



Dr. CAMILLE LARUE

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EDUCATION

- 2008- 2011** PhD in ecotoxicology from AgroParisTech (Paris Institute of Technology for Life Food and Environmental Sciences) with distinction
- 2007-2008** Fifth year of university in Soil Science (with distinction, ranked first) at Paris Sud XI University (France)
- 2004-2007** Master Degree in Engineering at the National Institute of Agronomic Sciences and Environment of Dijon (France)
- Languages** French (mother tongue), English (fluent), Spanish (basic), German (beginner)

RESEARCH

- Feb. 2015 - actual** **CNRS** (French National Center for Scientific Research) **scientist**. Laboratory for functional ecology and environment. Toulouse (31).
- April 2013 – Jan. 2015** **Postdoctoral position** as Marie Curie fellow on « Zinc and iron homeostasis in *Arabidopsis thaliana*: novel molecular factors and their influence on metal speciation and localization ». Ruhr Universität Bochum (Germany).
Supervision: Ute Kraemer
- Jan. 2012 – March 2013** **Postdoctoral position** on NanoHouse European project: impact of commercial paints containing nanoparticles on lettuce. Joseph Fourier University, Grenoble (France).
Supervision: Géraldine Sarret
- Oct. 2008 – Oct. 2011** **PhD** in ecotoxicology on “TiO₂ nanoparticle and carbon nanotube impact on plants” in the framework of iCEINT (International Consortium on Environmental Implications of Nanotechnologies). French Atomic Energy Commission (CEA), Saclay (France).
Supervision: Marie Carrière and Sylvain Chaillou
- Feb. 2008 – Jul. 2008** **Research project** on “the rhizosphere importance in phytoremediation processes”. Provence University (in partnership with a phytoremediation firm: Phytorestore), Marseille (France).
Supervision: Nathalie Korboulewsky and Jean-Philippe Mévy
- April 2007 – Sept. 2007** **Research project** on “the impact of a radioactive airborne pollution on crop production”. French Radioprotection and Nuclear Safety Institute (IRSN), Cadarache (France).
Supervision: Vanessa Parache and Catherine Mercat-Rommens
- June 2006 – Sept. 2006** **Research project** in a vegetable breeding company: Tozer Seeds (UK).
Supervision: Frances Gawthrop
- Jul. 2005 – Aug 2005** **Research project** on “gene regulation of *Arabidopsis* circadian clock”. Liverpool University (UK).
Supervision: Anthony Hall

RESEARCH INTEREST

- Fate of nanomaterials in the environment and transfer to plants
 - Study of the ageing of nanomaterials in complex matrixes
 - Phytotoxicity
- Phytoremediation and rhizospheric processes
- Modeling of crop sensibility to airborne contamination
- Metal homeostasis in plants

TECHNIQUES

Imaging and speciation:

- μ XRF, μ XAS/XAS, μ FTIR (synchrotron)
 - SEM / TEM
- μ PIXE, RBS, STIM (elemental distribution and quantification by nuclear microprobe)
- Distribution of molecular fragments by ToF-SIMS
 - Confocal Laser Scanning Microscopy
 - Raman Microspectroscopy
 - Autoradiography
- Quantification by ICP-MS and ICP-AES
- Analyse of root exudates and hormones by GC-MS

Analytical chemistry:

Modeling:

- Speciation in solution (phreeqC)
- Crop growth (STICS)
- Evaluation of radionuclide concentrations in diverse compartments of the food chain (ASTRAL)

Physico-chemical characterization of particles:

- Specific surface area by BET
- Crystalline structure by XRD
- Zeta potential and point of zero charge by doppler laser electrophoresis
- Hydrodynamic diameter by PCS

Biological techniques:

- Field work
- Biomonitoring
- Photosynthesis disruption and oxidative stress by UV spectrophotometry
 - Nutrient flux by ionic chromatography
 - Genotoxicity (micronuclei)
- Genetics: growth of GMOs, DNA extraction, DNA amplification by PCR and electrophoresis gel

PUBLICATION LIST

a. International journals with peer-reviewed committee

Olsen LJ, Hansen TH, **Larue C**, Osterberg JT, Hoffmann RD, Liesche J, Krämer U, Surblé S, Cadarsi S, Samson VA, Grolimund D, Husted S, Palmgren MG. (2016) Mother plant-mediated pumping of zinc into the developing seed. *Nature Plants* 16036, doi:10.1038/nplants.2016.36.

Larue C, Castillo-Michel H, Stein R, Fayard B, Pouyet E, Villanova J, Pradas del Real AE, Magnin V, Trcera N, Legros S, Sorieul S, Sarret G. (2016) Innovative combination of spectroscopic techniques to reveal nanoparticle fate in a crop plant. *Spectrochim Acta B* 119, 17-24.

