Symposium on
March 30-31, 2023

Transdisciplinary research for a healthy planet

Campus Croix Rouge - Amphitheater 10, Building 9
57 rue Pierre Taittinger 51096 Reims Cedex

PROGRAMME & ABSTRACTS

UNIVERSITÉ DE REIMS CHAMPAGNE-ARDENNE

PROGRAMME

DAY 1: MARCH 30TH, 2023

8:30 am - 9:00 am: Opening of the registration desk - welcoming coffee

9:00 am - 9:15 am: Official welcome and opening of the symposium
Pr. Christophe Clément, Vice-president, University of Reims Champagne-Ardenne (URCA)
Dr. Hélène Lacroix, Director of development, URCA

9:15 am - 10:15 am: Plenary Conference
« Politics of the Earth - Social sciences in the Anthropocene »
Dr. François Gemenne,
FNRS Senior Research Associate and Director of the Hugo Observatory at University of Liège

10:15 am - 10:45 am: Coffee break

10:45 am - 12:15 pm: European policy session – *Chaired by Dr. Hélène Lacroix, Director of development and Pr. Béatrice Marin, Doctoral Schools Policy Officer, URCA*

- 10:45 am - 11:30 am: « A Green Deal for a Healthy Planet: Research and Transition Policies for a sustainable future. »
  Mathieu Fromentin, Policy Officer, Ecological and Social Transitions Unit, Directorate-General for Research and Innovation, European Commission

- 11:30 am - 12:15 pm: « The role of the doctorate within research in Europe. »
  Dr. Alexander Hasgall, Head of the EUA Council for Doctoral Education at European University Association

12:15 pm - 1:30 pm: Lunch Break

1:30 pm - 2:30 pm: Poster session 1

2:30 pm - 5 pm: Session 1 - Develop a circular economy for climate - *Chaired by Dr. Bernard Kurek, Research Director, UMR INRAE-URCA Fractionation of Agroresources and Environment Laboratory (FARE) and Dr. Romain Debref, Associate Professor, Economics and Management Laboratory of Reims (REGARDS), URCA*

- 2:30 pm - 3:15 pm: « The deployment of the circular bioeconomy on our territory: a meeting place for scientific interdisciplinarity between the human sciences and the natural sciences. »
  Dr. Bernard Kurek, Research Director, UMR INRAE-URCA FARE and Dr. Romain Debref, Associate Professor, REGARDS, URCA

- 3:15 pm - 3:45 pm: « Sustainable transitions towards low fossil carbon economies: challenges and prospects. »
  Pr. Lorie Hamelin, Professor, Chair on Sustainable Transitions towards low fossil Carbon use, INRAE, Toulouse

3:45 pm - 4:15 pm: Coffee break

- 4:15 pm - 4:45 pm: « Pathways for circular agri-food ecosystems: excreta as a key to reconnect urban and rural areas. »
  Dr. Tanguy Fardet, Research Officer, OCAPI Program, Water, Environment and Urban Systems Laboratory (LEESU), Ecole des Ponts ParisTech

6 pm: Social Event - Visit of the Cathedral of Reims followed by a cocktail reception at La Caserne Chanzy

DAY 2: MARCH 31ST, 2023

9:00 am - 9:20 am: Welcoming coffee

9:20 am - 12:00 pm: Session 2 - Zero pollution in air, soil and water - *Chaired by Pr. Claudia Cosio, UMR INERIS-URCA Environmental Stress and Biomonitoring of Aquatic Environments (SEBIO) and Dr. Stéphanie Sayen, Associate Professor, UMR CNRS - URCA Molecular Chemistry Institute of Reims (ICMR)*

- 9:20 am - 9:30 am: Introduction of the session
  Pr. Claudia Cosio, UMR INERIS-URCA SEBIO and Dr. Stéphanie Sayen, UMR CNRS-URCA ICMR

- 9:30 am - 10:00 am: « A joint approach to air quality and carbon monitoring in support of cities' mitigation policies. »
  Pr. Thomas Lauvaux, Junior Professor Chair, UMR CNRS - URCA Atmospheric and Molecular Spectroscopy Group (GSMA)

- 10:00 am - 10:30 am: « Micropollutants in the environment: from interdisciplinary environmental research to OneHealth actions? »
  Dr. Gwenaël Imfeld, CNRS Research Director, UMR CNRS - Université de Strasbourg - ENGEES Institut Terre et Environnement de Strasbourg (ITES)

10:30 am - 11:00 am: Coffee break

- 11:00 am - 11:30 am: « From research to operations: development of *in situ* bioassays by caging gammarus for the diagnosis of chemical contamination and resistance of aquatic environments. »
  Dr. Guillaume Jubeaux, Co-founder and Director, Biomae

- 11:30 am - 12:00 pm: « Building the Climate-(Food)-Water-(Energy)-Ecosystem Nexus for guiding sustainable development. »
  Pr. Anthony Lehmann, enviroSPACE lab, Institute for Environmental Sciences, University of Geneva

12:00 pm - 1:00 pm: Lunch Break

1:00 pm - 2:00 pm: Poster session 2

2:00 pm - 3:30 pm: Session 3 - Artificial Intelligence for a sustainable bioeconomy - *Chaired by Pr. Luiz Angelo Steffenel, Computer Laboratory in Intensive Computing and Image for Simulation (LICIIS), URCA*

- 2:00 pm - 2:30 pm: « Improving Efficiency and Labour Conditions with the Help of AI: the case of smart-viticulture. »
  Pr. Luiz Angelo Steffenel, LICIIS, URCA

- 2:30 pm - 3:00 pm: « Digital platforms and embedded AI to target the smallholder communities. »
  Pr. Congduc Pham, Computer Science Research Laboratory of the University of Pau & Adour Countries

- 3:00 pm - 3:30 pm: « Artificial intelligence for smart agriculture. »
  Dr. Amine Chemchem, Data Science Researcher, ATOS

3:30 pm - 4:00 pm: Coffee break (Jury's deliberation – Poster Awards)

4:00 pm - 4:20 pm: Posters Awards - *Presented by Pr. Caroline Rémond, ABIES Doctoral School Assistant Director*

4:20 pm - 4:30 pm: Closing Remarks *by Dr. Hélène Lacroix, Director of development, URCA*

4:30 pm: Closing Cocktail

SPEAKERS BIOGRAPHIES

Guest speaker of the Plenary Conference

FRANÇOIS GEMENNE

FNRS SENIOR RESEARCH ASSOCIATE AND DIRECTOR OF THE HUGO OBSERVATORY
UNIVERSITY OF LIÈGE

François Gemenne is a specialist of environmental geopolitics and migration governance at the University of Liège, where he is a FNRS senior research associate and the Director of the Hugo Observatory. He also heads the Observatory on Defence and Climate of the French Ministry of Defence, jointly with Julia Tasse at IRIS. He is a lead author for the IPCC and he also lectures on climate change and migration policies in different universities, including Sciences Po and Sorbonne University in Paris.

