

FOURNIER, Isabelle

<https://orcid.org/0000-0003-1096-5044>

Web of Science Researcher ID: H-9195-2015

URL for web site: <https://laboratoire-prism.fr/index.php/about/members/18-fournier-isabelle>

• EDUCATION

- 2005** **Habilitation à Diriger les Recherches (mandatory diploma to apply for professorship)**, Biology Department, University Lille 1 Science & Technology (ULille 1), France, Development of MALDI MS Imaging and its Application to Biology
- 1996-2000** **PhD**, Laboratory of Organic & Biological Structural Chemistry, Chemistry Department, Univ. Pierre & Marie Curie, Paris, France, Contribution to the Study of Physico-Chemical Mechanisms Involved in the Matrix Assisted Laser/Desorption Ionization Process.
- 1994-1996** **Master's in Chemistry**, Mention Spectrochemistry & Organic Physicochemistry, Chemistry Department, University Pierre & Marie Curie, Paris, France

• CURRENT POSITIONS

- 2022-present** **Vice President for Doctoral Research**, University of Lille
- 2015-present** **Distinguished Professor & co-director**, Laboratory of Proteomics, Inflammatory Response & Mass Spectrometry (PRISM) Inserm U1192, Biology Department, University of Lille (ULille), France, www.laboratoire-prism.fr

• PREVIOUS POSITIONS

- 2017-2021** **Director** of the Public/private unit (O'Dreams), Mixed team with the company OCR
- 2010-2014** **Deputy Director**, Lab. of Fundamental and Applied Biological Mass Spectrometry, Biology Department, University Lille 1 Science & Technology (ULille 1), France
- 2009-2015** **Full Professor**, Biology Department, ULille 1, France
- 2004-2010** **Group Leader**, MALDI Imaging Team, Lab. of Annelids Neuroimmunology, Biology Department, ULille 1, France (9 full-time equivalent members)
- 2003-2009** **Associate Professor**, Faculty of Sciences, Biology Department, ULille 1, France
- 2001-2003** **Postdoctoral fellow**, Lab. Annelids Neuroimmunology, CNRS UMR8017, ULille 1, France
- 2000-2001** **Postdoctoral fellow**, Group of Prof. M. Karas, Department of Chemistry, University J.W. Goethe, Frankfurt-am-Main, Germany

• FELLOWSHIPS AND AWARDS

- 2021** **Unicancer** (grouping of French Cancer Centres) **Innovation Prize**, SpiderMass technology for oncology
- 2019** **Senior Member** of Research Excellence Academy, Institut Universitaire de France, France <http://www.iufrance.fr/les-membres-de-liuf/membre/633-isabelle-fournier.html>
- 2017** **MSACL Distinguished Contribution Award** www.msacel.org/ (International)
- 2015** **"Best Breakthrough Innovation" Award** International Board MATWIN (Maturation & Accelerating Translation with Industry) www.matwin.fr, France
- 2011** **Grand Prix Spécial** of Society of Sciences, Agriculture and Arts of Lille, France
- 2010** **Co-Funder** Imabiotech Start-up (www.imabiotech.com)
- 2009-2014** **Junior Member** of Research Excellence Academy, IUF (www.iufrance.fr), France
- 2009** National Institute for Intellectual Property (INPI) Award for North Region, France
- 2004-present** **Prime of Excellence (PES)** of French Minister of Research & Education, France (national)
- 2004** **ANR National Starting Grant**, ACI JC4074, Development of MALDI Mass Spectrometry Imaging. Creation of the MALDI Imaging (MIT) Team, France

• SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

- 2007-present** **Postdoctoral fellows (7)**: Atef Manaa (2021-present, Hauts de France Regional Council, Talent Researcher Award), Nina Ogrinc (2018-present, ISite ULNE Grants), Stacy Malaker (2018, visiting post-doc, 6 months, U. Stanford), Anna Baud (2018, Mixt Unit Laboratory-Company), Benoit Fatou (2015-2017, Inserm INCA grant), Jusal Quanico (2014-2019), ANR grant), Jae-Ho Kim (2011-2012 Koranet Program grant), Young-Yie Kim (2010-2011 KBSI Korea grant), Daniele Vergara (2008-2009 FP7 MSCA IF)
- 2003-2017** **22 PhD students** including 4 ongoing and 19 already defended. 5 PhD in cotutelle (U. Sherbrooke Canada (2), U. Monastir Tunisia (1) or Lebanese University, Lebanon (1)). 1 PhD with a company (CIFRE, Pierre Fabre). 3 PhD in codirection with the Physic Department. **37 Master 2-degree students** from biology, Chemistry, Physics & physicians

