

## Robots between Fictions and Facts

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*Abstract: The contribution sketches the emergence of the present days robotic art as the result and reflection of activities in fields of art creativity and science fiction (both literature and cinematography) in the first half of the previous century, and the convergence of art and scientific and technical development mainly during the second half of the 20<sup>th</sup> Century.*

*Keywords: robot, science-fiction, cybernetics, robotics, engineering, art, robotic art, cyberart, post-humanism*

*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. Have you ever thought of it that way?*

**Isaac Asimov: I, Robot, Introduction**

### 1 Introduction

In this contribution we try to sketch the developmental line leading from the early literal and cinematographic science-fiction, dealing with the concept of robots (and similar artificially created human-like more or less autonomous beings), from the scientific researches and technological engineering activities on the field of informatics, artificial intelligence, and robotics during the 20<sup>th</sup> Century, and from the art development towards abstraction, system aesthetic<sup>1</sup>, and acceptance of

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<sup>1</sup> For more about system aesthetics see (Burnham, 1968a). Jack Burnham is the author of the famous book (Burnham, 1968b) which traces developmental line in art creativity from static, inert objects through kinetic installations towards autonomous interacting open systems.

autonomy of work of art. The development in these directions leads towards remarkable results, which deeply influenced the development of the culture of all of the western type civilisations. Moreover, these two lines crossed in an interesting new branch of the artistic creativity in which the technology of robot design and engineering touch concepts dealing with emergence of society and culture made from and by human beings as well as machines (robots).

## 2 First Robots in Čapek's R. U. R.

As it is commonly known, the word *robot* originally appeared in the play *R. U. R.* (Rossum's Universal Robots) by the Czech writer and journalist Karel Čapek (1890-1938). He wrote the *R. U. R.* during his and his brother's Josef (1887-1945) vacation in the house of their parents in the spa Trenčianske Teplice, in former Czechoslovakia (now in Slovakia) during the summer 1920. The official premier of the *R. U. R.* was in the Prague National Theatre in January 25, 1921 under the direction of Vojta Novák. Costumes have been designed by Josef Čapek, the stage for the performance was designed by Bedřich Feuerstein.

Čapek opened two among the most appealing topics of the 20<sup>th</sup> Century intellectual discourse by his play:

- 1) He replaced the old (eternal) human dream about construction of *human-like machines* to the modern age, called the *age of machine*, by robot characters.
- 2) He reacted in his play to the automation of the mass-production, which brought about questions emerging from intensive *human-machine interaction*<sup>2</sup>, in different ways: e.g. (a) by a theme of crowds of robots produced by assembly lines of R. U. R. factory, (b) by a background of the scenes going on processes of dehumanisation of humankind (man becomes machine-like), and humanisation of artificial beings (through increasing machines human-like abilities), and (c) by situations of confusion caused by inability to distinguish between man and machine because of their similar behaviour (see the Prologue of the play *R. U. R.*) caused by generally shared adoration of machine-qualities of human body and mind in the age of machines.<sup>3</sup>

From the artistic point of view, the artificial humanoid beings introduced by Čapek might be understood also as his humanistic reaction to the trendy concepts dominating the modernistic view of human beings in the first third of the 20th century – the concept of a “new man” – e.g. in symbolist theatre conventions, in

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<sup>2</sup> More about continuous development from mechanisation through automation to interactive technologies see in (Huhtamo, 2001).

<sup>3</sup> More about the development and the transformation of the concept of robots can be found in (Horáková, Kelemen, 2008).

expressionism, in cubism etc., but most significantly in the numerous manifestos of the futurism yearning for mechanization of human and their adulation of the “cold beauty” of machines made by steel and tubes often depicted in the futuristic artworks.

Čapek’s robots can be considered also as reflection of social and political situation of Europe immediately after the end of the World War I, and thus as a metaphor of workers dehumanised by the hard stereotypical work, and consequently as both an abused social class that reacts on its situation by revolts, and as a dehumanised crowd dangerously unpredictable in its actions.

However, very soon after the first introduction of the Čapek’s play, the robot was understood as a mechanical creature, which is not determined to be forever part of the drama-fiction, but which can be sooner or later constructed and replaced from the realm of imagery to the realm of facts – the part of our reality. But Čapek never accepted the interpretation, that his robots are some kind of a „tin and cogwheels“ mechanism. In the first act of his play, the author is saying with words of character Harry Domin, just introducing the R.U.R. factory to the visitor Helena Glory: *And then, Miss Glory, old Rossum wrote among his chemical formulae: "Nature has found only one process by which to organize living matter. There is, however, another process, simpler, more moldable and faster, which nature has not hit upon at all. It is this other process, by means of which the development of life could proceed, that I have discovered this very day." Imagine, Miss Glory, that he wrote these lofty words about some phlegm of a colloidal jelly that not even a dog would eat. Imagine him sitting over a test tube and thinking how the whole tree of life would grow out of it, starting with some species of worm and ending – ending with man himself. Man made from a different matter than we are. Miss Glory, that was a tremendous moment* (Čapek, 1961, p. 6).

So, no any “tin and cogwheels”, no any engineering, but some kind of science, and some strange kind of colloidal jelly “not even a dog would eat” is the starting point for robots, according to Čapek’s opinion. He requires in author’s notes at the beginning of the play – see e.g. (Čapek, 1923, p. 6) – that robots appearing in the Prologue of the play should be dressed as humans, but on the other hand *...their (the robots) movements and pronunciation is brief, and faces are without emotional expressions* (ibid.). We conclude that Čapek gave to his robots a humanoid appearance but a machine-like behaviour. He built them as a metaphor of man-machine, which can be seen both as a humanoid machine and as a mechanised man.

