



# Frédéric Foucher

PhD (HDR) – Research Engineer – Physicist  
CNRS, Centre de Biophysique Moléculaire  
UPR CNRS 4301, Rue Charles Sadron  
45071 Orléans Cedex 2 – France



Phone: +33 (0)2 38 25 76 41,  
Portable : +33 (0)6 62 89 11 19,  
e-mail : [frederic.foucher@cnrs-orleans.fr](mailto:frederic.foucher@cnrs-orleans.fr)  
Website : <http://cbmchercheurs.cnrs-orleans.fr/foucher/>

Nationality: French  
Date of birth: February 6<sup>th</sup>, 1980

## Administration responsibilities

- CBM Laboratory Council, appointed member since 2018.
- CBM Communication Commission, member since 2018.
- CBM Security Commission, member since 2013.

## Instrumental responsibilities

- WITec Alpha 500 RA (Raman/AFM)
- Veeco/Bruker Dimension 3100 (AFM)
- Olympus BX-51 (optical microscope)
- Agilent Cary 610 (FT-IR spectrometer)
- Ocean Insight Flame (spectrometer)
- ThorLabs camera
- DJI Phantom 4 Pro (drone)
- DJI Mavic Pro (drone)
- PowerRay Explorer (submarine)

## Instrumental skills

- Raman spectroscopy
- Atomic Force Microscopy
- Optical microscopy
- Imaging
- Scanning Electron Microscopy
- Transmitted Electron Microscopy
- UV-Vis-NIR spectroscopy
- FT-IR spectroscopy
- Drone (professional)

## Computer skills

- Languages: HTML, PHP, SQL, Python.
- Mathematics: Matlab, Mathematica.
- Data processing: WITec project, WSxM, Nanoscope, Gwyddion, Agisoft photostan, Origin...
- Office automation: Microsoft Office, OpenOffice, LaTeX.
- Image processing: GIMP, Inkscape...

## Other

- Driving license B
- Certificate of Theoretical Microlight Instructor

After a PhD in Physics (material sciences), I joined the Exobiology group at CBM, CNRS Orléans, in October 2007. After a two-years postdoctoral position, I became research engineer (permanent position since 2010). I obtained my habilitation (HDR) in 2017. My researches focus on the detection of biosignatures in ancient terrestrial rocks and possibly on Mars, in particular using Raman spectroscopy. More broadly, I work on different topics including space exploration, analogues, and origins of Life.

## Education

- 2017 Habilitation in Physics (HDR)  
*"Methodology for the Search for Life on Mars"*  
University of Orléans, France.
- 2007 PhD in Physics  
*"Influence of the substrate on the buckling phenomenon of coated materials"*  
University of Poitiers, France.
- 2004 Master in Physics (DEA) - Grade B pass.  
*Physical and Mechanical Properties of Materials (P2M2)*  
University of Poitiers, France.
- 2002 Licence in Physics  
University of Poitiers, France.

## Research programs

- 2020 Géo-Origine (CNRS, Mission for Interdisciplinarity, Challenge Origin)  
*Development of a prebiotic reactor*  
Role: participant scientist
- 2019- RSOWG (ESA)  
*ExoMars 2022 Rover Science Operation Working Group*  
Role: participant scientist in the team "Micro"
- 2018- APPIMIL (CNES research program)  
*Astrobiology Project of Photonic and Ionic Martian Irradiation in the Laboratory.*  
Role: leader
- 2015-17 EURO-CARES (Horizon 2020 LEIT Space)  
*European Curation of Astromaterials Returned from Exploration of Space*  
Role: expert in Analogue Samples Working package
- 2017 DEVIL (CNRS, Mission for Interdisciplinarity, Challenge Intrum')  
*Drone Exploration for Versatile In-situ Learning*  
Role: leader
- 2014- CaliPhoto (CNRS, CNES and SATT Grand Centre)  
*Image processing for material identification and characterization (patent)*  
Role: inventor
- 2014- LithoSpace (CNES Research & Technology program )  
*Development of an automated in situ petrographic thin section maker*  
Role: leader
- 2010- ISAR (CNES, CNRS)  
*International Space Analogue Rockstore*  
Role: manager
- 2008- Mars GeoMicroPal (CNES)  
*Contribution to ExoMars*  
Role: participant scientist

## Networking activities

- Réseau Vecteurs non-humains et Instrumentation Embarquée, CNRS, member of the steering since 2020.
- European Astrobiology Network Association, elected member of the council since 2019.
- Réseau des Microscopies à Sonde Locale (RÉMiSoL), member of the steering committee in 2016-2019.
- Réseau Thématique de Recherche Image Région Centre, member since 2016.
- APOLO (APplications Optiques et Lasers d'Orléans), CNRS, member since 2016.
- Groupe de Travail Repositionnement, MI CNRS, leader in 2015-2018.
- Société Française d'Exobiologie, member of the administration council in 2015-2018.
- Réseau systèmes d'informations et bases de données, CNRS Orléans, member since 2013.