His research deals mostly with environmental and migration governance. He has worked in particular on populations displaced by environmental changes and the policies of adaptation to climate change, as well as on asylum and migration policies. He has conducted field studies in New Orleans after hurricane Katrina, Tuvalu, China, Kyrgyzstan, the Maldives, Mauritius, as well as in Japan after the Fukushima disaster.

He holds a joint doctorate in political science from Sciences Po Paris and the University of Liege (Belgium). He also holds a Master's degree in Development, Environment and Societies from the University of Louvain, as well as a Master of Research in Political Science from the London School of Economics, where he also taught. In 2008, he was awarded a post-doctoral scholarship from the AXA Research Fund. He has published in leading journals, including Science and Global Environmental Change, and has authored several books, amongst which "The Anthropocene and the Global Environmental Crisis" (edited with C. Hamilton and C. Bonneuil, Routledge 2015) the Atlas of Environmental Migration (with D. Ionesco et D. Mokhnacheva, Routledge 2016) or Handbook of Environmental Displacement and Migration (edited with R. McLeman, Routledge 2018).

MATHIEU FROMENTIN

POLICY OFFICER, ECOLOGICAL AND SOCIAL TRANSITIONS UNIT
DIRECTORATE-GENERAL FOR RESEARCH AND INNOVATION
EUROPEAN COMMISSION

Mathieu Fromentin is policy officer at the European Commission's Directorate-General on Research & Innovation. His work covers transition analysis, as well as international cooperation and coordination efforts for the directorates Healthy Planet and Clean Planet. He graduated in political sciences at Sciences Po and at the College of Europe in Bruges, where he studied European Affairs. His work focused on energy and environment-related policies.

ALEXANDER HASGALL

HEAD OF THE EUA COUNCIL FOR DOCTORAL EDUCATION
EUROPEAN UNIVERSITY ASSOCIATION

Alexander Hasgall is Head of the EUA Council for Doctoral Education (EUA-CDE). He is responsible for the largest European network in this field, covering 36 countries and bringing together a community of academic leaders and professionals from over 250 universities awarding doctoral degrees and institutions working on issues related to doctoral education and research training.

LORIE HAMELIN

PROFESSOR
CHAIR ON SUSTAINABLE TRANSITIONS
TOWARDS LOW FOSSIL CARBON USE
INRAE, TOULOUSE

Lorie Hamelin, laureate of the 2017 French presidential climate call “Make our planet great again” (Project Cambioscop), heads a research team at the Federal University of Toulouse. Her research focuses on the environmental performance of strategies to transit towards a low fossil carbon economy, at national and regional scales. Counting with 14 years of research experience in Canada, Denmark, Poland and France, she developed early methods for life cycle assessments of land use changes, biogas & overall manure management systems (PhD 2013), headed 3 work packages of EU projects related to Life Cycle Assessments and is advisor to the Swedish Biogas Research Centre. She supervised 12 PhD students (6 on-going), 7 postdocs, and several M.Sc. projects.

TANGUY FARDET

RESEARCH OFFICER
OCAPI PROGRAM
WATER, ENVIRONMENT AND URBAN SYSTEMS LABORATORY (LEESU)
ECOLE DES PONTS PARISTECH

Tanguy Fardet explores pathways to make agri-food ecosystems more circular and sustainable by improving usage of organic matter from urban areas within the OCAPI program. He considers how organic matter (from food residues to human urine and feces) may be converted into amendment and fertilizer to bring the nutrients they contain back to agricultural parcels. He uses modeling and graph analysis to investigate the logistics networks and the dynamics that could be associated to these resources. Within the OCAPI program, they work with members of the civil society to design and test actual implementations.

THOMAS LAUVAUX

PROFESSOR JUNIOR CHAIR
ATMOSPHERIC AND MOLECULAR SPECTROSCOPY GROUP
UMR CNRS GSMA
UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Thomas Lauvaux, chair professor at the University of Reims in climate sciences, develops monitoring systems based on atmospheric data to support climate policies at national and city scales. These systems combine atmospheric greenhouse gas measurements and numerical weather models to inform in real time how vegetation and human activities impact the carbon cycle.

GWENAËL IMFELD

CNRS RESEARCH DIRECTOR
INSTITUT TERRE ET ENVIRONNEMENT DE STRASBOURG
UMR CNRS ITES, UNIVERSITÉ DE STRASBOURG - ENGEES

Gwenaël Imfeld is CNRS research director in environmental biogeochemistry at the Institut Terre et Environnemenrt of Strasbourg (ITES, UMR7063). He specializes in the transformation of pollutants and microbial ecology in continental hydrosystems. His research group focuses on the hydrology of contaminants at the scale of the agricultural watershed and the reactive transport of industrial solvents and micropollutants. Current projects use isotopic, hydrological and biomolecular approaches to understand the fate of pesticides in soils, rivers, wetlands and aquifers, at scales ranging from elementary processes understood in microcosms, laboratory experiments and field studies. He directs the Research Federation on Environment and Sustainability (FERED).

GUILLAUME JUBEAUX

CO-FOUNDER AND DIRECTOR
BIOMAE

Guillaume Jubeaux has a classic university course (LMD) with a thesis at Irstea (Lyon-Villeurbanne ecotoxicology laboratory) between 2008 and 2012 on the development and use of vitellogenin measurement in gammarus (crustaceans from water) as a marker of endocrine disruption.
He then co-founded the Biomae laboratory in 2014 to promote the tools resulting from the research work of Irstea (now INRAE). Since then, he has been working on the operational and large-scale deployment of *in situ* bioassays based on the caging of gammarus for water agencies, local authorities and industrialists seeking to assess the chemical contamination and toxic impact of aquatic environments (in particular under the Directice Cadre Eau). He also participates in standardization projects for these methods (AFNOR, ISO) and the development of other applications in ecotoxicology.

