UNCANNY VALLEYS:
Thinking and Feeling in the Age of Synthetic Humans

Thursday, March 23, 2017, at 4 p.m.
Friends of the USC Libraries Lecture Hall
Doheny Memorial Library, Room 240
University of Southern California

ABOUT THE PANELISTS

- **Travis Deyle** is the co-founder and CEO of Cobalt Robotics, which builds indoor robots designed to provide better security than human guards can do alone. He previously worked at Google[x] Life Sciences, developing things like glucose-sensing contact lenses. In 2015, he was named one of MIT's "35 Innovators Under 35."
- **Jonathan Gratch** is the director of virtual-humans research at the USC Institute for Creative Technologies and co-director of USC's Computational Emotions Group.
- **Hiroshi Ishiguro** is the director of the Intelligent Robotics Laboratory at Osaka University, the lab that developed the humanlike Actroid. Ishiguro has modeled robots after himself and his daughter.
- **Yoshio Matsumoto** made the Actroid-F, which has been mistaken for a real human being and even called "sexy."
- **Jessica Riskin** is the author of *The Restless Clock: A History of the Centuries-Long Argument Over What Makes Living Things Tick*. She is a professor of history at Stanford University.

WHAT IS AN UNCANNY VALLEY, ANYWAY?

The "uncanny valley" refers to the hypothesis that human replicas that are almost, but not exactly, like human beings provoke feelings of eeriness and revulsion among some observers. The idea is that a human's emotional response to a robot becomes more positive and more empathic as the robot becomes more and more humanlike … up to a point. At the point that the robot becomes a little *too* humanlike, the human observer's response quickly turns from affection to revulsion. This space of repulsive response, of too much human-ness for something that is not fully human, is the uncanny valley.

The phenomenon of the uncanny valley was first described by Japanese roboticist Masahiro Mori in 1970 as *Bukimi no Tani Genshō*. The term was translated into English as "uncanny valley" in 1978.

DEFINITIONS

Android: A mobile robot, usually with a human form.

Automaton: A figure that appears to imitate the motions of human beings or animals.

Human: A bipedal primate mammal.

Robot: A machine in the form of a human being that performs the mechanical functions of a human being but lacks emotions and sensitivity; an automatic apparatus or device that performs functions ordinarily ascribed to human beings or operates with what appears to be almost human intelligence; or a mechanism that operates without human assistance.

HUMANLIKE ROBOTS IN HISTORICAL PERSPECTIVE

5th Century BCE The *Liezi*, a Taoist text, describes an automaton.

1206 Islamic polymath Ismail al-Jazari describes a band of humanoid automata that performed humanlike facial and bodily actions while playing music.

1495 Leonardo da Vinci sketches plans for a humanoid robot.

1738 French inventor and artist Jacques de Vaucanson builds life-size figures that can play music.

1774 Swiss watchmaker Pierre Jacquet-Droz and his son Henri-Louis create a boy-like figure that can write.

1920 Czech writer Karel Capek uses the term "robot" to describe machines that resemble humans in his play *Rossums Universal Robots*.

1927 The Maschinenmensch (Machine Man) appears in Fritz Lang's film *Metropolis*.

1928 A robot named Eric tours the world.

1942 Isaac Asimov lays out "The Three Laws of Robotics" in a short story.

1950 Alan Turing proposes what is now known as the Turing Test of whether a machine can truly think for itself. To pass the test, a machine must be indistinguishable from a human being during conversation.

1968 Stanley Kubrick's film version of Arthur C. Clarke's *2001: A Space Odyssey* features HAL, a computer who seems to develop a mind of his own.

1972 Engineer Miomir Vukobratović and his team build the first active anthropomorphic exoskeleton.

1977 Millions are introduced to the friendly robots R2-D2 and C-3PO in *Star Wars*.

1980s to the present Academic, military, and commercial labs all over the world develop increasingly humanlike robots.

THE USC INSTITUTE FOR CREATIVE TECHNOLOGIES

Established in 1999, the USC Institute for Creative Technologies is a Department of Defense–sponsored University Affiliated Research Center (UARC) working in collaboration with the U.S. Army Research Laboratory. ICT brings film and game industry artists together with computer and social scientists to study and develop immersive media for military training, health therapies, education, and more. Research projects explore and expand how people engage with computers, through virtual characters, video games, and simulated scenarios. ICT is a recognized leader in the development of virtual humans who look, think, and behave like real people. ICT is located in Playa Vista.

FOR FURTHER REFLECTION

Robots inspire wonder, fear, intense study, and speculation, particularly as the work of robotics and artificial intelligence experts advances toward making real what was previously fantastical science fiction in literature and film. As you explore your own responses to robots and humanlike androids, you might want to consider:

- What makes a human a human?
- Hiroshi Ishiguro has said that he hopes to decipher what the Japanese call *sonzaikan*—the feeling of being in the presence of a human being. What do you think creates that feeling?
- What would you say is the best use of humanlike robots? "Best" can mean most useful, most ethical, most fun, or whatever "best" means to you.

