R&I
Research and Investigation

Where's the Android?

IUPUI professor uses robots to study human behavior

BY LANETTA J. WILLIAMS

She sat at a display wearing a smart pink jacket and tan slacks, her friendly face framed by straight hair cut into a bob. The 30-something Japanese woman didn't look out of the ordinary to the people walking by at the 2005 World Exposition in Aizu, Japan. Maybe that's why when one man in his 70s stopped at the booth and took a quick glance around, he asked: "Where's the android?"

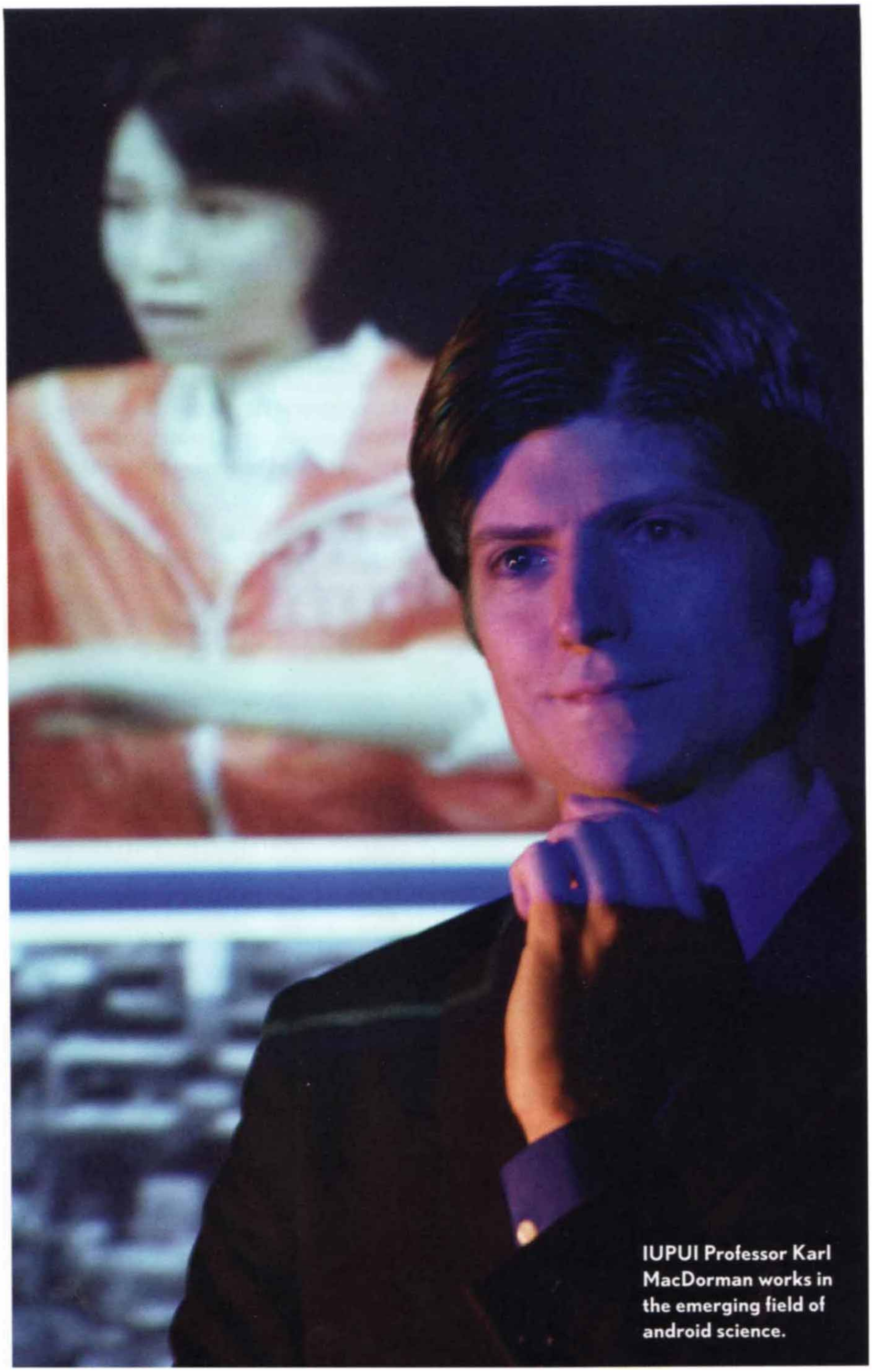
Repliee Q1Expo was right in front of him. The pretty young woman was really a robot who, instead of flesh and blood, was brought to life by wires and 42 air actuators that puffed animation into her face.

The man's confusion was a testament to what IUPUI Professor Karl MacDorman and his collaborators have achieved in their years spent developing the android's control systems. An android is a robot made to resemble a human and programmed to act like one.

MacDorman is one of a handful of experts working in the emerging field of android science, a cross-disciplinary approach to test hypotheses about human behavior.