## Organisation of events:

- EANA19 : 19th European Astrobiology Network Association Conference. Organised by F. Westall, F. Foucher, K. Hickman-Lewis, L. Selliez, A. Brack, J.-P. Lebreton, P. Modica, B. Cherville, C. Briois, P. Martin, C. Ramboz, C. Gabant, P. Legland & F. Gaillard. *Hôtel Dupanloup, Orléans, France, September 3-6, 2019.*
- Journée thématique repositionnement relocalisation recalage, MI du CNRS. Organised by F. Foucher, M. Bergounioux, X. Heiligenstein, P. Paul-Gilloteaux, I. Paintrand, A. Canivet, A. Mallet, I. Gillot, L. Klein, S. Cataloube, J.-F. Bergamini & A. Sartori-Rupp. *Hôtel Dupanloup, Orléans, France, November 21, 2017.*
- Journée thématique repositionnement relocalisation, MI du CNRS. Organised by F. Foucher, I. Paintrand, A. Canivet, A. Mallet, I. Gillot, L. Klein & J.-F. Bergamini. *Institut Pasteur, Paris, France, 29 juin 2016.*
- Workshop EURO-CARES WP5. Organised by F. Westall, F. Foucher & J. Zipfel. *Hôtel Dupanloup, Orléans, France, February 3-5, 2016.*
- Ecole Thématique du CNRS CarboRaman. Organised by F. Foucher & P. Simon. *Domaine de Chalès, Nouan le Fuzelier, France, October 12-17, 2014.*
- Workshop Analogues CNES. Organised by F. Westall, F. Foucher & N. Bost. *CNES, Paris, December 3, 2013.*

