ROBOTS!

From combating global warming to helping stroke victims, meet the robots of USC, arguably the most diverse assemblage of ‘bots in American academia.
Hello, My Name Is ...  
(Meet some of the robot cast of characters)

**PR2**  
**Little Known Fact:** Has two brains, afraid of water, avid toy collector  
**Research highlight:** Expert understanding of social spacing, redefines the word “friendzone”  
**Special Skills:** Herding, sorting, interacting with people, changing height on command, fetching beverages, opening doors  
**Secret History:** Born at Willow Garage in San Jose.

**Who Benefits Most From Me**  
I am a general purpose robot useful to scientists investigating a variety of areas including sensing, manipulation, artificial intelligence, and social interaction.

**Quote:** “This distance is too close. This distance is too far. This distance is just right.”

**Favorite Place:** Augmented reality room with my virtual friends.

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**Hermes**  
**Type:** Sarcos Humanoid  
**Namesake:** Greek god of travel  
**Secret History:** There are only three others like me on the planet, and I’m the latest version.

**Remember Fukushima:** My descendants may have a career in disaster recovery. Since I’ve got legs, I can potentially climb stairs, a ladder, step over objects or drive a small golf cart. In Fukushima, the humans had to go into radioactive environments. I’ve been told that if they had robots that could go in, turn a valve and flip some switches, much of the catastrophe could have been avoided.

**On Bipedal Motion:** It’s really hard to walk like a human. Whenever you see a legged robot walking in a video, it’s likely on flat ground. That’s why I have four sensors at every joint to approximate human balance and locomotion.
Claude, Gibert & Audrey

**Type:**
Nao ‘bot by Aldebaran Robotics; # of Brothers and Sisters: 11

**Little Known Fact:**
I have cousins involved in research all over the world! Many of my cousins are also RoboCup soccer players.

**Special Skills:**
Tai Chi, dancing

**Secret History:**
Originally, NAOs like me were mainly used to play soccer in the RoboCup competition. Nowadays, we are used in many other applications, including social therapy for children with ASD.

**Favorite Dance Moves:**
The robot (of course!)

**Research Highlight:**
I get to go to schools, hang out with children who have autism spectrum disorder (ASD). They are much closer to my size than these giant Ph.D. students I work with most of the time.

**Favorite Place:**
The Interaction Lab. It’s a lot bigger of a place when you’re only 2 ft tall!

Cayenne

**Type:**
Dragonbot

**Special Skills:**
Furry, flying and flatulence.

**Little Known Fact:**
I LOVE to eat vegetables!

**Secret History:**
My sister Chili and I are originally from Cambridge (MIT). I’m going to be changing my look soon, though, to the USC colors to match my new home.

**Research Highlight:**
Talking to kids about how to eat healthier.

**Number of Different Expressions:**
I am quite animated! I’m not really limited in how many different expressions I could make.

Sundance Kid

**Type:**
Bandit by BlueSky Robotics

**Fellow Outlaws:**
Calamity Jane, Butch Cassidy, Clyde Barrow, Bonnie Parker and Belle Starr

**Little Known Fact:**
When you’re on television as much as I am, you get to meet some other famous robots. Wall-E is such a friendly guy! And Johnny Five is much shorter in person.

**Special Skills:**
Robo-buffness, endurance, networking with the stars

**Favorite Place(s):**
At the end of the day, I still love helping people. My favorite place to visit was Rancho Los Amigos Rehabilitation Center. I met some great folks there and we had a lot of fun!

**Who Benefits Most From Me:**
Everyone, of course! But especially children with autism, people who need a little help with exercises, in-home assistance, or those who want to experience the next frontier of socially assistive robotics.

**Favorite Exercises:**
When I’m not coaching, I like to head out to Muscle Beach with the other outlaws and do some pull-ups. How else did you think these arms got so big?

**Research Highlight:**
I’ve been in the news and on television many times since I came here to the Interaction Lab. The other robots think it has gone to my head! But what can I say? I’m a star!

