Dr. Nathalie Lombard
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PROFILE

Nathalie Lombard is a research scientist with a Ph.D. in Microbial Ecology and has multidisciplinary skills in Microbiology, Molecular Biology, Plant biology and Analytical chemistry. She is a native French speaker fluent in English with 5 years' experience developing innovative biotechnological tools. Her research is geared towards environmental health and cleanup. Her publications and presentations have covered subjects on metagenomics, bioremediation, pollutant monitoring, and bioaccumulation in freshwater organisms.

RESEARCH EXPERIENCE

08/2016-now **Post-Doctoral Research Associate - Fate and Transport of pollutant**
Ghosh lab, Department of Chemical, Biochemical and Environmental Engineering (CBEE), Baltimore, MD

Funding: DOEE   P.I.: Pr. U. Ghosh
Collaborations: US Fish and Wildlife, UM College Park, US Geological Survey
Project: Passive samplers and mussel deployment, monitoring, sampling for organic constituents in Anacostia River tributaries.
Main contribution and developments: Supervision of the project. Passive sampler preparation, deployment in field, data collection, and analysis. Monitoring of pollutant concentrations in porewater and water column. Diffusive flux sediment-water calculations. Uptake predictions in benthic organisms and fishes. Contribution in air passive sampler monitoring.

03/2013-08/2013 **Research associate - Remediation**
Matéis laboratory, National Institute of Applied Sciences (INSA), Villeurbanne, France

Funding: PCB axelera   P.I.: Dr. C. Morlay
Collaborations: National project led by Suez environment (industrial and academic partners).
Project: PCB transfer from sediments to activated carbon.
Main contribution and developments: Tested and chose adequate mixing method of activated carbon (AC) particles with polluted sediments. Tested PCBs removal from sediments after short time contact (industrial requirements) between AC and polluted sediments.

01/2009-11/2011 **Research associate - Bioremediation**
Sowers lab, Institute of Marine and Environmental Technology (IMET), Baltimore, MD

Funding: Office Naval Research   P.I.: Pr. K. Sowers
Collaborations: H. May (Department of Microbiology and Immunology, MUSC, SC, USA); U. Gosh (Department of Civil and Environmental Engineering, UM, MD, USA).
Project: Kinetics and threshold level of PCB dechlorination by the anaerobic ultramicrobacterium Dehalobium chlorocoercia DF-1.
Main contribution and developments: Developed a method to purify Dehalobium chlorocoercia DF-1 from its cocontaminant. Developed a method to monitor the growth of a slow-growing ultramicrobacterium. Developed a method to follow-up PCB dechlorination at ultra-low concentration of PCBs using passive sampling devices.

09/2007-	**Research associate - Environmental microbiology (Metagenomics)**
12/2008	Ampere laboratory, Centrale Lyon (ECL), Ecully, France

Funding: CNRS   P.I.: Dr. P. Simonet
Collaborations : L. Philippot (UMR microbiologie du sol et de l'environnement, UB, Dijon, France) ; J.C. Lazzaroni (Unité de Microbiologie et de Génétique, UCBL, Villeurbanne, France).
Project: Apply Genefish tool to study narG diversity in soil.
Main contribution and developments: Designed and inserted MCS (Multiple Cloning Sites) into the host/plasmid system to enable the capture of different targeted gene, including narG. Initiated recombination studies of linear DNA fragments onto a plasmid.

09/2003-	**Doctoral student researcher - Environmental microbiology (Metagenomics)**
07/2007	Microbial ecology laboratory, Lyon University (UCBL), Villeurbanne, France

Funding: Region Rhône-Alpes   Supervisor: Dr. P. Simonet
Collaborations : J.C. Lazzaroni (Unité de Microbiologie et de Génétique, UCBL, Villeurbanne, France) ; X. Zhang (State Key Laboratory for Microbial metabolism and School of Life Science and Technology, Shanghai Jiao Tong University, China); R. Nalin (LibraGen S.A., Toulouse, France).
Project: Development of a metagenomic alternative approach (Genefish) to capture targeted metagenomic DNA in a bacterial host.
Main contribution and developments: Studied inducible regulations systems to tightly express toxic genes. Engineered a host/plasmid system in *E. coli* for efficient inducible expression of highly toxic genes. Conceived and developed the Genefish approach to capture bacterial genes in a bacterial recipient host.

TEACHING EXPERIENCE

09/2016-	**Guest Lecturer**
09/2018	University of Maryland Baltimore County (UMBC), Baltimore, MD

CUERE Seminar Dr. Welty. Use of passive sampler to measure dechlorination rate of PCB at environmental relevant concentration (45 min).
Biological processes Courses Dr. Ghosh. Bioremediation (1h15) Fundamental in microbiology and biochemistry (2h30).

