

Mass Spectrometry Imaging Society: Meet distinguished members of the MSI community

Professor Shuichi Shimma

Osaka University, Japan



Shuichi Shimma received his B.S. degree in 2001 and M.S. degree in 2003 from University of Tsukuba, Japan. He completed the doctoral course at the graduate university for advanced studies, and received his Ph.D in 2007. He served as JSPS post-doctoral fellow and assistant professor at Osaka University between 2007 and 2012. From 2012, he entered National Cancer Center Research Institute in Tokyo and started to apply MSI for clinical pharmacology. From 2015, he started a position as associate professor at Osaka University, Japan. His research interest is to develop instruments and applications for MSI in plant and food science, microorganisms, and medical science to visualize biomolecules (biological metabolites) and drugs.

How you came to be involved in MSI?

I started studying MSI in 2004. Until then, I had stayed and developed detectors for particle physics experiments at CERN, Geneva, during my master course. When I entered the doctoral program, I was also interested in biology, so I changed my research field and entered a different university. My laboratory was mainly studying molecular biology. But I wanted to do research using mass spectrometry for molecular biology study. Then, my supervisor allowed me to do mass spectrometry research (mainly protein sequence analysis using in-gel digestion) because I could understand the inside of the instrument. After starting the research, I learned that there was a technology called MSI, and I began the MSI study after consulting with a supervisor. I think I was lucky to launch a project to develop an instrument specialized for MSI in collaboration with Shimadzu. Currently, the instrument is commercialized by Shimadzu as the iMScope TRIO. During the development, I evaluated the performance of iMScope TRIO prototype. In addition, I also studied sample preparation methods. At that time, there were no researchers to study MSI in Japan except for me. So I had to study everything by myself.

In 2007, Dr. Ron Heeren and Dr. Markus Stoeckli were invited to the Annual Conference of the Mass Spectrometry Society of Japan. This is my first contact with prominent MSI researchers from overseas. Since then, I would like to get involved with European MSI researchers.

What do you think MSIS brings to the MSI field? What else would you like to see from the society?

I feel that MSIS is a very sophisticated organization. This trend is probably derived from COST Actions. I think the strength of MSIS is that various projects are

In this issue

- Distinguished members of the MSI community
Meet the host of 2022 OurCon in Japan: **Professor Shuichi Shimma** and the new member of the MSIS executive board and student representative: **Stefania Maneta-Stavarakaki**
- **EVENT!** Save the dates for the 24 hours of International Mass Spectrometry Imaging
- **WEBINARS** in MS Imaging in Collaboration with BMSS
- MSIS Calendar
- MSI vacancies

WEBINAR

Coming soon the MSIS Virtual OurCon Seminars, a series of interactive seminars primarily for Early Career Researchers to share their work with our community, ...to enable feedback and active discussion. Further information available will be available soon on the MSIS and OurCon websites.

www.ms-imaging.org

www.ourcon.org



Join the community and shape the future of MSI...

MSIS Calendar

2020

24 hours of International Mass Spectrometry Imaging

November 18-19, 2020

Virtual meeting

Organiser: Tiffany Porta Siegel and Peggi Angel

2021

OurCon VIII, Sheffield, UK

October 11-14, 2021.

Venue: Cutler's Hall and Sheffield Cathedral.

Local organizer: Malcolm Clench.

systematically promoted within the large organization of the EU and under strong leadership. In Japan, the MSI community does not have an academic society, but I hope to create an organization comparable to MSIS in Asia in the future. Participating in MSIS events from Japan, especially OurCon, is very important. The most valuable element is "networking." Japanese people sometimes hesitate to communicate with foreign scientists. However, if we join OurCon, we can take lectures in the same space throughout the session. In addition to the session, eating and drinking are all together. I believe that the importance of MSIS events will increase because the opportunities for close communication are challenging in large conference like ASMS.

Have you participated in OurCon and if yes what are your best memories?

I have participated in OurCon three times so far. The first is Antalya, the second is Charleston, and the third is St. Malo. As I mentioned above, the best memory is the ease of networking. Especially in Antalya, I experienced culture shock. I remember that the number of participants was not so large, but the conference gave me the opportunity to have a lot of discussions with various famous researchers. Also, during the conference, I stayed in the same hotel from morning to night, so I was able to remember the participants' faces and name easily. This OurCon in Antalya is the most impressive for me. As an organizer of the upcoming OurCon 2022, I had the opportunity to introduce the conference plan at Gala dinner. I remember the speech was unexpectedly well-received.

What drives your enthusiasm for the field of MS imaging?