• TEACHING ACTIVITIES

- 2003-present** **Teaching** in Analytical and Bioanalytical Chemistry, Mass Spectrometry & Proteomics for an equivalent of 192H/yr. Departments of Biology, Chemistry and Physics, Faculty of Science & Technology, ULille, Lille, France.
- 2020** **Coordinator** of the newly created M2 in Omics & Systems Biology within the Master of Bioinformatics, ULille, France (<https://www.univ-lille.fr/formations/fr-00002117.html>)
- 2015-2020** **Coordinator** of the Master 2 degree in Proteomics, Department of Biology, ULille, France.
- 2009-present** **Head of Teaching Units**, Master of Biotechnologies, Master of Advanced Spectroscopy in Chemistry (Erasmus Mundus), Master of Physics, Master of Health-Biology.

• **ORGANISATION OF SCIENTIFIC MEETINGS (most recents)**

- 2020-2022** **Member of the Scientific Committee**, Analytics 2022, 5-8 September 2022, Nantes, France (<https://www.analytics2022.fr/>), 750 participants expected
- 2020** **Head of the Organization Committee**, Virtual JFSM 2021 June 14-24 2021 (<https://jfsm2021.sciencesconf.org/resource/page/id/2>)
- 2020-2024** **Member of the Organization Committee**, 24th international Conference on Secondary Ion Mass Spectrometry, 8-13 September 2024, La Rochelle (<https://www.sims-24.com/>)
- 2019** **Member of the Scientific Committee**, SMAP 2019 Conference (Mass Spectrometry and Proteomics), 16-19 September 2019, Strasbourg, France (500 participants)
- 2014** **Workshop Organiser** “On-Tissue Digestion” Round-Robin, COST Action BM 1104, 50 participants, 25-27/06/2014, Lille, France

• **INSTITUTIONAL RESPONSIBILITIES**

- 2022-present** **Nominated Member of the Scientific Committee** Inserm CSS7 Health Technology
- 2021-present** **Member of the Steering Committee** National Priority Programs & Equipment for Exploratory Research (PEPR) Digital Health (ANR France Recovery Plan)
- 2021-present** **Member of the Steering Committee** Inserm National Cross-Cutting Program, Characterization of Cellular Functions by 3D Molecular Strategies
- 2021-present** **Member of the steering committee** of the GIS IBISA, national structure for technological platforms and resources (www.ibisa.net/decouvrir-ibisa.html)
- 2019-present** **Elected Statutory Member** of the National Committee of Universities, CNU 68
- 2016-2017** **Elected Member** of the Research Commission & Academic Council, ULille 1, France
- 2012-2017** **Member of the Steering Committee & Responsible** Imaging Platform of the SIRIC ONCOLille, Lille Comprehensive Cancer Center, Grant INCa-DGOS-Inserm 6041
- 2013-present** **Director** of the Clic-Imaging Core Facility, University of Lille, www.clic-imaging.com
- 2012-2013** **Deputy director**, Research Institute IFR 147, Lille, France <http://frabio.univ-lille1.fr>
- 2012-2017** **Member** of the Biology Department Council, University Lille 1, Lille, France
- 2007-2014** **Elected Member** of the Research Commission (2007-2008, 2012-2014) & Academic Council (2012-2014), ULille1, Lille, France.
- 2007-2009** **Nominated Member** of the National Committee of Universities, CNU 68

• **REVIEWING ACTIVITIES**

- 2022-present** **Associate Editor**, International Journal of Mass Spectrometry
- 2017-2019** **Vice Chair, H2020 RIA FET-OPEN**, Different Panels, 3 boards (2017, 2018, 2019)
- 2014-2020** **Remote Evaluator, H2020 FET-OPEN**, 2 calls (2014), 1 call (2015), 1 call (2017) & H2020 MSCA IF (2017, 2019, 2020, 2021, 2022), H2020 MSCA ITN (2018), Project Monitor (TopSpec)
- 2017-present** **Member of the Editorial Board**, Scientific Reports, Nature Publishing Group
- 2013** **Member Evaluation Committee**, FP7 EU FET-Open Project UNLOcX
- 2012-2018** **Remote Evaluator** (2012, 2017, 2018, 2019) & Jury President (2012), Chemistry Committee, Nature & Technologies Research Fund of Quebec (FRNTQ), Canada
- 2011-2018** **Evaluator & Panel member** (FNRS, Belgium, German Research Foundation (DFG), Germany), for the Mass Spectrometric Imaging in Life Sciences Panel, DFG, Germany.
- 2010** **Member of Evaluation Committee** of the National Evaluation Agency HCERES (national)

