

Sebastiaan Van Nuffel

PhD in Analytical Chemistry,
Specialized in Biological & Clinical Imaging Mass Spectrometry

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Recent Appointments

December 2020 -

Assistant Professor (UD)

Today

Location: Faculty of Science and Engineering as well as the M4I Division of Imaging Mass Spectrometry, Maastricht University

Activity: I will start building a research program and group focusing on expanding and connecting ToF-SIMS imaging to other levels of information in order to help us understand disease and biology from atoms to anatomy.

January 2020 -

Assistant Research Professor

December 2020

Location: Materials Characterization Laboratory (MCL), Materials Research Institute (MRI), Pennsylvania State University

Activity: I established independent collaborations with PSU faculty as well as industrial partners and obtained internal and external funding to sustain this research.

- January 2019 – **Postdoctoral Scholar**
December 2019
Location: Materials Characterization Laboratory (MCL),
Materials Research Institute (MRI), Pennsylvania State
University
Supervisor: Prof. Nicholas Winograd
Activity: I conducted biological ToF-SIMS research in the
Materials Characterization Laboratory (MCL) of the
Materials Research Institute (MRI) as well as the research
group of Professor Nicholas Winograd within the
Department of Chemistry.
- January 2017 - **Postdoctoral Researcher**
December 2018
Location: Natural Product Chemistry Institute (ICSN),
French National Center for Scientific Research (CNRS)
Supervisor: Dr. Alain Brunelle
Activity: I was part of Dr. Alain Brunelle's Mass
Spectrometry Group at the Natural Product Chemistry
Institute (ICSN) of the French National Center for Scientific
Research (CNRS). I worked on a variety of different projects
within the scope of the DEFIMAGE (Project ID:
ANR-15-CE29-0007) and CHEWING (Labex Ceba Strategic
Project 2017-2019) grants.
- November 2016 – **Research Assistant**
December 2016
Location: School of Pharmacy, University of Nottingham
Supervisor: Dr. Mischa Zelzer
Activity: Led a two-month project to design and test a new
sample holder for correlative cryo-SEM and cryo-ToF-SIMS
imaging of frozen cells.

Education

- 2016 PhD, School of Pharmacy, University of Nottingham (UK)
Supervisors: Dr. Mischa Zelzer and Dr. Noah Russell
Thesis title: "Three-dimensional Time-of-Flight Secondary Ion Mass
Spectrometry Imaging of Primary Neuronal Cell Cultures"

- 2013 MSc in Chemistry, University of Antwerp (BE)
Supervisor: Prof. Luc Van Vaeck
Thesis title: "Preliminary Research of Molecular Depth Profiling with ULAM-S-SIMS of Industrial Laminate Systems"
- 2011 BSc in Chemistry, University of Antwerp (BE)
Supervisors: Prof. Luc Van Vaeck and Prof. Koen Janssens
Thesis titles: "Optimization of the Imaging of coated Fibers with Time-of-flight (TOF) Static Secondary Ion Mass Spectrometry (S-SIMS)" and "Comparison of the Analysis Possibilities of Paint Samples using various FTIR Techniques"

Honors and Awards

- 2020 ACS Editors' Choice
- 2019 BMSS John Beynon Travel and Conference Fund
- 2019 Travel Grant for Early Career Scientists from the Analytical Division of the Royal Society of Chemistry
- 2019 Travel bursary from the Early Career Researchers Fund of the Institute of Physics
- 2018 Travel Grant for Early Career Scientists from the Analytical Division of the Royal Society of Chemistry
- 2016 Overseas Conference Travel Grant from the Analytical Chemistry Trust Fund
- 2013 MSc in Chemistry awarded cum laude
- 2011 BSc in Chemistry awarded cum laude

Grants and Contracts

Ongoing

- June 2020 – PSU Pathway to Partnerships (P3) Stage 2 Application
Role: Co-PI
- June 2021 Title: "Papillomavirus-induced tumor tissue imaging using two novel mass spectrometry methods: TOF-SIMS and MIBI-TOF"
PI: Prof. Neil Christensen
Scope: The College of Medicine has completed its review of the

2019 P3 Stage 2 RFA and our grant application will be recommended to the Pennsylvania Department of Health for final approval.

Completed (within the last 3 years)

March 2019 – Seed Project Funding, Pennsylvania State University
Role: Co-I

October 2020 Title: “Chemical Imaging of Zebrafish Pigmented Cells via Time-of-Flight Secondary Ion Mass Spectrometry”
PI: Prof. Keith Cheng
Scope: In this pilot study, we chemically imaged retinal pigment epithelium (RPE) in frozen-hydrated sections of larval zebrafish using cryo-ToF-SIMS and discovered new marker ions that are attributable to leucodopachrome. The findings were published as a research article in JASMS.