He expressed his own position concerning the origin of robots clearly in his writing published in the Prague newspaper *Lidové noviny* (June 9, 1935) some years later: *“...robots are not mechanisms. They have not been made up from tin and cogwheels. They have been built up not for glory of the mechanical engineering. Having the author in his mind some admire of the human mind, it was not the admiration of technology, but that of the science. I am terrified by the*

*responsibility for the idea that machines may replace humans in the future, and that in their cogwheels may emerge something like life, love or revolt.”*

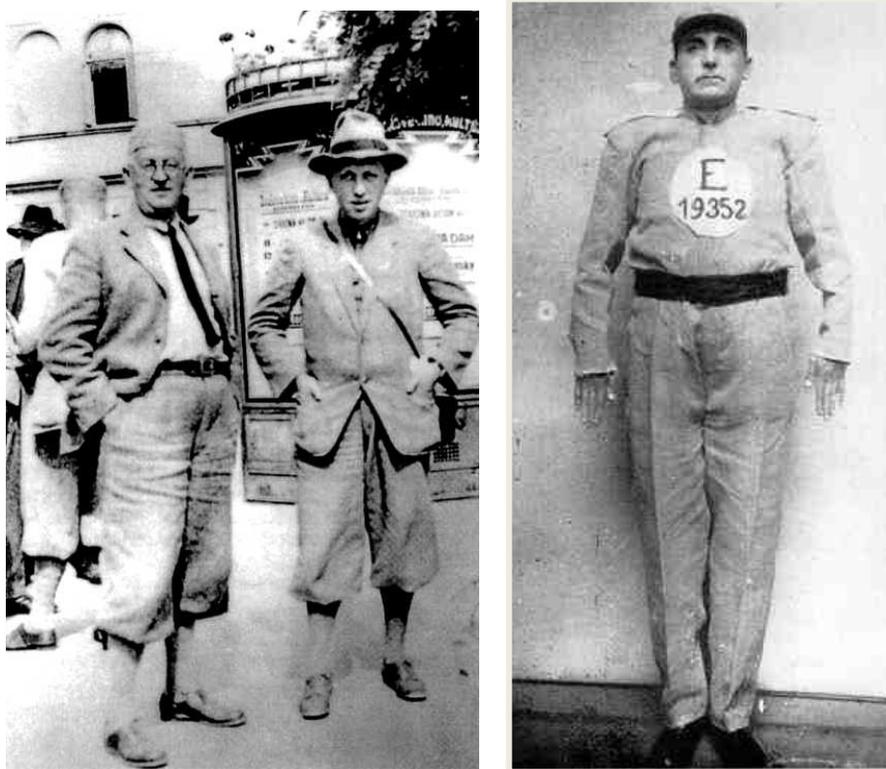


Figure 1

Josef (left) and Karel (right) Čapeks in the left photo made during the summer 1920 when Karel wrote the *R. U. R.*, and Josef invented the neologism *robot* derived from the Czech language, and by Josef designed costume in the right foto of a robot featuring in the Prague National Theatre first night of the Karel's *R. U. R.* in January 25, 1921.

Generally speaking, Čapek recognized *robots* as a metaphor of a *simplified man* (more precisely a simplified worker) not as a *sophisticated machine*. However, the author is never owner of his works and ideas. Real robots were soon built, even though autonomy and complexity of their behaviour was rather imitated by the first real robots, than they would really possessed expected qualities of humanoid machines physically and intellectually transcending human.

The best way to characterize the first real robots of 20s and 30s of the 20<sup>th</sup> Century is to label them as *curiosities of the age of machines*. One among these very first real robots was made by Westinghouse Corp. in the USA in 1927, and was called *Mr. Televox*, according to the device (televox) controlled remotely by human

voice, which *Mr. Televox* advertised in its productions. *Mr. Televox* was in fact the machine televox + humanoid limbs and head made from cardboard. His British robot-colleague, *Eric the Robot*, was a mechanical puppet built from steel with a support by captain W. H. Richards only one year later, in 1928, and was first time presented during Model Engineers' Society exhibition in London. *Eric* resembled a middle age knight look (in full outfit from steel) and he has written *R. U. R.* on his chest to not allow his viewers to hesitate about his lodestars.

### 3 First Mechanical Humanoid in Lang's *Metropolis*

We can detect certain similarities with *R. U. R.* drama topics in very different works of art of the Machine age period. We can see certain analogies in imagination of Charlie Chaplin, who in his famous movie *Modern Times* (1936) presented in his typical grotesque manner the assembly line “as a DJ”, who governs the rhythm of workers movements, as well as social unrest of the time.

Even more fruitful is to compare *R. U. R.* with another example from the film production of the time of its first night. We can see many analogical themes with the *R. U. R.* play in a classical expressionistic sci-fi movie *Metropolis*. In the period of 1925-1926, the German film director Fritz Lang (1890-1976) has been working on the completion of this film. Financial and technical expenses had been unparalleled in history. This film is one of the most famous and influential silent films and sci-fi films to that date. Thea von Harbou wrote the screenplay after her own novel of the same title published in 1926. Cameramen were Karl Feund and Günter Rittau. Universum-Film AG in Berlin produced the film. Aenne Willkomm was the costume designer. The premiere was in Berlin, October 1, 1927 (the premier of the cut version was in New York City, May 3, 1927).

As well as this of the *R. U. R.* also the *Metropolis* story is moved from presence to imaginary realms of future and utopias: *Metropolis* – according to the note on the DVD containing the restored version<sup>4</sup> – takes place in the year 2026, when the population is divided between crowd of workers who must work hard and live in the dark underground and factory owners who enjoy a futuristic city of splendour above.

