*, 161–190. [CrossRef]
47. Serholt, S.; Barendregt, W.; Vasalou, A.; Alves-Oliveira, P.; Jones, A.; Petisca, S.; Paiva, A. The case of classroom robots: Teachers' deliberations on the ethical tensions. *AI Soc.* **2017**, *32*, 613–631. [CrossRef]
48. Van den, H.H.J.; Lamers, M.; Verbeek, F. Understanding the artificial. *Int. J. Soc. Robot.* **2011**, *3*, 107–109. [CrossRef]
49. Movellan, J.R. Warning: The author of this document may have no mental states. Read at your own risk. *Interact. Stud.* **2010**, *11*, 238–245. [CrossRef]
50. Carmody, T. Let your children play with robots. Available online: https://www.wired.com/2010/10/children-robots (accessed on 9 May 2018).
51. Scassellati, B.; Admoni, H.; Mataric, M. Robots for use in autism research. *Annu. Rev. Biomed. Eng.* **2012**, *14*, 275–294. [CrossRef] [PubMed]
52. Kientz, J.A.; Goodwin, M.S.; Hayes, G.R.; Abowd, G.D. *Interactive Technologies for Autism*; Morgan & Claypool: San Rafael, CA, USA, 2014.

53. Kahn, P.H.; Friedman, B.; Hagman, J. 'I Care about him as a Pal': Conceptions of robotic pets in online AIBO discussion forums. In Proceedings of the CHI Extended Abstracts on Human Factors in Computing Systems, Minneapolis, MN, USA, 20–25 April 2002; pp. 632–633.
54. Melson, G.F. Child development robots: Social forces, children's perspectives. *Interact. Stud.* **2010**, *11*, 227–232. [CrossRef]
55. Šabanović, S. Robots in society, society in robots mutual shaping of society and technology as a framework for social robot design. *Int. J. Soc. Robotics* **2010**, *2*, 439–450. [CrossRef]
56. Brooks, R.A. Will robots rise up and demand their rights? Available online: http://content.time.com/time/magazine/article/0,9171,997274,00.html (accessed on 11 May 2018).
57. Kaerlein, T. Minimizing the human? Functional reductions of complexity in social robotics and their cybernetic heritage. In *Social Robots from a Human Perspective*; Vincent, J., Taipale, S., Sapio, B., Lugano, G., Fortunati, L., Eds.; Springer: Cham, Switzerland, 2016.
58. Tay. Available online: https://web.archive.org/web/20160414074049/https://www.tay.ai/ (accessed on 8 May 2018).
59. Mason, P. The racist hijacking of Microsoft's chatbot shows how the internet teems with hate. Available online: https://www.theguardian.com/world/2016/mar/29/microsoft-tay-tweets-antisemitic-racism (accessed on 10 May 2018).
60. Taylor, C. The dialogical self. In *Rethinking Knowledge*; Goodman, R.F., Fisher, W.R., Eds.; State University of New York Press: Albany, NY, USA, 1995.
61. Veruggio, G.; Operto, F.; Bekey, G. Roboethics: Social and ethical implications. In *Springer Handbook of Robotics*; Siciliano, B., Khatib, O., Eds.; Springer International Publishing: Cham, Switzerland, 2016.