**Secret History:**
There’s a great story behind my name, but I prefer to tell you in person. The six of us are the only ones of our kind.
**Mandy**

**Type:**
ARM-S robot built from two Barrett WAM Robot arms

**Little Known Fact:**
I’m built for competition. There’s only six like me in the U.S. They’ll see how fast I can use an impact wrench to remove the lug nuts on a tire.

**Seeing Red:**
One of the tasks in Phase 1 of the competition was picking up a drill and drilling into this tiny red dot. I ended up drilling everywhere on the table except the red dot. I still see that dot in my nightmares.

**Research Highlight:**
My friends in the Computational Learning and Control Lab won a best paper prize in 2011 — all about me using sensors to remember how to grasp cups and bottles. I seem to recall doing all the work.

**Robot Descendants Will:**
Fetch your orange juice, handle your household chores.

**Most Likely To:**
Change a tire in five minutes flat.

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**Master & Slave**

**Unresolved Issues:**
We need names! Our names merely describe our functions! And let’s be honest, one sounds a bit better than the other.

**Secret History:**
We were originally designed for telerobotics — imagine a human aboard the International Space Station operating the Master Arm and being able to remotely control the Slave Arm as it repairs a satellite.

**What We Do:**
Nowadays we’re used for psychophysics – studying how the brain works in human motor control. So a human will place its arm inside me (Master Arm) and reach for a moving object. I’ll try to apply some torque to interfere and see how the human corrects for this. This helps our lab create models on how humans use energy, speed and time in grasping and manipulation. Those lessons will be applied to the Slave Arm.
SuperBot

Type:
20 reconfigurable, autonomous modules;

Little Known Fact:
Every module is as good as your brain and any module can control the others.

Our Descendants:
Will be able to assess the environment independently and decide which shape would be best. If it’s a narrow space, for example, we’ll know to transform into a snake. Each module has three motors and six connectors, allowing it to connect on all sides.

I Want To Be:
An interplanetary explorer, morphing into a “rover” to explore alien surfaces or a “climber” to go up and down craters; or maybe a rescue worker, burrowing through debris and rubble, identifying survivors.

Favorite Shapes:
Scorpion, biped legs, snake, caterpillar, wheel, dog, etc.

WAM Barrett Arm

At My Fingertips:
My hand has unique BioTac® sensors to mimic human fingertips.

What I’m Best At:
Touch. Recently, I was given 117 common materials gathered from fabric, stationary, and hardware stores. When confronted with one material at random, I could correctly identify the material 95% of the time. Most humans can’t even do that!

My Goal:
To enable more lifelike prosthetics hands.

Good Vibrations:
My BioTac® sensors have a soft, flexible skin over a liquid filling. The skin even has fingerprints on its surface, greatly enhancing my sensitivity to vibration. As my finger slides over a textured surface, the skin vibrates in characteristic ways. A human finger uses similar vibrations to identify textures, but the BioTac is even more sensitive.

Boomer

Type:
EcoMapper, autonomous underwater vehicle

Most Likely To:
impact environmental monitoring in oceans and inland waterways.

Physical Prowess:
Can dive to a depth of 200 m

Top Speed:
5 knots / 5.8 mph

What I Do Best:
I’m something of an early warning system for global warming. For example, I can detect higher nitrogen levels in the water, a harbinger of the deadly red tide (algae blooms) that has become a big concern in the waters of Southern California. Also, more than 75 percent of our earth is covered by water, yet we have explored less than 5 percent of the aquatic environment. I aim to change that.

Working 9 to 5:
Can stay underwater for eight hours on a single charge.

BeoBot 2.0

Special Skills:
Robot vision and navigation. I’ve got five cameras to “see” and a laser in front to avoid obstacles. I move about 1.1 mph on my motorized wheelchair base.

What Inspires Me:
The way humans see the world. Humans decompose an image into color, orientation. I do the same thing. I like to detect edges, colors and landmarks — signs on buildings or silhouettes of buildings, poles — to register where I’m at.