ANTHONY LEHMANN

PROFESSOR
ENVIROSPACE LAB
INSTITUTE FOR ENVIRONMENTAL SCIENCES
UNIVERSITY OF GENEVA

Anthony Lehmann was a pioneer in the field of Species Distribution Modeling. He works on the use of eco-hydrological modeling to inform decision-making. He coordinated the FP7 enviroGRIDS project on the Black Sea catchment and the H2020 GEOEssential project on geoprocessing workflows linking Earth Observation to policy indicators with Essential Variables. He coordinated the SNF SWATCH21 project on eco-hydrological modeling of Swiss rivers. He is associate editor for the journal Environmental Sciences & Policy, co-edited the MOOC on Ecosystem Services and was leading the local organization of an International Ecology conference in Geneva in August 2022.

CONGDUC PHAM

PROFESSOR
COMPUTER SCIENCE RESEARCH LABORATORY
UNIVERSITY OF PAU & ADOUR COUNTRIES

Congduc Pham is a Professor of Computer Science at the University of Pau (France). His current research interests include wireless sensor networking, Internet of Thing and congestion control/resource allocation. In H2020 WAZIUP and H2020 WAZIHUB, he was the scientific expert on Internet-of-Thing and LoRa technology and developed the LoRa IoT generic framework used in various projects. In H2020 HUBIQUITOUS he is leading the deployment of SolutionLab for providing access to IoT and AI disruptive technologies in Digital Innovation Hubs in Africa. He is also coordinating the PRIMA INTEL-IRRIS project on smart irrigation for smallholders and PRIMA RESILINK to increase smallholder's resilience. Both projects target digital platforms, IoT and AI technologies to address smallholder's concerns.

AMINE CHEMCHEM

DATA SCIENCE RESEARCHER
ATOS

Amine Chemchem earned his B.S. in computer science from the University of Jijel in 2009. He then continued his education at USTHB, where he received an M.S. in intelligent computer systems in 2011 and a Ph.D. in computer science in 2015. His Ph.D. thesis focused on developing a new concept of knowledge mining for intelligent agents. After graduation, Amine worked as a lecturer at Saad Dahleb University. In 2018, Amine was admitted as a post-doctoral researcher at the University of Reims Champagne-Ardenne, specializing in Artificial Intelligence, machine learning, and high-performance computing. Since November 2020, Amine has been working as a datascientist at Atos, where he is recognized as a senior expert in AI.

CHAIRMEN BIOGRAPHIES

CLAUDIA COSIO

PROFESSOR AND DIRECTOR
ENVIRONMENTAL STRESS AND BIOMONITORING OF AQUATIC ENVIRONMENTS
UMR-I 02 SEBIO
UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Claudia Cosio is professor at the University of Reims Champagne-Ardenne and director of the SEBIO laboratory (UMR-I 02). The goals of her research are to understand the molecular mechanisms of how biota, transduce and adapt to simultaneous changes in environmental conditions affected by multiple pollution and climate changes. More in details, she aims to understand how organisms perceive and transmit stress signals and what function stress genes, metabolites and protein products have in conferring stress tolerance, as well as to understand their interaction with development. In this context, she addresses aspects of stress physiology and how alteration of multiple parameters of growth conditions affects the response to stress responses as well as how these processes interact with other aspects of metabolism and physiology.

ROMAIN DEBREF

ASSOCIATE PROFESSOR
ECONOMICS AND MANAGEMENT LABORATORY OF REIMS
EA 6292 REGARDS
UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Romain Debref is an Associate Professor in Economics at the University of Reims Champagne-Ardenne and member of the REGARDS laboratory (EA 6292) of the same university. He is also Secretary General and Vice President of the Research Network on Innovation since 2018. His current work focuses on the bioeconomy and its innovations in an ecological economy perspective. He is the author of the book "Environmental innovation and eco-design: certainties and controversies" published by ISTE (London).

BERNARD KUREK

RESEARCH DIRECTOR
FRACTIONATION OF AGRORESOURCES AND ENVIRONMENT LABORATORY
UMR INRAE 614 FARE
UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Bernard Kurek is a Research Director within UMR INRAE-URCA FARE. Over the past 10 years, he has worked in various regional, national and European contexts on inter- and transdisciplinary approaches to green chemistry and bioeconomies. His current field of research relates to the valorization of lignocelluloses for the use of biomaterials.

STÉPHANIE SAYEN

ASSISTANT PROFESSOR
MOLECULAR CHEMISTRY INSTITUTE OF REIMS
UMR CNRS 7312 ICMR
UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Stéphanie Sayen is assistant-professor at the University of Reims Champagne-Ardenne where she is conducting research in the Molecular Chemistry Institute of Reims (UMR CNRS 7312 ICMR URCA). She is studying, using a multi-scale approach, the behaviour of organic and inorganic contaminants in environmental matrices (soil, sediment, biosolid, water), more specifically their speciation and sorption at solid/liquid interfaces, and more recently their plant uptake. She is particularly interested in the establishment of structure-property relationships and the presence of contaminants in mixture, considering in particular interactions between metals and organic contaminants by complexation.

LUIZ ANGELO STEFFENEL

PROFESSOR AND DIRECTOR
COMPUTER LABORATORY IN INTENSIVE COMPUTING AND IMAGE FOR SIMULATION
LICIIS
UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

Luiz Angelo Steffenel obtained a Ph.D. in Computer Science in 2005 at Institut National Polytechnique of Grenoble, France. He joined the University of Reims Champagne-Ardenne in 2007 and since 2021 has been assigned Director of the LICIIS Laboratory. His research covers HPC, distributed computing, edge computing, and Artificial Intelligence applied to domains such as biochemistry, atmospheric sciences, and smart agriculture. Among his recent projects, we can cite the H2020 AI4DI and Horizon Europe EdgeAI projects on AI applied to smart agriculture, the CAPES-Cofecub AeroBI project on AI for atmospherical sciences, as well as the ANR E-COVISION and HT-COVID projects related to COVID-19 forecast and drug research.