• **MEMBERSHIPS OF SCIENTIFIC SOCIETIES**

- 2011-present** **Advice President** of the French Society for Mass Spectrometry (SFSM), www.sfsm.fr
- 2019-2021** **President** of the French Society for Mass Spectrometry (SFSM), www.sfsm.fr
- 2011-2016** **Member** of the Management Committee of the COST Action BM 1104 Mass Spectrometry Imaging: New Tools for Healthcare Research (<https://www.cost.eu/actions/BM1104>) & of the Governing Board of the EU Graduate School of Neurosciences Euron

2002-present Member of the American Society for Mass Spectrometry (www.asms.org)

2007-present Member Human Proteome Organization (www.hupo.org)

MAJOR COLLABORATIONS

1. Pr. Z. Takats, ICL, London, UK, *MS for intraoperative analysis*. **2. Pr. X. Roucou**, Dept. Biochemistry, Univ. Sherbrooke, Canada, *Identification of novel proteins coming from non-coding regions of RNA*. **3. Prof. A. Makarov**, Utrecht University, NL and Thermo Fisher Scientific, *Orbitrap MS instrument for the surgery*. **4. Dr. J-L. Dimarcq and Prof. Lee L Swanstrom**, IHU Strasbourg, FR, *gastrointestinal cancer*. **5. Prof. Dr. Nassir Navab**, TUM, GE, *Augmented reality for intraoperative MS data visualization*.

Ten years track-record

Whole career: 191 publications (125 over the last ten years) and 15 book chapters plus 11 patents. Scholar: h-factor 47 (7288 cit.), Publons: h-index 39 (4829 cit.). First Author 9%; Last author 30%, Corresponding author 32%, citations: 2 publications >300, 2 >200 and 9 > 100.

1) Representative Publications (citations from google scholar)

1. Quanico J., Franck J., Daully C, Strupat K., Dupuy J., Day R., Salzert M., **Fournier I.**, Wisztorski M.; *Development of liquid microjunction extraction strategy for improving protein identification from tissue sections*; *J. Proteomics* (2013), 79: 200-218. (IF 4.044, Citations 88). A new strategy for large spatial proteomics from tissues (bridging MS Imaging and Proteomics).
2. Fatou B., Philippe P., Leblanc E., Vinatier D., Mesdag V., Wisztorski M., Focsa C., Salzert M., Ziskind M., **Fournier I.**; *In vivo Real-Time Mass Spectrometry for Guided Surgery Application* ; *Sci. Rep.* (2016), 6: 25919 (IF: 4.379, citations 75). 1st demonstration of MS analysis *in vivo* under minimal invasiveness.
3. Wisztorski M., Desmons A., Quanico J., Fatou B., Gimeno J-P., Franck J., Salzert M., **Fournier I.**; *Spatially-resolved protein surface microsampling from tissue sections using liquid extraction surface analysis* ; *Proteomics* (2016), 16(11-12): 1622-32 (IF: 3.98, citations 45). Spatially-resolved strategy for intact proteins to explore large scale Top-Down protein Identification.
4. Delcourt V, Franck J, Leblanc E, Narducci F, Robin YM, Gimeno JP, Quanico J, Wisztorski M, Kobeissy F, Jacques JF, Roucou X, Salzert M, **Fournier I.**; *Combined Mass Spectrometry Imaging and Top-down Microproteomics Reveals Evidence of a Hidden Proteome in Ovarian Cancer*. *EBioMedicine*. (2017) 21: 55-64. (IF: 8.14, citations 33). Applications of MSI and top-down proteomics to ovarian cancer.
5. Mallah K., Quanico J., Trede D., Kobeissy F., Zibara K., Salzert M., **Fournier I.**; *Lipid changes associated with traumatic brain injury revealed by 3D MALDI-MSI*. *Anal. Chem.* (2018) 90 (17), 10568-10576 (IF: 6.986, citations 30). 3D imaging rat brain reconstruction to understand the brain injury process.
6. Fatou B., Ziskind M., Saudemont P., Quanico J., Focsa C., Salzert M., **Fournier I.**; *Remote atmospheric pressure infrared matrix-assisted laser desorption-ionization mass spectrometry (remote IR-MALDI MS) of proteins*. *Mol. Cell. Proteomics* (2018) 17(8), 1637-1649 (IF: 5.9, citations 10). First evidence of proteins identification using SPIDERMass and WALDI process
7. Saudemont P., Quanico J., Robin Y-M., Baud A., Balog J., Fatou B., Tierny D., Pascal Q., Minier K., Pottier M., Focsa C., Ziskind M., Takats Z., Salzert M., **Fournier I.**; *Real-time molecular diagnosis of tumors using water-assisted laser desorption/ionization mass spectrometry technology*; *Cancer Cell* (2018) 34(5): 840-851.e4. 1st demonstration of the *in vivo* laser MS technology for cancer research and surgery. (IF: 31.74, citations 45)
8. Ogrinc N, Saudemont P, Balog J, Robin YM, Gimeno JP, Pascal Q, Tierny D, Takats Z, Salzert M, **Fournier I.**; *Water-assisted laser desorption/ionization mass spectrometry for minimally invasive in vivo and real-time surface analysis using SpiderMass*. *Nat Protoc.* 2019 14(11): 3162-3182 (IF: 13.49, citations 17). Detail protocol of the *in vivo* MS system and application.
9. Seddiki K., Saudemont P., Precioso F., Ogrinc N., Wisztorski M., Salzert M., **Fournier I.**, Droit A. *Cumulative learning enables convolutional neural network representations for small mass spectrometry data classification*. *Nat Commun.* 2020 11(1):5595. doi: 10.1038/s41467-020-19354-z. (IF: 14.92, citations 2). Novel deep-learning strategy for MS data classification.
10. Ogrinc N., Saudemont P., Takats Z., Salzert M., **Fournier I.** *Cancer Surgery 2.0: Guidance by Real-Time Molecular Technologies*. *Trends Mol Med.* 2021 27(6):602-615. doi: 10.1016/j.molmed.2021.04.001. (IF: 11.95, citation 1). Review on the intraoperative analysis field.