This separation between owners and worker and thus lack of communication between them seems to be shared opinion about social problems of the time. Visually is this separation described very similarly: Čapek, Lang (and Chaplin too) present the factory directors isolated in their offices and only remotely

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<sup>4</sup> *Metropolis* – restored authorized version with the original 1927 orchestral score (124 min.), licensed by Transit Films on behalf of the Friedrich-Wilhelm-Murnau-Stiftung, Wiesbaden, copyright 2002 by Kino International Corporation, New York, USA.

communicating with the employees. There are windows, telephones, kind of cameras and other devices to be able to govern and control from distance (see the scene in the Fig. 2 from the *Modern Times*, for instance).



Figure 2

The *Modern Times* by Charlie Chaplin (1936) shows also the distance between the head and the hands, the owners and the workers

Similar to that one in *R. U. R.* is also the central conflict in *Metropolis*. It is a conflict between the classes of the “owners” and “workers” which ends with revolution and destruction. In both cases a revolution of the class of “factory workers” against the “factory-owners” is a culminating moment of the plot, and in both cases the solution of the problems is founded in the spiritual level. (Even though Lang is more optimistic than Čapek, because Lang bank on the young generation – the son of the factory owner – who serves as a “heard” or “mediator” between these two conflicting sides in *Metropolis*, described as “head and hands”. Čapek, on a contrary, doesn’t see solution in the level of human activities and he gives us, inspired with the bergsonian philosophy, only a hope into the vital power of nature and life).



Figure 3

The stage for the Prologue in the Prague 1921 first night of the *R. U. R.*, designed by Bedřich Feuerstein



Figure 4

A snapshot from the *Metropolis* with a very similar stage to that one in the Fig. 3

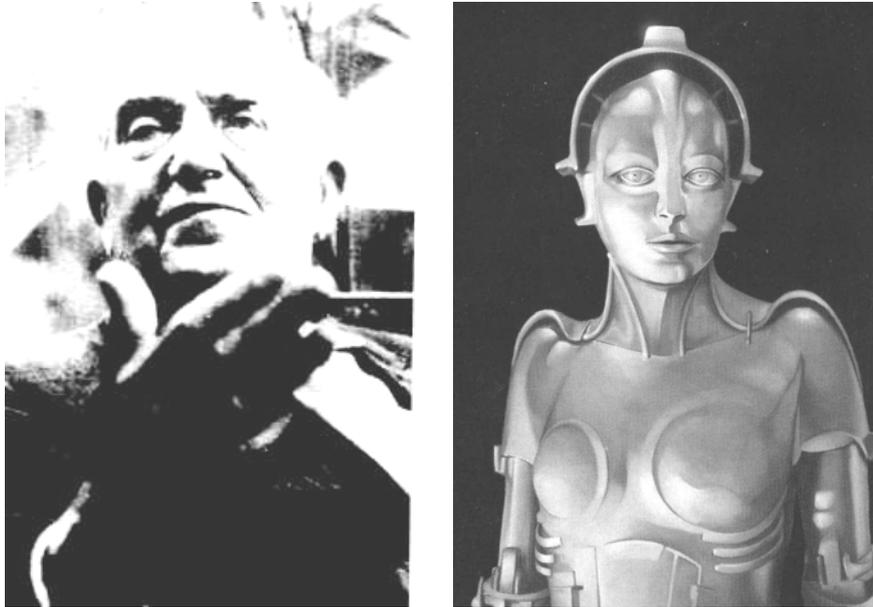


Figure 5

Fritz Lang (left photo from the Wikipedia), the director of the film *Metropolis*, and the machine woman (right photo from the DVD cover mentioned in footnote 4), performed by Brigitte Helm as a double-role together with Maria, the woman, and Maria, the robot

The third point to compare is the robot characters, which appears in the *R. U. R.*, and in the *Metropolis*. While, Čapek's robots are beings which escape its precise definition in favour to metaphor of mechanised man of crowd and a product of factory production, Lang works with robot character as an artificial creature with body from steel and "cogs and wheels" inside in more tradition way. We can say that Lang works with robot character in more traditional way. The Hel, creature made to resemble living woman Maria looks like she, but "inside" is her opposite. Maria-woman embodies Christian values of non-violence, patience and belief. But her double, the robot Maria cases revolution of workers, chaos and destruction. Lang presents the robot as an embodiment of evil, and as an instigator of the dark side of human character.

Hel's costume is clearly influenced by the "tin and cogwheels" idea, which replaced in robots "outlook" very quickly the original, Čapek's "organic" one. In fact, the "tin and cogwheels" robot-look has survived up to our days also thank to technology used in case of present day robots.

