Robots: The century past and the century ahead, 
an Introduction to the 2021 ALIFE conference

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Abstract

The theme of ALIFE 2021 conference is “Robots: The century past and the century ahead”, because we celebrate the centenary of Čapek’s R.U.R. and the worldwide-used word “robot”, which comes from this play. The conference was originally scheduled to be held in Prague, the city where the play had its official world premiere in 1921. However, because of the covid-19 pandemic and its repercussions, ALIFE 2021 conference is virtual. Nevertheless, in this introductory paper the history of the R.U.R. play and its plot are briefly outlined and its legacy to current research discussed, namely in the context of the field of artificial life.

Introduction

November 1920 was the month when the science fiction drama R.U.R. (subtitled as "Rossum’s Universal Robots") was published (Capek, 1920) and on 25 January, 1921 the play was premiered in the National Theatre in Prague in Czechoslovakia (Figure 1). The play had immediate success around the whole world. It was presented in New York in October 1922 (Figure 2), and in Tokyo in 1924. By 1923 it was translated into thirty languages. However, in almost all translations the original term “robot” was not translated. The author, famous Czech writer Karel Čapek, used this new word “robots” (on the advice of his brother Josef, Figure 3) for artificially made human-like beings and started the era when artificial agents working instead of people are called robots. The word “robot” comes from the word “robota” which in the Czech language means “corvée” or “serfdom”, i.e. forced labour of the kind that serfs had to perform on their masters’ lands.

Currently, many people know the R.U.R. play because of this fact that it was a play where the word “robot” was used for the first time. However, it is rare that they know the whole story. Although the play is one hundred year old, it opens many contemporary questions and many of them are related to artificial life research. Moreover, the ideas from Čapek’s R.U.R. bring to mind many familiar themes that we can we see today in cinema, sci-fi literature or games that focus on the technological future.

Figure 1: The costume design of robots at the Prague R.U.R. premiere in 1921. Robotess Sulla on the left (Horakova, 2010).

R.U.R. play

Spoiler warning: this section will make substantial use of spoilers with respect to Čapek’s R.U.R. play.

R.U.R. is a play about an island factory called Rossum’s Universal Robots, where artificial people are fabricated and sent around the world as working machines. In the beginning of the play, the central director of the company (Domin) tells the story about the factory founder, the old mad scientist Rossum, to the President of the Humanity League (Helena Glory).

“Old Rossum attempted by chemical synthesis to imitate the living matter known as protoplasm until he suddenly discovered a substance which behaved exactly like living matter although its chemical composition was different... He wrote the following among his chemical specimens: ‘Nature has found only one method of organizing living matter. There is,
however, another method, more simple, flexible and rapid, which has not yet occurred to nature at all. This second process by which life can be developed was discovered by me today... Imagine him sitting over a test tube, and thinking how the whole tree of life would grow from it, how all animals would proceed from it, beginning with some sort of beetle and ending with a man. A man of different substance from us. Now, the thing was how to get the life out of the test tubes, and hasten development and form organs, bones and nerves, and so on, and find such substances as catalytics, enzymes, hormones, and so forth... And then old Rossum started on the manufacture of man.”

In other words, old Rossum had not focused on life as we know it, but life as it could be. With a little imagination, we can say that he was a great artificial life researcher. Nevertheless, the artificial life field was established more than half a century later after Čapek’s R.U.R. publishing, in 1987 at the first Artificial Life Workshop in Los Alamos by Christopher Langton (which is generally accepted to be the founding of this interdisciplinary field) (Langton, 1987).

In R.U.R. one can find a plethora of contemporary artificial life related unsolved scientific problems and challenges, for example Rossum’s attempts by chemical synthesis to imitate the living matter correspond to wet artificial life and a working on construction of living systems in the laboratory. There are many such approaches in various levels from synthesis of biomolecules from inorganic precursors, from self-assembly of already-existing biomolecules into protocells to studying of the life-like expressions of substances that are completely artificial (Rasmussen et al., 2008).

Back into R.U.R. play. As Domin tells Miss Glory the story about the Rossum’s Universal Robots factory, the robotess Sulla enters the room. Miss Glory talks to her and does not realize that Sulla is not a girl. So, Miss Glory was impressed by the perfect chatbot she met that passed the Turing test. Of course, this terminology was not used in Čapek’s play, because it was not until the year 1950 that Alan Turing proposed his test by which an object can be said to possess artificial intelligence if it can mimic human responses (Turing, 1950).