March 2019 – Seed Project Funding, Pennsylvania State University
Role: Co-I

August 2020 Title: “Papillomavirus-induced Tumor Tissue Imaging Using Time-of-Flight Secondary Ion Mass Spectrometry”
PI: Prof. Yusheng Zhu
Scope: The goal of this pilot study was to determine whether we could distinguish tumor from adjacent normal muzzle tissues of the unique MmuPV1 model using imaging ToF-SIMS. The preliminary data was leveraged to successfully obtain external funding.

January 2019 – Management ToF-SIMS Facility, Pennsylvania State University

December 2020 Role: I co-managed the ToF-SIMS core facility at the Materials Characterization Laboratory.

Articles in Peer-Reviewed Journals

6. Tuck, M., Blanc, L., Touti, R., Patterson, N.H., **Van Nuffel, S.**, Villette, S., Taveau, J.C., Römpf, A., Brunelle, A., Lecomte, S., Desbenoit, N. (2021). Multimodal Imaging Based on Vibrational Spectroscopies and Mass Spectrometry Imaging Applied to

Biological Tissue: A Multiscale and Multiomics Review. *Analytical Chemistry*, 93(1), 445-477.

5. **Van Nuffel, S.**, Ang, K.C., Lin, A., Cheng, K. (2021). Chemical Imaging of Retinal Pigment Epithelium in Frozen Sections of Zebrafish Larvae using ToF-SIMS. *Journal of the American Society for Mass Spectrometry*, 32(1), 255-261.
4. **Van Nuffel, S.**, Quatredeniens, M., Pirkl, A., Zakel, J., Le Caer, J.P., Elie, N., Vanbellingen, Q., Dumas, S., Nakhleh, M., Ghigna, M., Fadel, E., Humbert, M., Chaurand, P., Touboul, D., Cohen-Kaminsky, S., Brunelle, A. (2020). Multimodal Imaging Mass Spectrometry to Identify Markers of Pulmonary Arterial Hypertension in Human Lung Tissue using MALDI-ToF, ToF-SIMS and Hybrid SIMS. *Analytical Chemistry*, 92(17), 12079-12087.
3. **Van Nuffel, S.**, Elie, N., Yang, E., Nouet, J., Touboul, D., Chaurand, P. & Brunelle, A. (2018). Insights into the MALDI Process after Matrix Deposition by Sublimation using 3D ToF-SIMS Imaging. *Analytical Chemistry*, 90(3), 1907-1914. 22 citations as at 14/07/2020.
2. **Van Nuffel, S.**, Parmenter, C., Scurr, D. J., Russell, N. A., & Zelzer, M. (2016). Multivariate analysis of 3D ToF-SIMS images: method validation and application to cultured neuronal networks. *Analyst*, 141(1), 90-95. 19 citations as at 14/07/2020.
1. Vercammen, Y., Moons, N., **Van Nuffel, S.**, Beenaerts, L., & Van Vaeck, L. (2013). Experimental study of the organic ion intensity distribution in the ion imaging of coated polymer fibres with S-SIMS. *Applied Surface Science*, 284, 354-365. 3 citations as at 14/07/2020.

Invited Talks

6. "Chemical Imaging of Retinal Pigment Epithelium in Frozen Sections of Zebrafish Larvae Using ToF-SIMS", Webinar: Third Annual Penn State College of Medicine Research Cores Symposium, Hershey, PA, USA, 18-19 November 2020.
5. "Chemical Imaging of Retinal Pigment Epithelium in Frozen Sections of Zebrafish Larvae Using ToF-SIMS", PHI's Virtual Fall Workshop, Minneapolis, MN, USA, 17-19 November 2020.
4. "Imaging Mass Spectrometry: Answering Biomedical Questions using Spatially Resolved Chemical Information", Department of Pathology and Anatomical Sciences Grand Rounds, University at Buffalo, Buffalo, NY, USA, 20 November 2019.

3. "Label-Free Chemical Imaging of Tissues and Single Cells using Imaging Mass Spectrometry", Webster Science Café Talk, PSU Post Doc Society, Pennsylvania State University, State College, PA, USA, 29 August 2019.
2. "3D Label-Free Chemical Imaging of Tissues and Single Cells using Imaging Mass Spectrometry", Millennium Café, Pennsylvania State University, University Park, PA, USA, 23 April 2019.
1. "Understanding MALDI through 3D ToF-SIMS Imaging", NESAC/BIO, University of Washington, Seattle, WA, USA, 16 November 2017.