Smulders S*, **Larue C***, Sarret G, Castillo-Michel H, Vanoirbeek J, Hoet P. (2015) Lung distribution, quantification, co-localization and speciation of silver nanoparticles after lung exposure in mice. *Toxicol Lett* 238(1), 1-6.

Larue C, Castillo-Michel H, Sobanska S, Trcera N, Sorieul S, Cecillon L, Ouerdane L, Legros S, Sarret G. (2014) Fate of pristine TiO₂ nanoparticles and aged paint-containing TiO₂ nanoparticles in crops after foliar exposure. *J Hazard Mater* 273, 17-26.

Larue C, Castillo-Michel H, Sobanska S, Cecillon L, Bureau S, Barthès V, Ouerdane L, Carrière M, Sarret G. (2014) Foliar exposure of the crop *Lactuca sativa* to silver nanoparticles: Evidence for internalization and changes in Ag speciation. *J Hazard Mater* 264, 98-106.

Larue C, Pinault M, Czarny B, Georgin D, Jaillard D, Bendiab N, Mayne M, Taran F, Dive V & Carriere M (2012) Quantitative evaluation of multi-walled carbon nanotube uptake in wheat and rapeseed. *J Hazard Mater* 227-228, 155-163.

Larue C, Laurette J, Herlin-Boime N, Fayard B, Flank AM, Brisset F & Carriere M (2012) Accumulation, translocation and impact of TiO₂ nanoparticles in wheat (*Triticum aestivum* spp.): influence of NP diameter and crystal phase. *Sci Total Environ* 431, 197-208.

Larue C, Veronesi G, Flank AM, Surble S, Herlin-Boime N & Carriere M (2012) Comparative uptake and impact of TiO₂ nanoparticles in wheat and rapeseed. *J Toxicol Environ Health* 75, 722-734.

Laurette J, **Larue C**, Mariet C, Brisset F, Khodja H, Bourguignon J & Carriere M (2012). Influence of uranium speciation on its accumulation and translocation in three plant species: oilseed rape, sunflower and wheat. *Environ Exp Bot* 77, 96-107.

Laurette J, **Larue C**, Alliot I, Jaillard D, Bourguignon J & Carriere M (2012) Speciation of uranium in plants upon root accumulation and root-to-shoot translocation: a XAS and TEM study. *Environ Exp Bot* 77, 87-95.

Larue C, Khodja H, Herlin-Boime N, Brisset F, Flank AM, Fayard B, Chaillou S & Carriere M (2011) Investigation of TiO₂ nanoparticle toxicity and uptake by plants. *JPCS* 304.

Larue C, Korboulewsky N, Wang R & Mévy JP (2010) Depollution potential of three macrophytes: exudated, wall-bound and intracellular peroxidase activities plus intracellular phenol concentrations. *Bioresource Technol* 101(20), 7951-7957.

Gould P, Locke J, **Larue C**, Southern M, Davis S, Hanano S, Putterill J, Millar A & Hall A (2006) The molecular basis of temperature compensation in the Arabidopsis clock. *Plant Cell* 18(5), 1177-1187.

b. Book or book chapter

Carriere M & **Larue C** (2012) Toxicology : Plants and Nanoparticles in *Encyclopedia of Nanotechnology*. (Springer Ed). ISBN: 978-90-481-9751-4.

c. In preparation

Larue C, Flank AM, Mariet C, Khodja H, Surblé S, Carrière M. *Influence of soil type on TiO₂ nanoparticle fate in wheat crop*.

Larue C, Pradas del Real AE, Sarret G, Castillo-Michel H. Tutorial review on the use of synchrotron based microXRF and microXANES in plant nanotoxicology. Invited paper in Plant Physiology and Biochemistry

SCIENTIFIC COMMUNICATIONS

a. Oral communications

Larue C., Castillo-Michel H., Carrière M., Sarret G. Fate of nanoparticles in plants: contributions from synchrotron microspectroscopic techniques. Invited talk at ESRF Users' Meeting, February 3-5, 2014. Grenoble, France.

Larue C., Pinault M., Czarny B., Georgin D., Flahaut E., Bendiab N., Mayne L'Hermite M., Dive V., Taran F., Carrière M. *MWCNT accumulation during hydroponic exposure of wheat and rapeseed: quantification and distribution*. NanoSafe, November 13-15, 2012. Grenoble, France.

Larue C., Castillo-Michel H., Cécillon L., Barthès V., Bourguignon J., Magnin V., Findling N., Bureau S., Sarret G. *Foliar transfer of TiO₂ and Ag nanoparticles in lettuce*. Metal Homeostasis 5th International IMBG Meeting, September 17-21, 2012. Autrans, France.