POSTERS ABSTRACTS

Poster 1 - Alexis Amo, EA 6292 REGARDS, URCA
Bioeconomy in response to challenges facing human societies: what bioeconomy, what for and to whom?

Poster 2 - Pierre-Yves Ancelin, EA 3795 GEGENAA, URCA
When yesterday's war generates life today: example of the ecological and territorial resilience of polemoforms in Reims sector (France).

Poster 3 - Julien Berthe, EA 3795 GEGENAA, URCA
Contribution of airborne LiDAR on the mapping of vulnerability to groundwater pollution – Example of the drinking water catchment of Trépail.

Poster 4 - Nicolas Berthelot, UMR-I 02 SEBIO, URCA
Next-generation biomonitoring: creation of an independent device to monitor aquatic environment.

Poster 5 - Yassine Bouhouch, USC INRAE 1488 RIBP URCA et Laboratoire de Biotechnologie Végétale et Valorisation des Bio-Ressources, Université Moulay Ismail, Maroc
Image based net blotch disease in barley by Convolutional Neural Network.

Poster 6 - Etienne de l'Estoile, Université Paris 1 Panthéon Sorbonne
Who takes the land? Quantifying the use of built-up land by economic activities to assess biodiversity-related transition risks in France.

Poster 7 - Mariam Fakih, UMR CNRS 7331 GSMA, URCA
Do photolysis and oxidation of first-generation oxidation products of monoterpene have any impact on local atmospheric pollution?

Poster 8 - Robin Fournier, URD Agro-Biotechnologies Industrielles (ABI), CEBB, AgroParisTech
Toward a green synthesis of Levoglucosenone (LGO) derivatives : an example of lignocellulosic biomass valorisation.

Poster 9 - Maëliss Gouchon, EA 6292 REGARDS, URCA
Bioeconomy and household food waste in France.

Poster 10 - Lilian Hollard, LICIIS, URCA
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Poster 11 - Clément Jacquemin, UMR CNRS 7331 GSMA, URCA
Carbon Dioxide Optical Sensors Using Near- and Mid-Infrared Semiconductor Lasers.

Poster 12 - Elie le Guyader, EA 3795 GEGENAA, URCA
Influence of organic amendments from date-palm residues on soil water retention and carbon mineralisation of arid and semi-arid soils.

Poster 13 - Ana Brinca-Moreira, USC INRAE 1488 RIBP, URCA, i3N, Departamento de Física, Universidade de Aveiro, Portugal and Associação SFCOLAB - Laboratório Colaborativo para a Inovação Digital na Agricultura, Portugal
Development of luminescent nanoparticles for the detection of pathogen-related diseases in plants.

Poster 14 - Ghinwa Mortada, UMR CNRS 7312 ICMR, URCA
Behaviour of ciprofloxacin and Cu(II) in biosolid-amended soils.

Poster 15 - Armando Rivera, SpELL, Spatial Epidemiology Lab, Université Libre de Bruxelles, Belgique
Uncertainty estimation of scenarios for greenhouse gas mitigation in the meat and milk industry.

Poster 16 - Clarisse Séguin, UMR-I 02 SEBIO, URCA
Effects of dietary mercury on proteome and metabolome in Dreissena polymorpha*, a sentinel of our aquatic environment.*

Poster 17 - Souleymane Sow, EA 7548 ITheMM, URCA et EA 3804 CRESTIC, URCA
The Artificial Intelligence-Based Vibratory Simulator for Rotating Machinery.

Poster 18 - Isabella Tucciarone, Università degli Studi di Firenze, Italia
Innovative feeds for Oreochromis niloticus *reared in aquaponic systems.*

Bioeconomy in response to challenges facing human societies: what bioeconomy, what for and to whom?

Alexis Amo[1], François Bost[2], Sylvie Benoît[1]

1- *EA 6292 REGARDS, Université de Reims Champagne-Ardenne, Bâtiment Recherche, BP 30, 57 rue Pierre Taittinger, 51571 Reims cedex, France*
2- EA 2076 HABITER, Université de Reims Champagne-Ardenne, BM 11, 57, rue Pierre Taittinger, B.P. 30, 51571 Reims Cedex, France

Today bioeconomy is introduced to us as a new means of operationalizing sustainable development and implementing the ecological transition. It would thus make it possible to meet the challenges facing human societies and, in particular, climate change. However, it is not easy to define precisely what the bioeconomy is. According to the European Commission, in an updated report from 2018, the bioeconomy "covers all sectors and systems that rely on biological resources – animals, plants, micro-organisms and derived biomass, including organic waste – as well as their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services." We can see here that bioeconomy means a new way to produce and to consume with the idea of developing the economy and solving the environmental crisis at the same time. Also, according to the OECD (Organization for Economic Cooperation and Development), the bioeconomy is defined as "a world in which biotechnologies contribute to a significant share of economic production" and "is based on three pillars: biotechnological knowledge, renewable biomass and the integration of technical applications". But it is relevant to question the conditions for the emergence of the concept of bioeconomy. The concept was actually popularized by Nicholas Georgescu-Roegen, and then other economists, in the 1970s under the name of "bioeconomics" with the idea of an epistemological revolution to restore the economy in the biophysical limits of the planet. Today, both concepts are struggling with opposed aims and contents and research in the social and human sciences can provide a better understanding of these debates and formulate new proposals.

Thus, it is essential to keep these historical and theoretical considerations in mind to know if the path we're taking is compatible with the desire to live in a healthy planet and if it can be satisfied by means of green growth. In this poster, I lay out the diversity of historical and existing meanings of the bioeconomy. In this matter I rely on a review of an academic and grey literature as well as in the exploitation of several former semi-directive interviews realized between 2018 and 2020 with industrial and agricultural stakeholders by researchers of the BIOCA project (« Bioéconomie en Champagne-Ardenne). Finally, we notice that the purpose of bioeconomy as part of the circular economy promoted by institutional and public policies is to create jobs, modernize industries and agriculture, decarbonize the economy and protect biodiversity and ecosystems. Nevertheless, we also observe that some goals stated as decarbonation and modernization of the economy to protect the environmental are closely linked with green growth seen as the further stage to achieve sustainability, which is a reinterpretation of the original concept and criticized by some ecological economists, post-growth researchers and degrowth movements.

