

Driving Innovation Through Structural Analysis: Challenges in Unlocking Unknown Molecular Structures



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From an applied physics researcher to an executive in the pharmaceutical industry, a venture capitalist, and ultimately an entrepreneur—Dr. Tsuboi, CEO of TEKMOF Co., Ltd., has pursued a truly unconventional career path while taking on the challenge of driving innovation in drug discovery through advanced analytical technologies.

At the core of the company's efforts is its proprietary technology based on the "crystal sponge method," which utilizes MOFs (metal-organic frameworks) to rapidly and accurately determine the molecular structures of trace compounds that were previously difficult to analyze. We spoke with TEKMOF about how the company is leveraging this breakthrough structural analysis technology to expand applications across the healthcare sector, including pharmaceuticals, functional foods, and dietary supplements.

Identifying a Critical Bottleneck in Research and Development

The foundation of Dr. Tsuboi's career was built on his university research in applied physics and crystal structure analysis. After earning his doctorate, he joined Asahi Kasei Pharma (now Asahi Kasei Therapeutics), where he collaborated with Professor Masaki Kawano of the Institute of Science Tokyo. Through this collaboration, he became convinced of the potential of metal-organic frameworks (MOFs)*1 for determining the molecular structures of pharmaceutical compounds and subsequently engaged in research on the *Crystal Sponge Method*2 a structural analysis technique based on MOFs. This experience demonstrated the tremendous potential of a technology capable of determining molecular structures rapidly and with high precision, while also revealing the significant bottleneck that structural analysis posed in pharmaceutical research and development.

He later transitioned into venture capital, supporting a wide range of life sciences startups. Across these companies, he repeatedly encountered the same challenge: the inability to determine the structures of metabolites and natural products was hindering research and development. Recognizing this unmet need inspired him to establish TEKMOF.

*1 MOF (Metal-Organic Framework): A highly porous crystalline material composed of metal ions and organic molecules. Its nanoscale pores can absorb and precisely arrange molecules, making it a powerful platform for molecular analysis.

*2 Crystal Sponge Method: A technique that determines the molecular structure of a compound by absorbing its molecules into the pores of a MOF crystal and analyzing them using X-ray diffraction. Unlike conventional methods, it does not require the compound itself to be crystallized.

Where Research Met Investment: The Journey to Entrepreneurship

The turning point came when two experiences converged: the technology he had once worked on as a researcher and the challenges he had witnessed firsthand while working in venture capital. Faced with the clear challenge that the inability to determine the structures of trace metabolites was hindering research and development, he became convinced that the MOF technology he had studied with Professor Kawano could provide the solution. While continuing his research on Professor Kawano's MOF technology, he spent nearly two years evaluating the business potential of the idea. He ultimately concluded that "there is no better time than now" and founded TEKMOF Co., Ltd. The company was born at the intersection of three key strengths: hands-on experience in molecular structure analysis for drug discovery, a business perspective gained through venture capital, and access to cutting-edge academic research.

Solving Social Challenges Through Grit and Trial and Error

Shortly after its founding, the company's technical capabilities were put to the test during Kobayashi Pharmaceutical's red yeast rice supplement crisis. After reports emerged that some compounds had yet to be structurally identified, the team proactively reached out to Kobayashi Pharmaceutical to offer its expertise. Through iCONM's network, the company connected with the National Institute of Health Sciences, accelerating the investigation. However, it was not an easy journey. Analyzing the provided samples demanded meticulous optimization of experimental conditions, and for months the researchers were unable even to position the compounds within the MOF. After painstakingly revisiting every aspect of the process—from sample preparation to experimental conditions—they ultimately succeeded in elucidating the structures of two previously unknown compounds. The achievement became a symbolic first step in realizing their mission: "provide data that helps people facing challenges in analytical technologies".

The Future Shaped by Audacity

Dr. Tsuboi believes that entrepreneurs need the audacity—the willingness to think beyond conventional limits—to envision an ambitious end goal. Instead of taking the incremental approach common among many Japanese startups, he argues that they should first define a bold big picture and then work backward to rapidly assemble the capital, technology, and talent required to make it a reality.

Even in the face of tough evaluations from investors, a startup CEO must have the resilience to "say the same thing today that they said yesterday, without being shaken." That ability to stay the course may be one of the defining qualities of a successful startup leader. Driven by an unwavering vision to become a leading infrastructure provider in metabolomics, TEKMOF's journey is only just beginning.



At the Magnet Area in iCONM

About TEKMOF Co., Ltd.▶



NEWS

Yamato Scientific Co., Ltd. and the Global Strategy Center for ME-BYO have joined the King SkyFront

Yamato Scientific Co., Ltd. is a leading manufacturer and distributor of scientific instruments, laboratory facilities, analytical and measurement equipment, and industrial testing and inspection systems. The Bio-innovation Center, established within the Life Innovation Center (LIC), serves as a hub for application development, workshops, and contract research services, utilizing cutting-edge research instruments and reagents supplied by the Yamato Scientific Group. The Global Strategy Center for ME-BYO (MGSC) is an industry-academia-government collaboration platform in the healthcare field. In collaboration with partner companies and organizations, including Meiji Co., Ltd. and Otsuka Pharmaceutical Co., Ltd., we advance evidence generation and the translation of research into practice through collaborative research and related activities, leveraging King SkyFront as a hub for addressing healthcare challenges.