Before coming to IUPUI in November 2005, MacDorman spent five years collaborating with Hiroshi Ishiguro, director of one of the world's foremost robotics laboratories, at Japan's Osaka University.

In building the humanlike robots, MacDorman hopes to help researchers better understand how humans work and interact with androids and also allow scientists



IUPUI Professor Karl MacDorman works in the emerging field of android science.

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to study human behavior without ethical limitations.

MacDorman teaches in the School of Informatics at IUPUI, where he continues his research and instructs graduate courses in the psychology of human-computer interaction.

"In psychology, a lot of theories are vague and descriptive," says MacDorman. "So using an android offers a way to precisely specify your models and implement and test them. And because they look like human beings, they can elicit the same reactions that another human being could elicit."

The first thing researchers discovered was that the way a robot looks affects our reactions to them. Unlike robots like Johnny-5 in the '80s film series *Short Circuit*, this android isn't metal on the outside but silicone to replicate human skin. She also has the ability to frown, smile, wave, or cock an eyebrow in curiosity or surprise.

She can speak, too, parting her lips realistically and blinking her eyes, thanks to the actuators in her upper body. Repliee Q1Expo's humanlike qualities helped scientists to discover that people are less likely to treat androids like a machine if they look like their next-door neighbors. A humanlike appearance of androids can prompt people to respond to them almost as if they were chatting with another human being.

In one experiment, the android asked questions. MacDorman says that in North America people tend to look up and to the right when thinking about how to answer, but in Japan people most often look downward. As the android interacted with people, researchers often found individuals breaking eye contact by looking down — a sign of modesty. But they did this only when they were told a human being controlled the android, MacDorman reports. For the other condition, when they were told the android was acting on its own, this pattern disappeared.

"What is really exciting is that this is the first experiment that showed who you think is on the other end — a human mind or a machine — affects how you break eye contact," he says. "They didn't feel the need for modesty when they were interacting with an android on its own. This is a good example of android science, because it's really more about how people's beliefs affect their behavior than about machines."

To get humanlike reactions, scientists are careful to make sure study participants don't see the android's inner components.

"If the android is shown with the skin on, it can elicit the mirror system to a greater extent than if it is shown with the skin off — even when performing the exact same action, like reaching to pick up a cup," MacDorman says.

In the future, MacDorman plans to continue work on making androids as humanlike as possible by paying close attention to vocal pitch and how a robot's human likeness affects sensitivity to its bodily and facial proportions.

BIOINFORMATICS
JAKE Y. CHEN
SCHOOL OF INFORMATICS

Chen

A School of Informatics researcher has joined a team of IU scientists who seek to develop more effective chemotherapy treatments for lung-cancer patients. Jake Y. Chen has been awarded a $174,000 grant to conduct bioinformatics research for the project Predictive Lung Cancer Systems Biology. The two-year grant comes from the IU Simon Cancer Center-based Lung Cancer Working Group. Chen's focus will be to collect proteomics profiles of patients, analyze lung-cancer relevant proteins, and apply data-mining techniques to predict which chemotherapy provides the most benefits. He says the research could have a "direct impact on saving lives."

GEOLOGY
SIMON BRASSELL
GEOLOGICAL SCIENCES

About 3,100 meters below the surface of the Pacific Ocean, scientists have made a discovery that suggests significant global fluctuations in temperature when dinosaurs roamed the Earth. IUB geologist Simon Brassell says the study shows an ancient Earth whose temperatures shifted erratically due to changes in carbon cycling and did so without the input of humans. Scientists traveled to Shatsky Rise, an underwater facility 1,000 miles of east of Japan. Using a drill, researchers collected rock samples from the sea floor that suggested the ocean's surface temperatures varied by as much as 11 degrees Fahrenheit about 120 million years ago.

PHYSIOLOGY
JANET P. WALLACE AND
JAUME PADILLA
KINESIOLOGY

Wallace

Hours after eating a high-fat meal, the arteries of a healthy adult can resemble those of a person with heart disease, according to IUB researchers. But toss in some exercise and it may not only reverse that but cause the arteries to function even better. Janet P. Wallace, a professor in the Department of Kinesiology, recently reported her findings in the *European Journal of Applied Physiology*. After a fatty meal, arteries lose their ability to expand in response to an increased blood flow, researchers say. The amount of time people spend in this state can influence conditions such as diabetes and heart disease. In a study of eight healthy 25-year-olds, they found that a simple walk after a meal counteracted this effect.

BIOLOGY
WILLIAM E. COOPER
DEPARTMENT OF BIOLOGY

William E. Cooper, a biology professor at IPFW, has labored at teaching, researching, and writing in the field of plant and animal sciences for the past 30 years. But when he received a letter from Thomson Scientific's: *www.ISIHighlyCited.com*, he realized the work had paid off. Not only has his writing been prolific, but other scientists have cited his works so much that he has been invited to appear on the free Web site. According to the company, less than one half of 1 percent of all publishing authors meet the criteria for inclusion. He joins more than 5,000 other researchers in 21 categories whose profiles are on the site.