Alexis Amo
University: University of Reims Champagne-Ardenne
PhD title: The Grand-Est area in France facing the challenge of a rooted bioeconomy.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Human and Social Sciences

When yesterday's war generates life today: example of the ecological and territorial resilience of polemoforms in Reims sector (France).

Pierre-Yves Ancelin, Julien Berthe, Alain Devos

EA 3795 GEGENAA, Université de Reims Champagne-Ardenne, Bâtiment 13, 57 rue Pierre Taittinger, 51100 Reims, France

After the defeat of 1870 against Prussia, France erected a defense organization of 450 forts and fortified batteries, consisting of 3 curtains of detached forts equipped with artillery guns ("Séré de Rivières" system). Reims region is part of the second line with a belt of 13 fortified structures built and modernized between 1875 and 1892.

During World War 1, some of these fortified were integrated into the defense networks and exposed to artillery fire leading with time to different states of preservation. After the conflict, many structures fell into disaffection. Some were assigned to municipalities and decommissioned, turned into stone quarries to provide geomaterials for reconstruction, or even deconstructed in order to take advantage of their land reserve.

Other fortifications took advantage from reconversion (museography, wine tourism, storage, reappropriation by associations). The presence of these forts, often unsuspected due to concealment forest and vegetation cover, thus has constituted a parallel vector of territorial dynamism for a century. It is no longer a question of observing the hot and steaming ruins, as they can still appear in the testimonies and archives, it is about analyzing the trajectories of resilience, and remanences acquired by these cooled fortified ruins by the peace. The resulting social uses reflect an appropriation, a perception, which should also be observed and analyzed to consider their current and future trajectory. A spatial analysis using GIS from archival documents (GCTA master plans, aerial photographs), airborne Lidar and field surveys allows a synthetic diagnosis of the multiple trajectories developed by the forts of the Reims belt to be carried out.

Their study reveals a significant potential to boost the heritage valuation, through tourist vectors (remembrance tourism, wine tourism), and local associations. Moreover, like the former Champagne battlefields converted into military camps, they represent islands of biodiversity in an openfield landscape dedicated to agro-resources. Their existence thus contributes to the fight against the ecological fragmentation carried by the notion of Green and Blue Tram (TVB). In this sense, they can be classified as natural areas of fauna and flora ecological interest (ZNIEFF), and Natura 2000.

Pierre-Yves Ancelin
University: University of Reims Champagne-Ardenne
PhD title: Morphologies and landscapes of the the fortified Séré de Rivières belt in Reims - contribution of multidisciplinary analysis (spatial approach GIS, lidar, historical, archaeometric).
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Human and Social Sciences

Contribution of airborne LiDAR on the mapping of vulnerability to groundwater pollution - Example of the drinking water catchment of Trépail.

Julien Berthe, Olivier Lejeune, Jessy Jaunat, Pierre-Yves Ancelin, Alain Devos, Nicolas Bollot

EA 3795 GEGENAA, Université de Reims Champagne-Ardenne, Bâtiment 13, 57 rue Pierre Taittinger, 51100 Reims, France

In France, there are two regulatory protection systems for water resources against pollution at water catchment points for human consumption. The Protection Perimeters of Catchment (PPC) concern concentrated and accidental pollution. The Alimentation Area of Catchment (AAC) deal with diffuse pollution, often agricultural. There are three types of PPCs: the immediate protection area, the close protection area and the remote protection area (optional) that can be translated respectively into zones of high, medium and low vulnerability. The AACs correspond to the catchment area of the water catchment combining the topographical catchment area and the hydrogeological one. The area of the PPC and the AAC is delivered by a certified hydrogeologist who interprets the bibliography, the existing maps having sometimes weak resolutions of 1 : 250 000 and the geometric data of the aquifers. In anisotropic environments, such as karstic hydrosystem, this work is also based on the mapping of the exokarst or concentrated infiltration points (sinkhole, chasm, etc.), on tracing operations and on the mapping of the endokarst. In this context, the delimitation of PPCs and AACs is risky because it is limited to the state of knowledge.

The objective of this study is to propose a method of mapping vulnerability to pollution adapted to the karst domain with the contribution of airborne LiDAR (Light Detection And Ranging), allowing a high resolution mapping of the exokarst and improving the understanding of the space.

The spring captured for drinking water supply in Trépail (Montagne de Reims, Marne, France) is used as an experimental site. This spring is located on the front of the Cuesta d'Ile de France, occupied from top to bottom by a forest of exception®, the vineyard of Champagne and the openfield.

The EPIK approach, created and tested for karstic environment, is a multi-criteria spatial analysis based on superimposed and weighted indices allowing the zoning of the vulnerability to pollution. The different parameters used by the EPIK method are the presence and type of Exokarstic morphology (E), the thickness of the Protective cover (P), the type of Infiltration (I) and the presence of Karstic networks (K). This work compares the result of the zoning done with EPIK without and with LiDAR data.

The LiDAR data allowed to map a karstic border located on the slopes of the Montagne de Reims within the topographic watershed but also in the adjacent watersheds (hydrographic capture). Moreover, the LiDAR resolution allows to propose a vulnerability mapping at the parcel scale. As such, it can be applied to land development projects to achieve zero pollution in water.

Finally, the topographic survey by airborne LiDAR carried out by IGN, at the scale of France, whose data will be publicly available in 2026, seems to be of great interest for the creation and updating of PPCs and AACs, especially in karstic contexts.

Julien Berthe
University: University of Reims Champagne-Ardenne
PhD title: Morphologies and landscapes of the Montagne of Reims - contribution of GIS spatial analysis of lidar images.
Thesis year: 3rd
Doctoral School (for URCA PhD students only): Human and Social Sciences

Next-generation biomonitoring: creation of an independent device to monitor aquatic environment.