I have opportunities to talk about MSI at various places (Japan, China, and South East Asia), and I always use the word "Seeing is believing." There are a variety of molecular imaging methods, but MSI, which can detect and visualize molecules directly by mass spectrometry, has a unique advantage. From the 1990s, when MSI started, to the early 2000s, the main target for imaging was proteins or peptides, and then to image small molecules such as drugs and phospholipids. Now various molecules, including metabolites, are being visualized. However, there are still many molecules that cannot be visualized. My passion is to think about how to see molecules that are not currently visible and what kind of science can be developed by MSI.

How do you think the field will be in 5-10 years from now?

As I have mentioned, many molecules are not yet visualized. I believe that a sample preparation method will be developed to detect these currently invisible molecules. For example, Prof. Per Andrén at Uppsala University is a pioneer in the field of on-tissue derivation. Not only the sample preparation method but also the instrument is developing rapidly, so I think the sensitivity can be dramatically improved.

To date, MSI is applied in many areas (plants, insects, and food). Except for those fields, for instance, in the field of biofilm research, especially in the field of periodontal disease biofilms, where there are currently many unknown factors, I believe that molecular imaging methods such as MSI will be an essential technology for visualizing molecular communication between microorganisms.



This photo is a selfie (Prof. Shu Shimma) taken at the Gala dinner, OurCon VII, Saint Malo



OurCon Charleston 2018. From left, Shimma, Prof. Richard Caprioli, Prof. Per Andren, and Dr. Bram Hejis.



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SAVE THE DATE

24 hours of International Mass Spectrometry Imaging (24h-IMSI):

Despite the disappointing postponement of OurCon 2020 due to the terrible COVID-19 pandemic, leaders from all over the globe have decided to unite and take up the challenge! Because we know and understand how much staying connected is important in particularly difficult times like the ones we are living, we have decided to organize a unique virtual event where mass spectrometry imaging (or imaging mass spectrometry) will raise its voice for 24 hours from all over the world. We are all happy to welcome you to the 24 hours of International Mass Spectrometry Imaging (24h-IMSI). The event will start in Auckland on November 19th at 8am NZST and end in Rio de Janeiro on November 19th at 5pm UCT+3 (yes – that will make it 24 hours). We wish that this unusual virtual event will give you the opportunity to exchange fruitfully and informally with participants from our amazing community from all over the world! We look forward to connecting with you soon!

Tiffany Porta Siegel (Maastricht) and **Peggi Angel** (Charleston), Chairs



What are the main challenges and the biggest success you have encountered in your career and what do you think can be improved in the field of MSI?

I changed my major from physics to biology (physiology) in my doctoral course and obtained a Ph.D. in iMScope development. The biggest challenge for me was when I got my Ph.D. My supervisor said to me, "Because your major is the field of physiology, it is not enough only to develop an instrument. You have to discover something new in physiology with the instrument." To overcome this problem, I studied simultaneously in physiology as well as in instrumental development. As a result, I discovered a specific distribution of gangliosides in the mouse hippocampus development, a particular distribution of phospholipids in mouse brain sections, and a specific distribution of phospholipids in liver cancer.1-3) Fortunately, I was able to get my Ph.D. in two years (typically three years in Japan). Though I spent tough days when I was in a Ph.D. course, that is an excellent experience for me.

I think there is still a lot of room for improvement in MSI. For example, I think we can improve the matrix itself and even its supplying method. It is also possible to process large amounts of data using various statistical analysis methods (Non-Linear t-SNE and UMAP as well as PCA) for the untargeted analysis. However, it is difficult to answer the origin of all the peaks. This is not limited to MSI, but I have high expectations for excellent database like METASPACE. In addition, I believe that the separation of structural isomers in MSI can be improved in the future. I have already published a review paper with Prof. Ron Heeren) but I think it is also important to develop technologies for IMS-MSI using timsTOF flex and SYNAPT as well as tandem mass spectrometry.

What advice would you give to a student entering an MSc/PhD project?

I think it is a very good opportunity to change the field with MSc and Ph.D. Because it is possible to conduct interdisciplinary research. I hope that students will continue their research not only in the immediate future but also from a broad perspective. Besides, if possible, let's participate in many collaborative research projects. Let's find areas where MSI research is unexplored. I like to make 0 to 1, so I hope more students will have that mindset.

Stefania Maneta-Stavrakaki

Imperial College London, United Kingdom



Stefania Maneta-Stavrakaki obtained a BSc in Chemistry from the University of Athens, followed by an MSc in Analytical Chemistry from King's College London, mainly focused in Mass Spectrometry. She then worked as an Analytical Scientist at GSK. Currently, she is completing her PhD in ambient mass spectrometry (DESI and REIMS) and its imaging applications at Prof. Zoltan Takats group at Imperial College London funded by GSK and BBSRC.



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Don't miss... In the next issue

We are discussing MS Imaging with:



Professor
Isabelle
Fournier from
Université de
Lille

Professor Jörg
Hanrieder from
Gothenburg
University



How you came to be involved in MSI?