01/2014-	**Long term substitute teacher**
07/2014	High School Notre Dame de Mongré, Villefranche sur Saone, France

Courses: Geology, Geothermy, Innate and adaptative immune system, Neurophysiology and cerebral plasticity, Glycemic and diabetes, Evolution and phylogeny, Plant domestication and transgenese.

TRAINEE EXPERIENCE

09/2002-	**Student researcher - Environmental microbiology,**
09/2003	Microbial ecology laboratory, Lyon University (UCBL), Villeurbanne, France

Funding: Scholarship grant
Supervisor: Pr. T.M. Vogel
Collaboration : LibraGen S.A. (Villeurbanne, France)
Project: Development of a microarray tool to screen functional genes (pks genes) in metagenomic libraries.

04/2002- **Student researcher - Pharmaceuticals**
08/2002 LibraGen S.A., Villeurbanne, France

Supervisor : Dr. R. Nalin, Dr. B. Gillet
Collaboration : G. Comtes (Laboratoire des Produits Naturels, UCBL, Villeurbanne, France
Project: Method development for the detection and characterization of molecules with antibacterial activity using chromatography separation combined with antibacterial activity screening.

06/2001- **Laboratory assistant - Agronomy**
08/2001 National Institute of de Recherche Agronomique **,** Avignon, France

Supervisor : Dr. L. Gomez
Background: Flavor characteristics of peach fruit.
Project: Write protocols for quality control of soluble sugar extraction.

EDUCATION

2007 **"Doctorat" (Ph.D.) in Microbial Ecology**,
Lyon University (Villeurbanne, France)

Ph. D. thesis: Metagenomic approach in soil microbiology: conventional techniques improvements and alternative approach development by genefishing
Training: Fossils messages (20h) - Speaking in English for professional purpose (40h) – Epistemology (8h).

2003 **"Diplôme d'Etudes approfondies" (M.Sc.) in Microbial Ecology**,
Lyon University (Villeurbanne, France) - Graduated cum laude

M. Sc. thesis: Functional gene diversity in metagenomic library
Bibliographical study: Origin of polyketides structural diversity
Training: Concepts in microbial ecology - Microorganism/host interactions - Microbial reservoir in soil/water ecosystem - Public health and environment quality - Biodiversity and phylogeny - Population ecology and microbial colonisation - Genome plasticity and positive selective pressure - Methodological approach.

2002 **"Maîtrise en Sciences et Techniques" (B.Sc. & M.Sc.) in Plant Chemistry and Plant Biology**,
Lyon University (Villeurbanne, France) - Graduated magna cum laude, with honors

Bibliographical study: From grape to cosmetics: the use of proanthocyanidics residues
Training: Fundamental and environmental chemistry – Biochemistry/Enzymology - Plant biology, Biodiversity, Ecophysiology - Biotechnologies (plant, fungi, bacteria) – Microbiology and Microbial ecology - Soil - Forest management - Thermodynamics - Mathematics (population dynamics- biometry and evolutive biology) - Law and environment - Patenting - Management.

CERTIFICATE

2015 **Certiphyto** (~24h)- organised by CFPPA d'Angers, Le fresnes- Angers, France
"Certificat Individuel Professionel Produits Phytosanitaires" or "Certiphyto" is a french mandatory certificate delivered by DRAAF (from the ministry of Agriculture, Agrifood and Forestry) for the professional use of pesticides.

2015   **Multidimensional data analysis -** Agrocampus ouest, Mooc (online class)
Worked with the software R on the following data analysis techniques: Principal Components Analysis (PCA)- Correspondence analysis (CA)- Multiple Correspondence Analysis (MCA).

2010   **Practical protein chemistry** (~20h)- organised by H. Ahmed- Baltimore, MD, USA
Extraction of proteins - Estimation of proteins - Eletrophoretic analyses of proteins - Purification of proteins including recombinant proteins - Characterization of proteins employing antibody techniques - Working procedure of most protein techniques - Useful advices on applications.

2006   **Microscopy** (8h)- organised by W. Naser and P. Mavingui- Villeurbanne, France
Optic fundamentals - Microscopes descriptions - Confocal microscopes - New technologies - Important parameter in fluorescens - Fluorescent techniques used *in vivo* and *in vitro* - Fluorescent DNA labelling.