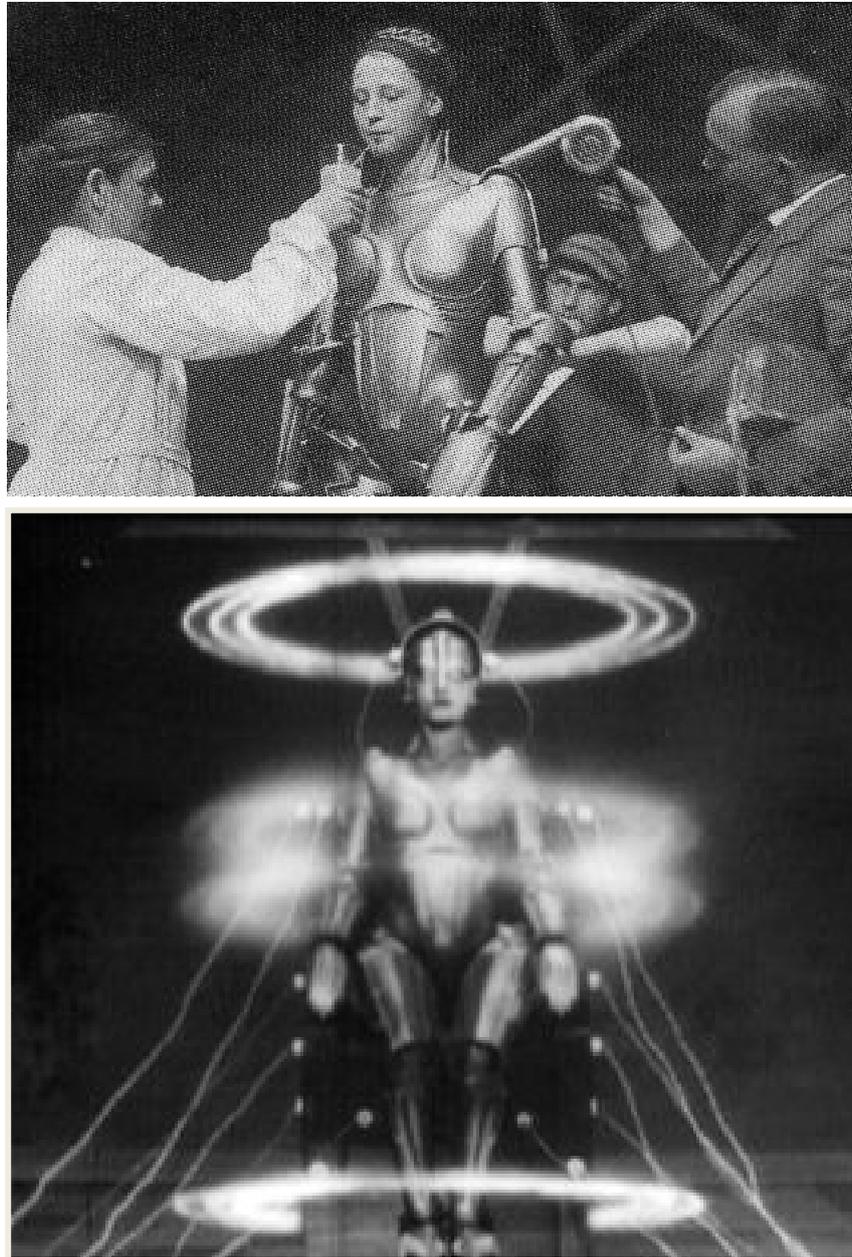


Figure 6

Dressing Brigitte Helm into the costume of Hel, the machine woman (and refreshing her), a photo from the above mentioned DVD cover, and the transformation of Hel into the form of the Maria, the machine, a snapshot from the film *Metropolis*

## 4 Robots as the Result of Science and Technology

First of all, it seems to be appropriate to clarify, the meaning of the word robot as we will use it. According to the Maja J. Mataric's introductory book (Mataric, 2007, p. 2), *a robot is an autonomous system which exists in the physical world, can sense its environment, and can act on it to achieve some goals.* Accepting this definition, all of the above mentioned robots and mechanical (wo)men, moreover, all human beings, and all animals are from this technical point of view robots. However, it seems to be useful in certain contexts to distinguish between all human beings, and generally, all animals and the robots! So, in order to separate human beings and animals from what we intuitively understand as robots, it seems to us as useful to start the Mataric's definition as follows: A robot is *by human beings constructed* autonomous system which....

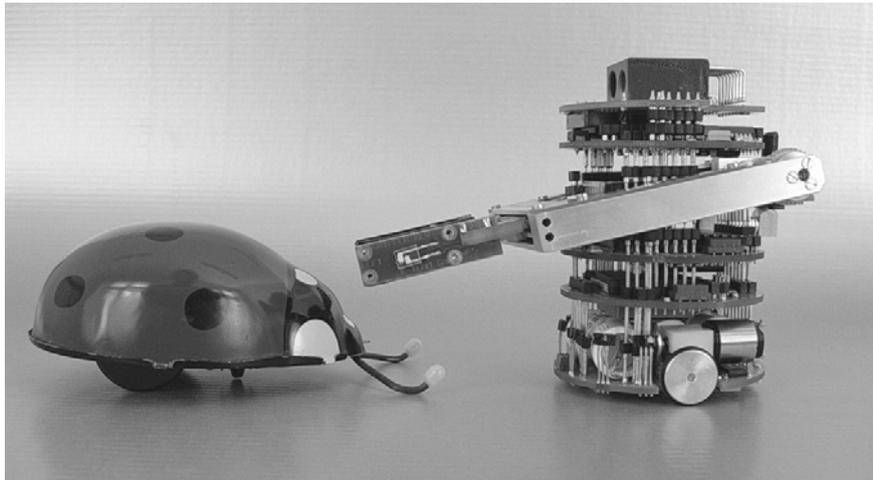


Figure 7

The mechanical ladybug toy, and the technically sophisticated Khepera robotic platform from the end of the 90s of the past century – made by the Switzerland based firm K-Team – for software experiments in robotic laboratories (photo by J. Kelemen)

The history of robots, if we accept Mataric's definition modified by us, started hundred years ago, when the first mechanical systems capable to react to its environments in order to prolong their functionality, are robots. An example of such old robotic concepts (having its roots several centuries before, somewhere in the far-east, probably in Japan or China) is the mechanical ladybug in the Fig. 7.<sup>5</sup>

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<sup>5</sup> More information on the rationality of the behaviour of this type of machines, on their "intelligence" provides (Kelemen, 1996).