Oral Presentations at Refereed Conferences

7. "ToF-SIMS Imaging of Zebrafish Pigmented Cells", 22nd International Conference on Secondary Ion Mass Spectrometry (SIMS22), Miyakomesse, Kyoto, Japan, 20-25 October 2019.
6. "ToF-SIMS Imaging of Biological Tissue: Challenges and Opportunities", 2019 PHI User's Meeting, Minneapolis, MN, USA, 10-11 September 2019.
5. "Gazing at Titian's Ecce Homo with Imaging Mass Spectrometry", SIMS Europe 2018, Physical Institutes of the University of Münster, Münster, Germany, 16-18 September 2018.
4. "Advanced ToF-SIMS Image Analysis: PCA, Random Forests and Applications", 8th Annual French ION-TOF User's Meeting, Esch-sur-Alzette, Luxembourg, 15-16 March 2018.
3. "Understanding MALDI through 3D ToF-SIMS Imaging", 21st International Conference on Secondary Ion Mass Spectrometry (SIMS21), Jagiellonian University, Kraków, Poland, 10-15 September 2017.
2. "3D ToF-SIMS Imaging of Primary Cell Cultures", SIMS Europe 2016, Physical Institutes of the University of Münster, Münster, Germany, 18-20 September 2016.
1. "3D ToF-SIMS Imaging of Primary Neuronal Cultures", RSC Biomaterials Chemistry Meeting, University of Birmingham, Birmingham, United Kingdom, 7-8 January 2016.

Teaching Experience

- May 13, 2020 Guest Lecturer, Making the Best of a Bad Situation characterization webinar series organized by the Pennsylvania State University, the University of Illinois, the University of Wisconsin and the University of Minnesota
Webinar titled: ["Time-of-Flight Secondary Ion Mass Spectrometry: Biological Applications"](#)
- June 13, 2019 Guest Lecturer, Chemistry Research Experience Undergraduate (REU) Program, Pennsylvania State University
Seminar titled: "3D Label-Free Chemical Imaging of Tissues and Single Cells using Time-of-Flight Secondary Ion Mass Spectrometry"
- Autumn 2017 Lecturer, Unités d'Enseignements (UE): Méthodologies en Protéomique for the M2 Ingénierie et Chimie des Biomolécules (ICBM) organized by Dr. Virginie Redeker, Université Paris-Saclay
Course on the fundamentals and instrumentation of mass spectrometry given to master's students in class sizes averaging 10 students.
- October 29, 2014 Guest Lecturer, SIMS and XPS Lecture Series organized by Dr. David Scurr, School of Pharmacy University of Nottingham
Lecture titled: "Time-of-Flight (TOF) Mass Analysers"
- January 21, 2014 Guest Lecturer, SIMS and XPS Lecture Series, organized by Dr. David Scurr, School of Pharmacy University of Nottingham
Lecture titled: "Ion Formation in Static Secondary Ion Mass Spectrometry (S-SIMS)"

Mentorship

- BSc students As a PhD student, I co-supervised undergraduate students during their bachelor thesis projects. I compiled reading lists for their literature review and helped them set up experimental plans, analyze data and writing their thesis.
- MSc students During my time as a postdoc with the CNRS, I co-supervised the master thesis project of a foreign exchange student.

Reviewer Duties

Analytical and Bioanalytical Chemistry (Springer)

Applied Surface Science (Elsevier)

Journal of Biomedical Materials Research: Part A (Wiley)

Committees

2020 International scientific committee member of the SIMS-23 conference

Scientific Memberships

2021 - today Nederlandse Vereniging voor Massaspectrometrie

2020 - today American Society for Mass Spectrometry

2015 - today Institute of Physics (MInstP)

2015 - today Royal Society of Chemistry (MRSC)

Licenses & Certifications

BSAFE

UNDSS, ID 2894679, October 2020 - no expiration date.

EMI Professional Development Series

FEMA, October 2020 - no expiration date.

Responsible Conduct of Research (RCR) - Basic

CITI Program, ID 36108122, July 2020 - no expiration date.

Essentials of Research Administration

CITI Program, ID 37446213, July 2020 - July 2023.

Good Laboratory Practice (GLP)

CITI Program, ID 37388889, July 2020 - July 2023.

GCP for Clinical Trials with Investigational Drugs & Medical Devices (U.S. FDA Focus)

CITI Program, ID 37388888, July 2020 - July 2023

Protection of Human Research Subjects - Biomedical course
CITI Program, ID 37446161, July 2020 - July 2023.

IONTOF Level 2 TOF.SIMS 5 Maintenance Certificate
IONTOF GmbH.

Languages

Dutch	native proficiency
English	bilingual proficiency
French	professional working proficiency