2) Granted patents

- **Fournier I.**; Salzert M.; Meriaux C.; Franck J. *Matrices for Mass Spectrometry Imaging*. CNRS-Université Lille 1 (Applicants). Application number and Priority Number: WO2009IB56037 20091215.
- Lemaire R.; **Fournier I.**; Salzert M.; Deschamps Michel; Tabet E.; Proess G.; Rudloff Ivo; Lemaitre M. *Use of Conjugates with Linkers Cleavable by Photodissociation or Fragmentation for Mass Spectrometry Analysis of Tissue Section*. CNRS-Université Lille 1-Eurogentec SA (Applicants). EP1889047B1.

- **I. Fournier**, B. Fatou, M. Wisztorski, C. Focsa, M. Ziskind, M. Salzet. Université Lille 1-CNRS (Applicants). *Device for Real-Time in vivo Molecular Analysis*. WO2016046748A1. Delivered US, CN, JP, AU and is pending in CA and EU. To be licensed end 2022.
- **I. Fournier**, J. Franck, F. Herve, M. Salzet. Satt Nord (Applicant). PCT/FR2021/050923. System and Method for the Analysis of Volatile Organic Compounds by Low Temperature Plasma and Mass Spectrometry

3) Invited Presentations

Overall, 144 (87 on invitation) conferences. 102 over the past 10 years including 67 on invitation. Since I established my group in Lille, I have chosen to put many efforts to develop MALDI MSI technology with a special focus on proteins. I pushed towards the development of combined strategies for bridging MS imaging of proteins to their large-scale identification or so-called Spatially Resolved Proteomics. I received invitations from both Mass Spectrometry and Proteomics societies. For examples, I was invited for a Keynote Lecture in 2007 at the 6th HUPO Conference held in Seoul. In 2008, I gave a Keynote at KHUPO in South Korea. In 2009, I was invited speaker at the EU COST Program EuroKUP, the Kidney Proteomic Community at Napflio in Greece. I was invited speaker in 2010 at the Annual Meeting of the Finnish Proteomics Association and in 2011 at the 6th Workshop in Protein in Denmark. In 2014, I gave a Keynote lecture at the 11th European FTMS conference in Paris & in 2016 invited for a Keynote at the International Mass Spectrometry Conference (IMSC) held in Toronto. In 2017, I gave a plenary lecture at the Italian Proteomics Association (ItPA) Annual Conference & a keynote at the British Mass Spectrometry Society (BMSS) Annual Meeting in September in Manchester. In 2018, I was invited as plenary speaker at the international Imaging Mass Spectrometry Conference Ourcon VI (Charleston, USA). In relation to my recent *in vivo* MS work I have been invited in 2019 to give plenary talks at the French Society of Medical Laser and as the famous Cancer Research UK Imperial Centre National Surgery Symposium, plus 3 keynotes one at the 1st European Top-Down Symposium, and 2 in Germany. In 2020 I have chaired the session “Imaging: Instrumentation & Method Development” at the ASMS Conference and I have given a keynote at MSACL US; both in reboot format due to the outbreak. In 2021 I was invited to give a keynote at the OURCON conference on Imaging Mass Spectrometry and I was invited for a seminar by the Department of Chemistry of the University of Yale.