Nicolas Berthelot[1], Clara Hourlier[1], Mélissa Palos-Ladeiro[1], Cécile Pochet[2], Alain Geffard [1]

1- UMR-I 02 SEBIO, université de Reims-Champagne-Ardennes, campus Moulin de la Housse, Chemin des Rouliers, 51100 Reims, France
2- Communauté Urbaine du Grand Reims, 3 Rue Eugène Desteuque, 51100 Reims, France

AZHUREV (Amménagement d'une Zone HUmide à Reims pour l'Epuration et la Vivant) is an original wetland with aims to reduce potential toxicity and contaminants concentration of treated water from wastewater treatment plant (WWTP) and urban weather flow waters before their reject in the Vesle river. Composed by three lagoons, chemical analysis are realized directly on water to detect contaminants and to follow physicochemical parameters. Using biota-based monitoring can complete chemical analysis. Briefly, using biota can give an information about toxicity of a water (while chemical analysis can only give an information about what contaminants are in the water). An organism can also accumulate microcontaminants in his tissues. This phenomenon permits to detect contaminants which are too low concentrate in water for detection by chemical analysis. So, the doctoral project aims to complete this chemical environmental evaluation using biomonitoring approach based on *Dreissena polymorpha* (zebra mussels) filtration capacities. In fact, two major objectives are developed:

i) Elaborate an *in-situ* experimental device to expose the mussels. One of the challenges associated with this objective is the inter-comparison of devices between lagoons (spatial variability) and between campaigns (temporal variability). One way to open this lock is to use the valvometry measurement. Valvometry is use as an estimation of the exchange time between the mussel and his environment. So, this opening time during caging experiments corresponds to the exposition time at the water. In this manner, bioaccumulation (accumulation of contaminants in organisms' tissues) and toxicity measurement (measurement of biological responses to contaminants, called biomarkers) will can be normalized thanks to valves opening time.

ii) Investigate bioaccumulation and physiological markers that indicate modification in mussel activity. These biomarkers could be analyzed at individual (behavior) or sub-individual (toxicity measurement) level. As for other bivalves, displacements of zebra mussels could be use as a marker for evaluate toxic effects. Laboratory works are realized to develop a methodology to measure the mussels' mobility in various conditions. Briefly, mobility of mussels is determined by counting moving/unmoving organisms over a given time and by measuring trails which correspond to displacement of mussels in a sand layer. Various conclusions are observed for protocol optimization:

- Small mussels travel more longer distance than longer mussels. Small mussels have also significantly move more often than longer mussels with 80% unmoving long mussels for 50% unmoving small mussels. So, using small mussels have been chosen for future experiments.

- Repeatability of mobility measurements have been tested for 4 mobility experiment with the same protocol with different mussels in each experiment. The percentage of moving mussels for each experiment vary between 40% and 53.3%. Repeat the same protocol have no significant effect on moving mussels' proportions and no significant difference in mean absolute distances (in straight line) between all experiments is observed.

- It appears that 30 min would be enough for having enough displacements. But more recently experiments appear to necessitate more time for observing mussels' displacements.

Currently, an application of the field tank in a prototype version is realized on the WWTP for a comparison between mussels' behavior measurement developments, bioaccumulation, and biomarkers, treated water analysis and other biomonitoring data.

Nicolas Berthelot
University: University of Reims Champagne-Ardenne
PhD title: Development of an *in situ* biomonitoring device to evaluate the functionning of the AZHUREV constructed wetland.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Agriculture, Food, Biology, Environment, Health

Image based net blotch disease in barley by Convolutional Neural Network.

Yassine Bouhouch[1,2], Qassim Esmaeel[1], Aurélie Backes[1], Nicolas Richet[1], Hafidi Majida[2], Cédric Jacquard[1], Lisa Sanchez[1]

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2- Laboratoire de Biotechnologie Végétale et Valorisation des Bio-Ressources (BVVBR), Université Moulay Ismail, Meknes 50050, Maroc

Maintaining a sustainable, safe and nutritious food supply for a growing human population is a current challenge. The use and development of creative strategies to reduce fungal contamination, as well as expansion on plant hosts, is an effective strategy against fungal effects on food safety. Barley (*Hordeum vulgare L.*) is one of the major cereal crops in the world, used for feed, malt production and human consumption. Commercial varieties of barley are selected for their disease resistance levels. The *fungus Pyrenophora* teres Drechsler (anamorph Drechslera teres [Sacc.] Shoem.) is the causal agent of the barley net blotch. Like other stubble-borne diseases, net blotch has become economically significant and has emerged as a major disease in many barley-growing areas worldwide. This disease can develop quickly and be responsible for a 40% decrease in grain yield. Therefore, early disease diagnosis is necessary to reduce future losses. Disease diagnosis requires the development of an automatic framework for disease quantification based on field-acquired images using aerial vehicles to increase the throughput. Our work proposes a deep learning framework to systematically segment individual leaf instances and corresponding diseased regions using a unified feature map with a multi-task loss function for end-to-end training. We develop in this study a high-throughput and non-invasive screening of net blotch in barley. The workflow creates a primary mask branch that predicts individual leaf segments (leaf instance segmentation) using a Convolutional Neural Network, an added disease region segmentation that utilizes the feature maps corresponding to leaf instances for generating diseased region masks. Disease quantification targets the necrosis area segmented from our dataset. We tested the framework on barley's seedling assay dataset with net blotch disease, several days post infection, and with or without biological control agent to verify the ability of our neural network training to quantify the evolution of necrosis area on the leaves. The experimental results showed a 91% correlation of disease severity with the manual ground truth data and run-time efficiency of 5 frames per second (fps).

Yassine Bouhouch
University: University of Reims Champagne-Ardenne
PhD title: Development of new tools to protect barley (*Hordeum vulgare L.*) against *Pyrenophora teres.*
Thesis year: 3rd
Doctoral School (for URCA PhD students only): Agriculture, Food, Biology, Environment, Health

Who takes the land?
Quantifying the use of built-up land by economic activities to assess biodiversity-related transition risks in France.