The first attempt to make a machine that would imitate some aspects of the behaviour of living creatures, e.g. the familiar test of animal intelligence in finding the way out of a maze, started from first third of the 20<sup>th</sup> Century. According, (Grey Walter, 1061, p. 110) Thomas Ross in the USA made a machine, which successfully imitated this experiment. R. A. Wallace built another creature of the same species, also in the USA in 1952. Claude Shannon has also devised a maze-learning creature, a sort of electro-mechanical mouse that fidgets its way out of confinement. In 1950 Alan Turing published his influential paper, which started researches in Artificial Intelligence, a conceptual base of advanced robotics up to now, and – last but not least – Isaac Asimov named the field of scientific and engineering interests connected with robots by the word *robotics*. The word appeared for the first time in 1941, in the sentence: ... *advances in robotics these days were tremendous* – cf. e.g. (Asimov, 1991, p. 31) – which represent everlasting fascination, which robots and activities connected with the effort to build them invoke in human.

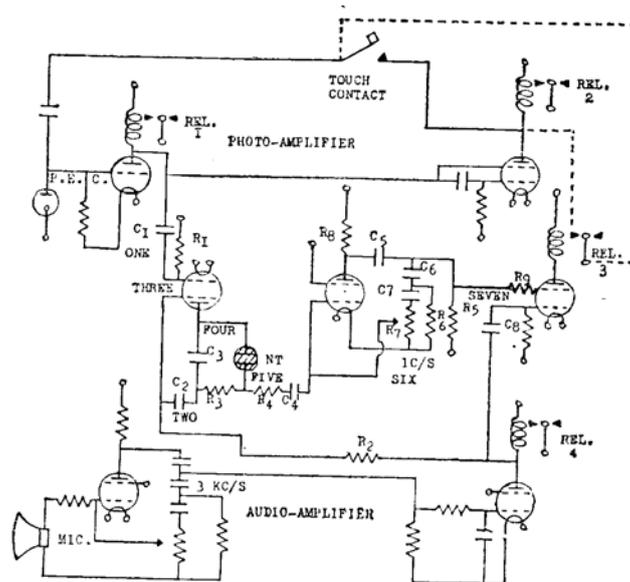


Figure 8

A functional circuit from (Grey Walter, 1961, p. 246). The numbers 1 to 7 refer to the operations performed by each element of his creature named *Machina Docilis*, and are detailed in Chapter 7 of his mentioned book

William Grey Walter in Burden Neurological Institute at Bristol, UK, experimented with different electro-mechanical creatures, which contain also a sort of artificial neurons for decision making and learning from own experience. In his book (Grey Walter, 1961) he provides also some detailed (electro-)technical

descriptions on some of these creatures.<sup>6</sup> Valentino Braitenberg in (Braitenberg, 1984) proposed a sequence of machines with subsequently growing “psychic” capacities.

Generally speaking, the robotics today has as its principal goal the development of as much as *necessary* autonomous systems, developed precisely according the needs of the research and the industry. This is the principal societal demand reflected also in financial supports of the robotic research. The development of humanoids as similar as possible to the real human beings (without any relation to their applications) remains to be a nice dream (however, time to time supported by grants for advanced laboratory research).

## 5 Robots and Cyborgs in the Art

Way of Euro-American society from modern age to the post-modern era goes in parallel with transition in our thinking from humanism to post-humanism. We can well examine this process on changes in our relationship to machines. These changes are clearly illustrated by replacement of metaphor of robot that dominated to the beginning of the twentieth century, by the metaphor of cyborg, referring to the 21<sup>st</sup> Century, as we analyzed earlier, e.g. in (Horáková, 2006). In this chapter we summarize in certain extent, and put into a new context our views expressed in the mentioned publication.

The *robot metaphor* is a product of a culminating phase of modern age (the machine age) identifying humanism with intellectual abilities (that enable human kind to overrule and subjugate its environment by means of instruments/machines that we construct). Robot is at the same time figure of discourse defending differences between man and machine in favour of distance between them. This is a condition of both mirroring each other (man and robot/machine) on a one hand and fearing from the *other* (robot) on the other hand.

The *Cyborg metaphor* refers to the way of thinking joined with post-industrial, information society, which is self-conscious about its dependence on information and communication technologies. The cyborg functions also as a figure of the rejection of the (modern humanistic) anthropocentric views and critiques of its failures, and became an expression of the post-human condition that is characteristic with blurring and questioning borders between traditional dichotomy order of concepts by which we grasp our world. Thus, the cyborg metaphor forces

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<sup>6</sup> These above mentioned purely mechanical or electromechanical creatures are real robots in the sense of Matarić’s definition. In other side, creatures like the famous Honda’s *Asimo* seem to be more *teleoperators* as real robots according to the same definition.

our thinking about relationship between human and machine beyond categories of irreconcilable oppositions<sup>7</sup>.

The appearance of *cybernetics paradigm* during the 50s and 60s of the past century that includes changes in understanding of human-machine relationship is closely connected with a fundamental transformation of machines themselves that is characterised by transition from factory work at assembly lines of the industrial societies towards the information and communication technologies of the post-industrial societies. Typical shape of contemporary machine is not anymore 'mega-machine' set up from smaller machines and working on the principle of to each other mesh together cog-wheels, but that kind of information technologies that is possible to describe only in categories of each other overlapping, conditioning, influencing and each other permeating information (sub-)systems – in categories of an information net. We can say that the development of informatics and the mass use of highly sophisticated information technologies markedly contributed to the spread of the development of the cybernetic paradigm and to its further modifications.