## Scientific articles – 43 articles, 8 of them as first author

- K. Hickman-Lewis, B. Cavalazzi, S. Sorieul, P. Gautret, F. Foucher, M. J. Whitehouse, H. Jeon, T. Georgelin, C. S. Cockell & F. Westall (2020). Metallomics in deep time and the influence of ocean chemistry on the metabolic landscapes of Earth's earliest ecosystems. *Scientific Reports* **10**:4965, [doi.org/10.1038/s41598-020-61774-w](https://doi.org/10.1038/s41598-020-61774-w).
- K. Hickman-Lewis, F. Foucher, S. Pelletier, F. Messori & F. Westall (2020). Geological appraisals of core samples using the ExoMars 2020 rover instrumentation. *Planetary and Space Science* **180**, 104743, [doi.org/10.1016/j.pss.2019.104743](https://doi.org/10.1016/j.pss.2019.104743).
- C.R. Cousins, S. Mikhail, F. Foucher, A. Steele & F. Westall (2020). Metamorphic evolution of carbonate-hosted microbial biosignatures. *Geochemical Perspective Letters* **12**, 40-45, [doi.org/10.7185/geochemlet.2002](https://doi.org/10.7185/geochemlet.2002).
- F. Foucher, G. Guimbretière, N. Bost, K. Hickman-Lewis, A. Courtois, L. Luengo, E. Marceau, M. Bergounioux & F. Westall (2019). The CaliPhoto Method. *Inventions* **4**:4, 67, [doi.org/10.3390/inventions4040067](https://doi.org/10.3390/inventions4040067).
- K. Hickman-Lewis, P. Gautret, L. Arbaret, S. Sorieul, R. De Wit, F. Foucher, B. Cavalazzi & F. Westall (2019). Mechanistic Morphogenesis of Organo-Sedimentary Structures Growing Under Geochemically Stressed Conditions: Keystone to Proving the Biogenicity of Some Archaean Stromatolites? *Geosciences* **9**:8, 359, [doi.org/10.3390/geosciences9080359](https://doi.org/10.3390/geosciences9080359).
- D. Guido, K. A. Campbell, F. Foucher & F. Westall (2019). Life is everywhere in sinters: examples from Jurassic hot-spring environments of Argentine Patagonia. *Geological Magazine* **156**:9, 1631-1638, [doi.org/10.1017/S0016756819000815](https://doi.org/10.1017/S0016756819000815).
- D. Gourier, L. Binet, T. Calligaro, S. Cappellia, H. Vezin, J.-G. Bréhéret, K. Hickman-Lewis, P. Gautret, F. Foucher, K. Campbell & F. Westall (2019). Extraterrestrial organic matter preserved in 3.33 Ga sediments from Barberton, South Africa. *Geochimica et Cosmochimica Acta* **258**, 207-225, [doi.org/10.1016/j.gca.2019.05.009](https://doi.org/10.1016/j.gca.2019.05.009).
- M. Di Bella, G. Sabatino, S. Quartieri, A. Ferretti, B. Cavalazzi, R. Barbieri, F. Foucher, F. Messori & F. Italiano (2019). Modern Iron Ooids of Hydrothermal Origin as a Proxy for Ancient Deposits. *Scientific Reports* **9**:7107, 9 p., [doi.org/10.1038/s41598-019-43181-y](https://doi.org/10.1038/s41598-019-43181-y).
- J.-P. de Vera *et al.* (56 authors including F. Foucher) (2019). Limits of Life and the Habitability of Mars: The ESA Space Experiment BIOMEX on the ISS. *Astrobiology* **19**:2, 145-157, [doi.org/10.1089/ast.2018.1897](https://doi.org/10.1089/ast.2018.1897).
- Zs Kapui, A. Kereszturi, K. Kiss, Z. Szalai, G. Újvari, K. Hickman-Lewis, F. Foucher & F. Westall (2018). Fluvial or aeolian grains? Separation of transport agents on Mars using earth analogue observations. *Planetary and Space Science* **163**, 56-76, [doi.org/10.1016/j.pss.2018.06.007](https://doi.org/10.1016/j.pss.2018.06.007).
- K. Hickman-Lewis, B. Cavalazzi, F. Foucher & F. Westall (2018). Most ancient evidence for life in the Barberton greenstone belt: Microbial mats and biofabrics of the ~3.47 Ga Middle Marker horizon. *Precambrian Research* **312**, 45-67, [doi.org/10.1016/j.precamres.2018.04.007](https://doi.org/10.1016/j.precamres.2018.04.007).
- F. Westall, K. Hickman-Lewis, N. Hinman, P. Gautret, K.A. Campbell, J.G. Bréhéret, F. Foucher, A. Hubert, S. Sorieul, A.V. Dass, T.P. Kee, T. Georgelin & A. Brack (2018). A Hydrothermal-Sedimentary Context for the Origin of Life. *Astrobiology* **18**:3, 259-293, [doi.org/10.1089/ast.2017.1680](https://doi.org/10.1089/ast.2017.1680).
- A.V. Dass, M. Jaber, A. Brack, F. Foucher, T. Georgelin & F. Westall (2018). Potential Role of Inorganic Confined Environments in Prebiotic Phosphorylation. *Life* **8**:7, 11 p., [doi.org/10.3390/life8010007](https://doi.org/10.3390/life8010007).
- F. Foucher, K. Hickman-Lewis, F. Westall & A. Brack (2017). A Statistical Approach to Illustrate the Challenge of Astrobiology for Public Outreach. *Life* **7**:40, 22 p., [doi.org/10.3390/life7040040](https://doi.org/10.3390/life7040040).
- F. Gaboyer *et al.* (27 authors including F. Foucher) (2017). Mineralization and Preservation of an extremotolerant Bacterium Isolated from an Early Mars Analog Environment. *Scientific Reports* **7**:8775, 14 p., [doi.org/10.1038/s41598-017-08929-4](https://doi.org/10.1038/s41598-017-08929-4).
- J.-L. Josset *et al.* (28 authors including F. Foucher) (2017). The Close-Up Imager Onboard the ESA ExoMars Rover: Objectives, Description, Operations, and Science Validation Activities. *Astrobiology* **17**:6-7, 595-611, [doi.org/10.1089/ast.2016.1546](https://doi.org/10.1089/ast.2016.1546).
- P. Manzari, S. D. Angelis, M. C. D. Sanctis, T. D. Iorio, E. Ammannito, N. Bost, F. Foucher & F. Westall (2016). Microimaging VIS-IR spectroscopy of ancient volcanic rocks as Mars analogues. *Earth and Space Science* **3**, 14 p., [doi.org/10.1002/2015EA000153](https://doi.org/10.1002/2015EA000153).

