Barbara Czarniawska & Bernward Joerges

Robotization - Then and Now

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Front cover: Two figures (1913-14), painting by Liubov Popova

Gothenburg Research Institute
School of Business, Economics and Law
at University of Gothenburg

P.O. Box 600
SE-405 30 Göteborg
Tel: +46 (0)31 - 786 54 13
Fax: +46 (0)31 - 786 56 19

e-mail: gri@gri.gu.se
gri.gu.se / gri-bloggen.se

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Robotization - Then and Now

Barbara Czarniawska
Senior Professor of Management, Gothenburg Research Institute

Bernward Joerges
Professor of Sociology (emeritus), Wissenschaftszentrum Berlin für Sozialforschung (WZB)

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Introduction

Karel Čapek, the Czech author, coined the term "robot" (from "robota", labor in Slavic languages; "robotnik" means "worker") in 1920. In his play, *R.U.R. - Rossum Universal Robots*, artificial humans made of synthetic organic materials were produced and worked in factories and developed lives not very different from those of the people[1].

R.U.R. became a science fiction classic between the wars, and its topics were taken up with great enthusiasm in the 1950s and 1960s. The Cold War found its expression in space competition, among others. Cybernetics and cyborgs seemed to be an inescapable future, initially in space travel, but then in other kinds of industrial production. Already in 1942 Isaac Asimov had formulated his Three Laws of Robotics, meant to constrain humanoid machines to their subordinate place with relation to humans. It was fiction, but has been taken very seriously by AI researchers and others ever since.

When the Iron Curtain fell, space travel lost its attractions, but robots entered production processes in many industries. The end of the 1970s had seen the latest of recurring debates about automation, technological unemployment and deskilling, triggered by Braverman's book (1974), but it had faded out in the 1980s.

Now the debate is back. "Robots could take half of the jobs in Germany" is a typical newspaper's title nowadays. Serious authors write either enthusiastic or dystopic books about robotization (John Searle has recently critically reviewed two from 2014, Floridi's enthusiastic *The Fourth Revolution* and Bostrom's dystopic *Superintelligence*, protesting that computers will never develop a consciousness). Apparently, we are witnessing a "robot revolution" – or so such serious sources as BofA Merill Lynch investigators claim.

In what follows, we first analyze the fears and hopes automation has occasioned, as reflected in popular culture from the coining of the term "robot" to the present media hype. Have such hopes and fears changed, and did the changes reflect actual changes in robotics, or do they remain the same? We limit the scope of our investigation by adopting a definition of robots taken from Danica Kragic, a professor at the Royal Institute of Technology in Stockholm (see e.g. Bütepage and Kragic, 2017): Robots are taken to be machines that possess a physical body and are equipped with sensors and motors/actuators. Artificial Intelligence is a learning software that processes information collected by robot's sensors, thus permitting it to work. In this sense, advanced robots are

[1] Machines doing things existed before, of course (see, e.g., Edgar A. Poe's essay on "Maelzel's Chess Player" from 1836; and more recently Riskin, 2016). But they were not meant to perform actual work.

dependent on AI, but not all AI software serve robots. (Kragic tends to look too far into the future here, however. After all, a great many industrial robots were and are *automatic* robots, operated by simple programs unable to learn. It is mostly now that the number of AI-steered robots, that is, *autonomous* robots, is growing.

We chose to include popular culture in our inquiry because we believe it has more impact on public opinion than social sciences (more on that in the section called "Robotization and popular culture"), but considering the enormity of the material involved (novels, films, comics etc.), we chose only the groundbreaking works, which were undoubtedly popular practically all over the world. Some of them has become widely popular only after having been remade into movies. They all belong to genre known as science fiction, and its close cousin, "speculative fiction"[2].

We begin by tracing down possible sources of the present media hype and of the centrality of robotization in popular culture.

[2] A term allegedly coined by Robert Heinlein (Asimow, 1981) but used to describe works of, e.g., Ursula LeGuin and Margaret Atwood.

1. Robot revolution

Most likely, the media hype took off in the wake of work done by Carl Benedikt Frey and Michael A. Osborne, who, after having organized an Oxford workshop on "Machines and Employment", published 17 September 2013 a report called "The Future of Employment: How Susceptible Are Jobs to Computerisation?" Quoting, among others, Brynjolfson and McAfee´s book from 2011, and McKinsey´s Global Institute Report from 2013 that suggested that sophisticated algorithms can replace something like 140 million knowledge workers, they examined expected impact of computerization on US labor markets.

Having scrutinized the increasing role technology played in economics, they pointed out that the original fears of technological unemployment, such as those formulated by Ricardo in 1819, were exaggerated, because "technological progress has two competing effects on employment" (p.13):

> First, as technology substitutes for labour, there is a destruction effect, requiring workers to reallocate their labour supply; and second, there is a capitalisation effect, as more companies enter industries where productivity is relatively high, leading employment in those industries to expand (ibid).

Until now, they continued, human workers were ahead of machines because of their ability to learn; yet recent developments in AI research suggest that digital machines can surpass human ability to learn. Historically, machines replaced people in manual and routine tasks; at present, they begin to undertake non-routine, cognitive tasks such as car driving. This is possible mostly because "[r] ecent technological breakthroughs are (…) due to efforts to turn non-routine tasks into well-defined problems" (p. 15), which in turn is facilitated by the accessibility of Big Data, and the use of sophisticated algorithms.

Frey and Osborne admitted that their study mainly estimated the destruction effect, but claimed that they also indicated possible fields where capitalization effects may be stronger. Having analyzed 702 occupations, they arrived at the conclusion that 47% of US employment is potentially automatable in a decade or two. Some of these results are not surprising, as the expected growing automation concerns transportation, logistics, production and administrative support (digital bureaucracy is obviously on the rise).

The authors were more surprised seeing a similar trend in services, sales and construction. They also claimed that this wave of automation would be followed by a slowdown, caused by engineering bottlenecks. Jobs requiring superior perception and manipulation will be saved until robotic competence will seriously increase (as we shall see, Neal Stephenson was predicting such an increase in his *Seveneves*, 2015). The most resistant to robotization will be "generalist occupations requiring knowledge of human heuristics, and specialist

occupations involving the development of novel ideas and artifacts" (p.40).

Frey and Osborne also discussed the limitations of their findings. Robotization will proceed when and where cheaper human labor is not available. Regulations and political actions may shape (facilitate or constrain) robotization differently in different places. Finally, they apologized for the use of such vague terms as "in a decade or two", explaining that "making predictions about technological progress is notoriously difficult" (p.43). They quoted Marvin Minsky saying in 1970 that "in from three to eight years we will have a machine with the general intelligence of an average human being". We can add that Hans Moravec claimed in 1988 that in 20 years it will be possible to upload the human brain into a silicon body (Joerges, 1989; apparently, he still says so).

Other reports followed suit. Swedish Stiftelse för strategisk forskning (Foundation for Strategic Research) asked economist Stefan Fölster (2014) to apply Frey and Osborne´s method to Swedish data including 109 occupations. The results indicated that 53% of Swedish employment might be automated in the next two decades, partly because Sweden has many industrial jobs that haven´t been robotized. Least threatened appeared foresters, priests and specialized teachers; most threatened were cashiers, sellers and machine operators (also photo models, but there are not so many of those jobs). In contrast to many works of popular fiction, police workers are unlikely to be replaced by robots, whereas book keepers and economists in general are very likely (46%) to be replaced. Additionally, and quite in agreement with Frey and Osborne´s list of limitations, Swedish economic reforms kept unemployment at bay, as it also happened in Germany and Switzerland, but not in Italy or France, according to Fölster.

Brito and Curl from the James A. Baker III Institute for Public Policy at Rice University published their report ("Turing Robots: Income Inequality and Social Mobility") on 18 February, 2015, acknowledging both the impact of Frey and Osborne's report and of Brynjolfsson and McAfee's book, but their data were mostly taken from Piketty (2014). The ground for their work was an observation that in 1970, the top 10 percent of the population earned 32 percent of labor income; in 2012, they earned 47 percent – a change that the authors attributed to automation. Their interpretation goes against the optimist one, which sees automation as creative destruction that will lead to new jobs.

> The machine age replaced muscle power with machines. However, until 1980 machines still needed human brains to operate and guide them, and the total numbers of jobs increased with growing production. *The second machine age is replacing human brains in tasks that can be reduced to an algorithm. It will be difficult to replace the jobs lost to computers* (Brito and Curl, 2015: 4, italics in original).

They defined "robots" as "Turing robots" (an automation technology that displaces a human worker), suggesting that they meant autonomous, and not only automated robots. Comparing the growth in Turing robots to the growing inequality of incomes, they conclude that if the number of robots increases at the same pace as at present, by 204, the top 10 percent of the population will be earning 130 percent more that the remaining 90 percent. The only good thing about it, in the opinion of the authors, is that the "demographic problem of too few young workers to support the elderly will be solved" (ibid).

The jobs that remain with humans will be those computers cannot do, i.e., tasks requiring skills relatively scarce among humans, and yet common enough to employ a significant part of the population. As to income inequality, a substantial retribution for the unemployed masses – most likely in the form of transfer payments – will be necessary to resolve it.

The authors ended their report in a similar vein as Frey and Osborne, by saying that an unpredictable technological change may turn their predictions upside down, but that "work and education are essential to maintaining a healthy society, and this will not change (p. 36).

While Brito and Curl's text is actually presented as a research paper, the Bank of America Merrill Lynch "Robot Revolution – Global Robot & AI Primer" (16 December 2015) is a report on reports: thus the "primer" in the title. Compiled by three "Equity Strategists" from UK (Beija Ma, Sarbjit Nahal and Felix Tran), it contains a review of most relevant reports on the theme until 2015.

In the opinion of the analysts, by 2025 robots will be performing 45 percent of manufacturing tasks (10 percent at the time of writing the report). Such adoption of robots can boost productivity in many industries by 30 percent, while cutting the production costs by 18-33 percent (observe the uncertain estimate). The authors agreed with the previous reports both as to the displacement of human labor and growth in inequality. They admitted problems related to cybersecurity, privacy, and possible "killer robots". Nevertheless, as is their interest as bank employees, they indicated eight (quite redundant) areas of importance to investors:

- AI (machine learning, elaboration of Big Data). "There is a 50% chance of full AI (high-level machine-learning) by 2040-50E and a 90% chance by 2075E according to AI researchers" (p.4).
- Industry (automation, industrial internet, robots). "There is huge scope for growth with robot penetration in industry at only 66 robots per 10,000 workers worldwide"[3] (p. 5, with huge differences between countries, with Japan in the lead).
- Autos & transport (autonomous vehicles). "Currently, only the US, the

[3] One could wonder how they counted robots. Obviously, all such predictions are highly speculative.

UK, Japan, Germany, France, Sweden and Singapore have permitted testing of AVs. An insurance framework needs to be developed addressing responsibility for collisions" (p.6).

- Aerospace and defense (unmanned systems, military drones, robots and AI). "Stakeholders, including experts in AI, lawyers and activists are also expressing growing concern that growing reliance on cheap drones, the lack of human control and unpredictable/"stupid" AI could pose a "killer robots" threat, as expressed at an October 2015 UN conference" (p.7).
- Finance (robo-advisors, AI & robo-analysts, automated trading systems). "Robots and automated systems will complement rather than replace humans in financial services in our view". 43 % of executives in finance believed that technology complicates communication, creating errors (vide bear market during the financial crisis or Flash Crash caused by error in robotrading), p.8.
- Healthcare (medical robots, computer-assisted surgery, care-bots). Global ageing and increasing per capita expenditures in Emerging Markets countries will drive growth in this area. "Japan is leading the way with one-third of the government budget on robots devoted to the elderly" (p. 9).
- Service (care-bots, companions, domestic help, education, entertainment, security). In the USA, household robots sell most, followed by toy robots. Next fast growth areas include assistance for elderly and disabled, and personal security and surveillance (p. 10).
- Agriculture (agribots, drones, unmanned aerial vehicles). "Up to 80% of the commercial market for drones could eventually be dedicated to agriculture" (p.11).

The summary of various reports ends with a note on analysts' surprise concerning weak predictions for robotization of mining industries.

In December 2016, the Executive Office of the US President (Barak Obama) published a report called "Artificial Intelligence, Automation, and the Economy". It starts with a statement that the AI-driven automation has great potential economic benefits, but such benefits will not necessarily be evenly distributed throughout society. Like ourselves, the authors of the report compare "then" – the 19th century – with "now" – the late 20th century. The automation of this first époque raised the productivity of lower-skilled workers. The present automation raised the productivity of higher-skilled workers, threatening all routine-intensive occupations. The future is hard to predict, as "AI is not a single technology, but rather a collection of technologies" (p.2). The authors agreed with Frey and Osborne, who are among studies quoted. Also, it seems that the trend that began in the 20th century continues: "Research continuously finds that the jobs that are threatened by automation are highly concentrated among lower-paid, lower-skilled, and less-educated workers" (ibid.). Yet "[t]echnology

is not destiny; economic incentives and public policy can play a significant role in shaping the direction and the effects of technological change" (p.3). The report suggests three strategies: 1) investing in the fields where AI is undoubtedly beneficial (like cyberdefense and the detection of fraudulent transactions and messages); 2) preparing US citizens for the necessity of continuous education, and 3) helping workers in transition, modernizing the social safety net. It ends with the following paragraph:

> If job displacements from AI are considerably beyond the patterns of technological change previously observed in economic history, a more aggressive policy response would likely be needed, with policymakers potentially exploring countervailing job creation strategies, new training supports, a more robust safety net, or additional strategies to combat inequality. (p.42)

The very last sentence suggests that it is unlikely that these conclusions will be adopted by the present Office of the President.

There were also many surveys, for example PewResearchCenter's "AI, Robotics, and the Future of Jobs" (6 August 2014), Edge's "What Do You Think About Machines That Think?" (26 January 2015), and the World Economic Forum's "The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution" (18 January 2016). The Preface to the latter ends with a sentence that well summarizes the conclusions from other surveys: "The current technological revolution need not become a race between humans and machines but rather an opportunity for work to truly become a channel through which people recognize their full potential". In all surveys, the respondents were neatly divided between the two opinions.

PewResearchCenter's collaborators Aaron Smith and Janna Anderson (2014) summarized the key findings of their survey – in which 1,896 experts[4] responded to the question formulated as follows: "The economic impact of robotic advances and AI, Self-driving cars, intelligent digital agents that can act for you, and robots are advancing rapidly. Will networked, automated, artificial intelligence (AI) applications and robotic devices have displaced more jobs than they have created by 2025?"

Key themes: reasons to be hopeful

1. Advances in technology may displace certain types of work, but historically they have been a net creator of jobs.
2. We will adapt to these changes by inventing entirely new types of work, and by taking advantage of uniquely human capabilities.

[4] Most of whom (84%) were from North America.

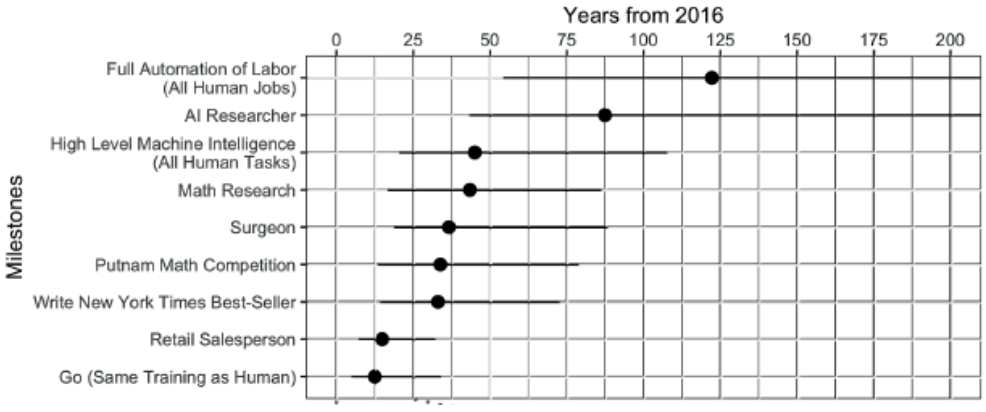
3. Technology will free us from day-to-day drudgery, and allow us to define our relationship with "work" in a more positive and socially beneficial way.
4. Ultimately, we as a society control our own destiny through the choices we make.