Larue C., Cécillon L., Castillo-Michel H., Barthès V., Magnin V., Findling N., Bureau S., Sarret G. *Foliar transfer of TiO₂ and Ag nanoparticles in lettuce*. Goldschmidt, June 24-29, 2012. Montreal, Canada.

Larue C., Khodja H., Herlin-Boime N., Brisset F., Flank AM., Fayard B., Chaillou S., Carrière M. *Investigation of TiO₂ nanoparticles toxicity and uptake by plants*. NanoSafe, November 16-18, 2010. Grenoble, France.

Larue C., Laurette J., Khodja H., Herlin-Boime N., Mayne-L'Hermite M., Chaillou S., Carrière M. *Investigation of TiO₂ nanoparticles and carbon nanotubes toxicity and their uptake by plants*. Society of Environmental Toxicology and Chemistry, May 23-27, 2010. Seville, Spain.

Larue C., Laurette J., Khodja H., Herlin-Boime N., Brisset F., Flank AM., Chaillou S. and Carrière M. *Investigation of titanium dioxide nanoparticles toxicity and uptake by plants*. SOLEIL Users' Meeting 2010. January 20-21, 2010. Saint Aubin (91), France.

Larue C., Laurette J., Herlin-Boime N., Mayne-L'Hermite M., Chaillou S., Carrière M. *Investigation of nanoparticles and carbon nanotubes toxicity and transfer in plants*. International Conference on the Environmental Implications of Nanotechnology. September 9-11, 2009. Washington (DC), USA.

b. Poster

Larue C., Haydon M., Castillo-Michel H., Rogalla D., Becker HW., Kraemer U. *The use of spectroscopic techniques to elucidate metal homeostasis in Arabidopsis thaliana mutants*. FESPB-EPSO, June 22-26, 2014. Dublin, Irlande.

Larue C., Cécillon L., Castillo-Michel H., Sobanska S., Bourguignon J., Carrière M., Bureau S., Magnin V., Sarret G. *Environmental dissemination of silver nanoparticles: which impact on crops?* NanoSafe, November 13-15, 2012. Grenoble, France.

COMMUNICATION TO PUBLIC AT LARGE

Larue C. (July 2015) Ecotoxicologie des nanomatériaux : nouvelles approches analytiques. *Bulletin de veille scientifique de l'ANSES* 27, 8-11.

Larue C. (December 2014) Quelles interactions entre les nanoparticules et les autres contaminants de l'environnement ? *Bulletin de veille scientifique de l'ANSES* 25, 8-11.

Larue C. (July 2014) Existe-t-il un lien entre caractéristiques physico-chimiques des nanomatériaux et leur écotoxicité ? *Bulletin de veille scientifique de l'ANSES* 24, 8-11.

Larue C & M Carriere (July 2011) Ecotoxicologie des nanoparticules : avancées méthodologiques dans l'évaluation des risques. *Bulletin de veille scientifique de l'ANSES* 15, 10-14.

Larue C & Carriere M (June 2011) Les nanoparticules dans l'écosystème eau. *Bulletin de veille scientifique de l'ANSES* 14, 13-16.

Larue C & Carriere M (March 2011) Les nanoparticules dans l'écosystème sol. *Bulletin de veille scientifique de l'ANSES* 13, 6-10.

Larue C & Carriere M (February 2011) Impact de nanoparticules sur des végétaux. *Bulletin de veille scientifique de l'ANSES* 12, 9-12.

OTHER RESPONSABILITIES

- **Teaching** on nanoparticle ecotoxicology (Institut National des Sciences et Techniques du Nucléaire)
- **Supervision** of trainee during their research experience in lab

- **Technical and scientific manager** for the zetasizer
- **Expert** on nanoparticle ecotoxicology for ANSES (French National Agency for Food, Environment and Labor Safety) (Aug 2009 – Dec 2015) – Science news brief redaction
- **Reviewer** for Environmental Pollution, Chemosphere, Plant and Soil, Plant Physiology and Biochemistry, Journal of Hazardous Materials, Planta, Environmental and Science Technology, Plant Cell and Environment, Scientific Reports in Nature,...

AWARDS

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| 2013 | Marie Curie fellowship |
| 2012 | Best poster award at the 6 th international conference on nanotoxicology, September 4-7, 2012, Beijing, China. |
| 2012 | IMBG (Grenoble Institute for Metals in Biology) travel grant |
| 2008-2011 | Environment and Energy Management Agency / Atomic Energy Commission research scholarship |
| 2006 | Leonardo da Vinci student travel grant (European Union program) |