## Session convener:

- Session AB<sub>1</sub> Astrobiology. Convener: F. Gómez, co-conveners: F. Foucher & F. Westall. EPSC 2015, Nantes, France, 27 September 27 to October 2, 2015.

- Session AB<sub>4</sub> The importance of organic matter evolution from the Interstellar medium to planetary systems. Convener: G. Danger, co-conveners: L. d'Hendecourt, F. Foucher & F. Westall. EPSC 2015, Nantes, France, 27 September 27 to October 2, 2015.

- Session LF<sub>3</sub> Planetary analogue samples and environmental simulators. Convener: F. Foucher, co-conveners: G. Danger, O. Prieto-Ballesteros, F. Gómez, B.H. Foing, F. Westall, L. Rodrigues, L. Preston & A. Elsaesser. EPSC 2014, Lisboa, Portugal, September 7-12, 2014.

- Session AB<sub>1</sub> Astrobiology. Convener: F. Gómez, co-conveners: F. Foucher & F. Westall. EPSC 2014, Lisboa, Portugal, September 7-12, 2014.

- Session AB<sub>1</sub> Astrobiology. Convener: F. Gómez, co-conveners: F. Foucher & R. Amils. EPSC 2013, London, UK, 8-13 September 8-13, 2013.

- Session AB<sub>3</sub> Astrobiology. Convener: F. Westall, co-conveners: F. Foucher, F. Gómez & R. Amils. EPSC 2012, Madrid, Spain, September 23-28, 2012.

- Session BG8.1 Biosignatures and their applicability to astrobiology and primitive life. Convener: F. Foucher, co-conveners: N. Bost, C. Heim, B. Cavalazzi & F. Westall. EGU 2012, Vienna, Austria, April 27, 2012.

- Session BG1.4 Compositional imaging: at the cutting edge. Convener: C. Heim, co-conveners: B. Cavalazzi, F. Foucher, F. Westall & V. Thiel. EGU 2011, Vienna, Austria, April 4, 2011.

## Reviewer for :

- Journal of Raman Spectroscopy
- Planetary and Space Science
- Origins of Life and Evolution of Biospheres
- Nature Protocols
- Precambrian Research
- Life
- Applied Spectroscopy
- Geosciences
- ACS Earth and Space Chemistry
- Spectrochimica Acta
- Challenges
- PNAS
- FEMS

- F. Westall, F. Foucher, N. Bost, M. Bertrand, D. Loizeau, J. L. Vago, G. Kminek, F. Gaboyer, K. A. Campbell, J. G. Bréhéret, P. Gautret & C. S. Cockell (2015). Biosignatures on Mars: What, Where, and How? Implications for the Search for Martian Life. *Astrobiology* **15:11**, 998-1029, [doi.org/10.1089/ast.2015.1374](https://doi.org/10.1089/ast.2015.1374).

- K.A. Campbell, B.Y. Lynne, K.M. Handley, S. Jordan, J.D. Farmer, D.M. Guido, F. Foucher, S. Turner & R.S. Perry (2015). Tracing Biosignature Preservation of Geothermally Silicified Microbial Textures into the Geological Record. *Astrobiology* **15:10**, 858-882, [doi.org/10.1089/ast.2015.1307](https://doi.org/10.1089/ast.2015.1307).

- F. Westall, K. A. Campbell, J.-G. Bréhéret, F. Foucher, P. Gautret, A. Hubert, S. Sorieul, N. Grassineau & D. M. Guido (2015). Archean (3.33 Ga) microbe-sediment systems were diverse and flourished in a hydrothermal context. *Geology* **43**, 615-618, [doi.org/10.1130/G36646.1](https://doi.org/10.1130/G36646.1).

- F. Foucher, M.-R. Ammar & F. Westall (2015). Revealing the biotic origin of silicified Precambrian carbonaceous microstructures using Raman spectroscopic mapping, a potential method for the detection of microfossils on Mars. *Journal of Raman Spectroscopy* **46**, 873-879, [doi.org/10.1002/jrs.4687](https://doi.org/10.1002/jrs.4687).

- V.M. Gaspar, P. Baril, E.C. Cost, D. de Melo-Diogo, F. Foucher, J.A. Queiroz, F. Sousa, C. Pichon & I.J. Correia (2015). Bioreducible poly(2-ethyl-2-oxazoline)-PLA-PEI-SS triblock copolymer micelles for co-delivery of DNA minicircles and Doxorubicin. *Journal of Controlled Release* **213**, 175-191, [doi.org/10.1016/j.jconrel.2015.07.011](https://doi.org/10.1016/j.jconrel.2015.07.011).

