In the lead up to its 90th anniversary, Osaka University has embraced an ambitious vision to increase openness and innovation in its research, education, community and governance in order to stimulate the kind of cross-disciplinary, cross-institutional and cross-border research needed to meet global challenges.

One feature that has characterized research and technological advancement since the turn of the century has been the steady rise and remarkable fruitfulness of interdisciplinary and inter-institutional collaboration. In its bold vision for the next six years, Osaka University has its sights set on taking this type of collaborative openness to a new level, opening the laboratory doors to the broader research and industrial community and also to society at large.

“Our vision emphasizes openness,” says the university’s president, Shojiro Nishio. “We want to break down the barriers between departments on campus and those separating the university from the outside world. We plan to open our academic findings and research outcomes to society through our five ‘pillars’ of open education, open research, open innovation, open community and open governance. By interweaving knowledge from different disciplines and working together with diverse participants in society, we aim to evolve into a place where new knowledge can be co-created together.”

One key initiative of the university’s vision for open research is the development of a big data platform designed to centralize and share all of the accumulated data obtained through experiments and simulations in every academic discipline across the university, as well as measured in various fields of society. “Using this platform, we will be able to cross data between and among fields, including humanities and social sciences dealing with ethical, legal and economic issues, to create new integrated fields of study that can produce social and economic value,” explains Nishio. “Our focus on the contact point between science, technology and society will foster interdisciplinary research that deals with global challenges. We call it open research.”

Osaka University embarks on this open research revolution from a position as Japan’s most innovative university and among the most innovative institutions in the world, ahead of global heavyweights like Caltech, Johns Hopkins University and the University of Cambridge, according to Reuters 2015 Top 100 Innovative Universities. Osaka University’s ability to innovate through generating original research and creating useful technology with economic impact stems from its broad disciplinary spectrum and a long history of challenging convention.

With its roots in the famous Kaidokudo and Tekijuku schools that were established in 1724 and 1838 respectively and produced an extraordinary number of Japan’s modern luminaries, the ‘Osaka spirit’ has emboldened the university community as a place where future leaders can rise above fixed social standings to engage in solving the social issues. Today, this means taking the leading global research through open dialogue and innovative thinking.

“Our university was founded with the support of civil society, and due to this tradition, we are open to society and have been actively promoting collaboration with industry for many years,” explains
Nishio. "We were the first university in Japan to establish joint collaborative laboratories on campus through our Industry on Campus initiative. The university is expanding in the more dynamic University–Industry Co-Creation programme. Osaka University continues to be one of the country’s leading institutions — we had the highest ratio of joint papers with industry among national comprehensive universities in Japan in 2014 and are active in local and international patent registrations."

Research with impact

As a comprehensive educational and research institution, Osaka University covers a full repertoire of academic disciplines. Among them, the university has cultivated particularly strong research teams in the fields of immunology, robotics and the emerging field of photon science and technology.

The university is a renowned international hub for immunology research and hosts the prestigious Immunology Frontier Research Center (IFReC), one of nine exclusive World Premier International research centers in Japan that have been singled out by the government for significant long-term funding. "Since the beginning of its research activities in 2008, IFReC has published more than 1,000 papers in a wide variety of immunology fields, with a large proportion in high-impact international journals," says executive vice president, Toshiya Hoshino. IFReC covers a broad range of research fields from autoimmune diseases to malaria, osteoporosis and metabolic syndrome, incorporating the latest measurement and simulation technologies. The work of the centre is aimed at devising new and more efficient development strategies for vaccines and immune therapies.

"At the IFReC, we have a number of world-renowned researchers in the field, including Shizuo Akira and Shimon Sakaguchi," says Hoshino. "Both are recipients of the Thomson Reuters Citation Laureate prize and the prestigious Canada Gairdner International Award." Akira discovered that receptors in the body’s cells sense microbes and spur the immune system to combat infection and develop long-term immunity; this discovery could facilitate the development of therapies for cancer and allergies. Sakaguchi is investigating regulatory T cells as the immune cells that suppress immune reactions. His work contributes to the understanding of these enigmatic immune cells and has guided research into various physiological and pathological immune responses.

Osaka University is also globally regarded for its cutting-edge research on robotics. Hiroshi Ishiguro, for example, is a world leader in the development of human-like androids as a platform for research aimed at understanding how people converse with and operate lifelike robots. While Ishiguro’s team deals with human reactions, the group of Minoru Asada focuses on the cognitive development of robots themselves. Asada’s research addresses one of the most fundamental issues for the future of robotics: how cognition and the identification of self and others can be developed in robots, and how this relates to the possibility of artificial empathy. This requires research on the full developmental trajectory, crossing over with neural dynamics as the basis for understanding the interactions between the body, brain and environment that generate rich behaviours.

With more than 100 photonics laboratories, Osaka University is among the most active research institutes in the world in the field of photon science and quantum beam technology. "We conduct world-class research in nanophotonics, power photonics, plasma photonics, X-ray optics and beam optics," says Ryosuke Kodama, one of the world’s leading researchers in photon science — a field that promises to yield innovative technologies with exciting applications in industry and medicine. Researchers at Osaka University collaborate extensively with other national and international leaders in photon science, covering a diverse variety of fields including life science, materials science, high-energy-density science and high-energy physics, supported by the Harima Center for Photon Science located at the SPring-8 national synchrotron facility.

"With the distinction of being selected as a Top Global University by the Japanese government and Osaka’s ranking as Japan’s most innovative university," says Hoshino, "we have a responsibility to fulfil our role as a leading national university by providing rich courses and programmes, nurturing global-mindedness, and promoting research and innovation in the most advanced science and technology, humanities and social sciences to solve issues of global concern. This is our ‘open’ revolution.”

Contact

E-mail: global-ou@ml.office.osaka-u.ac.jp
Tel: + 81 6 6105 5886

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