Key themes: reasons to be concerned

1. Impacts from automation have thus far impacted mostly blue-collar employment; the coming wave of innovation threatens to upend white-collar work as well.
2. Certain highly-skilled workers will succeed wildly in this new environment – but far more may be displaced into lower paying service industry jobs at best, or permanent unemployment at worst.
3. Our educational system is not adequately preparing us for work of the future, and our political and economic institutions are poorly equipped to handle these hard choices (p.4).

The proportion was as follows: 52 percent were of the opinion that the hopes prevail, 48 percent that the fears will win. We can expect a similar distribution of hopes and fears in the material we analyzed, but are the hopes and the fears the same across time? Perhaps proportions will change according to actual developments. The Future of Humanity Institute at Oxford University has made very concrete predictions, for instance, based on a survey of AI experts (Grace et al., 2017, p.3):

Table 1: When will robots replace people at work?



While predictions continue to be made, they also constantly change. We shall return to this issue in the part concerning media. Now, however, excursions into (science) fiction.

2. Robotization and popular culture

No wonder that the topic of robotization, and related themes such as space travels, constantly return to popular culture. And as popular culture both reflects and shapes social life – including work organization and management – it would be instructive to follow changes in the representation of robots and robotization over time. Robotization can revolutionize labor markets (in particular, according to current debates, robots can replace immigrants in menial jobs...), or else can occur as a stepwise transformation with complex effects, like it was the case of computerization.

The claim that there is a dynamic circular relationship between culture and other fields of social endeavor is not new. As shown by Czarniawska and Rhodes (2006), this relationship is especially obvious with respect to popular culture. They claimed that, in the first place, mass culture fulfills the same functions as high culture – on a larger scale. It does so not only in the sense that it reaches "the people", but also in the sense that it popularizes high culture. It perpetuates and modernizes myths, sagas, and folktales. In doing so, popular culture might caricature or flatten high culture and mythology, or even criticize and ridicule them. What is important is that popular culture reaches more people, more quickly.

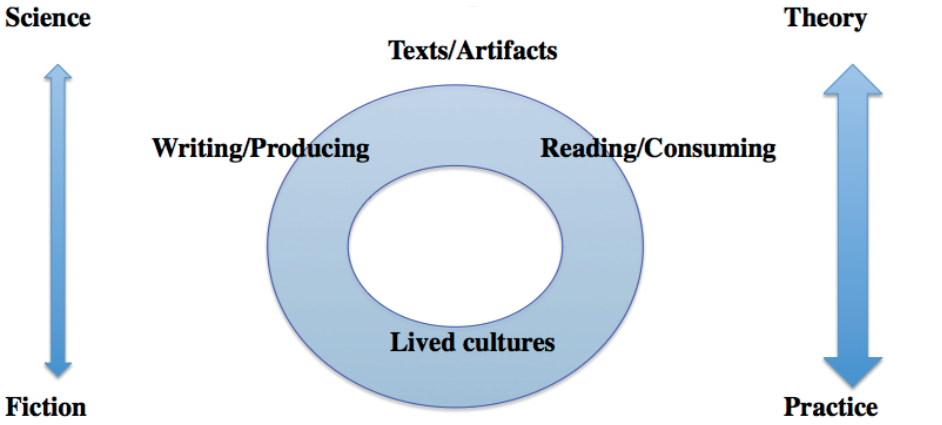
Secondly, popular culture, apart from portraying its own era, also perpetuates various strong plots, known from mythologies (Greek and Judeo-Christian in case of western management), classic drama and folk tales. It renders plots from Greek dramas, Shakespeare, and the Bible simple and familiar. Emplotment, as Hayden White (1998) pointed out, is not only a question of form; indeed, the form carries a content, or the medium is the message. The re-use of strong plots might be a matter of convention, of lack of imagination, of literary conservatism, and so forth, but it still offers a blueprint for the management of meaning, so central to the practice of organizing.

Thirdly, popular culture propagates the ideas of its times, but also represents practices. It needs to be emphasized that those ideas and those practices might be good or bad, in both a moral and an aesthetic sense. Popular culture shows how to be a hero, but also how to be a villain. Swedish journalists made a documentary about young mafia criminals, revealing, that one of the young gangsters knew by heart all of Al Pacino's lines from Brian De Palma's movie Scarface (Liljefors and Sundgren, 2003). Both Sicilian and US mafiosi took their cues from movies, first from *The Godfather* and then from *Scarface* (Varese, 2004). Thus popular culture not only represents, in the sense of mirroring; it also invents. The practices represented may be as reported, but they may also be imaginary. Yet while abstract models cannot teach people what to say or how to act during a first management meeting, a movie might.

This stance is close to the so-called circuit model of culture (Johnson, 1986–87), which postulates that production, circulation and consumption of cultural products constitute a loop, not a line. There is no border between inscribed cultures (texts, objects) and lived cultures, between science and fiction, between theory and practice. Texts are read; artifacts are consumed but also interpreted. Ideas shape practices, and practice gives rise to new ideas. Science feeds fiction, but fiction may guide scientific endeavors.

The circuit model can be illustrated schematically by the following figure.

Figure 1: A circuit of culture. Based on Johnson, 1986–7



Science and fiction, theory and practice are extremes on the same dimension, rather than opposites. Acts of writing, and producing, have their origins in lived culture, but transform it into texts and other artifacts. These, in turn, become read or consumed, and in this way re-enter the living culture. Further, expression becomes control, as popular culture selects and reinforces certain wishes and anxieties of its audience (Traube, 1992): control provokes further expression, both of submission and of resistance.

This leads us to an additional, fourth claim: that popular culture not only transmits ideas and furnishes descriptions, but also actively teaches practices and provides templates for interpretation of the world (Czarniawska, 2010). In short, mirroring and projection, expression and construction, imitation and creation are never separate. A manager might read a detective story or watch a Hollywood movie for amusement, but might also learn from them about actual or invented practices; and might imitate them, without explicit reflection. When unexpected events happen at a workplace, people examine their common repertoires of plots for the ways of emplotting them, and thus making sense of that which does not make sense. Some might read the Bible, Shakespeare or Euripides, but most of them will read a newspaper or watch a TV series. Was Wall Street, as we

know it from the first Oliver Stone's movie (1987), like Wall Street before the movie was made? Apparently, Wall Street traders began wearing suspenders only after movie. Were suspenders the only things they imitated? "Representations of fictional bankers influence the behaviour and attitudes of 'real' bankers", noted Linda McDowell (1997: 39-40). Therefore, is more likely that the public opinion on dangers and promises of robotization is more profoundly shaped by the products of popular culture than by the BofA reports.

The connection between popular culture and industrial practices functions was noticed in accounting as early as the 1930s (Coleman, 1936). William H. Whyte dedicated two chapters of *The Organization Man* (1956) to "the organization man in fiction". There he traced representations of his eponymous organization man in fictional stories from the cinema, novels and popular magazines. Whyte believed that popular fiction could be read to gain "an index of changes in popular belief" (p. 231). Yet it is only since the 1990s that this relationship has been studied systematically.

Martin Parker and his colleagues (Parker et al., 1999) edited a special issue of *Organization* dedicated to science fiction. Their idea was not "to add science fiction to the list of things that might be 'useful' for management, but instead to try to disturb the discipline itself" (579-580). This task may prove difficult, however, because, as the authors immediately acknowledged, there is a great deal of science fiction in management practice already. Indeed, the corroborating studies continue to accumulate: from the "eternal myth of technology" (Eriksson-Zetterquist, 2008), through "strategic planning scenarios" (Greenman, 2008) to various accounts of "cyborgization" (Parker, 1998; Czarniawska and Gustavsson, 2008; Czarniawska, 2012). The message of this special issue has been that organization theory can learn from science fiction in the matters of reporting and reflecting about actual and possible practices – a theme later raised by Rhodes and Brown (2005). David Metz (2003) has suggested that science fiction offers identity models to the incumbents of new jobs and occupations – information technology freelancers and various temporary workers, for instance. Brian Bloomfield (2003) saw science fiction as a template for making sense of the relationships between human beings and advanced technologies. And as Katherine N. Hayles had suggested, "visions of the future, especially in technologically advanced areas, can dramatically affect present developments" (2005: 131).

The variety of the examples quoted may raise the question of what is meant by "popular culture" in this text. As an attempt to delineate (rather than to define), we include what follows: popular literature (novels that stand on the shelf called 'Fiction', and not 'Literature' in English bookstores), films, TV series, cartoons, and journalists' tales. After all, lines between high and low culture are judgmental, political and arbitrary (Street, 1997). As a result, they can also be destabilized. Additionally, contemporary mass culture has a tendency to appropriate "high" cultural forms (Traube, 1992: 76); much as high culture appropriated older folk culture forms (of which opera and folk tales are the best examples).

3. Robots in popular culture

As mentioned earlier, choosing works of popular culture presenting robots we used a simplified definition of the term, but applied by robotics scientists as well, thus permitting us to limit an extremely vast material,

Accordingly, to repeat, robots are taken to be physical bodies endowed with sensors for collecting information about the outside world and with activators permitting to affect changes in it. Artificial Intelligence is meant to be an advanced software that permits robots to fulfil their tasks by processing large amounts of information collected by robot's sensory systems and by controlling their motor systems.

Applying this frame, we choose twelve works of science fiction beginning with Čapek's classic *R.U.R.*, considered by the critics and by the general public as well to be truly popular in their time.

3.1. Rossum's Universal Robots (R.U.R. 1920)

R.U.R. is a comedy play by the Czech author Karel Čapek, who very probably meant it as an allegory of the fate of workers in the contemporary world, and did not expect it to launch the term "robot" into English and then into other languages. As pointed out by many commentators, among them Dennis G. Jerz, "(a)lthough the term today conjures up images of clanking metal contraptions, Čapek's Robots (...) are more accurately the product of what we would now call genetic engineering."[5] Indeed, Philip K. Dick (1995: 211) went to great lengths to explain that his androids or replicants in *Blade Runner* were not robots, as they were made with the specific purpose of imitating humans – but so were Čapek's robots. Dick's point was that although the border between mechanized humans (cyborgs) and humanized machines might be almost non-existent, its crossing carried an enormous symbolic meaning. As our examples will show, he was right. It is this blurring of borders that continues to provoke most reactions. This is why, in what follows, we treat as "robots" all things – organic and nonorganic – that were *made* in order to work.

As to Čapek, he consistently ignored the difference between organic and mechanic[6], or rather made it one of the main points of his comedy. "Old Rossum", the father, found the way of creating life; as Čapek explained in a later interview:

[5] http://jerz.setonhill.edu/resources/rur/template.htm, accessed 2016-06-09

[6] One explanation is that, as DNA was unknown at the time, the idea that organisms are machines assembled in a special way could have been considered. The differences between humans and non-humans was the "soul".

> For instance, he could have created a jellyfish with a Socratic brain or a one-hundred-fifty-foot worm. But because he hadn't a shred of humor about it, he took into his head to create an ordinary vertebrate, possibly a human being (1990: 38[7]).

It was his son, an engineer, "who had an idea to create living and intelligent labor machines from this mess" (p. 39). "When he took a look at human anatomy he saw immediately that it was too complex and that a good engineer could simplify it." (p.40). And later:

> FABRY [technical director]: One Robot can do the work of two-and half human laborers. The human machine (…) was hopelessly imperfect. It needed to be done away with once and for all.
> BUSMAN [marketing director]: It was too costly.
> FABRY: It was less then efficient. It couldn't keep up with modern technology (p.49).

The readers learn all this together with Helena, a daughter of the President, who came to visit Rossum's Universal Robots (the name of the factory is in English, suggesting an international company). The General Director, Domin, asks her, what is the best kind of worker? Honest and dedicated, she answers. No, the cheapest, he corrects her. And gives the examples of work best done by Robots, which reads like a quote from the reports discussed in the previous section: street cleaners, bricklayers, accountants, secretaries, all kinds of office staff, factory workers, agriculture workers, miners. Čapek maliciously adds one more occupation to this list:

> If one read them the Encyclopedia Britannica they could repeat everything back in order, but they never think up anything original. They'd make fine university professors (p.45).

Helena came to *R.U.R.* under the pretext of learning about the production of robots, but actually she wanted to ignite a robot revolt. She botched her task immediately, taking robots for people, and people for robots (directors are never Robots!). Instead of starting the revolution, she marries Domin and stays at *R.U.R.* Perhaps she becomes convinced by the ideology presented to her by the directors:

> DOMIN: … within the next ten years Rossum's Universal Robots will produce so much wheat, so much cloth, so much everything that things will no longer have any value. Everyone will be able to take as much as he needs. There'll be no poverty. Yes, people will be out of work, but

[7] In what follows we are quoting the version of the play to be found in *Toward the Radical Center: A Karel Čapek Reader*, 1990.

> by then there'll be no work left to be done. Everything will be done by living machines. People will do only what they enjoy. They will live only to perfect themselves. (…)
>
> But before that some awful things may happen (…) That just can't be avoided. But then the subjugation of man by man and the slavery of man to matter will cease. Never again will anyone pay for his bread with hatred and his life. There'll be no more laborers, no more secretaries. No one will have to mine coal or slave over someone else's machines. No longer will man need to destroy his soul doing work that he hates (p.52).

This sermon seems to be inspired by Marx, with a note of doom that will resonate in the report by Brito and Curl (2014). Čapek himself, asked about his opinion, suggested that the play is about a conflict between different ideologies, not between humans and robots:

> General Director Domin shows in the play that the development of technology frees man from heavy physical labor, and he is right. Alquist [another director], with his Tolstoyan outlook, believes that technology demoralizes man, and I think he is right, too. Busman [yet another director] believes that only industrialism is capable of meeting modern needs, and he is right. Helena instinctively fears all these human machinations, and she is quite right. Finally, the robots themselves revolt against all these idealists, and it seems they are right, too (1990: 31).

Indeed, Robots truly revolt – ten years after Helena married Domin. Not that those ten years were peaceful: Workers revolted against the Robots, so other people gave the Robots weapons to defend themselves, which led to great many deaths, after which governments started using Robots as soldiers, which led to many wars. But according to Domin, this was a price of the transition to a new system. And even at the moment when the directors and Helena are surrounded by the revolting Robots, Domin still defends his dream of liberating humans from drudgery, while Alquist, "clerk of the works", points out that this dream wasn't shared either by young Rossum, who wanted to become rich, or the shareholders, who wanted dividends. "And on those dividends humanity will perish" (p.84).

Turns out that the Robot revolt has been caused by Dr. Gall who, convinced by Helena, made them human by giving them soul. Helena thought that in this way the Robots would feel sympathy and compassion towards the humans, whereas, Domin claims, that is exactly what made them to hate humans: "No one can hate more than man hates man!"[8]

[8] It should be added that in Czech original Čapek does not speak of "men" but of "human beings" (člověk); a noun that has a male grammatical gender but is not associated with men only.