- K. A. Campbell, D. M. Guido, P. Gautret, F. Foucher, C. Ramboz & F. Westall (2015). Geysertite in hot-spring siliceous sinter: Window on Earth's hottest terrestrial (paleo)environment and its extreme life. *Earth-Science Reviews* **148**, 44-64, [doi.org/10.1016/j.earscirev.2015.05.009](https://doi.org/10.1016/j.earscirev.2015.05.009).

- N. Bost, C. Ramboz, N. Lebreton, F. Foucher, G. Lopez-Reyes, S. De Angelis, M. Josset, G. Venegas, A. Sanz-Arranz, F.R. Pérez, J. Medina, J.-L. Josset, A. Souchon, E. Ammannito, C. Carli, J. L. Vago & F. Westall (2015). Testing the ability of the ExoMars 2018 payload to document geological context and potential habitability on Mars. *Planetary and Space Science* **108**, 87-97, [doi.org/10.1016/j.pss.2015.01.006](https://doi.org/10.1016/j.pss.2015.01.006).

- M. Moczyłowska, F. Westall & F. Foucher (2014). Microstructure and Biogeochemistry of the Organically Preserved Ediacaran Metazoan Sabellidites. *Journal of Paleontology* **88:2**, 224-239, [doi.org/10.1666/13-003](https://doi.org/10.1666/13-003).

- A. Hofmann, R. Bolhar, B. Orberger & F. Foucher (2013). Cherts of the Barberton Greenstone Belt, South Africa: Petrology and Trace-element Geochemistry of 3.5 To 3.3 Ga Old Silicified Volcaniclastic Sediments. *South African Journal of Geology* **116:2**, 297-322, [doi.org/10.2113/gssaajg.116.2.297](https://doi.org/10.2113/gssaajg.116.2.297).

- F. Westall, D. Loizeau, F. Foucher, N. Bost, M. Bertrand, J. Vago & G. Kminek (2013). Habitability on Mars from a Microbial Point of View. *Astrobiology* **13:9**, 887-897, [doi.org/10.1089/ast.2013.1000](https://doi.org/10.1089/ast.2013.1000).

- G. Lopez-Reyes, F. Rull, G. Venegas, F. Westall, F. Foucher, N. Bost, A. Sanz, A. Catala-Espi, A. Vegas, I. Hermosilla, A. Sansano & J. Medina (2013). Analysis of the scientific capabilities of the ExoMars Raman Laser Spectrometer instrument. *European Journal of Mineralogy* **25**, 721-733, [doi.org/10.1127/0935-1221/2013/0025-2317](https://doi.org/10.1127/0935-1221/2013/0025-2317).

- N. Bost, F. Westall, C. Ramboz, F. Foucher, D. Pullan, A. Meunier, S. Petit, I. Fleischer, G. Klingelhöfer & J. Vago (2013). Missions to Mars: Characterisation of Mars analogue rocks for the International Space Analogue Rockstore (ISAR). *Planetary and Space Science* **82-83**, 113-127, [doi.org/10.1016/j.pss.2013.04.006](https://doi.org/10.1016/j.pss.2013.04.006).

- F. Foucher, G. Lopez-Reyes, N. Bost, F. Rull Pérez, P. Rübmann & F. Westall (2013). Effect of grain size distribution on Raman analyses and the consequences for in situ planetary missions. *Journal of Raman Spectroscopy* **44**, 916-925, [doi.org/10.1002/jrs.4307](https://doi.org/10.1002/jrs.4307).

- S. Lacerda, C. S. Bonnet, A. Pallier, S. Villette, F. Foucher, F. Westall, F. Buron, F. Suzenet, C. Pichon, S. Petoud and E. Toth (2013). Lanthanide-Based, Near-Infrared Luminescent and Magnetic Lipoparticles: Monitoring Particle Integrity. *Small* **9:16**, 2662-2666, [doi.org/10.1002/smll.201201923](https://doi.org/10.1002/smll.201201923).

- F. Foucher & F. Westall (2013). Raman imaging of metastable opal in carbonaceous microfossils of the 700-800 Ma old Draken Formation. *Astrobiology* **13:1**, 57-67, [doi.org/10.1089/ast.2012.0889](https://doi.org/10.1089/ast.2012.0889).