However, then the discussion about robots’ properties continues and Miss Glory wonders why robots have no soul, no interest in life, no enjoyment. She argues that they should have feelings and emotions. Domin opposes her, that robots are just working machines that must not play the piano, must not feel happy, must not do a whole lot of other unnecessary things, similarly as a gasoline motor must not have tassels or ornaments. Everything that does not contribute directly to the progress of work and that makes the robot more expensive was rejected. In modern discussions by experts in the fields such as AI or robotics, there is still no consensus whether robots (namely humanoids) need the mental abilities of a living being such as reason, character, feeling, consciousness, memory, perception, thinking, etc. Another fundamental question is related to the ability to self-replicate and evolve. The theme of self-replicating machines and robots is excellently summarized in a recent book by Taylor and Dorin (2020).

Later on five more male figures enter the stage, the representatives of R.U.R. company. Helena misunderstands; she thinks that they are also robots and offers them the help. She is the President of the Humanity League, which ensures good treatment for robots. After that, in this one century old play, the actual question is opened – whether robots have rights. In the play they ask if the robots should have the rights to vote, drink beer or got a salary. Recently similar questions about robots rights were spread in public around whole the world when robot Sofia was granted the first non-human citizenship and Saudi Arabia became the first country in the world that gave a robot citizenship. It was very controversial step because now the humanoid Sophia has
more rights than Saudi women (Parviainen and Ceeckelberg, 2020).

Then the discussion of Helena with six representatives of R.U.R. continues and the question is what the humans will do when all of their work will be done by robots. The Domín’s prognosis is: "Rossum’s Universal Robots will produce so much corn, so much cloth, so much everything, that things will be practically without price. There will be no poverty. All work will be done by living machines. Everybody will be free from worry and liberated from the degradation of labor. Everybody will live only to perfect himself." Similar to the fictional representative of R.U.R. company, some current leading researchers see the future optimistically. The humans will perform no work and their aim will be only to care to perfect themselves.

The first act of R.U.R., in summary, is very optimistic and predicts the future of humans in the company of robots as a paradise. Finally Miss Glory accepts (besides Domín’s marriage proposal) the arguments of all six male representatives of the company that there is no risk to produce more and more robots and that the future of humanity is like a heaven. Nevertheless, the following two acts bring the other scenario, darker then expected. I think that this short introduction of the play is enough to show how many actual topics one can find there and that they are relevant to modern artificial life research.

**R.U.R. centenary**

On the occasion of the centenary of R.U.R. publishing and premiere, the theme of this year’s ALIFE 2021 conference is "Robots: The century past and the century ahead" (Figure 4). Besides dedicated workshops and keynote talks, the conference offers also a social program related to this anniversary. In honor of this century-old literary work, we have a student essay competition where the undergraduate and PhD students submitted essays related to R.U.R., robots or artificial intelligence.

Another literary piece of work that pay tribute to R.U.R. is the book Robot 100. The Czech edition was released in November 2020 and includes the first edition of R.U.R. in its original 1920 version together with contemporary perspectives on Čapek’s one-hundred-year old piece through the eyes of one hundred personalities from the Czech Republic and from around the world, including scientists, writers, journalists, artists, and athletes. More than half of the authors are artificial life researchers, who contributed to the book by brilliant chapters about the history and progress in fields such as robotics, synthetic biology, artificial intelligence, and, of course, artificial life, and discussed also the challenges arising from today’s modern technologies. The English edition will be published by MIT Press in Fall 2022 on the occasion of 100th anniversary of the first North American production of the R.U.R. play and thus the introduction of the word "robot" to the English language.

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**Figure 4:** Logo of the ALIFE 2021 conference in Prague on the occasion of the centenary of Prague R.U.R. premiere. (Graphic design: Tereza Tomáštiková.)

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Figure 5: 100 authors who contributed to the Czech edition of *Robot 100* book.

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Figure 6: The cover of the Czech book *Robot 100* (Cejkova, 2020). (Graphic design: Jonáš Ledecký).