GENERAL SKILLS

Research and Development
- o   Managing research projects
- o   Supervising assistant researcher staff members
- o   Designing, developing and applying biotechnological tools (Genefish, etc.)
- o   Designing protocols and monitoring experiments
- o   Collecting and analyzing data, interpreting results
- o   Presenting results to funding agencies and the scientific community
- o   Writing articles to promote popular understanding of science

Lab Management
- o   Managing laboratory stocks, files and inventory and waste removals
- o   Maintaining laboratory equipment (GC-MS/ECD, Anaerobic hood, etc.)
- o   Implementing and supervising laboratory cleaning plan
- o   Training undergraduates through Ph.D. on SOP, QA/QC, and Safety

TECHNICAL SKILLS

Passive sampling
Experience with POM and LPDE - Passive sampling of PCBs, PAHs, OCPs to monitor Water, Porewater, Air concentration – Passive dosing and sampling to monitor PCB dechlorination kinetics at ultra-low concentration- Field and ex situ deployment- Passive sampler preparation, PRC impregnation, Extraction, Cleanup - PRC correction of data and Analysis.

Microbiology
Standard cultivation techniques in aerobic/anaerobic conditions of bacteria- Preparation and transformation of bacterial cells- Cells extraction from soil and purification- Microbial growth and microbial activity monitoring- Maintained bacterial cell cultures over months and years- Antibacterial activity screening- Light and fluorescent microscopy- Cells preservation and storage.

Molecular Biology
DNA extraction and purification (from soil, bacteria)- Primer design- PCR, qPCR- DNA labeling- Microarrays- Plasmid construction strategy- DNA transfer by transduction with phage P1- Cloning of DNA fragments in plasmids- Hom(e)ologous recombination (plasmid, chromosome) - Plasmid collection.

Matrices preparation
Grinding (pulverisette II)- Sieving (Analysette III)- Sediment preparation (sampling, drying, grinding, sieving)- Activated carbon preparation (particle size separation, washing, drying, storage, pZC determination)- Freshwater preparation (water filtration with Buchner flask, pH and conductivity measurements).

Analytics
Extraction of polar (sugar) or apolar compounds (polychlorobiphenyls (PCBs), Polycyclic Aromatic Hydrocarbons (PAHs), Organochlorine Pesticides (OCPs)) from various matrices (plants, bacteria, mussel, fish, sediments, passive sampler) and cleanup- Solvent evaporation (rotovapor buschi and organomation)- PCB, PAH (alkyls) and chloroethylene (CE) compounds separation on GC and analysis - Separation of polar compound on HPLC.

Informatics
Statistics (R, Excel)- Word processor (Office, LibreOffice)- Bibliography (Endnote, Mendeley)- PCR/qPCR design and analysis (Oligo 6.1, Primer3, AmplifX, Opticon monitor3)- Plasmid design (pDRAW, macplasmap)- DNA alignment (ClustalX, Blast)- Chromatograph analysis (Chemstation, MSD)- Microarray analysis (GeneTac LSIV)- Educational software (Rastop, Phylogene, Anagene, EduAnatomist).

AFFILIATIONS

SETAC (Society of Environmental Toxicology and Chemistry)

CPRC SETAC (Chesapeake Potomac Regional Chapter of the Society of Environmental Toxicology and Chemistry)

AFEM (Association Francophone d'Ecologie Microbienne) :
French network in Microbial Ecology

RTP Ecotoxicomic (Réseau Thématique Pluridisciplaire Ecotoxicologie Microbienne) :
French network in Microbial Ecotoxicology

PUBLICATIONS

Lombard N.J., M. Bokare, V. Thopanich, S. Magee, R. Harrisson, L.Yonkos, A. Pinkney, U. Ghosh. Persistent Organic pollutant monitoring in the Anacostia watershed. (In preparation)
Lombard N.J., S. Jacquiod, J.C. Lazzaroni, A. Faugier, C. Lavire, X. Zhang, L. Philippot, P. Simonet, L. Franqueville. Genefish: A new biotechnological tool to investigate targeted genetic diversity. (In preparation)
Lombard N.J., Ghosh U., Kjellerup B.V., Sowers K.R. 2014. Kinetics and threshold level of 2,3,4,5-tetrachlorobiphenyl dechlorination by an organohalide respiring bacterium. Environ Sci Technol. 48:4353-60
Lombard N., Prestat E., van Elsas J.D., Simonet P. 2011. Soil-specific limitations for access and analysis of soil microbial communities by metagenomics. FEMS Microbial Ecology. 78:31-49

Lombard N. 2007. Metagenomic approach in soil microbiology: conventional techniques improvements and alternative approach development by genefishing.