TO LEARN MORE, EXPLORE THESE RESOURCES:

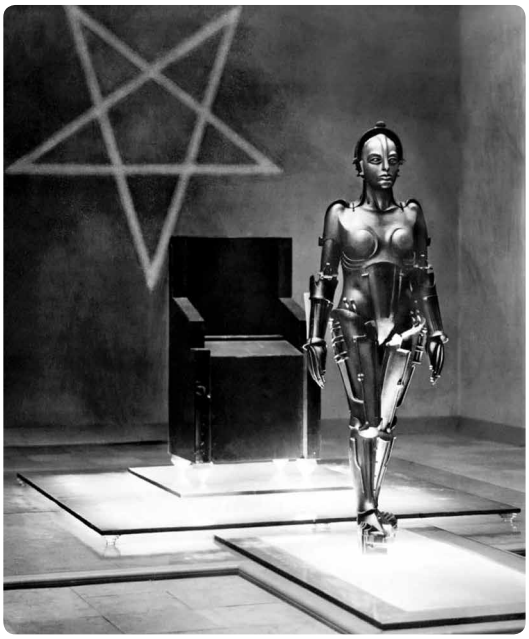
- Hiroshi Ishiguro Laboratories
  http://www.geminoid.jp/en/index.html
- Jessica Riskin's book *The Restless Clock: A History of the Centuries-Long Argument Over What Makes Living Things Tick*
- *Popular Science*'s gallery of vintage robots
  http://www.popsci.com/gadgets/article/2010-04/bots-bygone-eras
- Classic books about robots like Arthur C. Clarke's *2001*, Philip K. Dick's *Do Androids Dream of Electric Sheep?*, and Isaac Asimov's *I, Robot*

ISAAC ASIMOV'S THREE LAWS OF ROBOTICS (1942)

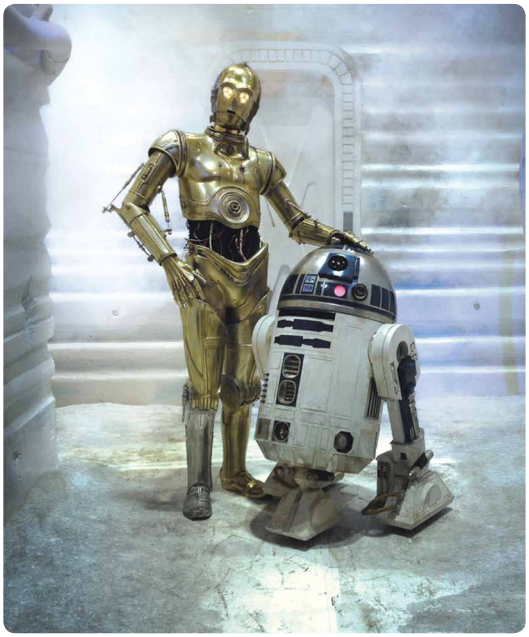
1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.

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 Laws.



Machine Man from Fritz Lang's film *Metropolis*.



R2-D2 and C-3PO from the movie *Star Wars*.

DISCOVER MORE AT THE USC LIBRARIES

ANNE-MARIE MAXWELL and **MELISSA MILLER** of the USC Libraries have selected the following resources to help you learn more about today's event and the accompanying exhibition. You can access electronic resources, which include the journals and databases listed below, through the search bar on the USC Libraries homepage at **libraries.usc.edu.** DVDs are available for check-out from the Leavey Library circulation desk.

BOOKS

Karel Capek, *R.U.R* English version by Paul Selver and Nigel Playfair. (New York: Samuel French Inc., 1923)

Daniel H. Wilson, *Robopocalypse* (New York: Doubleday, 2011)

Isaac Asimov, *I, Robot* (New York: Gnome Press, 1950)

Siegfried Zielinski and Peter Weibel eds., *Allah's Automata*, *Artifacts of the Arab-Islamic Renaissance (800–1200)* (Ostfildern: Hatje Cantz Verlag, 2015)

George A. Bekey. *Autonomous Robots: From Biological Inspiration to Implementation and Control* (Boston: MIT Press, 2005)

JOURNALS

Robotica, Cambridge University Press (1983–Current)

Robotics Today, Society of Manufacturing Engineers (1979–1988)

IEEE Robotics & Automation Magazine, Institute of Electrical and Electronics Engineers (1994–Current)

DVDS

Ex Machina, directed by Alex Garland (2015; Santa Monica, CA: Lions Gate), DVD.

Blade Runner, directed by Ridley Scott (1982; Burbank, CA: Warner Bros), DVD.

2001: A Space Odyssey, directed by Stanley Kubrick (1968; Beverly Hills, CA: MGM.), DVD.

Artificial Intelligence, directed by Steven Spielberg (2001; Burbank, CA: Warner Bros.), DVD.

The Terminator, directed by James Cameron (1984; Los Angeles, CA: Orion Pictures), DVD.

DATABASES

Academic Video Online Premium
Select Academic Video Online Premium database, type "Robotics" in the search bar, and 488 videos should appear in the results list. The first video listed is Hiroshi Ishiguro.

Kanopy Streaming Service
Select Kanopy Streaming Service database, type "Robotics" in the search bar, and 91 videos should appear in the results list. A separate search for "Artificial Intelligence" should yield 80 videos.

AAAI Digital Library

ACM Digital Library

Xplore (IEEE Electronic Library)

arXiv Computer Science

Engineering Village 2