The managers believe that offering the revolting Robots the original papers of old Rossman that explain how they are done may save their lives, but it turns out that Helena has already burned them. Busman (an obvious allusion to businessman) believes the Robots can be bought with money, but he dies electrocuted. Robots enter the place of directors, and their leader gives a speech obviously paroding Lenin: "Robots of the world! (…) The age of mankind is over! A new world has begun! The rule of Robots!" (p.100) There is even a Central Committee of Robots; its representatives inform Alquist, the only surviving human being, what they have learned from books: "You have to kill and rule if you want to be like people! (…) You have to conquer and murder if you want to be people" (p.104).

In the last act of the play, when it becomes known that Rossum's papers are lost and Alquist is not able to re-discover the secret behind the production of robots, love conquers all and a pair of Robots, Helena ("a robotess") and Primus, are going to retire to a cozy cottage with a garden where cute dogs are playing, and, according to Alquist, to become a new Adam and Eve. No technical details are given, and, in general, a bitter comedy changes into a sentimental melodrama[9].

While the play was undoubtedly a great success in its time, critical receptions differed. According to Luciano Floridi, "Philosophically rich and controversial, R.U.R was unanimously acknowledged as a masterpiece from its first appearance, and has become a classic of technologically dystopian literature" (2002: 207). According to Isaac Asimov, Čapek's play was "…a terribly bad one, but is immortal for that one word. It contributed the word 'robot' not only to English but, through English, to all the languages in which science fiction is now written" (1979/1981: 67). At any rate, it is easy to agree with Arthur Miller, who in his commentary in *Čapek's Reader* said: "We have evolved into his nightmare. In our time his Faustian conviction that nothing is impossible makes him very nearly a realist" (1990: vi).

3.2. I, Robot (Isaac Asimov, 1950)

The Three Laws of Robotics:

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Handbook of Robotics, 56th Edition, 2058 A.D. (Asimov, 1950: 8)

[9] Much, it seems to us, like in *Blade Runner 2049*...

Asimov had hinted and even explicitly written about "laws of robotics" in his short stories from the 1940s, but the laws became generally known and cited after he put those stories together in the book *I, Robot* in 1950. Stories became chapters put in a chronological order (where the chronology was dictated by the plot, not by Asimov's writing order), and were held together by an interview conducted with one Susan Calvin, retiring at the age of 75 from her position as a robopsychologist at US Robot and Mechanical Men, Inc., in 2057. At that time, Dr. Calvin was, in the eye of the public, the most important Representative of US Robot, and its leading mind.

In the stories that follow, Asimov mostly played with paradoxical situations in which the three laws can get in conflict with one another. As a result, robots go crazy, walk in circles, become religious fanatics, etc. The aim of the stories is not to offer realistic predictions; but in their development, Asimov now and then mentioned exactly the hopes and fears typical for the time in which he was writing. Setting a woman in such an elevated position was a provocative move, though.

Susan Calvin begins her answers to the journalist's questions by pointing out their age difference of 42 years:

> 'There was a time when humanity faced the universe alone and without a friend. Now he has creatures to help him; stronger creatures than himself, more faithful, more useful, and absolutely devoted to him. Mankind is no longer alone. (…) To you, a robot is a robot. Gears and metal, electricity and positrons. – Mind and iron! Human-made! If necessary, human-destroyed! But you haven't worked with them (…) They are a cleaner, better breed than we are' (p. 11).

These, it seems, were the main hopes: humans no longer alone in the frightening universe. But the primary task of robots was to work; so "[t]he labor unions, of course, naturally opposed robot competition for human jobs, and various segments of religious opinion had their superstitious objections" (p. 12), continued Calvin.

The fears gave rise to serious counter-actions. "New York has just passed an ordinance keeping all robots off the streets between sunset and sunrise" (p. 22). There were periods when fears were winning over hopes: "Most of the world governments banned robot use on Earth for any purpose other than scientific research between 2003 and 2007" (p.36) Later, the use of robots with positronic brains was to be limited to interstellar activities only. There was something like "anti-robot propaganda" (p. 109) that increased with each progress in robot

sophistication[10]. The robot makers fought against it, and one of their moves consisted in building into robots a slave mentality. They addressed people as "Master", and they wouldn't move unless a human was sitting on their shoulders (pp. 42-43). Perhaps in the same vain, when interrogating robots, Susan Calvin and her colleague addressed them as "boy", the same way the representatives of the British Empire did in the colonies[11].

This cannot be explained by robots' miniature stature, because, in general, Asimov's robots were big:

> It was not over-massive by any means, in spite of its construction as thinking-unit of an integrated seven-unit robot team. It was seven feet tall, and a half-ton of metal and electricity. A lot? Not when that half-ton has to be a mass of condensers, circuits, relays, and vacuum cells that can handle practically any psychological reaction known to humans. And a positronic brain, which with ten pounds of matter and a few quintillions of positrons runs the whole show (p.85).

Massive, but then it is enough to remember how enormous the first computers were. As to the positronic brain, according to Wikipedia, the positron – an antimatter counterpart of the electron – was newly discovered at the time of the writing, so the word made the stories sound more scientific[12]. And the robots are replicants, if made mostly of metal and not organic material. Mostly, because:

> 'By using human ova and hormone control, one can grow human flesh and skin over a skeleton of porous silicone plastics that would defy external examination[13]. The eyes, the hair, the skin would be really human, not humanoid. And if you put a positronic brain and such other gadgets as you may desire inside, you have a humanoid robot' (p. 206).

What was the difference? Čapek's robots didn't have soul; Asimov's robots didn't have free will, which, by that time, was the definition of humanity (to be replaced by consciousness later on). They did have things like "a personal

[10] Here Asimov couldn't resist a poke in the direction of the media: "The Machines are not super-brains in the Sunday supplement sense – although they are so pictured in the Sunday supplements" (p.226).

[11] Though in a later story, Calvin explains that "The Brain" (the biggest they built yet) has a personality of a child or an idiot savant (p.166). In general, Asimov's robots are not very mature, though sometimes they get the idea of being cleverer than the people.

[12] https://en.wikipedia.org/wiki/Positronic_brain, accessed 2016-07-26.

[13] This is roughly how Alicia Wikander, that is, Ava, was constructed in *Ex Machina* (2015).

initiative hookup" (p.94) and other psychological circuits. The three laws of robotics were inbuilt in their brains and ruled their moral judgments.

What jobs did they do? Industrial manufacturing, mining, running space devices, etc., but already in the first story the reader meets a robot who was a nursemaid, preferred by the child to a dog she was offered. The idea of robots employed in the care is apparently quite old. But what to say about a possibility of a robot becoming a district attorney, and running for the office of a mayor of an important city (hiding his robot identity, of course)? Those who suspected the candidate of being a robot ("He is almost too human to be credible", p.200) demanded a test. It was not a Turing-type of a test, though: The candidate was expected to eat in public. He eats an apple, but that proves nothing; he is to be x-rayed. He turns out to be x-ray protected: Because he is a robot, or because he is a lawyer defending human rights? Whichever it was, in the eyes of Susan Calvin it was a positive trait. This is what she says to the journalist:

> You share a prejudice against robots which is quite unreasoning. He was a very good Mayor; five years later he did become Regional Co-ordinator. And when the Regions of Earth formed their Federation in 2044, he became the first World Co-ordinator. By that time, it was the Machines that were running the world anyway. (p.220)

The anti-robot movement "Society for Humanity" tried to disturb this smooth functioning, but the World Co-ordinator knew how to deal with it. And this is what he said to Susan:

> Every period of human development, Susan (…) has had its own particular type of human conflict – its own variety of problem that, apparently, could be settled only by force. And each time, frustratingly enough, force never really settled the problem. Instead, it persisted through a series of conflicts, then vanished to itself (…), as the economic and social environment changed. And then, new problems, and a new series of wars. – Apparently endlessly cyclic. (p.223)

The Co-ordinator then presents a historical analysis of events from the 16th century on, but what the uncanny similarity of his speech to a recent blog by the archaeologist Toby Stone is striking:

> ... we humans have a habit of going into phases of mass destruction, generally self imposed to some extent or another. (…) At a local level in time people think things are fine, then things rapidly spiral out of control until they become unstoppable, and we wreak massive destruction on ourselves. For the people living in the midst of this it is hard to see happening and hard to understand. To historians later it all makes sense and we see clearly how one thing led to another. (…)

> My point is that this is a cycle. It happens again and again, but as most people only have a 50–100 years historical perspective they don't see that it's happening again. (…) A little thing leads to an unstoppable destruction that could have been prevented if you'd listened and thought a bit. But people smoke, and people die from it. That is the way of the human.
>
> So I feel it's all inevitable. I don't know what it will be, but we are entering a bad phase. It will be unpleasant for those living through it, maybe even will unravel into being hellish and beyond imagination. Humans will come out the other side, recover, and move on[14].

So perhaps it would be better if Machines run our world? The question is, of course, what is cyclical?: the events, the doomsday predictions or both? The cultural circuit theory would vote for the latter.

Were Asimov's opinions shared in his time? An interesting comparison could be made with the 1952 book by John Diebold[15], *Automation: The Advent of Automatic Factory*. The author did not quote Asimov, but began his analysis of hopes and fears related to an automated factory by recalling *Frankenstein* (1818), the film *Der Golem* (1915) and *R.U.R.* (1921). What worried him was that the science writers (Norbert Wiener was his main target) with their "perverse" interpretations made people to confuse fiction with facts.

> Currently the subject [of robots, machines who look and act like humans] is enormously popular, and the pseudo-scientific language in which today's stories are told, when coupled with the animal-machine analogy of the Norbert Wiener school, surrounds the whole with the area of reality. (…)
>
> The accounts that describe the new machines in human terms neglect one very important fact. *Free will*, the essential human quality, is absent from all of these machines. In no way can this quality be attributed to any machine yet developed, nor is there any indication that any such machine *could* be developed (pp. 154-155).

Even if it was possible, Diebold continued, there will be both moral and economic problems to consider. It is true that humans are very inefficient in performing simple, mechanical, repetitive tasks. "How much better to build machines which could perform these tasks without having the added ability to play games of chess, to walk, to solve difficult problems and to communicate with others" (p.156).

We know now that he was wrong on that last point, but his further analysis of the consequences of automation of industrial production could have been written

[14] https://medium.com/@theonlytoby/history-tells-us-what-will-happen-next-with-brexit-trump-a3fefd154714#.vwqv11fxq, accessed 2016-07-27.

[15] Who claimed to have invented the neologism "automation", as "automatization" was too awkward (p. ix).

today. He protested Wiener's idea that automation would cause unemployment, but did agree with him that simple, repetitive tasks are degrading to human dignity. Machines do not debase the workers, they free them for other tasks. It is, however, possible, that automation will impact human jobs, not only machines, and here again Diebold took examples from popular culture: the film *A Nous la Liberté* by René Clair (1931) and Charlie Chaplin's *Modern Times* (1936). But the automated factory will remove, not aggravate this problem: the jobs will be upgraded (up to a point; a maintenance mechanic will not become an engineer).

Yet another problem is leisure: will people really need it? (He meant a leisure produced by a change from twelve hours of work a day for seven days a week to eight hours a day for five days a week). The solution would be to teach people some sensible types of leisure occupation.

Diebold continued to analyze the effects of automation in the light of a changing U.S. population, of the Cold War race, of introducing automation in underdeveloped areas and of its effect on trade. He ended his book with a whole series of questions, and concluded as follows:

> Automation, however beneficial, will raise very real problems for the human race (…)
>
> But, these problems are not altogether new. Just as automation is part of a longer continuum, so too the problems which automation will raise have been with us, in varying forms, for many years. Some of these problems seem to solve themselves, while others require a conscious effort for solution. (…) For it is indeed hard to provide a society in which increased material welfare truly benefits man rather than cheapens him. (p.175)

The solutions (in Diebeld's view "strong moral leadership and men of good") seem to be as stable as the problems, and mostly ineffective. An inevitable cycle indeed?

3.3. Player Piano (Kurt Vonnegut, 1952)

> I was working for General Electric at the time, right after World War Two, and I saw a milling machine for cutting the rotors on jet engines, gas turbines. This was a very expensive thing for a machinist to do, to cut what is essentially one of those Brancusi forms. So they had a computer-operated milling machine built to cut the blades, and I was fascinated by that. This was in 1949 and the guys who were working on it were foreseeing all sorts of machines being run by little boxes and punched cards. *Player Piano* was my response to the implications of having everything run by little boxes. The idea of doing that, you know, made sense, perfect sense.

> To have a little clicking box make all the decisions wasn't a vicious thing to do. But it was too bad for the human beings who got their dignity from their jobs[16].

In the rest of the interview, Vonnegut said that science fiction seemed the best way to write about it, as the General Electric Company was science fiction. But *Player Piano* is in the first place a stinging satire on corporate life. Also, somewhat inspired by Aldous Huxley's *Brave New World*, the novel paints a dystopic future of mechanized consumerist society.

The main protagonist is engineer Dr. Paul Proteus[17], who is employed by the Ilium Works. Proteus lives in the not-too-distant future, in the aftermath of the WWII, which had given birth to a massive mechanization of the entire country. His father had pioneered the birth of this society, and Proteus is following in his footsteps as a top manager in a plant in Ilium, a futuristic town north of New York modelled after GE's Schenectady. Gradually, Proteus becomes dissatisfied with his work and finally drops out to take part in a Luddite rebellion against the domination of society by a system that progressively substitutes human work with machines.

Ilium is divided in three parts. One is Ilium Works where machines have taken basically all jobs, both mechanical and cognitive, in the production of goods. The second is the area where the small group of engineers and managers live. These persons have been chosen by EPICAC XIV, a giant central computer housed in a faraway cavern, as the most intelligent part of the population for the ongoing design, redesign and management of the machine population. The third is Homestead, an area across the river where the rest of the population lives. The Homesteaders have lost their jobs and are dumped in the Reconstruction and Reclamation Corps (so-called Reeks and Wrecks) or the Army, both public organizations applying a kind of work therapy. The rather meandering plots of the novel can be summarized as follows:

Early on, Dr. Ewing J. Halyard of the State Department shows around and explains the Ilium Works to a foreign visitor, the Shah of Bratpuhr, who represents a colonial periphery dominated by the USA. Every citizen, points out Halyard, who cannot do a job better than a machine, is relegated to Reeks and

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[16] http://scrapsfromtheloft.com/2016/10/04/kurt-vonnegut-playboy-interview/, accessed 2018-01-05.

[17] The critics considered a possibility that Vonnegut alluded to the mythological Proteus, but the most convincing guess is that Proteus was the middle name of the legendary GE engineer, Charles Proteus Steinmetz (http://blogs.smithsonianmag.com/history/2011/08/charles-proteus-steinmetz-the-wizard-of-schenectady/, accessed 2018-01-05). At present, there exists a Proteus software.

Wrecks. The Shah initially interprets this as communism, but later as a society of slaves, failing to comprehend Halyard's concept of a "citizen". The Shah is depicted throughout as "crazy as a bedbug", devoted to drink, and utterly ridiculous (though in the end revealing and wise) in his commentary on America.

Proteus buys an old car at Homestead, a first act of rebellion against the machine and class order. He returns home to his wife Anita, when Finnerty – a previously important but failed member of Ilium's engineering and management elite – arrives.

Proteus goes back to his office at Ilium Works but discovers that Finnerty has stolen the gas and a gun from his car. Yet Finnerty visits Proteus in his office and later lures him to a bar in Homestead. They observe a huge, colorful carnival taking place, the first sign of a rising popular movement.

Proteus returns to work hangovered, and discovers that his job has been taken over by his competitors. All kinds of rumors about him are being spread. The police want to question him about the gun, and Anita has redecorated their home in colonial style. Things start looking shaky in other parts of Ilium and at the upper echelons of the system.

