



Foster, M. E. (2019) From clockwork automata to robot newsreaders. *Nature Machine Intelligence*, 1, pp. 170-171.
(doi:[10.1038/s42256-019-0043-2](https://doi.org/10.1038/s42256-019-0043-2))

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Deposited on: 04 June 2019

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Title: From clockwork automata to robot newsreaders

Exhibition info: 'Robots', National Museum of Scotland

Running from 18 Jan – 5 May 2019

Tickets: £10

In my working life, I mainly do research in social robotics: as I usually describe it to people, my overall goal is to develop robots that are able to have a face-to-face conversation with a human, in as natural a setting as possible. In practice, therefore, much of my research career involves developing interactive robots and then putting the robots into the world and seeing how people interact with and react to them.

I was excited to see the [Robots exhibition](#) currently at the National Museum of Scotland: not only to see the very wide range of robots included, but also – and mainly – to see how those robots are described to the public, and to see how people react to them who don't have as much experience of robots.

Aside from one purely industrial robot – a mid-20th century loom – the exhibition focusses almost entirely on the sort of robots that I work with, and that people usually think of when they hear the word "robot": shiny, approximately human-shaped machines that are able to talk to – or at least interact with – people in the world (think C-3PO or, if you must, the Terminator). Through a large set of robots and related machines – old and new, fictional and real, autonomous and human-controlled – the exhibition aims to examine what the role of robots through the centuries says about our conception of humanity.

After beginning with a somewhat creepy animatronic baby (apparently designed for use as a film double), clearly demonstrating that "[c]oming face-to-face with a mechanical human is a disconcerting experience", the exhibition proper starts with a wide selection of centuries-old mechanical devices and creatures. Beginning in the 16th century, two important developments came together to result in the first machines which could reasonably be termed "robots". On the one hand, the development of increasingly sophisticated clockwork machines, which were able to accurately track time and to model and predict the motion of the solar system; on the other hand, anatomists developed an increased understanding of the structure and operation of the human body, and indeed began to describe the operation of the human body using mechanical terms. This section contained a lot of very cool historical automata, ranging from a tiny spider designed to scuttle across a table to a giant, incredibly ornate automatic lathe, as well as many human-shaped figures of various sorts. The most striking part of this section for me was the discussion of people's responses to these first "mechanical humans", which mirror discussions that we are still having today about the nature of humanity and the role of artificial agents in society.

After a brief detour into industrial robotics, the second large section focussed on fictional robots: there was, of course, a replica of the Maria robot from Fritz Lang's 1927 film "Metropolis", as well as a prop used during the filming of "Terminator Salvation" in 2009. This section also includes a number of vintage toy robots, movie posters, and video clips, as well as several giant robots designed for publicity purposes. I especially liked the replica of Eric, the "first modern British robot", originally built in 1928 to stand in for the Duke of York at an exhibition in London. Although the fictional robots

in this section are striking, in practice they are all fully controlled by a human operator, or else perform scripted behaviour in Hollywood movies. As noted in the description of the Terminator prop, while these sort of fictional robots have had a lasting effect on popular culture, in practice, no actual humanoid robot has anything close to the capabilities of these robots – and this can cause real problems with user expectations when deploying actual robots into the real world in 2019.

In contrast, the final large section concentrates on actual, modern robots rather than centuries-old automata or fictional depictions of robots – and, in contrast to the robots in the previous sections, many of these robots are actually able to operate more independently and intelligently, without scripting or direct human control. This section provided accessible explanations of all the main challenges in developing this sort of robot, including locomotion, movement, manipulation, artificial intelligence, communication, and learning. A particularly exciting aspect of this section for me was that it included just about all of the social robots which I have been citing in my research for more than a decade, including Cog, Nexi, and Kaspar, as well as a wide selection of modern robots designed to interact with humans in real-world settings, ranging from more industrial-style robots like Baxter to an eerily realistic robot newsreader from Japan. I did wonder how someone without robotics expertise would react to this section, though: the capabilities of actual modern robots are still rather lower than those of fictional robots such as those found in the preceding sections, and (as I mentioned above) in my experience this can often lead to confusion and disappointment. Maybe because of this, most of the robots in this section included little signs indicating what the visitors could expect: examples included "I don't move", "I perform on a timer", and "I perform on my own".

The final, Edinburgh-specific section included examples of hardware to support two-legged robot walking, as well as an interactive display about the NASA Valkyrie humanoid robot and a short video showing other robotics research carried out in Edinburgh. This was a good addition to the exhibit, showing that high-quality work is underway in this active research field in the local area.

All in all, the Robots exhibition gave a good summary of the process of development of the robotics field, particularly the sub-area of social robotics: as a researcher I did not disagree with any of the explanations, and putting everything in the context of clockwork automata made it clear that the issues currently arising about the roles of robots in society are not new ones, but have actually been around since the development of the first mechanical humans. The other visitors I saw at the exhibition seemed intrigued by all of the robots, and hopefully they came away with a better understanding both of the development of robots as well as the actual capabilities and possibilities for such robots in the years to come.