



Peizhi Zhang (left), Mamiko Kato (center), and Hironori Kasahara with WABOT-2, a robot completed in 1984 by Waseda engineers that was originally designed to play the electric piano.

ROBOTS, BASEBALL, AND BILINGUALISM EMBODY WASEDA UNIVERSITY'S CULTURE OF SCHOLARSHIP

Waseda University in Tokyo, one of Japan's premier private institutions, seeks to educate the next generation of researchers through rigorous academic study combined with a focus on independent scholarship in a diverse atmosphere.

The softer side of robots

Japan's rapidly aging population and declining birthrate are motivating researchers to develop robots that can assist humans in their daily lives. Waseda, with its rich history of humanoid robot development dating back to the 1970s, is taking a new approach to designing robots that are safe to interact with humans.

"We are devising new kinds of actuators to drive soft robots based on magnetorheological elastomers (MREs)—smart materials embedded with ferromagnetic nanoparticles that change their physical and mechanical properties when a magnetic field is applied," says Peizhi Zhang, a Ph.D. candidate in Waseda's Graduate Program for Embodiment Informatics, which served as a foundation for the university's Information Communications and Technology (ICT) and Robotics Model Unit. "These robots have soft bodies, making them safe to interact with humans."

Zhang, who hails from China, is currently developing an MRE suction cup for attachment to a soft actuator, for the purpose of picking up objects. "My challenge right now," he says, "is to improve the MRE material and build an efficient, compact magnetic field generator so the elastomer becomes stronger and better at responding."

Finding a winning path

Baseball is one of the most popular sports in Japan. The official ballparks of Nippon Professional Baseball teams now use Doppler radar to measure pitched and batted-ball trajectories during games. Coaches use the data to evaluate players' performance. Mamiko Kato, a Ph.D. candidate in Waseda's Graduate School of Sport Sciences, points out that for the data to be truly useful, there is a need to validate it as well as to interpret and apply it effectively.

"To do this, we need to analyze the data scientifically," says Kato. "This requires a theoretical base to work from. My aim is not only to authenticate the data but to use it to create a new method for performance evaluation and to suggest ways to improve player performance in games."

Kato initially found it difficult to construct clearly defined research questions. In response to her struggles, her supervisor asked her two questions: Why do research in sport sciences? How will your research findings help players?

"This made me really question why I am doing this work and how I can contribute to our society," says Kato. She understood that her supervisor's intention was not to discourage, but rather help her find her own research direction—an example of Waseda's culture, which stresses independence of scholarship. "While my advisor is always encouraging and ready to help, I must answer the questions that my research raises," she says, adding that this is both tremendously challenging yet also motivating. "It is one of the reasons I chose to come to Waseda."

A bridge to anywhere in the world

Both Zhang and Kato enjoy the international atmosphere at Waseda. For instance, Kato has recently conducted research at KU Leuven in Belgium with support from Waseda's Health Promotion Model Unit. Zhang adds that roughly half the researchers he collaborates with are international, from countries such as Mexico, India, and the United States.

Hironori Kasahara, senior executive vice president for research, points out that Waseda is ideal for students and researchers who want to learn about Japan's culture and appreciate a bilingual education. "If you only want to study or do research in English, you can go to the United Kingdom or the United States. But come to Waseda and you can build a bridge to take you anywhere in the world."

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