Etienne de L'Estoile[1,3], Mathilde Salin[2,3]

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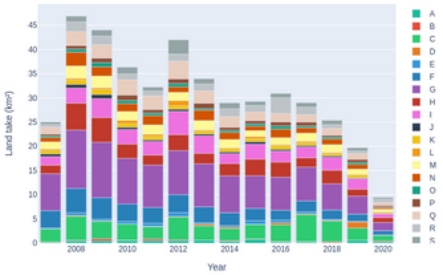
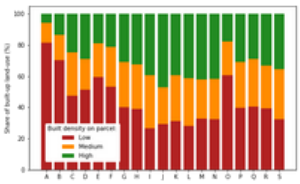
The mandate of central banks in the Eurosystem includes the maintenance of financial stability. To this end, they started investigating the economic and financial risks that could emerge from misalignments of current business models with ambitious climate or biodiversity transition policies. In France, the objective to reach "no net land-take" (NNLT) by 2050, and a reduction of land-take by half by 2030, was recently written into the law to protect agricultural land and natural ecosystems from conversion into built-up areas. If NNLT were to restrict access to real estate, companies in sectors relying strongly on land for their production process could be exposed to transition risks. We investigate this heterogeneous exposure: using cadastral data and geolocated information on French firms, we develop and explore accounts tracing back each sector's annual use of built-up land (a stock) and annual land take (a flow).
Our work valuably complements the literature on (i) environmental accounting and environmentally extended input-output analysis; (ii) land as a (potentially limiting) factor of production for economic sectors, and (iii) biodiversity-related financial risks.
The database we build is a useful tool to monitor activity-driven land-take dynamics and to attribute "responsibility" for land-take. The trade sector has been the main contributor throughout the period, although its absolute and relative impacts have been declining over time. On the other hand, we can see an increasing contribution of the manufacturing sector at the end of the period.

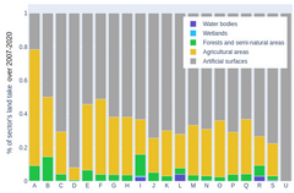


Annual contribution to land-take by sectors

This work helps us conducting the first analysis of possible economic risks induced by a "worst case" scenario where NNLT leads to increasing real estate prices for firms. We develop a multi-criteria analysis of various risk components (exposure to shock, adaptive capacity) based on our database, but also on complementary sources such as firms' balance sheets. It suggests that the sectors most exposed to transition risks are expanding sectors, future users of buildings and renters. In particular, the concern should be greater for users of non-dense built-up land, which are not able to share the increase in land price with other users. Moreover, those whose business model binds them to locate out of cities (such as dangerous plants) should be forced to take new land and to face high compensation costs.

Parcels density by sectors





Types of land-taken by sectors

This work paves the way for the development of stress tests aiming to assess the consequences of the ecological transition on economic and financial stability.

Etienne de l'Estoile
University: University Paris 1 Panthéon Sorbonne
PhD title: Landing on earth: real estate and financial stability.
Thesis year: 3rd

Do photolysis and oxidation of first-generation oxidation products of monoterpene have any impact on local atmospheric pollution?

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2- UMR CNRS 7312 ICMR, Université de Reims Champagne-Ardenne, Moulin de la Housse, 51687 Reims Cedex 2, France

Various types of non-methane volatile organic compounds (VOC) are emitted into troposphere. As important constituents of Biogenic VOC (BVOCs) emissions, the monoterpenes ($C_{10}H_{16}$) contribute to the formation of tropospheric ozone and secondary organic aerosol (SOA). The atmospheric degradation or photolysis of monoterpenes and their first oxidation products impact directly the HO balance (HO_x = HO + HO_2). Hence the importance to understand the atmospheric oxidation processes involving these compounds as well as the atmospheric fate of the main products resulting from the first generation of the monoterpenes oxidation. However, atmospheric oxidation of these products still less well understood.

This work presents the determination of UV spectra and kinetic studies of several first-generation oxidation products of monoterpenes with OH radicals, chlorine radicals and ozone over the temperature range 298-353 K in air and at near atmospheric pressure of 760 Torr. The UV absorption cross section measurements were carried out using an optical system coupled to a deuterium lamp-monochromator system and conducted at temperature 353 K. While, kinetic experiments were performed using a 63 L Pyrex atmospheric chamber, surrounded with 24 fluorescent black lamps, coupled to a PTR-MS (proton transfer reaction-Mass spectrometer) and FTIR (Fourier Transformed InfraRed Spectrometry).

The UV spectrum of all five target compounds « nopinone, myrtenal, limononaldehyde, caronaldehyde and ketolimonene » shows a significative absorption above 290 nm. This indicates that their photolysis potential in the troposphere is significant. Rate constants for the reactions of OH and Cl with nopinone, myrtenal, limononaldehyde and ketolimonene were found to exhibit no or low temperature dependence under our experimental conditions, whereas for ozone reactions clear temperature dependence was observed.

As a conclusion, photolytic and oxidant gas phase oxidation processes of these compounds could significantly contribute to their elimination from the atmosphere in just few hours.

Mariam Fakih
University: University of Reims Champagne-Ardenne
PhD title: Atmospheric Reactivity of the main first-generation oxidation products of Monoterpenes (REATMO).
Thesis year: 3rd
Doctoral School (for URCA PhD students only): Basic Sciences Health

Toward a green synthesis of Levoglucosenone (LGO) derivatives : an example of lignocellulosic biomass valorisation.

Robin Fournier, Amandine Flourat, Sami Fadlallah, Louis Mouterde, Aurélien Peru, Florent Allais

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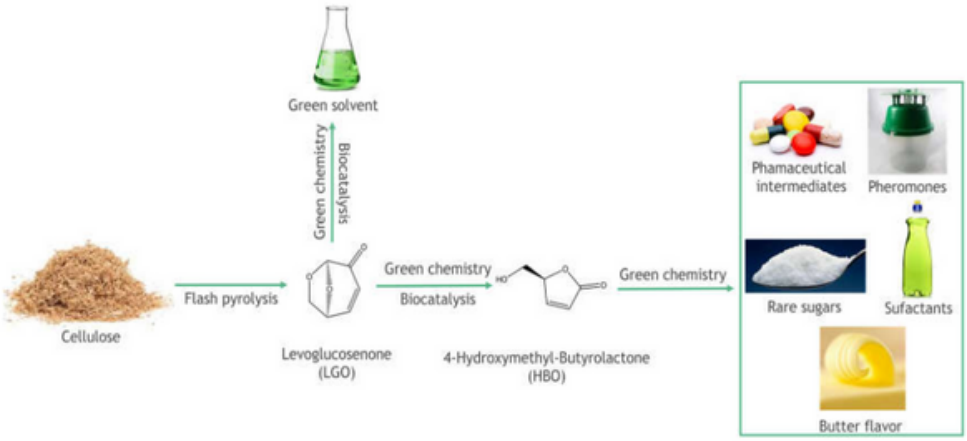
Lignocellulosic biomass is present all over the world in different forms in agricultural waste and its valorization represents a major challenge in multiple fields of research such as bio-fuels or paper industry. Cellulose, an homopolymer of glucose, is the main constituent of the cell wall of plants and wood. Since the 70's, a very interesting and versatile molecule called Levoglucosenone (LGO) has been described from flash pyrolysis of wood cellulose.