In the meantime, Halyard shows the Shah around the massive EPICAC XIV, the remote computer that calculates and controls all variables of the economy, making production and personnel decisions at all levels of the system. President Jonathan Lynn, an ex-reality television actor and ceremonial figurehead of the state, unveils its newest version.

Proteus starts planning his exit from Ilium: He is going to buy and restore an old house and farm, and to live a self-supporting life, reviving agriculture without machines. He continues his contacts with the new underground, where Finnerty and a person called Lasher, a sort of evangelical religious leader, have founded the Ghost Shirt Society, a group of radicals, in which they ascribe a reluctant Proteus a leading role. The Society wants to topple and revolutionize the machine-system, or, according to one of the top brass engineers, to "kill us, wreck the plants, and take over the country" (p. 226)[18].

Anita leaves Proteus for one of his competitors higher up in the hierarchy, after he confessed to her: "In order to get what we've got, Anita, we have, in effect, traded these people out of what was the most important thing on earth to them—the feeling of being needed and useful, the foundation of self-respect" (p. 175).

Proteus travels to the Meadows, where the annual, highly ritualized festival of USA's managing class takes place[19]. He competes for a new, higher-up job. He meets Illium's top managers, who promise him a new appointment provided

[18] Quotes from *Player Piano,* 1952, Kindle version.

[19] Apparently, this was modelled after similar festivals organized by the real GE at the time (see http://www.tommcmahon.net/2007/04/kurt_vonneguts__1.html, accessed 2018-01-04).

he joins The Ghost Society and spies for them. They work out a plan to fire Proteus, hoping that The Ghost Society will then welcome him in.

The Shah visits a barbershop to get his hair cut. Barbers are one of the few professions that haven't been mechanized, but soon will be. A funny story about the replacements of barbers by a new machine follows.

Proteus, by now desperate, quits his job at the Ilium Works but no one takes it seriously: Managers believe that he simply pretends in order to take up his role as an informant. Proteus goes back to the bar at Homestead but is rebuked because everyone knows he has been fired.

Meanwhile the Shah meets a woman in the street who offers her body to him: She and her husband are impoverished. Her husband is a writer whose first novel was refused by the publishers because it was too long, badly written, etc., but in fact because it was judged anti-machine. All works of art must fit into the media serving the masses and must support the system.

On his way back from the Meadows to Ilium, Proteus takes train, where various conversations occur about the mechanization of the railroad and of the military, all pointing to the superfluity of humans in service of the machines. He goes to his farm, only to discover that he is unable to work the land. He tells himself that the life of a high IQ member of the elite is not worthwhile, that it would be better to live the life of an ordinary man. A policeman comes and tells him that now he has lost his job, he must register with the police.

Proteus goes to the police station and completes endless forms. A computer processes the forms and marks him as a saboteur; more strange things happen at the police station. Eventually, Proteus goes back to Homestead bar to interact with the leaders of the Ghost Society.

Finnerty and Lasher explain to him that Ghost Society is named after the "Ghost Dance religion.": When Native Americans were being suppressed by white men, the Ghost Dance religion started, promising that they would reconquer their just place in the new America. Proteus is taken to a meeting of the Ghost Shirt Society, where he also recognizes Ludwig von Neumann, formerly a political science professor, who lost his job to the machines. Detailed plans for the revolution and the destruction of the machines are being developed.

Later, Proteus is grilled by the police and confesses the story of his involvement with the Ghost Society and his conviction that the corporate system is wrong. After that, Proteus is put into jail and prosecuted for treason as one of the leaders of the Ghost Society. Under interrogation by a lie detector he defends his case for destroying the machines. Questioned about his motives, his answers register false, and he realizes that his true motive for rebellion lies in his suppressed anger at his famous father, the founder of the new, machine-based corporate America.

The revolutionary putsch takes place, including a coup against EPIAC, but quickly fails everywhere in the USA, except in Ilium and a couple of other places, which however are soon recaptured by the system. The leadership of the Ghost Society has lost control over the uprising and resigns. Helicopters

over the destroyed Ilium Works announce the victory of the government forces and request the handing over of Proteus, Finnerty and von Neumann. Proteus and Finnerty reminiscence about good old days, when as young engineers they believed in the system without being aware of the social consequences of the machine-age. Lasher reminds them of the fate of the original Ghost Shirts, who were overpowered and destroyed by White Man.

In Ilium as elsewhere, people, having demolished the machines, start reassembling them. The out-of-control riots end in restarting the cycle of handing over work to the new-old machines, under the corporate regime. Proteus, Finnerty, Lasher and other members of the Ghost Shirt Society admit that at least they had tried to stop the government's system, before surrendering themselves to the military[20].

Player Piano is usually interpreted as Vonnegut's framing of consecutive phases of the Industrial Revolution and its Golden Ages, with specific US overtones, such as the extinction of Native Americans. The First Industrial Revolution liberated people from the treadmill of manual labor. Industrial technology such as railroads and factories led to the automation of manual tasks, and it has been discovered that machines could easily and cheaply perform the routine jobs of scores of factory workers. The Second Industrial Revolution, with its electronic technology, liberated people from routine mental calculations. *Player Piano* is about the Third Industrial Revolution: the almost total overtaking of all kinds of work by a machine-system, the total loss of meaningful work, and therefore human dignity for most people. As Prof. von Neumann writes in a propaganda letter to all factories in the country, it is about "the divine right of machines, efficiency, and organization" as an all-inclusive organizing principle (p. 301).

This is of course a highly simplified rendering, but Vonnegut was not a historian. Also, the novel's central themes echo much of current debates about the threat of robots. In Vonnegut's imagined future, machines have totally enslaved men. Although Proteus is captive as a member of his own class, academic professions are said to vanish too: Lawyers are replaced by lie detectors and centralized data systems, medical diagnoses are made by machines, doctors mechanically execute necessary treatments and medications. The number of managers and engineers is declining, because machines automatically fire them as their knowledge is no longer required in the automated factories; they are indefinitely suspended and lose their upper-class status. But as can be seen from the spontaneous reconstructions of the machines after the revolt, people got used to a comfortable life and do not want to give it up. To quote Thomas. M. Sipos: "Like many satirists, Vonnegut is better at identifying and ridiculing a problem than in offering a

[20] Vonnegut himself had left GE in disgust, retreating to his abode on Cape Cod for the rest of his life.

solution. *Player Piano* ends on a pessimistic note. That may be because some problems have no solution."[21]

Are Vonnegut's machines (computers, robots) good or bad? Do they evoke hope or fear? His overall verdict: They are and do neither – on the whole, his picture is of a dystopia with plenty of melancholic overtones: "What distinguishes man from the rest of the animals is his ability to do artificial things [said Paul Proteus] … and a step backward, after making a wrong turn, is a step in the right direction" (p. 312). Most of Vonnegut's themes can be found in the dystopian literature of today. But even Proteus' dreams of farming and agriculture came back in currently fashionable retrotopias (see Greer, 2016; Bauman, 2017), yet unlike the enthusiasts of retrotopias, Vonnegut reverted in the end, in this novel as in many of his consecutive works, to a rather resigned "And so it goes"[22].

3.4. 2001: A Space Odyssey (Stanley Kubrick and Arthur C. Clark, 1968)

Stanley Kubrick's movie (based on a novel by Arthur. C. Clark) is counted among the most successful, and most researched, SF works of all times[23]. A question remains whether or not HAL 9000, the impressive central Computer Intelligence on board the US-spacecraft Discovery embarking on its mission to Jupiter should count as a robot in the present meaning of the term. HAL no doubt controls robot-like machines under it, but is it itself a robot, and what kind of work they all do?

The entire film can be read as a millenialist story of technological evolution, and of the impact of aliens across eons of time: The story evolves around the deployment of a series of mysterious monoliths on Earth, the Moon and Jupiter, by some extraterrestrial Intelligence. A transition from pre-human to civilizing human to post-human or superhuman is set in motion, ending with the final disposal of deadly militaristic (nuclear) technology on Earth.

Within this story, at least four technological tales are told. A quasi-anthropological tale begins four million years ago: A strange and impenetrable extraterrestrial artifact arrives among a flock of sleepy and peaceful apes in East Africa. It is the tool-making beginning of civilization, marked from the start by fear, curiosity and warfare. In a sensational shot with Nietzschean overtones (the music from *Also sprach Zarathustra*), humankind is transported from wielding bones to discovering space, and developing a manifold spacecraft circling earth

[21] https://www.lewrockwell.com/2005/05/thomas-m-sipos/kurt-vonneguts-neocon-america-war-and-socialism-in-playerpiano/, accessed 2018-01-04.

[22] Which is also the title of his best-known biography, Shields, 2011.

[23] See e.g. http://scireview.de/2001/, accessed 2018-01-26.

(the dance of spaceships accompanied by the *Blue Danube* waltz)[24].

Here begin the second and third technological tales. The US spaceship Discovery lands on the Tycho crater of the Moon, where another mysterious magnetic object (the Sentinel) is discovered 12 meters under ground. At the moment of the perfect alignment of Earth, Moon and Sun, when the first ray of the rising sun falls on the object, the Sentinel sends a powerful radio signal directed at one of Jupiter's moons. The discovery of the alien object triggers Earth's (i.e. the United States') concern with possible repercussions on the fate of its population, and preparations for exploring the extraterrestrial trail begin. After aborted exchanges with a Soviet delegation on the Moon, Discovery's crew undertakes to find the mysterious location under the guidance of HAL 9000, a fail-free robot-like sentient computer.

The third tale starts 18 months later, when the Discovery starts on its mission with a crew from whom the true purpose of the mission is kept secret. A series of misunderstandings between HAL, mission control on Earth, and the crew leads to the breakdown of HAL, culminating in its murder of the astronauts – except for Dr. David Bowman, the surviving human who, after a heroic struggle, puts HAL into a coma.

With the elimination of HAL, the stunning fourth and final act of the cosmic technological drama begins. Bowman goes through a series of mysterious encounters with the extraterrestrial intelligence, metamorphosing in the end onto an embryo and the new-born "Star-Child". A new epoch of human evolution has begun. The Star-Child somehow makes it back to Earth, just in time to prevent a nuclear Holocaust and to start another cycle of cosmic change.

It is the third technological tale that is of interest in the present context, as it is in that part of the story – at the height of modern, rational and scientific civilization, when humankind tries to conquer space beyond the moon – that HAL takes center stage. The Discovery is home to three astronauts in cryogenic hibernation, two scientist-astronauts Dr. David Bowman and Dr. Frank Poole, and HAL 9000 (a *H*euristically programmed *AL*gorithmic computer). HAL is presented as an error-free computer controlling all operations of the spacecraft and of its human crew. "The 9000 series is the most reliable computer ever made. No 9000 computer has ever made a mistake or distorted information. We are all, by any practical definition of the words, foolproof and incapable of error", brags HAL.

Still, misunderstandings arise in the communication between HAL and the astronauts. HAL knows the real purpose of the mission, while Bowman and Poole do not. They spend most of their day checking systems, and making sure things go as planned. Discovery passes close to Jupiter and sends out robot monitoring devices, of which one responds. At this point, HAL informs Bowman and Poole that AE-35,

[24] These scenes exhibit lots of militaristic cold war imagery. In one of the pivotal moments of the film, the bone is hurtled into space turning into a US-spaceship.

the device communicating with mission control on Earth, will soon fail. In HAL's seductive voice that has been replayed by millions of SF-fans[25]: "I have just picked up a fault in the AE-35 unit. It's going to go 100 percent failure in 72 hours."

Poole exits the spaceship to replace the device, but HAL advices the crew that the new unit is about to fail too. The crew starts to doubt HAL, talking to each other in a shielded cabin, but HAL overhears them, lip-reading their conversation. Poole steps out again to check the new AE-35 component. HAL directs a robot-space pod to ram Poole and kill him. Bowman suspects Hal of murder and requests manual control of the de-hibernation robots. HAL pretends to give in, only to release an airlock sending the frozen astronauts into deadly space. Strangely enough, HAL develops guilty feelings – for lying to the crew about the true mission of Discovery, for destroying the AE-35 device, and for killing crew members in order to protect itself and its task.

Bowman manages to trick HAL and to reenter the spaceship. After various exchanges between HAL and mission control on Earth, he disconnects HAL's vital systems. In the process, HAL reverts to childlike basic functions and goes into coma or dies (interpretations differ). Bowman directs the spaceship manually to its destination on Jupiter's moon, where it crashes in a psychedelic series of visual fireworks into the magic Monolith.

So, is HAL a robot? It is not mobile, but it has a body, and it has sensors. At first glance, HAL's story is a straightforward stylized version of the relationship between a human being and computer (Blütekrage and Cragic, 2017). An advanced model, "foolproof and incapable of error", it supports human astronauts by doing the boring work, as it should. But the relationship between machinery and crew of the spaceship housing HAL is quite complicated. Actually, who is doing the boring work, astronauts or HAL?

What work does HAL perform? It can see, hear and otherwise sense and receive signals from all components of the ship and earthbound control stations, and can determine their actions. In other word, HAL is a sentient computer (or an autonomous Artificial General Intelligence). Various pieces of machinery, controlled by HAL but also manually operable, look much like robots, or automated parts of the ship, especially the independently functioning repair pods and robotized spaces for various functions (communication, toilets, suspended animation, etc.). The life support systems of the argonauts are automated, too, but under control of HAL.[26]

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[25] One can listen to it on http://www.moviesoundclips.net/sound.php?id=44, accessed 2018-01-26.

[26] For a related piece of popular culture: The company Papercraft is marketing a mashup between HAL and an autonomous robotic vacuum cleaner Roomba ("Ever wondered what it would look like if you cross the villainous HAL 9000 AI with the Roomba?" http://www.papercraftsquare.com/irobot-roomba-hal-9000-papercraft.html, accessed 2017-05-24)

Neither Kubrick, who was primarily interested in extraterrestrial life, nor Clark, who was interested in space travel and astrophysics, were particularly fascinated by robotics or intelligent computer software. Their treatment of relationships between humans on board, mission control back home, and HAL, seem sketchy and cavalier, quite implausible in fact. Sometimes, the robot-like pods operate as mere appendices of HAL, at other times autonomously or under manual control by the crew. Yet quite a few standard topics concerning the relationships between robots and human beings are weaved in the plot.

Apart from HAL's overall capacity to enforce its demands and directives, the focal issue in *2001* has to do with the failure of HAL and the reasons for it. HAL received contradictory instructions, or instructions that he could not reconcile with his principal mandate to deliver the spaceship to Jupiter and the Monolith. HAL understands that its immediate masters, Bowman and Poole, sense that something is amiss with it. Under the strain of conflicting goals, HAL misleads them and attempts to manipulate them. When that fails, and upon overhearing their secret exchanges about maybe dismantling it, HAL embarks on its killing spree.

When Bowman prevails and begins disconnecting it, HAL slowly regresses, loses its mind, betrays things Earth wanted to be kept secret from the crew, and becomes childlike. In its final moments HAL sings a lullaby, *Daisy Bell*.[27]

Interpretations of viewers as to what happened to HAL varied, and the case remains quite puzzling. But various hints in the episode support a following answer:

> …early script drafts made clear that HAL's breakdown is triggered by authorities on Earth, who order him to withhold information from the astronauts about the purpose of the mission... In an interview with Joseph Gelmis in 1969, Kubrick stated that HAL "had an acute emotional crisis because he could not accept evidence of his own fallibility".[28]

Be that as it may, HAL's narrative stands as a kind of endpoint in the emergence of advanced technologies, seen by the author and the director as a militarizing and ultimately dehumanizing force, which in the end threatens to perform whatever tasks there are more precisely and rapidly, and making human agency superfluous. Things end badly for HAL, however. The most rational computer of

[27] Inspired, it seems, by Clarke's visit to Bell Labs in 1961, where he witnessed an IBM 704 sing *Daisy Bell*, the earliest known song performed using computer speech synthesis (in turn derived from the German children's song "Hänschen klein...", about growing up in the world, reportedly because Zuse's Z22 computer (a German first) was the first to be programmed to sing a piece of music in 1958.