I was first introduced to the topic of MSI during my master's degree and I found it very interesting from the beginning. So, when the time came to choose a topic for the course's research project, MSI was my first choice. That was when I got more seriously involved in MSI and I was lucky enough to get trained on MALDI MSI by Peter Marshall at GSK. I really enjoyed my time there and I became even more intrigued in the field which prompted me to pursue a PhD project and further study in MSI.

What do you think MSIS brings to the MSI field? What else would you like to see from the society?

I think that having a society that brings people of same interests together is very important and MSIS has been successful in doing so, through the OurCon series, other events throughout the year and even now with this newsletter. It is nice to meet other people who are also working in this field and establish collaborations and a network that can help to improve this field even more.

Have you participated in OurCon and if yes what are your best memories?

I have only participated in one OurCon so far, last year at St Malo which I really enjoyed. Charles Pineau did a great job as an organiser. I will not forget our attempt to surf on the first day of the conference; it was a very cold and rainy day and there were no waves, so we did paddle surfing instead. The first 10 min were torturous, walking in the very cold sand or falling from the board (as I did many times) in the cold sea but after a while I got used to the temperature and I really enjoyed the session.

What drives your enthusiasm for the field of MS imaging?

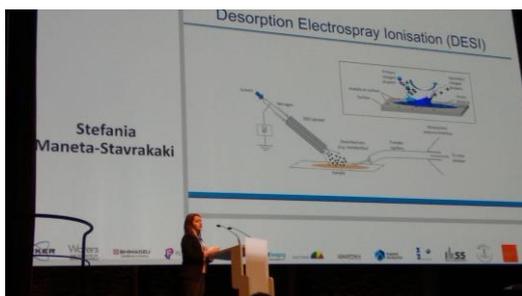
I believe that mass spectrometry in general is a very powerful tool and can play a very important role in the elucidation of major problems, clinical and non-clinical and I am fascinated with how many different ways we can use it to maximise the amount of information we are getting; from coupling it to separation techniques such as liquid chromatography or do MS imaging. From my very first introduction to MS imaging I was convinced that it is something worth studying, with so many applications and so many prospects for innovation.

How do you think the field will be in 5-10 years from now?

I believe and hope that we will be able to do routine single cell imaging. The spatial resolution and sensitivity of the various MS imaging techniques are continuously improving, and I would really like to see the ambient ionisation techniques as established as MALDI is in the imaging world.

What are the main challenges and the biggest success you have encountered in your career and what do you think can be improved in the field of MSI?

The months after the completion my BSc degree, when I had to decide what my next step should be, was one of the most challenging time in my career. I knew I wanted to follow a career in Analytical Chemistry, but I didn't know exactly how to do it. My



Stefania in OurCon VII, St Malo, 2019



The beautiful beach of St Malo from the conference centre



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MSI vacancies

Postdoctoral position, Molecular Horizons
Institute at the University of Wollongong,
Australia

**Technische Assistenz - Mass Spectrometry
Imaging**, Boehringer Ingelheim, Germany

**PhD position focussing on "(Multimodal)
Imaging Techniques in Biosciences"**

(specific announcement for women ESRs, 4
years appointment)

The Technical University Vienna, Austria
details: https://www.cta.tuwien.ac.at/division_instrumental_and_imaging_analytical_chemistry/omics_technologies/open_positions/

**PhD student high throughput mass
microscopy (NWO)**

M4I institute, Maastricht, The Netherlands
More information can be obtained by contacting
Prof. Ron M.A. Heeren,
r.heeren@maastrichtuniversity.nl

For links to the MSI vacancies and regular
updates, please visit www.ms-imaging.org.

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<https://ms-imaging.org/wp/membership-account/membership-levels/>

professional options in Greece were very limited; the financial and political scene was extremely bad at the time and science had been affected very badly by it. The alternative was to leave Greece and get my MSc degree in the UK, which also had its downsides, such as the big financial cost and the uncertainty of living away from your home country, family and friends. Fortunately, after several months of deliberation I decided to come in the UK, which I now consider one of the best decisions I have made. My studies and work in the UK exposed me to the international scientific scene and I would not be where I am now if I hadn't made that choice, so despite the difficulties I am very happy with how things turned out.

I think as a community we need to focus more on the standardisation of MS imaging techniques and the improvement of its robustness and reproducibility. If we do this, MS imaging will have all the potential of being used routinely, and potentially replace more user-dependent techniques such as the histological analysis.

What advice would you give to a student entering an MSc/PhD project?

I think the advice I would like to hear when I was a MSc student or when I was starting my PhD project would be to choose a field that you're really interested in. This is the only way to commit to the responsibilities of these degrees and invest the time needed to complete them. I generally believe that if you enjoy what you are doing you are naturally good at it and I was lucky enough to choose a research topic I am enjoying studying and researching.

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