# Researcher CV

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## Personal Statement

I graduated with a PhD title from the University of Liège in 2012. From 2015 I have been working at the Luxembourg Institute of Science and Technology (LIST), where in 2021 I was appointed a senior R&T Associate. Currently (2023/24), I have been working at the University of California Santa Barbara, in O’Malley lab, as a visiting research scholar. To date, I have co-authored over 40 peer-reviewed scientific articles (h-index of 20, i10-index of 27, 1552 citations), in journals that include: *BMC Microbiome, Nature Communications Biology, Briefings in Bioinformatics, FEMS Microbiology Reviews,* *etc*., two book chapters and one patent. My main scientific interests are centred around the microbial strategies of biomass degradation, focusing on two model systems, *i.e.* the process of anaerobic digestion and the termite gut.

## Personal details – Individual narrative profile

I studied Biotechnology at the Intercollegiate Faculty of Biotechnology, University of Gdansk. I graduated with master’s degree in 2005. Between 2005 and 2007 I worked as a research associate at the Institute of Agrifood Research and Technology (IRTA) in Barcelona. I obtained a PhD diploma from the University of Liège in February 2012, working in the domain of hydrogen production via dark fermentation. From 2012 I have been working in Luxembourg, first at the CRP-GL and from 2015 at the LIST (between 2013 and 2015 I was employed at 80% of the full-time equivalent). I was a visiting scholar at the University of Gdansk, the University of Bochum and the University of Sao Paulo. I am guest lecturer at the University of Luxembourg, the University of Louvain-la-Neuve, the Ghent University and the Autonomous University of Barcelona, giving seminars in the domain of molecular microbiology and the application of omics in microbial ecology studies. I have been involved in (co)supervision of nine PhD students and younger post-docs. In 2020 I received an accreditation to supervise PhD students (ADR) at the University of Luxembourg. I also have previous experience in coordinating bigger research consortia in the framework of national and other collaborative projects involving academic and industrial partners. Moreover, I regularly meet private companies and develop common projects with a private section, fulfilling the role of LIST as an RTO organization.

Key outputs, contributions, and achievements

**Development of omics and their application in biogas microbiome studies:** Since 2012 I have been involved in the development of novel high-throughput sequencing protocols and bioinformatics pipelines to characterise microbial communities in biogas reactors. They were key factors to reach success in the first research project that I was involved in at the CRP-GL, named GASPOP (over 10 scientific publications, one filed patent and one graduated PhD student). The newly developed sequencing and data analysis pipelines were further at the basis of several technology transfer agreements signed between LIST and other European institutions, *e.g.* the University of Liège, the University of Strasbourg, the University of Magdeburg, and the Norwegian University of Science and Technology. It also allowed the team to gain international visibility and to extend the network towards new collaboration, *e.g.* Swedish University of Agricultural Sciences (SLU). Taken my expertise in omics analyses and SLU expertise in cultivating bacteria, we have been trying to grow new microbes with putative industrial applications, *e.g.* focusing on syntrophic propionate oxidising bacteria of the candidate phylum Cloacimonetes (CLOMICS project). It has resulted in several published studies including a recent review paper published in the FEMS Microbiology Reviews Journal. My contribution to knowledge development in this area opened the possibility to create two new permanent positions at the LIST. It gave the opportunity to my younger colleague Dr. Xavier Goux to become an R&T associate. It also allowed him to move to Sweden (SLU) for a four-month visit, where he acquired new skills related to the cultivation of anaerobic microorganisms. The second position was filed by Dr. Malte Herold, who joined our team in 2021 as a bioinformatician. This new talent acquisition will largely reinforce our expertise is omics data analysis, also envisaged in the current project proposal.

**Bioprospecting biomass-rich environments for carbohydrate active enzymes**: Lignocellulosic biomass (plant matter) is at the basis of future innovative bio-based technologies as well as green chemistry. However, plant matter is defiant and often has to be pre-treated in order to release its structure and enable further bioprocessing. Being inspired by the termite gut digestion system, I contributed to the OPTILYS project acquisition, aiming at the characterisation of the termite gut hydrolytic potential, later becoming the PI of this project. In the framework of OPTILYS we largely improved our skills in bioinformatics and we initiated the expertise around heterologous protein production and purification, that was not present in LIST before. We also enlarged our network of international collaboration, including Ghent University, University of Brussels, University of Paris 13 and the Technical University of Liberec (through past collaboration with Dr, Nguyen on bioplastic degradation). Two PhD students were graduated, including Dr. Marie Bertucci who was recruited by LIST as research engineer in 2020, after having worked one year for a private biotech sector. As such our effort of training new generation scientists was paid back and we could have retained expertise developed at LIST. Our team is the only one bioprospecting natural systems for novel lignocellulolytic strategies in Luxembourg (<https://www.fnr.lu/research-with-impact-fnr-highlight/spotlight-nature-does-it-best/>). Currently, I have been supervising another PhD student who was awarded with an AFR grant (individual PhD scholarship) from FNR, to exploit the hidden lignocellulolytic potential of anaerobic Planctomycetes bacteria with culture-dependent and culture-independent tools.

**Characterization of topsoil microbiome in Luxembourgish soils**: Topsoil is the most diverse and microbe’s rich habitat on Earth, and at the same time is one of the least explored. Before 2018, when we were contacted by the Ministry of Agriculture, Viticulture and Rural development, soil microbial communities had not been investigated in Luxembourg (<https://agriculture.public.lu/de/actualites/2019/dezember-2019/journee-mondiale-sols.html>). Initially, three consecutive service projects were funded, which afterwards turned into a full-time collaborative research project between LIST and the Ministry. To have a first overview of microbial diversity and richness in agricultural lands (arable and grasslands) and forest, I first applied our previously developed 16S rRNA gene amplicon sequencing approach to monitor geologically different soil types, over a period of three years. This activity allowed us to characterize the structure and stability of topsoil microbiomes. In continuation, I relied on the long-read sequencing technology to create the gene catalogue that allowed us to further characterize uncultured microbes present in soil. Subsequent metatranscriptomics analyses were applied to arable and grasslands submitted to the different agricultural practices, allowing us to study the carbon and nitrogen cycle pathways mediated by soil microorganisms. Metagenomics and metatranscriptomics protocols and analysis pipeline that were optimized in the framework of these projects, will further be applied in research on bioplastic degradation, which I have been conducting at the University of California Santa Barbara, as a visiting scholar.