[28] https://en.wikipedia.org/wiki/2001:_A_Space_Odyssey_(film), accessed 2017-05-24.

all times, as it brags at the outset, exhibits behaviors the Asimov's robots would never dream of (if they dreamt). Under the pressure of conflicting programs, HAL loses its autonomy and transmogrifies into something "human": Prey to guilt, deviousness, lies, sentimentality, regression and childhood memories. Technology falls apart.

HAL remains intriguing, in that its character emphasizes the fundamental issue in robotics: Who is in control? Humans, or some variety of super-humans? Who holds the moral high ground? Whose survival is valuable? The author and the director remained unequivocally on the side of the human beings: They will endure and win the day. At the same time, Kubrick's overarching imagination of human evolution and resilience, far beyond technological control and "the Death of a Computer", turns humankind's technological destiny into an impenetrable mystery.

3.5. Star Wars (First trilogy, George Lucas, 1977-1980)

First, we need to justify our selection of *Star Wars* (hereafter SW) rather than *Star Trek*. After all, both are science fiction films, both are immensely popular, and both can be seen as the products of counter-culture, at least at their inception. As observed by Charlie Jane Anders, the editor-in-chief of io9.com, *"Star Trek* very much wants to interrogate the dangers of too much state power, while *Star Wars* very much yearns for the possibility of an enlightened government, the good Republic which is *Star Wars*' Paradise Lost".[29] Whichever the reason, SW is much more popular, as witnessed by its fourth position on the list of the highest grossing films ever.[30]

Our main reason is that SW contains a whole population of robots. They are called "droids", a short for "androids". Droids are a species of robots that possess varying degrees of artificial intelligence, which defines the class of droids they belong to. By 2017, the latest episode of SW, there were five classes of droids:

- Class one droids, expensive but mostly computer-like, contains medical, biological science, physical science and mathematical droids.
- Class two is engineering droids: astromechs, exploration, environment, engineering, and maintenance droids.
- Class three droids are programmed to interact with humans: protocol droids (specializing in diplomacy), servant, tutor and child care droids.

[29] http://io9.gizmodo.com/the-essential-difference-between-star-wars-and-star-tre-1754297235, accessed 2016-07-29. All the differences are elaborated in detail in Cass R. Sunstein's *The World According to Star Wars*, 2016.

[30] https://en.wikipedia.org/wiki/List_of_highest-grossing_films#Highest-grossing_franchises_and_film_series, accessed 2016-07-29.

- Class four droids are programmed to fight: security, gladiator, battle and assassin droids.
- Class five droids are simple workers, specializing in general labor, specialist labor, or hazardous services.

In (film) time, there were more and more types of specialized droids; they also multiplied in video games and novels inspired by SW. In what follows we shall limit our analysis to the two main droids present in the original trilogy (these are the most visible in 2017 version as well). Though the viewers do pay attention to Harrison Ford (Han) and other human actors, "the two robots, like a well-atuned comedy team, become the focus of the film although they are only the unwitting participants of an intergalactic drama" (Reichardt, 1978: 62). C-3PO (droids' names are usually a combination of numbers and letters) is a protocol droid, humanoid in appearance, and features in all sequels and prequels. R2-D2 is an astromech also present in all films, who, as it has been pointed out many a time, looks like a biggish vacuum cleaner. It should be pointed out that, in (film) time, some droids become more and more violent, but there also appear more peaceful female droids.

The trilogy begins when the Galactic Empire is about to finish the construction of the space station Death Star (in the episode A New Hope). The station will allow the Empire to stop the Rebel Alliance, a movement formed to fight the tyrant, Emperor Palpatine. Emperor's right hand, Darth Vader, captures Princess Leia, a member of the rebellion, who has stolen the plans revealing the weak spot of Death Star, and hid them in the R2-D2. Together with C-3PO, the astromech escapes to the desert planet Tatooine. A family of farmers purchases the two droids. When their nephew Luke Skywalker cleans R2-D2, the robot reveals a message from Leia asking for assistance the legendary Jedi Knight Obi-Wan Kenobi. Luke, aided by the droids, finds the exiled Jedi, who is now pretending to be an old hermit, Ben Kenobi. Luke asks him about his father, also a Jedi, whom he has never met. Kenobi tells him that Anakin Skywalker was a great Jedi who was betrayed and murdered by Darth Vader. Kenobi and Luke hire the smuggler Han Solo and his co-pilot Chewbacca (Chew), a member of a species of intelligent bipeds, to take them to Leia's home planet. Alas, this has already been destroyed by the Death Star, as a way to frighten Leia into betraying the location of the rebel planet. But Luke and Han get on board of the space station, and – with the help of the droids and Chew – rescue Leia. Kenobi enters in a lightsaber (energy sword) duel with Vader and allows himself to be killed. Thanks to it, the others can escape. In the end, Luke, guided by the power of the Force (the collective energy produced by positive feelings, although it also has a dark side, produced by the negative feelings), but also helped by R2-D2 and eventually by Han and Chew, destroys the deadly space station.

In the second part (*The Empire Strikes Back)* Luke, accompanied by R2-D2, begins the Jedi training with Master Yoda, but Vader lures him into a trap by

capturing Han, Leia, Chew and C-3PO with help of Han's earlier friend. During a lightsaber duel, Vader tells Luke he is his father, and tries to convince him to join the dark side of the Force. In this part, droids multiply. Twice, Luke is attended to by robot doctors and surgeons: First at the rebel planet, where he was attacked by a strange animal and almost froze down, and then after Vader damaged his arm. A robot surgeon gives him a cyborg forearm. The doctor droids are humanoid, but a "nurse" is another kind of a vacuum cleaner. Also, on the planet where the trap for Han and his friends were set, there is 4-LOM, a protocol droid who turned into bounty hunter and captured and disassembled C-3PO (later re-assembled by Chew and R2-D2). At the same time, the linguistic talents of protocol droids are revealed (60 million semantic forms), though their weaknesses remain the same. Forces of the Empire have reconnaissance droids that look like a combination of a large beetle and a vacuum cleaner; they look realistic enough to make the viewer suspect that something similar may actually be used in today's military. R2-D2, the astromech, finally saves everybody by performing an operation for which it has not been programmed. Thus, the variety of droids is widened: They are good droids and evil droids; humanoids and machine-like droids; those limited in their capacities and those capable of surpassing their programming.

In the third part of the trilogy (*The Return of the Jedi*) Luke undertakes rescue of Han who has been delivered to the gangster Jabba in whose debt he was. At first, the attempt does not go well, and the droids become Jabba's property. They enter a kind of a workshop where both workers and foremen are robots. Disobedient robots are being tortured and punished by the supervising robots. But Luke frees Han and returns to Yoda, who turned 900 and is dying. After his death, the ghost of Kenobi tells Luke to confront his father once again, and also reveals that Leia is Luke's twin sister. The Rebels attack the second Death Star, while Luke engages Vader in another lightsaber duel in the presence of the Emperor, who goads Luke to kill his father, and in this way move to the dark side. When Luke refuses, the Emperor tries to kill him, but Vader turns sides and kills the Emperor. Mortally wounded, but returned to the form of Anakin Skywalker, the father dies in Luke's arms. In the meantime, the droids help the rebels: The protocol droid by becoming a god-like figure within a tribe of teddy-bear-like natives, and the astromech by solving all technical problems, at risk of being destroyed himself. The Rebels demolish the second Death Star and celebrate.

In general, though SW do not take up the issues of unemployment, they well illustrate a recurring hopes and fears connected to robots. Depending on the model and its corresponding purpose, droids could be obedient and expendable, or independently thinking and therefore potentially dangerous. They all have a vast memory recall, and many are excellent mathematicians. Lack of autonomy or its presence is both advantage and disadvantage: Obedient droids are less efficient; independently thinking robots can turn treacherous. There is no doubt,

however, that within the trilogy C-3PO and R2-D2 are treated by humans like friends: Always rescued in need, and always remembered in critical moments. As to their loyalty, C-3PO has moments of weakness when frightened, whereas R2-D2 is irreversibly loyal. Yet many commentators of the trilogy wondered, why the general sympathy of the public remained with R2-D2 and not with C-3PO. After all, fear and weakness are also human traits. True, C-3PO also possesses some unattractive human attributes: It is vain, often silly, and quite neurotic.

Beyond this, it should be pointed out that the soldiers of Empire, and Darth Vader himself, though human, look like humanoid robots in their armor. This is why SW was treated as illustrative of the phenomenon of "uncanny valley". The uncanny valley theory, formulated in the 1970s by the Japanese robotics professor Masahiro Mori, and introduced to the Anglo-Saxon readership by the Polish-British author Jasia Reichardt in 1978, suggested that replicas that liken real human beings are likely to elicit revulsion (MacDorman and Ishiguro, 2006); in the case of Darth Vader, also fear. As we shall see in recent works, such as *Interstellar* and *Sevenevens*, this lesson was taken seriously by some popular culture and robotics. Yet human replicas are constantly being made. Perhaps the reason is the conviction that certain robotic tasks require a humanoid shape: communicators and doctors, for example.

All in all, SW is not about work. Perhaps Sunstein was right claiming that the first trilogy is about fatherhood, redemption, and freedom (2016: 7). Some female viewers might have an impression that there are great too many male duels, both individual and in groups. Perhaps *Star Wars* are actually a parable for the origins and development of civilizations in general. After all, as Bruno Latour (1987: 91) observed, "We all believe that negation and thus dialectics are the great masters of history, the midwives of our societies. Nothing is achieved, we all admit too quickly, without struggle, and dispute, and wars, and destruction."

At any rate, next trilogy (which is a prequel, as it shows the earlier events) is mostly about politics, and the last about the mysteries of universe. Unsurprisingly, works about work are seldom overly popular.

3.6. Blade Runner (Do Androids Dream of Electric Sheep, Philip K. Dick 1968, Ridley Scott 1982)

Ridley Scott's *Blade Runner* of 1982 was, we felt, an unavoidable choice, because no other film has so often been mentioned in the social science literature (Joerges and Kress, 2002). Indeed, academics began writing analyses of the film almost as soon as it was released, as it revolves around two crucial themes: the dystopian

city of the future[31], and the essence of humanness[32].

The film is based on a novel by Philip Dick from 1968, but Ridley introduced many changes and improvisations (as mentioned before, robots are not called androids, but replicants). The action is set in a dystopian Los Angeles of 2019, and the movie starts with a following text of introduction:

> THE TYRELL CORPORATION advanced Robot evolution into the next NEXUS phase – a being virtually identical to a human – known as a Replicant.
>
> The NEXUS 6 *Replicants* were superior in strength and agility, and at least equal in intelligence, to the genetic engineers who created them.
>
> *Replicants* were used Off-world as slave labor, in the hazardous exploration and colonization of other planers.
>
> After a bloody mutiny by a NEXUS 6 combat team in an Off-world colony, *Replicants* were declared illegal on earth – under penalty of death.
>
> Special police squads – BLADE RUNNER UNITS – had order to shoot to kill, upon detection, any trespassing *Replicant*.
>
> This was not called execution.
>
> It was called retirement.

NEXUS 6 models were so similar to people, that the only way to distinguish them was by using a specially designed Voight-Kampff machine test. Replicants differed from real people in two aspects, namely: They had no emotions (or so their creators believed), and they died after four years of age. The humans spoke in a derogatory way of them as "skin-jobs", insinuating an empty inside.

The replicants did the work of serving in the colonies on other planets; but after a rebellion were not allowed to return to Earth. Yet the NEXUS 6 models wished to prolong their lives and returned to the Earth to "meet their maker," Dr. Eldon Tyrell. Six of them hijacked a spaceship; two were killed on arrival, but four managed to disperse in LA. An ex-cop, Rick Deckard, specialized in "retiring" replicants, was bullied back into service. The hunted group acquired a fifth member, an experimental replicant model, Rachael, who did not know that she was not human, as she had implanted memories of Eldon Tyrell's niece, and worked as his assistant. Now, however, she has learned that she is a replicant and has vanished into the city as well.

The replicants kill Tyrell and several of his collaborators, and are on the edge of killing Deckard, but Rachael saves him. In turn, he saves Rachael, and they

[31] For the review of texts dedicated to this issue and a discussion see Joerges, 1996. https://www.wzb.eu/www2000/alt/met/pdf/leinwandstaedte.pdf.

[32] For some early comments on this issue (which was taken up by many other authors), see e.g. Brooks, 1988 and Bullaro, 1993).

both vanish at the end of the film (endings have been changed in the seven different cuts of the film)[33].

Replicants working in colonies had various specialties. Here are those of the four escapees:

Roy (the leader of the fugitives) was a self-sufficient combat model for the colonization defence program. (Physical-A, Mental-A, serial number N6MAA10816.)

Pris was a "basic pleasure model" for military personnel (Physical-A, Mental-B, N6FAB21416). After escape, she worked as a "woman-with-a-snake" in a night club.

Zhora was trained for a murder squad (Physical-A, Mental-B, N6FAB61216.)

Leon was a combat model and a loader of nuclear fission materials. (Physical-A, Mental-C, N6MAC41717.)

As to humanness, the Voight-Kampff test would reveal a replicant of Mental-C, like Leon, very quickly, but it was not so easy with Rachael. In fact, although the VK machine is obviously a variation on the Turing test, one wonders if Ridley Scott wasn't – intentionally or not – poking fun at the expense of intelligence tests, known for their cultural inadequacy. Rachael fails namely to answer the question, what would she do, were she invited for a dinner where a dog was served as the main dish...

The final test is obvious, and most poetically formulated by the dying Roy:

> I've seen things you people wouldn't believe. Attack ships on fire off the shoulder of Orion; I watched C-beams glitter in the dark near the Tannhauser Gate. All those moments will be lost in time like tears in rain. [He cries, rain washing off his tears]

So yes, replicants have feelings, and apparently deeper and more human feelings than the humans, who did not hesitate to exploit them, like they exploited slaves, centuries ago (the analogy is brought up in the film several times). The replicants show compassion and concern for one another, and are juxtaposed against human characters who lack sympathy, while the mass of humanity on the streets is cold and impersonal. As to love, it is hard to say, as Rachael may have saved Deckard in order to make him her debtor, and her love declarations sound rather robotic and are obviously forced by him. In the epoch of #metoo his professional future would be in question (see also Tasker, 2013, on the feminist critique of films noir).

All in all, it is difficult not to agree with Douglas E. Williams (2017), when he thus summarized the impact of the *Blade Runner* from 1982:

[33] After the 1981 film, there was an on-going debate as to Deckard was human or a replicant. Allegedly, Ridley Scott claimed that in his vision, Deckard was a replicant, while Harrison Ford who plays Deckard insisted that he was a human; the 2017 sequel made his humanity obvious.

> Despite the seeming simplicity of its plot, the stylistic complexity, ideological ambiguity and frequently searching, philosophical nature of the sparse dialogue we are presented with, make *Blade Runner* a film that has much to teach, or at least worry, us about unprecedented and life-threatening complexities of our technologies, the social and political definition of their deployment and development, and the incoherence of our currently stereotypical attempts to escape from the repercussions of the world we see taking shape before our eyes.[34]

As in so many other SF-films, the robots of *Blade Runner* have performed revolting, dirty, dull and bodily dangerous tasks humans could not perform. But this in itself is not seen in the film as either good or bad. Yet the film arouses compassion for replicants whose life span was programmed by their corporate inventor.

