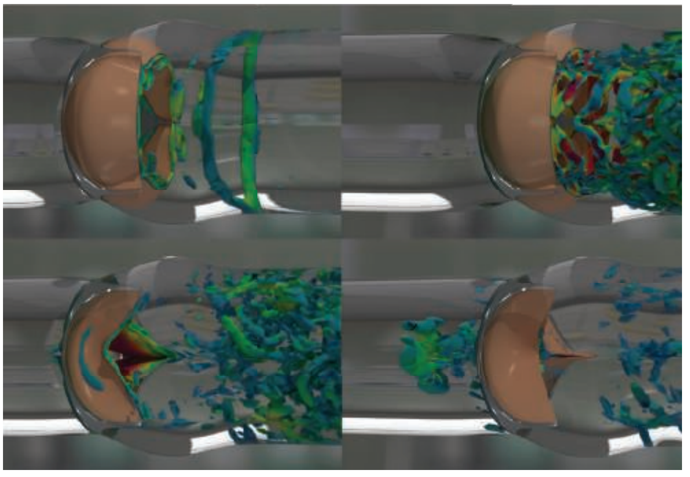

Computational fluid–structure interaction analysis of a bioprosthetic heart valve

Waseda University's Multiscale Analysis, Modelling and Simulation (MAMAS) Model Unit

The aim of MAMAS is to develop joint education and research opportunities in physics and mathematics—two disciplines for which Waseda is renowned. MAMAS is one of the seven model research units comprising the Waseda Goes Global plan, an ambitious, 10-year project started in 2014 and part of the Japanese government's multibillion-dollar Top Global University scheme to internationalize the country's leading universities. The other model research units are in the fields of global Japanese studies, health promotion, information and communications technology and robotics, energy and nanomaterials, empirical research in political economics, and global Asia studies.

MAMAS has collaborated with several universities worldwide to create a global doctoral program that has students apply interdisciplinary studies such as nonlinear partial differential equations, geometry, and quantum mechanics to practical applications such as fluidics and the flow of gases and liquids. Research topics include mathematical modeling based on imaging the interaction of molten metals with concrete, analyzing cloud formations to better understand climate change, and observing blood flow in humans for early diagnosis of cardiovascular disease.

To prevent the disease from spreading, the Japanese government restricted overseas travelers from entering the country. Fortunately, Waseda was able to arrange for him to work remotely.

When the entry of foreigners was permitted again in October 2020, Scholz made new preparations and finally arrived in Japan in November. "But I had to stay indoors because the government had imposed a fourteen-day quarantine on people coming into the country," says Scholz.

He was impressed with the care Waseda's administrative staff took to help him settle in during those difficult early weeks. "For instance, I wasn't able to use public transport on arriving in Japan because of the quarantine restrictions. So Waseda arranged private transport for me, and they set me up in an apartment in the university's guest housing."

Unique solutions to real-world problems

When he was finally able to visit the main Waseda campus in Tokyo, Scholz was delighted to find it larger than expected: "The area around the campus is very attractive; it's very enjoyable living here." He was also happy with his work location in the Institute for Frontier Fluid Structure Interaction Analysis, which is housed in the Green Computing Systems Research Organization. At the institute, Scholz and his colleagues tackle a wide range of real-world problems that few research groups are equipped to address. The classes of applications targeted include fluid machinery, ground vehicles, aerospace technologies, home appliances, and medical applications. "We have a large, active group that includes experienced researchers as well as bachelor's, Master's, and doctoral degree students."

The plan is for Scholz to spend up to 3 years doing research at Waseda, which he believes will give him ample time to develop the skills and form the professional relationships necessary to advance his career. "I want to formulate efficient and powerful methods for numerical simulations on complicated geometries. Using new methods, we can increase the efficiency of the overall design process. I'd like to produce results that can be generalized and used to tackle a large class of applications stemming from real-world problems."