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the Yamato Scientific website



MGSC website



NEWS

KISTEC Bio Open Lab and CIEM-DREAMS begin operations.

Kanagawa Institute of Industrial Science and Technology (KISTEC) operates the KISTEC Bio Open Lab, a facility dedicated to supporting drug discovery startups in bringing their innovations to market. In addition to shared facilities, including gene and protein laboratories and cell culture rooms, users can also access quality evaluation services.

The Central Institute for Experimental Medicine and Life Science (CIEM) also operates CIEM-DREAMS, a platform that provides access to experimental animal facilities and a variety of support services related to animal experiments. We invite companies and researchers seeking to advance their research, development, and commercialization activities to make full use of these services. For further details, please visit the websites of the respective organizations.

■KISTEC Bio Open Lab. (https://www.kistec.jp/r_and_d/bio-open-lab/)

contact : 044-280-1181

■CIEM-DREAMS (https://www.ciem.or.jp/img/home/pdf/manual_26060101.pdf)

contact : 044-201-8510



TONOBITO



Shimadzu Corporation
Ryo Yamaguchi

For more details



“TONOBITO” is a feature series that introduces the personalities and everyday lives of the people working at KING SKYFRONT, offering a chance to get to know them and fostering opportunities for connection.

We spoke with Mr. Ryo Yamaguchi of Shimadzu Corporation. After working in the Mechanical Design Division and the Marketing Department, he is currently part of the Solutions COE within the Analytical & Measuring Instruments Division, where he is responsible for, among other things, managing the ‘commissioned analysis’ operations — receiving evaluation samples from customers and returning the measurement results to them.”

What Mr. Yamaguchi considers most important in his work is engaging with others sincerely. When interacting with clients, he seeks to look beyond the requests themselves and carefully uncover the challenges that lie behind them. As a result, it is not unusual for the conversation to reveal issues that differ from those originally recognized by the end of the meeting. That attitude is also reflected in the way he interacts with junior team members. When assigning work, he makes a point of explaining why he is asking someone to take on a particular responsibility and what skills or capabilities he hopes they will gain through the experience. This helps team members take ownership of their work and supports their growth in a proactive and meaningful way. He says that one of the greatest sources of motivation in his work is hearing that team members have earned appreciation from customers. In recent years, he has also contributed to a joint research project with Tohoku University, promoting research support for reactive sulfur species, which have attracted attention for their potential role in extending healthy life expectancy. In doing so, he is helping advance Shimadzu Corporation’s strategic commitment to the pursuit of “human health and well-being.”

Mr. Yamaguchi, who is currently living apart from his family due to a work assignment, returns home on weekends to spend time with his family and his beloved Italian Greyhound, which allows him to relax and recharge. “My dog often barks at me as if I were a stranger,” he says with a laugh. Even so, the broad smile on his face when talking about his beloved pet was particularly memorable.

iCONM NOW

“Nursing Engineering Lab” Newly Established at iCONM

On April 1 of this year, the “Nursing Engineering Lab” was newly established at iCONM. This lab serves as a hub for directly linking the needs of the medical and nursing fields with engineering technology, and for comprehensively advancing activities ranging from research and development to societal implementation. The JST COI-NEXT Kawasaki Hub (Project CHANGE), which we are promoting, is built on two pillars: “Aging Control (Nano-Medicine),” which focuses on the perspective of care recipients, and “Nursing Engineering,” which focuses on the perspective of care providers. Particularly regarding the latter, through collaboration with the Kawasaki City Nursing Association, “Pilot Study Fields” have been established throughout the city, and our ability to conduct research and development based on real-world challenges is a major strength. Dr. Gojiro Nakagami, Professor at the Graduate School of Medicine, The University of Tokyo (Department of Health Sciences and Nursing) and a board member of the Japan Society of Nursing Science and Engineering, has been appointed as the Lab Director (Principal Research Scientist) to further advance our practical initiatives at the intersection of nursing and engineering. Furthermore, through collaboration with the “Kawasaki Care Design Consortium (Care-Saki),” which currently involves over 40 companies, a system has been established to rapidly translate research findings into products and services and link them to real-world implementation. The “Nursing Engineering Lab” will serve as a hub connecting industry, academia, government, and clinical settings, playing a pivotal role in dramatically increasing the speed and effectiveness of research and development.

The NHK morning drama series currently airing, “The Scent of the Wind,” depicts in detail the duties of nurses—aspects that have rarely been discussed before. By law, a nurse’s duties include not only “assisting with medical treatment” but also “providing care during convalescence,” which is a crucial role. This work is supported by a high level of expertise that sets it apart from the general notion of “caregiving”—including making beds with not a single wrinkle, performing body washes that incorporate massage techniques, assisting with early mobilization after surgery, and possessing specialized knowledge regarding infection control. As the population ages and birth rates decline, accelerating the shift toward home-based care, we are entering an era where not only healthcare professionals but everyone is expected to have the tools and knowledge to properly care for patients.

Reference: Sangyo-Joho Kawasaki issued on July 1, 2026: Kanmin-Kogaku Column No. 26 “What Does “Care for the Convalescent” Mean in Nursing?”
<https://kawasaki-sanshinkaikan.jp/sangyo/jyohou/>

This magazine shares a variety of information about KING SKYFRONT-affiliated institutions. Please send us your feedback via the QR code survey. Additionally, please send inquiries regarding news publication requests to the email address below.

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