So, from our point of view, *Blade Runner* from 1982 re-formulates the query that was already posed in *R.U.R.* and will be coming again and again: What if robots and humans blur, and what if, and when, robots emerge as superior entities? The film suggests that the replicants are morally superior, but offers no conclusion as to human-robot relationships that should follow. It ends in a manner appropriate for an escapist fairy tale.

3.7. Snow Crash (Neal Stephenson, 1992)

Not finding popular culture works related to robotization standing out in the decade separating *Blade Runner* from *Snow Crash* could be explained by the fact that the 1980s were seen as a "winter period" in AI development (Crevier, 1993).

Snow Crash is mostly about hackers, virtual reality, avatars and the breakdown of cyberspace; robots in the present meaning seem largely absent. Yet they are present, and at least two types are worth attention: The first type precisely because these robots are so different from both the humanoids and "the vacuum-cleaners", yet Stephenson referred to them as robots:

> In a Mr. Lee's Greater Hong Kong franchise in Phoenix, Arizona, Ng Security Industries Semi-Autonomous Guard Unit B-782 comes awake. The factory that put him together thinks of him as a robot named Number B-782. But he thinks of himself as a pit bullterrier named Fido. (p. 249)

There is also no doubt about the fact that Fido is working:

> He has an important job: Protect the yard. Sometimes people come in and

[34] http://scrapsfromtheloft.com/2017/07/06/ideology-dystopia-interpretation-blade-runner/, accessed 2017-11-07.

> out of the yard. Most of the time, they are good people, and he does not bother them. He doesn't know why they are good people. He just knows it. Sometimes they are bad people, and he has to do bad things to them to make them go away. This is fitting and proper.
>
> Out in the world beyond his yard, there are other yards with other doggies just like him. They aren't nasty dogs. They are all his friends. (…) He belongs to a big pack of nice doggies. (p.89)

"Nice doggies", known generally as Rat Things, are guards, which perhaps could be called cyborgs rather than robots, but then an interesting question arises: in cases where mechanical parts dominate organic parts, are these creatures cyborgs or robots? Perhaps it should be added that Ng, the owner of Ng Security, is himself such a creature, thanks to the Vietnam War.

When Y.T, the Kourier (the courier), one of the main characters in *Snow Crash,* learns that Rat Things are made from dog parts, she thinks it is cruel. Ng explains to her why she is wrong:

> "Your mistake," Ng says, "is that you think that all mechanically assisted organisms – like me – are pathetic cripples. In fact, we are better than we were before."
>
> "Where do you get the pit bulls from?"
>
> "An incredible number of them are abandoned every day, in cities all over the place."
>
> "You cut up pound puppies?"
>
> "We save abandoned dogs from certain extinction and send them to what amount to dog heaven". (p. 248)

It appears that preserving "dog parts" has at least two functions. Firstly, it permits Rat Dogs to enjoy life: when not on active duty, they live what truly amounts to a "dog heaven".

> Ng Security Industries Semi-Autonomous Guard Unit #A-367 lives in a pleasant black-and-white Metaverse [virtual reality] where porterhouse steaks grow on trees, dangling at head level from low branches, and blood-drenched Frisbees fly through the crisp, cool air for no reason at all, until you catch them. (p.89)

When at work, they are still enjoying themselves ("Can't you imagine how liberating it is for a pit bull-terrier to be capable or running seven hundred miles an hour?", p.248). Secondly, it preserves one important characteristic of real dogs: loyalty to (good) people. In fact, Y.T. and her boyfriend have once saved Fido, and he remembers it, and is always ready to protect her. And it is Fido who delivers justice in the final scene.

There are more robots in *Snow Crash*, usually security guards, most of them in

virtual reality as avatars.

> "Daemon" is an old piece of jargon from the UNIX operating system, where it referred to a piece of low-level utility software, a fundamental part of the operating system. In The Black Sun [a pub in virtual reality], a demon is like an avatar, but it does not represent a human being. (…) The Black Sun has a number of daemons that serve imaginary drinks to the patrons and run little errands for people. (p.55)

Most of them look like people, though, and not all of them are low-level software. The one that is truly remarkable is the Librarian; a kind of a robot each scientist would be only too happy to posses.

> The Librarian daemon looks like a pleasant, silver-haired, bearded man with bright blue eyes, wearing a V-neck sweater over a work shirt, with a coarsely woven, tweedy-looking wool tie. (…) Even though he's just a piece of software, he has reasons to be cheerful; he can move through the nearly infinite stacks of information in the Library with the agility of a spider dancing across a vast web of cross-references. (…) the only thing he can't do is think. (p. 107)

A browser in a humanoid shape then, and though according to Stephenson the Librarian cannot think, the robot does not offer just a page of links ordered according to who paid more money to Google: It offers correct answers to any question the user may ask. What is more, it is able to develop its skills:

> "You're a pretty decent piece of ware. Who wrote you, anyway?"
> "For the most part I write myself," the Librarian says. "That is, I have an innate ability to learn from experience. But this ability was originally coded into me by my creator". (p.109)

Stephenson was here some thirty years ahead of the actual AI developments, but of course this trait has been discussed, planned for, or at least hoped for from the outset.

The Librarian's only fault is that it imitates real librarians only too well: it moves so quietly, that the user does not hear it, and wants more noise to avoid being startled. Also, the robot does not have a memory; the Library is its memory, and it can only recall what is there. Still, the users may not be sure about what the Librarian can or cannot do.

> He suspects that the Librarian may be pulling his leg, playing him for a fool. But he knows that the Librarian, however convincingly rendered he may be, is just a piece of software and cannot actually do such things (p.209).

Can't it do that, though? This is a new kind of fear, not predicted by Asimov in his laws of robotics: that robots, or quasi-robots, can ridicule humans.

May it be added that compared to *Seveneves* (2015), where robots (of a peculiar kind) will play a truly important role, in *Snow Crash* they are mostly narrative devices. The Librarian fulfills an important function in that, like in all Stephenson's books, there is a significant summary of research results (in this case, on Sumerian tradition, Babel Tower and language history in general), which the robot can deliver. Rat Things can be seen as a variation of one of the most popular job for robots – that of security guards. Yet both the suspect tendency of the Librarian to mock its user, and the dogs' tendency to reward good conduct with loyalty are interesting if small addition to the robotization debate.

3.8. The Matrix (Lana and Lily Wachowski, 1998)

The Matrix is about the most extreme fear the humans have towards their creation: In this movie, Artificial Intelligence attacked the humans, and started growing human bodies as the source of energy they needed (at certain point Morpheus, one of the characters that rebel against the robots, shows Neo, the main character and the future savior, a battery to explain to him the role the human bodies play in 2199). In order to prevent humans from resisting and rebelling, the AIs created a simulation of a real world, which keeps humans happy, and which is under total control of the AI. If this sounds like the most unrealistic fantasy, it is enough to remind the present readers that Elon Musk recently claimed that "There's a billion to one chance we're living in base reality,"(which, he thinks, is better than being dead[35]).

In the movie, robots do all things that humans cannot (until they acquire superhuman power, like Neo does). In the Matrix, all security services are humanoid robots, and so are the police, although they are better masquerading as humans (all agents look almost the same). They are not so much replicants, as "sentient programs", to quote Morpheus again. They are great many other robots, whose shape and form depends on their function. A bugging robot looks like a scorpion (it gets inside a bugged person via the navel); robots meant to destroy the rebel hovercraft are called sentinels or "squiddy", because they look like squids, and their function is to "search and destroy". These are autonomous killing machines that patrol the ancient sewers of the dead human cities in search of Zion's hovercrafts (Zion is the last colony of real humans, living deep inside

[35] http://www.theverge.com/2016/6/2/11837874/elon-musk-says-odds-living-in-simulation, accessed 2017-03-01.

the Earth, where it is still warm[36]) or wandering, defenseless human beings for some or another reason walking in the tunnels. Their tentacles work as audio sensors, able to pick out all sounds, so that Zion's ships have to shut down power when the squiddies approach. Close up, these tentacles change into sharp claws, drilling through the ship's hull or killing the humans. Even rebels have robots for some more basic functions, like transporting, collecting, etc.

The commentators, human or not, are often quite sarcastic about the humans. Here is Morpheus again:

> We don't know who struck first, us or them. But we know that it was us that scorched the sky. At the time they were dependent on solar power and it was believed that they would be unable to survive without an energy source as abundant as the sun. Throughout human history, we have been dependent on machines to survive. Fate it seems is not without a sense of irony.

Now the machines use humans in order to survive. What is worse, robots' opinion of humans as workers is not high: "Never send a human to do a machine's job", says Agent Smith.

But robots are not only "the bad guys". In fact, Agent Smith telling the history of the Matrix says that originally it was supposed to be a perfect world, full of happiness. Alas, it did not work: Apparently, humans cannot live without suffering and misery, so the AIs simply provided them with what they wanted.

In later sequels, it turns out that even the benevolent Oracle was a machine, but the one that specialized in human psychology and understood its complicated and sometimes contradictory nature better; thus giving them philosophical advice that they fulfilled opposing it. Yet in the original Matrix movie there are not many more insights, as the major part of the movie is dedicated to various fights and duels, which seem to suggest that fighting is what robots and humans alike are fond of (these are mostly duels between male characters, though Trinity contributes as well). Also, as Morpheus is a god of dreams, it may mean that his idea of a savior coming was but a dream.

3.9. Stepford Wives (Ira Levin 1972, Frank Oz 2004)

In 1988, in the year that allegedly was the beginning of another "winter" in the development of AI, the independent German film director Peter Krieg made a film essay called *Machine Dreams*. Krieg's films were cinematic dissertations; he had also made one on money and one on chaos theory. Machine Dreams

[36] For a long time, and at least since the times of Gabriel Tarde (see his sci-fi story, *Underground Man*, 1896/1905) it was believed that the environmental catastrophe would consist of global cooling, not of global warming.

contained a thesis on the genesis and development of technology, a rich field material, and quotes from scientific literature delivered by the authors themselves. It ended with a theory about the development of machines as a realization of both dreams and nightmares of men.[37] It unfolded as follows: men constructed machines to escape their biological nature (of which women play a large part). This technical "second nature", however, brought them more disappointment than relief because, according to Krieg, projected dreams and nightmares are only apt to return. Indeed, our analysis here tends to confirm his observation.

Within this general thesis or plot there are several subplots, situated historically. One of the main drives behind the construction of machines was to relieve humans of heavy menial work; once successful, they moved to mechanizing of lighter menial work, like household work[38]. Another drive was to protect men from threat; and as men feel threatened by women, replacing women as sex objects with sex machines was the next step. If one develops this logic to its absurd consequence, housewives can be seen as a combination of household machines and sex objects. Thus, Stepford wives.

The topic of the original novel, Ira Levin's book from 1972 was, in our reading, the rising feminism, or women's liberation, as it was then called. After all, the book begins with a quote from Simone de Beauvoir's *The Second Sex* (1949).

There are two main points to the book, and Ira Levin proved to be right about both of them. One is that men will not lightly accept women's liberation – especially their liberation from household duties, including sexual services. They will fight back. The other point is that this liberation is inevitable. They would have to kill women – and/or turn them into robots– to stop it.

Yet technology does not play an important part in the book; it is merely a prop necessary for the plot. The plot evolves as follows: professional photographer Joanne Eberhart has just moved home to Stepford with her family, but she finds it difficult to make new friends, as all women she meets are somewhat peculiar. Women in Stepford do not chat and drink coffee together: They have a lot of cleaning and housework to do. Together with her only friend, another professional woman, Bobbie, Joanne tries to decipher the situation and discovers that the Stepford housewives used to belong to a powerful women's association, and that after Betty Friedan gave a talk there, a Men's Association was formed, and women's behavior started to change drastically.

Levin's book actually reverts to the plot of *R.U.R.*: After all, Čapek's robots were organic products. His innovation consisted in relocating the conflict: It is no longer between robots and people, or between industrialists and workers,

[37] Literally men: "All machines are female, because men dream of them", Krieg says in the film.

[38] Krieg was obviously unaware of Ruth Schwartz Cowan's work (1985), *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave.*

but between men and women. In Čapek's play, the robots win; in Levin's book, the women lose, but both endings are absurd and were intended as such. The purpose was to force the spectators or the readers to reflect over issues that might prove disturbing.

The novel is very short, which probably prompted the subsequent filmmakers to extend it, at the same time giving them enough space to do it the way they preferred. The movie from 1975 (screenwriter William Goldman, director Bryan Forbes) focused on portraying the USA as obsessed by commercials. The other two themes – technology and women – are marginal. Technology is threatening; anything of importance is made manually, and men dealing with technology are sinister. Computer and various lab companies have sinister, black-and-white signboards, unlike everything else in the movie, which is colorful. The women in the film are real, and by the end of the movie, it is difficult to combat a feeling that they get what they deserve. They seem to be intellectually handicapped, or at least made so by their love of their spouses and children.

The next remake of *Stepford Wives* (2004) has been made in a time when Levin's claims seemed prophetic. Women's liberation has advanced, and technology has taken over the society, used by both men and women. The points that Levin had made could not be made again, so the plot was arranged accordingly. After being fired as president of a television network, Joanna has a nervous breakdown, and her husband Walter takes her to a simple Connecticut town called Stepford to recuperate. But Stepford is a little strange: The husbands gather at a men's club, while the wives – all in bright summer frocks and constantly smiling – only exercise and cook pastries. Joanna, together with other new arrivals Bobbie and Roger, soon discovers that the mastermind of Stepford has used cybernetics to "improve" womankind.

The motivation of Stepford men returns to the one hinted at by Levin, but is more convincing: In the 1975 version they were a bunch of weird technos with mean ideas, but in 2004 they are less successful husbands of successful wives. The technology portrayed in the movie is complex and important, and the genius at the end of it is a woman. In addition, the idea of a house-machine is made equal because a gay partner is also remade into such a model.

All in all, the 2004 version comes closest to Peter Krieg's thesis. Technology is used to rid human life of imperfection ("biological nature"); but the key to happiness lies in accepting imperfections, not in getting rid of them. Yet the topic of "women-as-technology" is especially interesting, although it did not attract much attention from the reviewers. This is an ancient topic, after all: If Eve was made of Adam's rib, women are like Dolly sheep, cloned from a bit of man, to serve him in life. It is a matter of accessible technology whether they are made of metal and springs, like a long series of antique docks shown in Peter Krieg's film; of plastic and computers, like Japanese robots in the same film; or are brain-engineered cyborgs, as in *Stepford Wives* 2004. Here, the symbolic border that Philip K. Dick emphasized so much is crossed again, but in the

opposite direction than in most sci-fi works: It is people who become robot-like, not robots that become human-like.

One dominant impression is that the novelist and the filmmakers did not know much about the household as a workplace, as they reproduce various kind of stereotypical thinking about the organization of a household. The 2004 movie opens with a 1950s' style commercial, in which the new household machines are playing the main role. In this way, the movie establishes a historical background alluding to the rationalization of housework in a Tayloristic spirit. In Stepford, however, there is no need for the new machines because women are machines. At the same time, the traditional role of a housewife who can do anything is preserved.

The mechanization of the household held the same double message at the time of its inception. As Ruth Cowan Schwartz (1985) demonstrated, household technology, intended to relieve women from heavy duties, relieved men from literally heavy duties, and children from light household duties. Women, on the other hand, became even busier, as the standards of a clean, effective household skyrocketed. No wonder Stepford wives didn't have time to chat! As Boel Berner (1996) reminded her readers, housewives in the rationalized society were supposed to acquire new technical competences, setting them on a par with their technically minded husbands. But were the machines intended to keep women at home, or were they supposed to free women to assume jobs in the public sphere?