The cybernetics paradigm has influenced not only ways of thinking about human-machine relationship but has spread over the field of art, more precisely over the domain of different kinds of so called *living arts* (events, happenings, performances).

Nam June Paik in his manifesto of the cyberart wrote: *Cybernetics, the science of pure relationship itself, has its origin in karma. Marshall McLuhan's famous phrase "medium is a message" was formulated by Norbert Wiener in 1948 as "The signal, where the message is sent, plays equally important role as the signal, where the message is not sent* (Paik, 1966). The manifesto refers to these categories that were the most evaluated on cybernetics by artists of 50-ies and 60-ies: It was the conceptual apparatus of cybernetics that systematically articulated relationships and processes (by terms as loop, feedback, close or open circuit). These terms were able to describe aesthetical happenings/experiences of artists and their audience, artworks, spectators and environment, so exactly these categories that dominated to the field of art in 1960ties.

Owing to the atmosphere in the field of the art after the World War II, in which we can trace down an accent on process, system, environment and participation of spectators, it was possible that cybernetics became certain theoretical model of a second half of the 20<sup>th</sup> Century art. This massive influence of cybernetics on field of art was mediated by aesthetical context that corresponded with scientific theories that appear in 40s of 20<sup>th</sup> Century and was possible thanks to the complementarity of cybernetics with central tendencies of the experimental art of the 20<sup>th</sup> Century.

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<sup>7</sup> For a famous example of texts which redefine understanding of the figure of cyborg see (Haraway, 1991).

As we have tried to describe above, this trend is possible to characterize as a process of convergence of science, technology, and art. An expression of this trend is artists' increasing interest in categories of scientific and engineering knowledge. However, this trend doesn't mean that this convergence or blurring of boundaries between spheres of art, science and technology necessarily have to mean increasing domination of technology in our society that is connected with mostly negative connotations and fears in a broader society. This trend can equally refer to the opposite tendency – to the extension of sphere of artistic creativity that in the late modernity phase has overflowed from ghettos of galleries to the streets, to the artists' as well as audience's private spaces and in case of widespread of the cybernetics paradigm close connected with information technologies find another space of inspiration in laboratories of scientists.

This tendency dominates to the art of the second half of the 20<sup>th</sup> Century as an expression of heading beyond boundaries of mimeses and re-presentation of the world in an artistic production. These processes are part of the very important shift in understanding of artist's relationship to his/her work and creative process as such, that has certain analogies in technical discoveries in the fields of Artificial Intelligence (AI) and Artificial Life (AL)<sup>8</sup>, and in constructions of autonomous robotic systems indicating certain elements of intelligence. We can make picture of wide use of the newest scientific knowledge and technological inventions in a contemporary media art (or field called art and technology) as well as about the conceptual heterogeneity of artistic creativity that realizes potential of new technologies in (Whitelaw, 2004).

It is not an accident that many artists working in 1960s in the field of conceptual or minimal art have become pioneers of so called cybernetics art. In cybernetics art generally we can usually meet with artistic presentation of the concept of machine (organic-artificial relationship) in a shape of hybrid penetration of biological and technological and blurring boundaries between them.

A good example of this approach to the biological-technological relationship, even not from the field of artistic but genuinely scientific creativity, is an experiment executed and described by British professor of cybernetics Kevin Warwick (Warwick, 2004). During this experiment/event Mr. and Mrs. Warwick communicated in a close circuit (between his and her nervous system) through connection of both nervous systems to the computer.

In the context of cyberart we can demonstrate this tendency also in the well-known work of Australian performer Stelarc. He focuses on evolution and adaptation of human on highly technological environments reminding cyberpunk fiction in his performances/experiments. For example, he experiments/performs with prosthetic technologies as in case of a third hand or with tele-presence

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<sup>8</sup> We have connected AL with robots appearing in the Čapek's *R. U. R.* in (Horáková, Kelemen, 2009).

technologies by which he connects his body through the www, and in this way he enables remote participants of his performances to stimulate motions of his muscles leading into unintentional gestures and motions of his body.

An inclination to blurring and to mudding boundaries between organic and digital systems implies efforts of artists to make experience of human-machine interaction as 'natural' for human as possible, and an interface through which we communicate with machines as invisible (transparent) as possible. This trend leads towards different shapes of digital environments (virtual realities) into which we can immerse and which react "spontaneously" (in real time) on even the smallest input/stimulation from side of users. Bolter and Grusin in (Bolter, Grusin, 1999) specify this aesthetic strategy as a tendency towards *immediacy*, and argue that there exists another, complementary tendency in design of mediated experiences to make the formal and material qualities of the used media and technology a part of the experience, equal to the "message". They call this second aesthetic strategy as *hypermediacy*.

Robotic art can be understood through the prism of this second tendency, using the strategy of hypermediacy, from its origins in around 1960s of the 20<sup>th</sup> Century. This aesthetic strategy is in the case of the robotic art joined with the concept of (human-machine) *interactivity*, which artists share with scientists and engineers working in robotics and in AI and AL, the scientific branches developed from preconditions established by cybernetics and informatics. They were inspired directly by some of the concrete outcomes of scientists and technicians efforts to create kind of system, which behaviour would simulate human behaviour (in case of AI) or behaviour of living organisms (in the case of AL).