- A. Ferretti, B. Cavalazzi, R. Barbieri, F. Westall, F. Foucher & R. Todesco (2012). From black-and-white to colour in the Silurian. *Palaeogeography, Palaeoclimatology, Palaeoecology* **367-368**, 178-192, [doi.org/10.1016/j.palaeo.2012.10.025](https://doi.org/10.1016/j.palaeo.2012.10.025).



## Teaching and supervision:

- 2019, training course supervisor, Licence 3 of Physics, University of Orléans. Students: R. Gay and P. Koumba-Ibala.
- 2018, training course supervisor, Master 2 of Geology, University of Bologna, Italy. Student: F. Messori
- 2018, training course co-supervisor, Licence 3 of Geology, University of Tours. Student: S. Pelletier.
- 2017, teaching, Master 1 "Origins", University of Orléans.
- 2017-2019, contribution to a PhD thesis in Geology, University of Orléans. Student : K. Hickman-Lewis.
- 2016, training course supervisor, 1<sup>st</sup> year of engineering school in biology at the *Ecole Supérieure de Biotechnologie de Strasbourg*. Student: J. Le Galudec.
- 2016, training course supervisor, 5<sup>th</sup> year of engineering school, *Mecatronic and System Conception*, PolyTech' Orléans. Students: J. Li and T. Platel.
- 2016, project supervisor, Master 2 *Mathematics, Signal and Image Processing*, University of Orléans. Student: A. Courtois.
- 2015, training course supervisor, Master 1 *Mathematics, Signal and Image Processing*, University of Orléans. Student: A. Courtois.
- 2014, training course supervisor, Master 1 in *Earth and Environmental Sciences*, University of Orléans. Student: Etienne Marceau.
- 2009-2012, contribution to a PhD thesis in Geology, University of Orléans. Student : N. Bost.
- 2012, training course supervisor, 4<sup>th</sup> year of secondary school (3<sup>ème</sup>). Student: C. Hodier.
- 2011, training course supervisor, Master 1 in *Physics and Engineering Sciences*, University of Orléans. Student: P. Rüßmann.
- 2010, training course supervisor, Master 1 in Geology, University of Orléans. Student: T. Dequillbecq.
- 2009, training course co-supervisor, License 3 in Geology, University of Tours. Student: A. Hubert
- 2006-2007, training course co-supervisor, Master 1 in Material Science, University of Poitiers-La Rochelle.
- 2005-2007, teaching in 1<sup>st</sup> and 2<sup>nd</sup> second year in Material science University Institute of Technology, Poitiers.

- N. Bost, F. Westall, F. Gaillard, C. Ramboz & F. Foucher (2012). Synthesis of a spinifex-textured Basalt as an analog to Gusev crater basalts, Mars. *Meteoritics & Planetary Science* **47**, 820-831, [doi.org/10.1111/j.1945-5100.2012.01355.x](https://doi.org/10.1111/j.1945-5100.2012.01355.x).
- A. Courtin-Nomade, O. Rakotorisoa, H. Bril, M. Grybos, L. Forestier, F. Foucher & M. Kunz (2012). Weathering of Sb-rich mining and smelting residues: Insight in solid speciation and soil bacteria toxicity. *Chemie der Erde* **72**, 29-39, [doi.org/10.1016/j.chemer.2012.02.004](https://doi.org/10.1016/j.chemer.2012.02.004).
- F. Westall, B. Cavalazzi, L. Lemelle, Y. Marrocchi, J.-N. Rouzaud, A. Simionovici, M. Salomé, S. Mostefaoui, C. Andreatza, F. Foucher, J. Toporski, A. Jauss, V. Thiel, G. Southam, L. MacLean, S. Wirick, A. Hofmann, A. Meibom, F. Robert & C. Defarge (2011). Implications of *in situ* calcification for photosynthesis in a ~3.3 Ga-old microbial biofilm from the Barberton greenstone belt, South Africa. *Earth and Planetary Science Letters* **310**, 468-479, [doi.org/10.1016/j.epsl.2011.08.029](https://doi.org/10.1016/j.epsl.2011.08.029).
- B. Cavalazzi, F. Westall, S. L. Cady, R. Barbieri & F. Foucher (2011). Potential fossil endoliths in vesicular pillow basalt, Coral Patch Seamount, eastern North Atlantic Ocean. *Astrobiology* **11**:7, 619-632, [doi.org/10.1089/ast.2011.0657](https://doi.org/10.1089/ast.2011.0657).
- F. Westall, F. Foucher, B. Cavalazzi, S. T. de Vries, W. Nijman, V. Pearson, J. Watson, A. Verchovsky, I. Wright, J.-N. Rouzaud, D. Marchesini, & S. Anne (2011). Volcaniclastic habitats for early life on Earth and Mars: A case study from 3.5 Ga-old rocks from the Pilbara, Australia. *Planetary and Space Science* **59**, 1093-1106, [doi.org/10.1016/j.pss.2010.09.006](https://doi.org/10.1016/j.pss.2010.09.006).
- F. Foucher, F. Westall, F. Brandstätter, R. Demets, J. Parnell, C. S. Cockell, H. G. M. Edwards, J.-M. Bény & A. Brack (2010). Testing the survival of microfossils in martian sedimentary meteorites during Earth's atmospheric entry: the STONE 6 experiment. *Icarus* **207**, 616-630, [doi.org/10.1016/j.icarus.2009.12.014](https://doi.org/10.1016/j.icarus.2009.12.014).
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- F. Foucher, C. Coupeau, J. Colin, A. Cimetièrè & J. Grilhé (2006). How Does Crystalline Substrate Plasticity Modify Thin Film Buckling? *Physical Review Letters* **97**, 096101, [doi.org/10.1103/PhysRevLett.97.096101](https://doi.org/10.1103/PhysRevLett.97.096101).
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- G. Parry, J. Colin, C. Coupeau, F. Foucher, A. Cimetièrè & J. Grilhé (2005). Effect of Substrate Compliance on the Global Unilateral Post-Buckling of Coatings: AFM Observations and Finite Element Calculations. *Acta Materialia* **53**, 441-447, [doi.org/10.1016/j.actamat.2004.09.039](https://doi.org/10.1016/j.actamat.2004.09.039).