In the 2004 version, the "real" women left the housework to men, to be able to pursue their careers without a thought of family and home. The 2004 Joanna takes for granted the existence of a hi-tech "smart home". She takes also for granted that her husband knows how to use the controls. Yet women of the 1950s and the 1960s have had an important position in the family; though not the masters, they were its organizers (Berner, 1996: 122), and in this function they were irreplaceable. When Joanna lost her job, she had no power platform whatsoever, and was unable to answer her husband's accusation that it may be she who was defective. Joanna's unfamiliarity with the household technology turned it into her foe. The talking fridge reminded her of her shortcomings and the security system refused to let her in.

Stepford husbands were clearly not afraid that their robotic wives would turn against them, like robots in *The Terminator*, *Blade Runner* and *RoboCop*. The traditional assumption that people control the robots and not the other way around has not been challenged. Yet an interesting twist in the 2004 version is that it is a woman (played by Glenn Close) who is finally responsible for the robotization of the women. She thinks that everything was better before women left the household and their traditional roles. She used to be a talented researcher in the field of brain surgery and cybertechnology, and she applies her expertise to turn back the clock.

Intentionally or not, this is yet another way in which the movie shows that

women's familiarity with technology is a serious threat to the patriarchs. *Stepford Wives*, throughout its variations, took up several topics that do not cease to be relevant: the differences between public and private workplaces, the promises and traps of professional competition between men and women, and the hopes and fears of technologies.

A contemporary public may see the "household machine hopes" as a thing of the past, a historical curiosity. Not so with another part of machine dreams: cyborgs and androids as wives, lovers and work colleagues. In general, to what extent the development of the characters in the 32 years of the existence of *Stepford Wives* reflects the development in the society at large?

Feminists have since introduced the term "backlash", and, indeed, it is quite possible that in the 21st century women can be imprisoned at home, their political and educational rights taken away. Changes do take place, but in opposite directions.

In 1983, Cynthia Cockburn and her collaborators interviewed an advertising worker who said "It would be quite unthinkable to present a publicity (...) where the woman, if she was visible in the picture, was not the one who did the kitchen work" (Cockburn, 1996: 24). If this advertising man were not yet retired, he would not have said the same thing now. We are all used to publicity showing women in front of computers (with eyeglasses signaling intellectual aptitude), and men in aprons in front of (induction) kitchens. Yet "Stepfordwives" has become a label in the USA: Stepford is a marker for small, conservative suburbs that emerge around big cities.

But there are more and rather unpleasant analogies between the world of today and the original *Stepford Wives*, and not only in the USA. According to Rappe and Strannegård (2004), more and more people in Sweden want to have a clean house or an even "cleaner house", and fewer and fewer will do the cleaning themselves. Electrolux's robotic vacuum cleaner still does not do a very good of cleaning the corners. One solution is, as Ehrenreich and Hochschild pointed out in 2002, the immigrant women. They clean and iron, take care of children and the old, and provide sexual services. Like robots, they are not on the same emotional and intellectual level as their masters/employers (one can't talk with them), and they raise the same anxieties: What happens if they hurt themselves/break? Will it be possible to get a new model quickly? What if they stage a revolution? If one could only impose Asimov's laws on them!

At present, the situation became more acute, and it does not concern women only. Who is more dangerous: Immigrants or robots? Who is more prone to rebel? Can robots fill the lack of workforce if the immigrants won't?

3.10. Big Hero 6 (Marvin Comics 1998, Disney 2014)

There are at least three reasons for including an animated movie here. Firstly, it was highly popular, to put it mildly: It was the highest-grossing animated film of 2014, as it grossed over $500 million worldwide.[39] Secondly, it was especially popular among young people, and after all it is they who will decide the fate of the robots in the future. Thirdly, the main robot in the film (of which they are many) is (basically) a medical robot; the job that seems to be the main novelty in the use of robots, as compared to industrial robots of yesteryear.

The movie begins with a bot-fight: An equivalent of dog fight – obviously, an interest for the ne'er-do-wells. Unfortunately, and much to chagrin of his older brother Tadashi, an extremely talented young Hiro frequents those, his clever bots winning against those of various villains. Using subterfuge, Tadashi succeeds in taking Hiro to a "nerd lab", in which a group of young people work under guidance of professor Callaghan; "we push the boundaries of robotics here", says Tadashi proudly.

Tadashi's own project is Baymax, an inflatable medical robot, looking like an enormous human-shaped balloon, whose inside equipment contains all possible diagnoses and 10 000 medical procedures. Baymax is able to diagnose both bodily and psychological states. Hiro is so impressed that he decides to apply to the School that educates the "nerds". In order to prepare his entrance work, he goes to a kind of garage (as readers will know, all important digital inventions were made in garages), and constructs a microbot. Microbot is a bigger version of a nanorobot (of which we shall see more in Stephenson's next novel; the movie contains several allusions to Stephenson's works), in that it is visible with naked eye, but like nanorobots it can combine itself in any kind of shape desired by its operator. Hiro wins the competition and is accepted by the school, while a CEO of Krei company wants to buy his invention. Professor Callaghan encourages him to decline the offer and enter the school; the CEO attempts to steal the microbot, but apparently fails.

The same night a fire starts in the School; Tadashi enters in to save the Professor, but both die in the fire. Hiro is so despondent that he wants to drop the School and return to bot-fights, but on the way there he hurts his foot. His cry is heard by Baymax, which turns out to be in Hiro and Tadashi's home. The robot diagnoses Hiro's physical and psychological pain, and gives him a lecture on the dangers of puberty. (All the time during the movie Baymax utters a lot of psychological platitudes, but it is hard to say whether the intention is satirical or not).

Baymax also discovers that the microbot is moving as if intending to go places, so the big robot follows the little robot via the streets of San Fransokyo (a futuristic combination of San Francisco and Tokyo), Hiro behind them. They

[39] https://en.wikipedia.org/wiki/Big_Hero_6_(film), accessed 2017-04-15.

end up in an old factory building and discover that somebody is producing microbots on a big scale. They become attacked by microbots guided by a man in a Kabuki mask; they go to the police but are not believed.

Baymax feels that his batteries are down; consequently, he behaves like a drunk, and Hiro has to smuggle him to his room so that his aunt (unlike her nephews and their chums, she simply works in cafeteria and cooks dinners at home) will not see them. Once charged, Baymax looks for prescriptions on how to manage a loss, and discovers that compassion, companionship and physical reassurance are needed. While hugging Hiro, it asks for help Tadashi's colleagues from the Nerd Lab (thus the six in the title – two men and two women join in).

Hiro discovers that fire was not an accident, suspects Krei, and updates Baymax to become a warrior: Teaches him karate, and gives him an order to go and get "that guy in Kabuki mask". Various exchanges make it quite clear that robots cannot understand jokes, until they learn them; and cannot be hurt or offended (Baymax says often "I am a robot, and therefore…"). The two follow the Kabuki man, and almost fall off the edge into the water when he vanishes (Baymax: "Always wait one hour after eating before swimming"). When Kabuki and his microbots turn back to attack them, Hiro and Baymax discover that the lab group has been following them in a little car. A chase starts, which gets serious only when one of the women takes over the wheel. The Kabuki man manages to push the car with all of them in the ocean, but the balloon-like Baymax saves them.

They hide in one of the guys' house, which turns to be a posh villa with a butler. Hiro "updates" them all to various kind of cyborg-warriors, and they test their capacities on the butler. This time, Baymax becomes a super-Superman, and Hiro puts the black-and-red killer sim-card aside its green "medical" card. On Baymax's back Hiro can fly to the top of the Golden Bridge, and all over San Fransokyo. Baymax is also able to discover the place the Kabuki man hides by scanning all the bodies in the city. The team arrives at an island where Krei's factory is located, and discovers a video showing that Krei was working with teleportation, and send a young woman Abigail into space. The experiment did not work and the woman was lost.

The Kabuki man shows up, and a prolonged fight takes place. Hiro gives Baymax the order to destroy, but the women know better, remove the killer card, and block the possibility of changing the programming. The Kabuki man escapes.

To comfort Hiro, Baymax shows him a video of Tadashi's work with his invention, which convinces Hiro's that robot's task is to heal and help, not to destroy. The only thing that is needed is to take the mask off the Kabuki man, so that he will not be able to command his microbots. The team eventually manages it, upon which they discover that Professor Callaghan is the man behind the Kabuki mask, as Abigail was his daughter, and he is seeking revenge. It was he who stole Hiro's microbot, and allowed Tadashi to die. The Professor gets the

mask back, and the fight continues, because the team is able to find new angles (again, a joke on management platitudes or a serious advice?).

Baymax is able to scan the outer space and discover a human being in there: Abigail is alive. Hiro and the robot get in, find Abigail, but Baymax suffers from a crash and divides in parts. It asks Hiro to close him down, which can be achieved by saying "I am satisfied with your care". Hiro's heart is broken, but he says it. He brings Abigail back to the world, and police takes Professor in custody. Only when drinking coffee in his aunt's cafeteria, Hiro discovers that the remaining part of Baymax, a fist, holds its programming card. The robot can be reproduced.

The (US) critics were positive. A typical review said that the movie "offers something for everyone: action, camaraderie, superheroes and villains. But mostly, Baymax offers a compassionate and healing voice for those suffering, and a hug that can be felt through the screen".[40]

As it often happens, some European critics begged to differ. Here is a Norwegian opinion:

> Big Hero 6 is the best in the two first acts when the young boy and the robot draw lines and get better acquainted with each other. I was disappointed that the film did not focus a little more on the grieving process after the young boy has lost his brother; it did not take many minutes before it was forgotten and laughter and fun took over. (…)
>
> The end is cowardly, very cowardly. I realize why one chooses a hopeless end like this in children's films, but as an adult I am always disappointed. [41]

The Italian review is even harsher:

> That Disney Animation Studios do some sort of Avengers for a younger audience is one thing that is perplexing, but that they do so in a manner so bland and uninteresting is really depressing. Yet to begin with the construction of the universe in which the film is set – a future world in which Japanese culture strongly influences the United States – makes obvious the main problem of the project: an attempt to build the story around the marketing potential instead of the dramaturgical necessities.[42]

It could be that this difference in reception between US reviewers and Europeans is only to be expected – although quite a few Swedish reviewers were enchanted, and some US reviewers agreed with the quotes above ("The character is a windfall

[40] http://www.dfw.com/2014/11/06/941360/movie-review-big-hero-6.html, accessed 2017-03-15.

[41] http://dvd-world.biz/filmblogg/?p=23263, accessed 2017-03-15.

[42] http://www.cinefile.biz/big-hero-6-di-don-hall-chris-williams, accessed 2017-03-15.

of laughs, emotion, and merchandising potential – in short, a marketer's dream."[43]). The difference in reception between (some) adults and children could be due to age (though we were recommended the movie by a 27-year old doctoral student).

In our opinion, Baymax is no doubt cleverly thought up as a medical robot. His balloon-like body means that it can embrace humans, and in this way get close to their bodies without hurting them. His declared capacities are incredible. Yet in the movie its talents are mostly used in chases and fights; the fights are more sophisticated that bot-fights, as they include various clever moves, and their goal is "to help human beings" (before every step Baymax asks Hiro if he will feel better afterwards), but these fights take up most part of the movie. One observation is undoubtedly correct: Japan will have much to say about the direction which the construction of robots will take.

3.11. Interstellar (Christopher Nolan, 2014)

The role robots play in that movie is quite limited. Still, it is worth attention for at least two reasons. The first is the way they are built: There is nothing humanoid in their shape. They are rectangular blocks of metal, but composed of four panels that can move independently. The two extremes operate like arms and legs, but when needed, the whole thing converts into kind of windmill, with all the four panels revolting. The center panels function also as screen, on which information is visualized. Inside there is a lot of cables and connections, visible when the robots are being repaired or destroyed. The second reason is the funny and cheeky retorts that they give their human masters; very much unlike the mechanical voices that the viewers are used to.

The movie starts with a post-apocalyptic (US) landscape. The only thing that can be cultivated is corn, and the humans suffer from horrible dust waves. It is known that soon even the corn will die out. The main character, Joseph Cooper, lives with his two children and his father-in-law, because his wife died earlier, and his son is supposed to continue his work as a farmer. Originally, Cooper was a pilot, but his pilot career ended in a difficult to explain accident. His younger daughter is called Murphy, and she complains of hearing and seeing a ghost in her room. The ghost moves books in her bedroom, and she tries to figure out the what could be a message – without much success, however, until another dust wave leaves a peculiar sand pattern on the floor. Cooper and Murphy manage to decipher it – these are coordinates of a place that Cooper is determined to investigate. Murphy is forbidden to follow him, but does it at any rate, hiding in the pickup.

The place turns out to be a facility of NASA, which still operates clandestinely. Everybody inside knows Cooper's piloting skills. There, Cooper meets a robot,

[43] http://www.cinemixtape.com/movie-reviews/big-hero-6/, accessed 2017-03-15.

called TARS, which is one of former U.S. Marine Corps tactical robots that now work for NASA. Cooper also meets a person he knows very well, professor Brand, who continues his work on spaceships in hiding. Brand convinces Cooper that he needs to perform another piloting operation, "not to save the world, but to leave it". NASA has namely discovered a shortcut to another galaxy, which contains several planets similar to Earth. Ships were sent there to investigate, and some of the scots sent back positive messages. Cooper with crew is to check those planets, to decide which of them could be the destination of people from the doomed Earth.

At the first meeting with TARS, Cooper's first associates it with a vacuum-cleaner (an obvious allusion to *Star Wars*), but then discovers that the robot has a sense of humor, edging on sarcasm. Cooper asks TARS how it is possible, to which the robot explains that it has been programmed with 100% human humor, but only 90% honesty, because diplomacy is often better than straightforward answers.

Cooper decides to join the mission, even if Murphy does not want him to go, and claims that the ghost left a message saying "STAY"! He leaves on a spaceship called Endurance in the company of Amelia Brand, professor's daughter, and two other human collaborators, Doyle and Romilly. On board, Cooper meets another robot, called CASE, which is less talkative than TARS, but an excellent co-pilot. They travel through the wormhole, and arrive at the other galaxy, where they are to visit three planets. One of the persons sent there seems to be a good friend of Amelia, and Cooper asks TARS if those two are an item. TARS answers that his discretion programming is also 100% – no gossips allowed.

TARS and CASE, which look the same, have very un-human shapes, but very human attributes, including different personalities. TARS does not seem to like Cooper, whereas CASE collaborates without comments.

They decide to go first to the planet called "Miller" from the surname of woman who went there; however, an hour on that planet is equivalent of seven years on the Earth. It turns out that enormous waves killed Miller and destroyed her equipment. The waves are about to attack the vehicle on which Cooper, Amelia and Doyle arrived for reconnaissance. Cooper gives CASE order to "Go and get her", and the robot, turning into a windmill, manages to save Amelia, while Doyle is taken off by the wave.

They go back to Endurance, on which Romilly has aged 23 years. They do not have fuel for visiting both planets and going home, so they need to choose which one planet to go next to. Amelia, guided by loving intuition, wants to go to the planet on which her beloved Edmund is, but Cooper decides, rationally, to select the planet from which Dr. Mann sent very attractive reports, while

Amelia believes that only love can cross time and space.[44]

Still on Endurance, they decide that TARS should be send as a kind of a probe into the black hole (called Gargantua) because there the secret of gravity is apparently hidden. Amelia protests, as TARS may not come back from such an excursion, to which TARS responds "Don't forget that I am a robot, and we do as we are told".