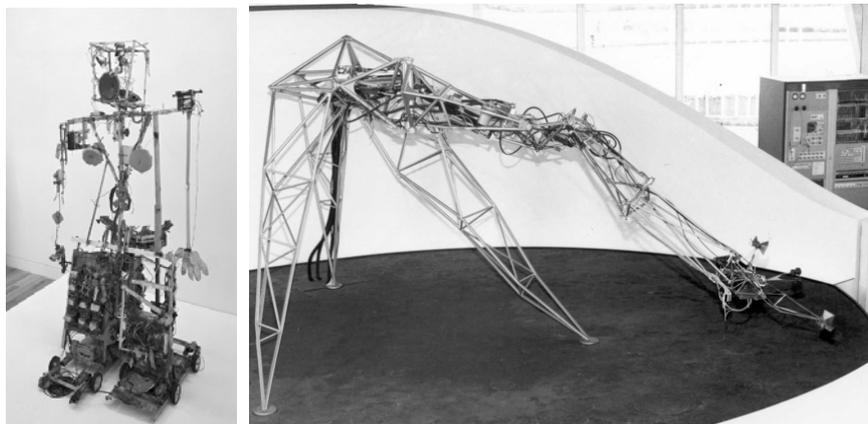


Figure 9

Nam June Paik's *Robot K-456*, an artwork from 1964 (left), and *The Senster* (1969-70) by E. Ihnatowicz (right)

The trend towards hypermediacy and elaboration on a concept of human-machine interactivity are well reflected in robotic art since very first works – e.g. in the case of *Robot K-456* (1964) by Nam June Paik, but notably in the case of Edward Ihnatowicz's first autonomous robotic construct, *The Senster* (1969-1970), that showed certain marks of independent behaviour contrasting with traditional associations connected with robot.

We can say that the concept of the robot (with its long and contradictory cultural history) together with new technologies that enable artists to create unusual interactive communication scripts in a physical or virtual worlds, possibly telematic, spaces is in a context of contemporary art connected with a new aesthetical dimension that prefers modelling of behaviour (an artist creates not only the form but also actions and reactions of robotic system according to inner or outer stimulations) over creation of static objects. Preference of behaviour over form and system over object is understood as a general and characteristic feature of robotic and cybernetic art.

## 6 The Post-Human

The just sketched cybernetic or computational approaches to the human beings lies in a heart of post-human thinking which evolution and metamorphoses in different cultural contexts (from literature to informatics) maps Katherine N. Hayles in her book *How We Became Posthuman* (Hayles, 1999). Hayles connects acceptance of post-humanism with a general spread of concept of cyborg as an expression or image that characterises contemporary state of humanity. However, Hayles does not see a cyborg as a human with added technological prostheses, repeatedly constructed from sci-fi imagery. She recognizes the shift from humanism to post-humanism as a process that have come on a conceptual level when we accepted definition of human (under general influence of concepts of cybernetics and informatics discourse) as information processing systems with qualities similar to other kinds of such systems especially to intelligent computers and advanced robots as a sufficient description. In correspondence with last opinions/knowledge in the fields of AI and AL, Hayles accents the role of an 'embodied cognition' that makes impossible to think about functioning of any 'processing system' without consideration of its body. For public probably radical and hardly acceptable statement of scientists about equal character of 'information processing systems' of human and machine (computer) is this way moderated by awareness that "*human mind without human body is not human mind.*" (Hayles, 1999, p. 246) We can understand this sentence in two ways: On the one hand as a defence of humanity and on the other hand, when we relate it to "postmodern machines"-computers, as an argument for acceptance of their "otherness", their irreducibility into analogies with functions of minds and bodies

of their creators. The otherness of machines, their emancipation from our binary structured imagination, is one among the central themes of contemporary *robotic art*.

As an interesting and inspiring contribution to the understanding of human-machine relationship in a context of the post-humanism or the cyborg-culture era we see robotic art of two Canadian artists – Luis-Philippe Demers and Bill Vorn.

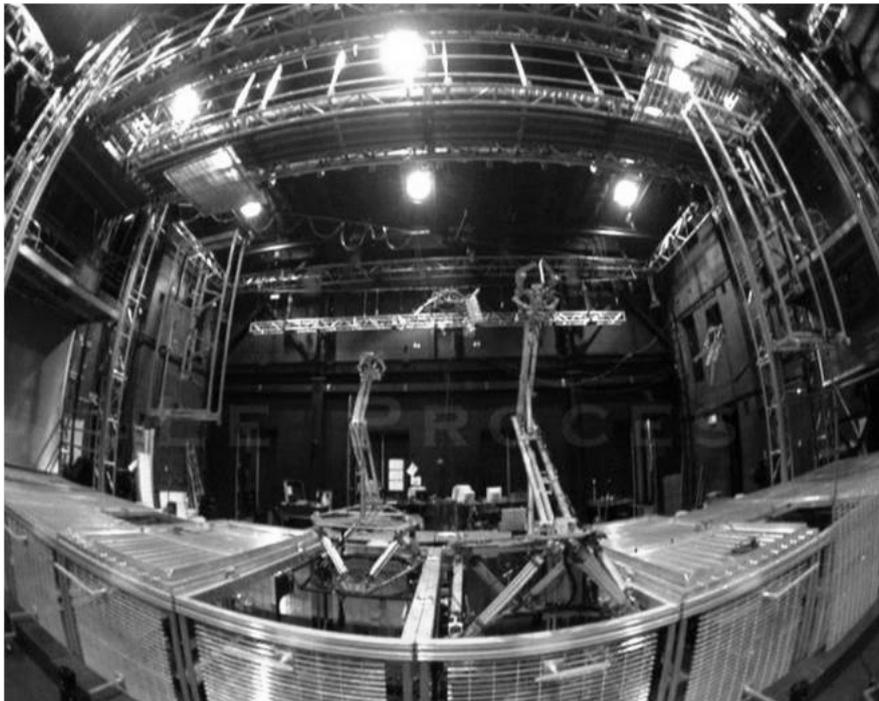


Figure 10

The stage with two robotic arms in the robotic performance *The Trial* (1999) by Bill Vorn and Luis-Philippe Demers