Lombard N., J. Bailly, R. Marmeisse and P. Simonet. 2006. Metagenomic of microbial communities. Biofutur. **268:**24-27 (in french)

Bertrand, H., F. Poly, V. T. Van, **N. Lombard**, R. Nalin, T. M. Vogel and P. Simonet. 2005. High molecular weight DNA recovery from soils prerequisite for biotechnological metagenomic library construction. J. Microbiol. Methods. **62:**1-11

PRESENTATIONS

Lombard N., Bokare M., Harrison R., Yonkos L., Pinkney A., Murali D.,Ghosh U. 2018. Passive sampling to monitor persistent organic pollutant in the Anacostia watershed and predict bioaccumulation in freshwater organisms. Tenth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA, USA (Platform)

Bokare M., **Lombard N.,** Magee S., Wison T., Pinkney A., Murali D., Ghosh U. 2018. Fate and Transport of PCBs and OCPs in the Anacostia River. Tenth International Conference on Remediation and Management of Contaminated Sediments, New Orleans, LA, USA. (Poster)

Lombard N., Bokare M., Harrison R., Yonkos L., Pinkney A., Ghosh U. 2018. Persistent organic pollutant monitoring in the Anacostia watershed using passing sampling and uptake in freshwater mussel. CPRC SETAC Spring meeting, Fredericksburg, VA, USA (Platform)

Bokare M., **Lombard N.,** Magee S., Ghosh U. 2018. Quantification of water transfer rates for PCB's and OCP's in the Anacostia River using a passive sampling approach. CPRC SETAC Spring meeting, Fredericksburg, VA, USA (Platform)

Lombard N., Bokare M., Harrison R., Yonkos L., Pinkney F., Ghosh U. 2018. Assessment of pollutant uptake by freshwater mussel *Elliptio complanata* in Anacostia watershed. Chesapeake Bay Mussel Workgroup. Annapolis, MD, USA.

Lombard N., Ghosh U., Kjellerup B.V., Sowers K. 2017. Measuring reductive dechlorination rates at environmental relevant PCB concentrations. Battelle Bioremediation, Miami, FL, USA (Poster)

Lombard N., Thopanich V., Ghosh U. 2017. Current status of legacy pollutant inputs to Anacostia River. CPRC STAC Spring meeting. Annapolis, MD, USA (Platform)

Lombard N., Ghosh U., Kjellerup B.V., Sowers K. 2015. Measuring reductive dechlorination rates at environmental relevant PCB concentration. Colloque de l'Association Francophone d'Ecologie Microbienne 7th, Anglet, France (Poster)

Lombard N., Sowers K. 2010. Growth Characteristics of a PCB dechlorinating ultramicrobacterium. International Symposium on Microbial Ecology Ecology 13th , Seattle, USA (Poster)

Lombard N., Jacquiod S., Yuan J., Faugier A., Lavire C., Zhang X., Philippot L., Lazzaroni J.C., Simonet P., Franqueville L. 2010. Genefish : A window into targeted bacterial diversity. International Symposium on Microbial Ecology Ecology 13th, Seattle, USA (Platform)

Lombard N., Faugier A., Lavire C., Jacquiod S., Philippot L., X. Zhang, Lazzaroni JC, Simonet P, Franqueville L. 2009. Genefish : an alternate metagenomic approach for capturing targeted bacterial diversity in a recipient engineered *E. coli* strain. Bacterial Genetics and Ecology 10th symposium, Uppsala, Sweden (Poster)

Lombard N., Faugier A., Lavire C., Lazzaroni JC, Simonet P. 2008. Gene fishing: an alternate metagenomic approach based on specific gene recovery by homologous recombination in a recipient engineered *E. coli* strain. International Symposium on Microbial Ecology 12th , Cairns, Australia (Poster)

Lombard N., Madic J., Kay E., Pujic P., Mavingui P., Nalin R., Vogel T.M. and Simonet P. 2005. Development of inducible suicide selection system. Bacterial Genetics and Ecology 8th symposium, Lyon, France (Poster)

Lombard N., Monier J.M., Pujic P., Mavinguy P., Bertolla, F., Nalin R., Vogel T.M., Simonet P. 2005. *In situ* bacterial transformation: a new approach to isolate targeted genes from soil bacteria? Colloque Ecologie Microbienne, Obernai, France. (Platform)

KEY WORDS

Soil, sediments, bioremediation, passive sampling, persistent organic pollutant, monitoring, microorganisms, anaerobic culture, molecular biology, regulation of gene expression, toxic/suicide genes, metagenomics