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## Book chapters – 3 as first author

- F. Foucher (2018). Detection of biosignatures using Raman spectroscopy in *Biosignature for Astrobiology*, edited by Barbara Cavalazzi and Frances Westall, Springer, Chapter 13, 267-282, [doi.org/10.1007/978-3-319-96175-0\\_13](https://doi.org/10.1007/978-3-319-96175-0_13).
- F. Foucher, G. Guimbretière, N. Bost et F. Westall (2017). Petrographical and Mineralogical Applications of Raman Mapping in *Raman Spectroscopy and Applications*, edited by Khan Maaz, InTechOpen Limited, Chapter 8, 163-180, [doi.org/10.5772/65112](https://doi.org/10.5772/65112).
- F. Foucher, C. Coupeau, J. Colin, A. Cimetièrè & J. Grilhé (2011). Understanding substrate plasticity and buckling of thin films in *Thin film growth, Physics, materials science and applications*, edited by Cao Zexian, Woodhead Publishing Limited, Chapter 13, 317-339, [doi.org/10.1533/9780857093295.2.317](https://doi.org/10.1533/9780857093295.2.317).

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## Proceedings – 8 articles, 6 of them as first author

- F. Westall, N. Bost & F. Foucher (2014). Calibration and testing of payload instrument for in situ space missions. *Space research in France*, Report of the COSPAR 2014, Russia, 40th scientific assembly, 48-49.
- F. Foucher, F. Westall, N. Bost & M. Viso (2013). *Compte rendu du Workshop Analogues du 3 décembre 2013*, CNES, Paris, 22p.

## Training courses:

- 2019, Python, Orléans, October 14-16.
- 2018, autoclaves, April 12<sup>th</sup>, Orléans.
- 2017, image processing with MATLAB and ICY, Orléans, November 21<sup>st</sup>.
- 2017, flying of professional drones, Toulouse, November 6-10.
- 2016, image processing, Orléans, January.
- 2015, first aid qualification, Orléans, October 1-2.
- 2015, mineralogy using optical microscopy, Orléans, March-April.
- 2015, CarboRaman summer school, Nouan le Fuzelier, October 2014.
- 2012, Media training, Orléans, December 17-18.
- 2011, WorkShop : recent innovations in optical microscopy, Orléans, June 6-9.
- 2010, Advanced Instruments & Software Operation Training, WITec Academy, Ulm, Germany, November 10-11.
- 2010, Martian geology, exploration and exobiology, Workshop Mars III, Les Houches, France, March 28-April 2<sup>nd</sup>.
- 2009, geology, Lodève, June 8-12.
- 2009, WITec Alpha 500RA use and maintenance, Orléans, January 28-30.
- 2009, AFM/Raman coupling, Workshop WITec, Orléans, January 27.
- 2007, Raman confocal microscopy, WITec, Ulm, Germany, October 10-11.
- 2007, Communication and personal development, Poitiers.
- 2006, project management, Poitiers.
- 2005, summer school Internal Stresses, Nant, France, September.
- 2005, Management, Poitiers.
- 2005, PM-5 polishing system, Logitech Ltd., Glasgow, Scotland, January.