4) Organization of international Conference

As a long run member of the French MS (SFSM) and proteomics (FPS) societies, I was involved in the organization of several national conferences including being part of the scientific committee of several SFM Annual Conference (350 participants) and twice of the SMAP which is the joint conference between SFSM and FPS (400-500 participants). Within the Frame of the COST Action related to MSI in which I co-chaired the thematic on “Sample and Tissue preparation”; I organized an international Workshop in Lille for the last step of a common initiative as a Round Robin session for standardization of sample preparation for MALDI MSI regrouping all EU groups. In 2020, I was invited to chair the session on MS Imaging at the ASMS 2020 Conference and this year, due to the outbreak I had to chair the Annual Congress of the SFM that was for the 1st time organized as a virtual meeting. I am also in the organization committee of the International SIMS 2024 conference, and I am part of the organization and scientific committee of the Analytics 2022 conference which gathers 4 societies (Mass Spectrometry, Proteomics, Metabolomics and Analytical Science). I am currently co-chair in the French bid for the organization of the International Conference of Mass Spectrometry (IMSC) in 2026 which gather more about 1,500 people.

5) Prizes/Awards/Academy Membership

I started to develop MALDI MSI in 2002, being one of pioneers in Europe. I was awarded for my research a French Starting Grant in 2004 thus establishing my own group. In 2009, I was awarded as Junior Member of Institut Universitaire de France (IUF) which is an academy of excellence, for my research in the field of MS Imaging. For all these achievements I received in 2011 the Grand Prix Spécial of the Society of Sciences, Agriculture and Arts of Lille. Recently I decided to explore the field of in-vivo MS and the proof-of-concept was awarded by the MATWIN International Board in 2015. For my overall contribution to MS in clinics, I received in 2018 the MSACL (Mass Spectrometry Applications to the Clinical Lab) Distinguished Contribution Award. In 2019, I was awarded as Senior Member of IUF for my contribution in MS to clinics.

6) Major Contributions to the early careers of excellent researchers

Since I established as Ass. Prof. in 2003, I trained many graduate and PhD students. The young MALDI Imaging Team (2004) was the 1st group in France to develop MALDI MSI and has developed a unique expertise that was transmitted to the young researchers helping them for starting themselves careers as excellent researchers. Dr. M. Wisztorski (PhD 2006) is now Ass Professor. Dr. J. Stauber (PhD 2008) is CEO of the Start-Up Imabiotech providing service in MSI which I co-founded. Dr. J. Franck (PhD 2009) is Ass. Professor and received the SFSM PhD Award (2010). Dr. R. Longuespée (PhD 2011) is now leading his own group at the University of Heidelberg, Germany. Dr. B. Fatou (PhD 2015) also received the SFSM PhD Award (2017) and is Post-doctorate at the Boston Children’s Hospital, Harvard Medical School. Dr. M. Duhamel

(PhD 2016) received the FPS PhD Award (2018) and is now Ass. Prof. after a post-doctoral in VIB at KU Leuven. Dr. Mallah (PhD 2018) is post-doctoral fellow at the University of Charleston and will start his own group next year. Dr. S. Malaker who came as visiting professor has now started her own group at Yale University. Since 2018, Dr. N. Ogrinc has joined the team and she has been selected for the hearings at the competitive recruitment for researchers of Inserm.

7) Leadership in Industrial Innovation and Design

Since 2002 I have been part of the pioneers working on the development of MALDI MS Imaging. This has led me, among others, to introduce the concept of targeted MS imaging (TagMass) through the development of tagged probes with photocleavable reporters for multiplex MS imaging. This was the foundational idea taken up for LA-ICP MS imaging with metal reporters and now exploited by Fluidigm company. I have also cofounded the Imabiotech Start-Up (www.imabiotech.com) which provides services in MALDI MSI notably for DMPK. The company has now a subsidiary in USA. In 2013, I have introduced the concept of Spatially Resolved Proteomics for combining large identification with proteins localization and created a service platform (Clic-Imaging). Overall, these different developments have led me to collaborate since 2005 with several major in the field of MS or proteomics including Bruker, Advion, Thermo, Waters and Amberg. In 2014 I have developed a novel tool technology of in vivo mass spectrometry with a targeted application for guided surgery. This project is under incubation at EuraSanté for the creation in 2022 of a Start-up (Celeos).