In the meantime, TARS charts the course to Dr. Mann's planet (when Cooper gives it an order, it responds "Roger that, Cooper"). Arriving there, they discover another robot of the same type called KIPP, which was decommissioned. After having de-hibernated Dr. Mann, they discover that he was a cheater who faked his report in order to be saved – the planet is completely uninhabitable. Dr. Mann tries to kill Cooper, but Cooper manages to defend himself and asks Amelia for help – she arrives with CASE. They hear an explosion from Dr. Mann's base, and TARS appears and apologizes for being unable to save Romilly, who was killed there.

Dr. Mann is trying to dock into Endurance, but Cooper engages TARS to fend him off. He asks the robot: "What is your trust setting, TARS?" "Higher than yours, apparently", answers TARS. While dr. Mann fails the docking, and puts Endurance into a spin, Cooper tells CASE to dock their vehicle. "It is not possible", says CASE, to which Cooper answers, "No, but it is necessary". They arrive safely at Endurance, and the new plan is to approach the Gargantua as close as it is safe, to travel on the strength of the black hole, and then separate and go to Edmund's planet, saving the fuel for the return. TARS, however, needs to be sacrificed at the last moment, to which it says "That's what robots are for". TARS says "Good-bye Dr. Brand" to Amelia, and somewhat strangely "See you on the other side, Cooper" and so it turns out that Cooper has to join him into the black hole.

Once stopped moving on, Cooper calls TARS, but gets no answer. Instead, he discovers himself to be on the other side of his daughter Murphy's bookshelf. He travelled back in time. He leaves the message "STAY" indeed, but after that TARS finds him and informs him that "they" are saving them, and that the message to the Earth should be sent with gravity. TARS tries to explain to Cooper that "they" didn't bring them to this place to change the past, and Cooper starts to understand that "they" are "us", people from the successful future. Cooper and TARS decide that the secret of gravity that they discovered in the black hole can be conveyed to adult Murphy, now first-class space scientist, with Morse code on the second hand of the watch Cooper left for his daughter to remember him.

The movie ends with the 124 years old Cooper landing on what is called

[44] *Interstellar* contains quite some bits of the typical US sentimentality, concerning the power of feelings towards your lovers and children, but it is easy to hop over it and it is not very disturbing.

"Cooper Station" in honor of his daughter, who did solve the gravity problem and helped to move people from the Earth. She was in a cryonic sleep for two years, waiting for him to come and say goodbye before dying. Cooper then returns to Amelia (who discovered that Edmund was dead, but the planet was habitable), to help her to continue their task. He restarts TARS, which now has 95 % honesty, but only 75% humor, and 60% of autodestruct. Cooper gives him a nickname "Slick". It needs to be added that all the robots speak with male voices: There seems to be a pervasive tendency to male gendering of robots in the film.

It is hard not to agree with Eric Sofge (2014), when he reminded the readers of *Popular Science* that humans will travel into space together with robots. After all, robots have already been to Mars. But it is still unclear what shape will they have, and what functions will they be able to perform.

> Would they be humanoids, like NASA's present-day experimental bot, Robonaut 2, which is currently being tested aboard the International Space Station? Or would they be more alien themselves, with bodies and behaviors that support humans, without physically mimicking them? In (…) *Interstellar*, we see the latter option. The robots that accompany a manned expedition to another world are monolithic space oddities, rectangular slabs whose plank-like segments can decouple and rotate to pull off a variety of actions.[45]

In Sofge's opinion, *Interstellar* robots are "gorgeous and silly". Maybe, although it is difficult to understand how they can perform tasks requiring hands and fingers. Yet director Nolan's choice does revoke the old issue of creepiness of the humanoid robots versus the alienness of the non-humanoid ones.

The next popular science fiction work seems to convincingly solve this problem in the context of space travel, but perhaps the solution is not practicable in health care and social care.

3.12. Seveneves (Neal Stephenson, 2015)

Neal Stephenson stands out, like Arthur C. Clarke in his time, for including a lot of actual scientific research results into his science fiction[46]. In *Seveneves* there is so much science, actually a space science, that it seems at times that the author

[45] http://www.popsci.com/article/technology/co-robots-interstellar-are-gorgeous-and-silly, accessed 2017-03-31.

[46] See also his joint initiative with Arizona State University, https://en.wikipedia.org/wiki/Project_Hieroglyph, accessed 2018-01-06.

forgot that he was writing a work of fiction.[47] Yet we decided to include it into our analysis, although is this an exception in that it is very unlike that *Seveneves* will ever become a bestseller (with its almost 900 pages); there is a film in the making, though. The reason for inclusion is that the robots in *Seveneves* are very different from most of the robots presented before. Considering the scientific leaning of the text, it is most likely to be quite close to reality, and in the next part we will be getting closer to reality, and away from fiction.

The plot: The Moon breaks into seven pieces that continue to revolve around the Earth. Alas, it turns out that the break was not final: The pieces will continue to divide, which may mean that after White Sky (a cloud of dust), a Hard Rain (a meteorite bombardment) will depopulate the Earth. One of the solutions is to build a Cloud Ark, and send the "delegates", who will carry on the human race, in small "arklets" to join the already existing International Space Station (called ISS or Izzy).

ISS is bolted to an asteroid called Amalthea, and its original function was to mine the asteroid for nickel and iron. This work was to be done by robots, programmed, run and supervised by Dinah MacQuarie:

> ... she programmed, tested, and evaluated a menagerie of robots, ranging in size from cockroach to cocker spaniel, all adapted for the task of crawling around on the surface of Amalthea, analyzing its mineral composition, cutting bits off, and taking them to a smelter. (p. 9)
>
> Scurrying over [astroid's] surface was a score of different robots, belonging to four distinct "species": one that looked like a snake, one that picked its way along like a crab, one that looked like a sort of rolling geodesic dome, and another that looked like a swarm of insects (p.10).
>
> Most software developers had to write code, compile it into a program, and then run the program to see whether it was working as intended. Dinah wrote code, beamed it into the robots scurrying around on Amalthea's surface a few meters away, and stared out the window to see whether it was working. (p.11)

As new problems arose (for example a possible shortage of transistors, which could be destroyed by cosmic rays while the new ones will not be send from the Earth anymore), Dinah's and robots' tasks had to change.

> The world's military-industrial complexes had put a lot of money and brainpower into making "rad-hard" electronics, more resistant to cosmic ray strikes. The resulting chips and circuit boards were, by and large, clunkier than the sleek consumer electronics that earthbound customers had come to expect. A lot more expensive too. So much so that Dinah had

[47] Stephenson compensated for it in Part III, which takes place 5 000 years later and is completely fictitious (also robots start being used to rather fictitious tasks, for example, making up whips used in fights, p. 845).

> avoided using them at all in her robots. She used cheap, tiny off-the-shelf electronics in the expectation that a certain number of her robots would be found dead every week. A functional robot could carry a dead one back to the little airlock between Dinah's workshop and the pitted surface of Amalthea, and Dinah could swap its fried circuit board out for a new one. Sometimes the new one would already be dead, struck by a cosmic ray while it was just sitting there in storage. (pp. 44–45)

Thus, Dinah ordered the robots to cut a storage niche in the asteroid, and hid all sensitive electronic materials there (using an eight-legged robot to put them in, but also to cover them with its body). Observe that Dinah's robots could be "found dead"; very un-humanoid robots are described now and then in terms conventionally meant for animals.

There were several kinds of robots. The one with eight legs, and with an electromagnet on its tip, keeping it on the surface of the asteroid, made mostly of iron, was a Grabb (Grabby Crab), good for picking up things. If it needed to pick up something, it switched off the magnet. A Siwi (probably named after a sidewinder snake) was originally designed for exploring collapsed buildings. The electromagnets were arranged around its body in a double helix, so it could roll diagonally by switching some of them on and off. A Buckie (short for a kind of football) was bigger and spherical, so it could roll in various directions. There were also nanorobots, called Nats, powered by the sun, which were supposed to work in a swarm.

At the time of the catastrophe, a mining magnate put into operation a comet-mining spacecraft Ymir, planning to bring an ice-comet close to ISS, thus supplying Cloud Ark with water. He needed to borrow Dinah's robots for the task, but first they had to learn to deal with ice. In a test, one of Dinah's collaborator emptied a cardboard full of Nats (which look like silicon beetles) on a block of ice. Some of Nats fell on the floor, but after a while scaled the block, joining the others; all of them began to tunnel the ice. Some of them would carry small ice grains when they fell wrongly. Dinah explained to an observer called Rhys that it worked the same way as when one put a wet finger into the freezer – ice cubes stick to it.

Rhys had some scientists among his ancestors whose work made him think of a new use for surplus Nats, that were bigger and not as flexible as the newer models. He "turned them into a new kind of robot that he dubbed the Flynk, for flying link, and taught them to be really good at forming themselves up into chain" (p.342). Such chains can be put around various objects and move those when needed, which would be of much help when Ymir had to be saved later on. Yet there were some dangers, too – a contaminated robot may spread the contamination anyplace it goes. When Dina put it to work, it did, however:

> Then she pulled up the window she used to communicate with her network of robots and typed in a single-word command: JETTISON. It was the name of a program (…) meant to be run simultaneously by every robot in the shard, as well as some other systems down in the boiler room. (…)
>
> Ymir had begun grumbling. Dinah felt as if she were trapped inside the belly of a frost giant with indigestion. What she was hearing, she knew, was the collective noise made by thousands of Nats, and hundreds of larger robots, as they moved to safe positions on the inner surface of the hollow shard and gnawed away at the structural webbing that connected it to the reactor core. (pp. 491-492)

At the end of the two first parts, the robots weld what remained of the ISS, arklets and other ships in a safe position in a cleft between two asteroids.

As a movie is still in production, we avoid spoilers as much as possible, especially as the dramatic tensions of the plot do not depend on robots. Grabbs (which can also be Grimmed, that is, covered with a steel armour), Siwis, Buckies and Nats work tirelessly for their human masters (or rather mistresses, as *Seveneves* can be seen as a depiction of a matriarchate), and when fail, it is not their fault. Once again, the (obviously intended) animalization is worth emphasizing:

> Dinah pulled herself into position before her triptych of flat-panels, and began opening windows, checking on the activities of her menagerie of robots: some sunning themselves on the outside to soak up power, others sipping juice from the reactors, some mining propellant for the next burn, others mending the nozzle. (p.465)

So, robots not as (humanoid) slaves, but as working animals? Taken well care of, and performing tasks that humans are too weak, too big, or not skilful enough to perform?

4. Robots in popular culture: A tentative taxonomy

In order to summarize our analysis we constructed a tentative taxonomy, answering the questions: What good, and what bad can robots do to people; and What good, and what bad, people can do to robots. We chose intentionally the polysemic terms "bad" and "good", exactly because they suggest both functional and moral assessments.

In case the reader may tend to think that such a taxonomy is not only simple, but simplistic, let us justify our action with a quote from Stephen Turner (2014: 138):

> … social theory often begins with taxonomy. Taxonomies create categories of like objects that are alike in a definable way. They enable us to group things in a way that allows us to avoid the confusions produced by general terms, including of course the terms that we use in explanations of different practices, like corruption. But they also help with attempts at generalization, because new taxonomies can help us reveal commonalities within the new taxonomic category. Taxonomy is the sister of analogizing: it is a map of where to apply analogies to similar cases.

Our taxonomy contains four categories, and their content is presented in apposite tables.

Table 1. What robots can do to people: Good
Perform all "dirty, dull and dangerous" jobs (an expression taken from GE Digital's blog): R.U.R.; Player Piano; 2001; Star Wars; Blade Runner; The Matrix; Stepford Wives; Interstellar, Seveneves
Perform jobs that are impossible for human bodies: 2001; Blade Runner; Interstellar; Seveneves
Perform complex tasks better than people: Player Piano; 2001; Star Wars, robot-surgeon; Big Hero 6, Interstellar
Work faster and more efficient; learn new skills quicker: R.U.R (all later works take these two for given)

Free people from work: R.U.R., Player Piano, 2001 (but no later works)
Protect and defend people: Star Wars, good droids; Snow Crash, the dogs; Big Hero 6
Offer companionship, sympathy and care: I, Robot; 2001; Big Hero 6.
Surpass their programming in a manner that serves people: Player Piano; 2001; Star Wars, good droids; Snow Crash, the Librarian
Take over the world, as people are self-destructive: I, Robot
Help to save the world, as people are destructive: 2001; Interstellar

Most interesting, and perhaps most surprising is the fact that the idea of "freeing people from work" vanished so quickly. Yet Burenstam Linder's *The Harried Leisure Class* came out already in 1970; soon afterward it turned out that the leisure class not only works a lot, but wants to work a lot (see, e.g., Schor, 1991).

Table 2. What robots can do to people: Bad
Kill or damage people in fights among groups of people: R.U.R; I, Robot; Player Piano; 2001; Big Hero 6
Commit criminal acts: R.U.R; I, Robot; Blade Runner; Big Hero 6
Deprive people of jobs: R.U.R., Player Piano
Ridicule people: Snow Crash, the Librarian; Interstellar
Surpass their programming in a way threatening to people: Player Piano; 2001; Star Wars, bad droids

Take over the world: R.U.R.; The Matrix
Use people as a source of energy: The Matrix

In contrast, though depriving people of their jobs stops as a theme even earlier than the idea of providing people with leisure, this is going to be one of main themes, if not the main theme in media debates. The reason is partly as above: People want to work, and unemployment is a central topic for economy, and therefore for politics.

Table 3. What people can do to robots: Good
Give them consciousness (”soul”, ”free will”): R.U.R.; I, Robot; 2001
Give them non-human shapes, making them unthreatening (remove ”uncanniness”) and free them from human failings: 2001; Star Wars, R2D2; Snow Crash; Big Hero 6; Seveneves

The first theme is typical for AI debates, so we shall not focus much attention on it; the other is highly topical, though not always directly discussed.

Table 4. What people can do to robots: Bad
Make them human-like, and equip them with human failings: 2001; Star War, C-380
Use them to stop women from achieving equality: Stepford Wives
Treat robots as slaves: R.U.R.; I, Robot; Player Piano

These topics are also discussed mostly in philosophical terms (although it can be claimed that the idea of taxing robots belongs here – but only if one assumes that taxes are “bad”.

We analyzed the chronology of those attributes but could not see many special patters. Most authors and directors over the years agreed that robots will perform "dirty, dull and dangerous" jobs, and that they will work and learn faster and more efficiently than the humans. The idea of "freeing people from work" faded out very quickly, but so did the idea of depriving people of work, so topical in the media at present. Other topics appeared and vanished, with no specific pattern we could establish.

All in all, it seems that Karek Čapek foresaw most issues to be debated in the future (or did his path-breaking work simply direct the future imagination?). Especially in later works, it becomes obvious that the authors and the directors of popular culture works seem to realize that robots themselves need a lot of work being done with them. They also do not exaggerate bad outcomes to achieve a dramatic effect: "bad" and "good" co-exist, but "good" wins (because a happy-end sells better?). Yet the authors and the directors of popular culture works have at their disposal devices inaccessible to social scientists, and only partly accessible to journalists: They can separate bad from good by ascribing the two to different characters, thus resolving ambiguities.

In the next part (in progress), we shall analyze (traditional) media (though some blogs are included as well). As it is impossible to cover all the media (in all languages?), we decided to introduce a "layperson" approach. In this case, the laypersons are the two of us, as we consider ourselves rather average as far as our interest in media is concerned. We may access media in more languages[48] than an average person (if such a person exists), but as traditional media quote themselves and translate most breaking news, this does not extend out field of vision much – and may help to illustrate general trends with some local translations.

[48] English, French, German, Italian, Polish, Swedish.

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