They create different types of noisy, violent, and uneasy “robotic ecosystems”, as they call their installations. Their robots are not humanoid but purposely technomorphic, these robots do not act as a man, only perform their autonomous machinity. The authors call their robotic environments as “theatre of affect” to stress the emotional level on which their works communicate with viewers, in a frame of theatre situation known as a “suspension of disbelief” (Demers, Horáková, 2008). Their robotic installations are constructed to reflect our experience of life in always more and more technological societies. However, they don’t see this as a human treating. They believe that machines are (natural) part of our life and evolution (Whitelaw, 2004, p. 124). They describe their concept of human-machine relationship by comparison: *We understand machines as entities*

*different from us insofar as we differ ourselves from a nature* (Demers, Vorn, 1995). So, we can say that they leave an answer on everyone of us, according to our individual approach to this problem.

### Conclusions

At the beginning of this contribution we promised to discuss the developmental line leading from the early literal and cinematographic fictions dealing with the concept of robots (and similar artificially created human-like more or less autonomous beings), and from the scientific researches and technological engineering activities on the field of informatics, artificial intelligence, and robotics during the 20<sup>th</sup> Century towards new developmental lines of the art. We conclude, that this development led not only to the new forms of artistic expressions of the human being about himself, but also to the new situation, characterized very precisely in (Demers, Vorn, 1995), according the opinion of which we start to ... *understand machines as entities different from us insofar as we differ ourselves from a nature.*

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### References

- [1] Asimov, I.: *I, Robot*. Bantam Books, New York, 1991
- [2] Braitenberg, V.: *Vehicles – Experiments in Synthetic Psychology*. The MIT Press, Cambridge, Mass., 1984
- [3] Bolter, J. D., Grusin, R.: *Remediation – Understanding New Media*. The MIT Press, Cambridge, Mass., 1999
- [4] Burnham, J.: *System Aesthetics*. Artforum, September, 1968a, on-line: <http://www.volweb.cz/horvitz/burnham/systems-aesthetics.html>
- [5] Burnham, J.: *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of This Century*. Penguin Press, London, 1968b
- [6] Čapek, K.: *R. U. R.* Aventinum, Praha, 1923
- [7] Čapek, J. and K.: *R. U. R. and The Insect Play*. Oxford University Press, Oxford, 1961 (translated from the Czech by P. Selver and adapted for the English stage by N. Playfair)
- [8] Demers, L.-Ph., Horáková, J.: Anthropocentrism and the Staging of Robots. In: *Transdisciplinary Digital Art* (R. Adams et al., eds.). Springer, Berlin, 2008, pp. 434-450

- [9] Demers, L.-Ph., Vorn, B.: Real Artificial Life as an Immersive Medium. In: *Convergence – the 5<sup>th</sup> Biennial Symposium of Arts and Technology*. Connecticut College, Connecticut, 1995, pp. 190-203
- [10] Grey Walter, W.: *The Living Brain*. Penguin Books, Harmondsworth, 1961
- [11] Hayles, K. N.: *How We Became Posthuman*. The University of Chicago Press, Chicago, Ill., 1999
- [12] Horáková, J.: Staging Robots – Cyborg Culture as a Context of Robots Emancipation. In: *Cybernetics and System Research* (R. Trappl, Ed.). Austrian Society for Cybernetics Studies, Vienna, 2006, pp. 312-317
- [13] Horáková, J., Kelemen, J.: Robots – Some Cultural Roots. In: *Proc. 4<sup>th</sup> International Symposium on Computational Intelligence*. Budapest Polytechnic, Budapest, 2003, pp. 39-50
- [14] Horáková, J., Kelemen, J.: The Robot Story – Why Robots were Born and How They Grew Up. In: *The Mechanical Mind in History* (Ph. Husbands et al. eds.). The MIT Press, Cambridge, Mass., 2008, pp. 283-306
- [15] Horáková, J., Kelemen, J.: Artificial Living Beings and Robots – One Root, Variety of Influences. *Artificial Life and Robotics* **13** (2009) 555-560
- [16] Haraway, D.: A Cyborg Manifesto – Science, Technology, and Socialist Feminism in the Late Twentieth Century. In: *Simians, Cyborgs and Women – The Reinvention of Nature*. Routledge, New York, 1991, pp. 149-181
- [17] Huhtamo, E.: From Cybernation to Interaction – a Contribution to an Archeology of Interactivity. In: *The Digital Dialectic – New Essays on New Media* (P. Lunenfeld, Ed.). The MIT Press, Cambridge, Mass., 2001
- [18] Kac, E.: Origin and Development of Robotic Art. *Art Journal* **56** (1997) 60-67
- [19] Kelemen, J.: A Note on Achieving Low-Level Rationality from Pure Reactivity *Journal of Experimental and Theoretical Artificial Intelligence* **8** (1996) 121-127
- [20] Mataric, M. J.: *The Robotics Primer*. The MIT Press, Cambridge, Mass., 2007
- [21] Paik, N. J.: From Manifestos. In: *The New Media Reader* (Wardrip-Fruin, N., Montford, N., eds.). The MIT Press, Cambridge, Mass., 2003, p. 229
- [22] Warwick, K.: *I, Cyborg*. University of Illinois Press, Chicago, Ill., 2002
- [23] Whitelaw, M.: *Metacreation – Art and Artificial Life*. The MIT Press, Cambridge, Mass., 2004