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## The Robots Are Here

**Robots**, the mechanical men of pop culture, are among the most futuristic elements of sci-fi, but they are also among the oldest. They first appeared in Greek mythology, made by the lame god **Hephaestus** (a/k/a Vulcan to the Romans) to help him work at the forge.

These were assistants shaped like golden women as well as self-moving tables. He also created a fearsome autonomous defense robot, a bronze giant named **Talos** which ran constantly around the island of Crete throwing large rocks at would-be invaders.

If this seems somehow oddly familiar, it is because the robots of ancient myth are little different from C-3PO, R2-D2, and the killer **droids** of *Star Wars*, proving that nothing is ever really new. But the greatest dreams typically take a very, very long time to manifest.

Robots have taken ages to arrive, but at last they're finally here. However, they're not quite like what we expected them to be.

### **Mechanical marvels of the imagination**

Many cultures had tales of artificial beings with amazing powers. Several alleged wizards in Europe were even rumored to own talking **brazen heads**. But the first machines that mimicked living beings since antiquity were **automatons** constructed during the Renaissance using the latest in clockwork technology. Da Vinci himself made a self-steering moving table as well as an armored knight.

But it was not until the 20<sup>th</sup> Century that electric technology could move robotics beyond the rigid limits of mechanical toys. This may have inspired new thinking including a 1921 Czech play that invented the word "robot" from a Slavic word for "work" or "labor".

The satirical drama, *R.U.R.* (for "Rossum's Universal Robots"), depicted a world where synthetic humans drudge for their idle masters. It was the first piece to show not only robots, but their **rebellion**, a theme that has been a staple of science fiction ever since.

In 1926, the German film *Metropolis* famously featured a female robot that became a cult leader in human disguise. In 1942, **Isaac Asimov** published the first of his robot series, with its famous **Three Laws** that defined how robots were imagined for decades.

Since then, robots in film and fiction have ranged from slow, boxy mannikins to those indistinguishable from humans to ginormous monsters. All those types and a **lot more** besides are in current development.

### **Black boxes and deep connections**

To be more than just an automaton, a robot must perceive and react to its environment. It must deal with a flood of constantly changing sensory data to perform actions leading towards its goal and judge them.

To function, robots have to process a lot of information about this messy and uncertain universe. Yet digital devices **reason** by strict mathematical rules using only 1 and 0.

The history of AI, **artificial intelligence**, has been a long quest to get around these limits. Writing scripts for every possibility in a situation soon failed. Just to have a robot **sense** and identify objects or act on its own were almost unsolvable problems until researchers saw that **probability** was the key. By relying on the odds, they found ways to handle the various encountered uncertainties.

The biggest breakthrough came from enabling AIs to **teach** themselves by trial and error. Pitting them to **compete** against each other further sped up the process of learning.

But there's one tiny little problem: nobody can tell **what** they are thinking or **why**.

Humans cannot know what anybody else is thinking anyway, so why is this a big deal? People rely on education with repetition, tests, and so on to make sure everyone's on

the same page, but it's not so simple when dealing with an inscrutable **black box**, where data goes in and the answers just pop out.

This is not just a puzzle for robotics but all AI, for so much of modern life is now determined by unseen **algorithms** mysteriously crunching data. It's chilling enough when a program determines whether or not to grant insurance, admit students, or fire workers for reasons unknown, but when it is actively delivering medicine or driving a car, it's critical.

For instance, self-driving Teslas have occasionally run into police cars with **flashing lights**. Something in the AIs' training interfered with recognition. It will take a lot of effort to work out all such possible glitches enough to trust robots with human lives.

One thing most masters of science fiction, including Asimov, often overlooked were the immense variety of robots all linked together. Aside from supercolossal **mainframes**, their robots were usually stand-alone humanoids.

Generalized **humanoid robots** only make sense if they are intended to replace human workers, doing laundry or making martinis. But it may be cheaper and more efficient to use various specialized bots for the many tasks for which the human form is not ideal.

Intelligent cars will likely be less expensive than robots who can drive. Most robots will probably not be run solely by onboard computers anyway. **Networking** greatly increases efficiency, and it would make sense to connect every device that could be reached.

What happens then? Would there be a single, **worldwide machine** instead of a multitude of individual devices? Could consciousness **emerge** from such a grouping? If so, since it is an AI, its thoughts could not be fathomed by others and its agenda would be determined according to its own inner logic.

### **The long shadow of servitude**

A scary thought? Some **thinkers**, including Stephen Hawking and Elon Musk, have warned about AI. The lack of transparency of computer "thought" is one reason. There are many fears of robots and not all are irrational.

But they are not at all due to the machines themselves. Robots are but instruments built to do what we humans tell them to do. If they fail, it is not their fault but our own.

The real problem with robots is **slavery**.

Forced servitude has been a feature of human existence since the dawn of history. The mighty Greek and Roman civilizations were founded entirely upon it and our own country is still recovering from its grim heritage.

Slavery is such a part of our history and literature that we uneasily recognize not only its terrific benefits to masters but the terrible price paid by the enslaved. So uncomplaining humanoid machines in the latter role could provide unspeakable temptations to some.

People must develop **ethical systems** that govern the proper uses of robots, but that will depend on how we answer the many deep **philosophical questions** robots pose. Then robots will somehow have to be taught their own appropriate ethics much like kids.

Yet we cannot escape our history. **Autonomous killing machines**, for instance, are seen by most people as a really bad idea, but they are already guarding facilities today.

Perhaps it is the dark legacy of slavery that makes arming robots seem so ill-advised. But a violent rebellion is **not the only way** robots could do us in. Programming them to enjoy serving us is fraught with moral issues of its own and might not save us. Simply catering to all our desires might be deadly enough.

For looming among these questions is that of **agency**. How can people judge a self-motivated robot's actions? Is it a conscious decision or a simulation? Does it even matter?

Whatever the answer, maybe we humans can evolve a more positive relationship with our creations. Beyond the **uncanny valley** lie friendly **robot companions**. In this uncaring world, that is surely better for us than slaves.

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