## Dissemination activities:

- 2019, creation of a board game on exobiology for public outreach.
- Since 2015, yearly training course of two days on exobiology for secondary school teachers, CNRS/Maison pour la Science, Orléans.
- Multiple conferences for pupils, students and general public (more than 25 since 2009).
- Multiple interventions in media (TV, radio, newspaper).

## Awards:

- 2016, Poster award, EANA 16<sup>th</sup> meeting, Athens, Greece, July 27-30.
- 2014, Best poster award, Origins 2014, Nara, Japan, July 6-11.
- 2014, Silver WITec paper award 2014.

- F. Foucher, B. Cavalazzi & F. Westall (2010). Micro-RAMAN Characterization of Precambrian Permineralized Cells, Draken Formation: Preliminary Results, *Special Issue: Abstracts from the 9th European Workshop on Astrobiology, Origins of Life and Evolution of Biospheres* **40:6**, 528-529, (2010).
- F. Foucher & F. Westall (2009). Investigating the Oldest Traces of Life by AFM/Confocal Raman Spectroscopy: Applications for the Analysis of Martian Rocks. *Proceedings of the Conference on Micro-Raman Spectroscopy and Luminescence Studies in the Earth and Planetary Sciences*, AIP Conference Proceedings 1163, 47-58, [doi.org/10.1063/1.3222893](https://doi.org/10.1063/1.3222893).
- F. Foucher, F. Westall, F. Brandstätter, R. Demets, J. Parnell, C. Cockell, H. Edwards, G. Kurat & A. Brack (2009). Testing the survival of microfossils during entry into the Earth's atmosphere: the STONE 6 experiment. *Supplement: Abstract for the 72nd Annual Meteoritical Society Meeting, Meteoritics and Planetary Sciences* **44:7**, No. 5055, A207.
- F. Foucher, F. Westall, J.-M. Bény, F. Brandstätter & R. Demets (2009). STONE 6 Experiment: An Investigation of the Survival of Microfossils During Atmospheric Entry. *Special Issue : Abstracts from the 2008 ISSOL meeting, Origins of Life and Evolution of Biospheres* **39:4**, 360-361.
- F. Westall, L. Lemelle, A. Simionovici, M. Salome, Y. Marrocchi, F. Foucher, B. Cavalazzi, A. Meibom, F. Robert, S. Mostafaoui, A. Jaus, J. Toporski, L. Lacleau, G. Southam, S. Wirick, S. Villette, F. Jamme & P. Dumas (2009). *In situ* analysis of the molecular organic and elemental composition of a 3.33 Ga microbial mat from Barberton. *Geochimica Et Cosmochimica Acta* **73**, Goldschmidt abstract 1430, [doi.org/10.1016/j.gca.2009.05.027](https://doi.org/10.1016/j.gca.2009.05.027).
- F. Foucher, C. Coupeau, J. Colin, A. Cimetière & J. Grillé (2007). Influence of Dislocation Emergence Process on Buckling: an AFM Experimental Investigation. *Material Research Society Symposium Proceedings* **12**, 1021-HH06.

## Technical report and patent

- F. Foucher, G. Guimbretière, N. Bost & A. Courtois (2015). CaliPhoto, patent n°BNT220287FR01.
- F. Foucher, N. Bost, S. Janiec, F. Westall, N. Le Breton, M. Tagger, M. Viso, P. Chazalnoël, F. Courtade & M. Villenave (2015). *LithoSpace : Dispositif de préparation de lames minces pétrographiques in situ*, CNES Functional specifications, DCT/PO/PM 2015-4917.



**Abstracts** – more than 120, more than 70 as first author

**Invited seminars** – more than 25

**Oral presentations in congresses** – more than 50

**Poster presentations in congresses** – more than 40



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[https://www.researchgate.net/profile/Frederic\\_Foucher](https://www.researchgate.net/profile/Frederic_Foucher)



<https://orcid.org/0000-0002-6037-8633>



<https://www.linkedin.com/in/fr%C3%A9d%C3%A9ric-foucher-34b7588a/>