LGO is an α,β-unsaturated bicyclic ketone derived from Levoglucosan. Due to its multiple reactive sites and its enantiopurity, it has been modified and valorized in multiple ways to access "platform" molecules that could be used for the synthesis of a wide range of molecules such as drugs, pheromones, green solvents, monomers and polymers.

Among the several aforementioned molecules, there are two major LGO-derived compounds that have reached TRL above 4 (kilo-scale synthesis): the two main known valorizations of LGO appear as the following:

- Cyrene, a green solvent representing a promising alternative for toxic polar aprotic organic solvents such as NMP, DMF ;
- 4-hydroxymethyl-butyrolactone (HBO), the precursor of several molecules (e.g., rare sugars, drugs, flavors, pheromones).

The many applications and possibilities of those biobased LGO-dervied compounds are yet to be discovered, and represent a huge step in lignocellulosic valorization.



Robin Fournier
Universities: AgroParisTech and University of Florida
PhD title: Design and optimization of chemo-enzymatic pathways toward nucleoside analogues from cellulose-derived LGO.
Thesis year: 3rd

Bioeconomy and household food waste in France.

Maëliss Gouchon, Franck-Dominique Vivien

EA 6292 REGARDS, Université de Reims Champagne-Ardenne, Bâtiment Recherche, BP 30, 57 rue Pierre Taittinger, 51571 Reims cedex, France

Bioeconomy is often held as one of the key solutions for the implementation of the ecological transition. It consists in substituting fossil carbon from petroleum mainly with renewable carbon from biomass, in order to create bioproducts such as biofuels, bioplastics, biofertilizers, etc. Although a large part of bioeconomic activities today relies on agricultural resources grown for that purpose, there is a growing interest for another source of biomass: residual biomass, in other words, biowaste. This type of biomass is already being used as a resource in farms (with manure or crop residues for instance) or in food industries that reuse byproducts, as analyzed by industrial economics studies. But that is less the case for biowaste emitted by households, administrations and regular firms. Enhancing the use of such residual biomass would bear at least three types of benefits. First, it would help alleviate the increasing pressure put on agricultural land by the demand for food and non-food biomass. Second, it would participate to the rise of a circular bioeconomy, where waste is reinserted in the economic process. Third, it would contribute to the current effort to reduce the amount of waste dumped into landfills or burnt in incinerators, and to reduce the associated negative environmental damages.

However, building a bioeconomy upon biowaste begets several issues linked to the "waste" nature of such resource. In this poster, I present these different types of issues. I take the example of household food waste valorization activities in France, as these activities are currently undergoing an intense development, owing to a European regulation that makes source separation of biowaste mandatory for all biowaste producers starting in January 2024. My analysis relies upon the analysis of academic and grey literatures, as well as on eight semi-directive interviews and three observation sessions conducted with field actors and researchers. After providing a short description of the resource under study and of the legislative context, I expound four types of issues that arise when developing bioeconomic activities based on biowaste.

- Juridical issues: waste is a legal status and changing from this status to that of a product in order to sell the latter requires the implementation of several norms, which entails economic costs.
- Sociological issues: waste is not a neutral object in the eyes of the public and associated social norms may prove as obstacles or opportunities for the sector.
- Economic issues: the shift from a waste to a product is likely to require the rebuilding of business models for existing actors in the waste sector.
- Policy issues: biowaste seems to be often seen as a waste before being seen as a biomass resource, especially for public actors; thus, waste-related policies may interfere with bioeconomic activities in several ways.

Maëliss Gouchon
University: University of Reims Champagne-Ardenne
PhD title: Bioeconomy and urban biowaste: an ecological socioeconomics analysis.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Human and Social Sciences

Artificial Intelligence for Smart Agriculture.

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The development of Artificial Intelligence (AI) systems has raised interesting opportunities for improved automation in smart agriculture. AI defines a collection of tools for understanding and explaining the data around us, as well as helping with automation and decision-making tasks. Today, agriculture thrives for more sustainable and efficient practices to address food insecurity, climate change, and ecological concerns. Smart agriculture is, therefore, one of the domains that can benefit from AI, both in crop and environment monitoring, planning, work automation, and quality control. Among such subjects, this work focuses on the challenges to perform yield estimation and identifying crop diseases.

Indeed, earlier yield predictions allow a better market assessment, good accounting, and investment reasoning, as well as plant management and harvest organization. The interest in knowing the yields early enough involves several economic, administrative, and qualitative objectives. For this reason, our works combine historical harvest and meteorological data with computer vision deep learning algorithms and linear regression to monitor different cultures such as soybean and grapevine.

Similarly, early identifying diseases is crucial, as about 20% to 40% of crops lost are due to diseases and pests, and new regulations tend to restrict the usage of phytosanitary products. Plant diseases also affect the quality of the harvest, with a non-negligible impact on the price and marketing of the final products. Current works on AI show results that outperform humans in early disease detection, with the advantage of allowing large-scale solutions deployment. At LICIIS, we develop AI models for disease detection for the Champagne industry, reaching 90% accuracy on disease detection and identification. Also, we focus on low-energy efficient AI running on microcontrollers to reduce the impact of energy usage and improve the solutions' portability.

The work is structured as follows: presenting AI in general and its benefits for agriculture, yield estimating methods with machine learning and deep learning solutions, and disease detection with deep learning algorithms, followed by discussions and conclusions.

Lilian Hollard
University: University of Reims Champagne-Ardenne
PhD title: Optimization of Artificial Intelligence Models for Embedded Devices.
Thesis year: 1st
Doctoral School (for URCA PhD students only): Digital and Engineering Sciences

Carbon Dioxide Optical Sensors Using Near- and Mid-Infrared Semiconductor Lasers.

Clément Jacquemin[1], Florent Defossez[1], Raphaël Vallon[1], Bertrand Parvitte[1], Grégory Maisons[2], Mathieu Carras[2], Virginie Zéninari[1]

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One of the greatest challenges facing humanity is how to reconcile the growing demand for energy with the population and economic growth without causing irreparable damage to the environment. The continuous exhaust of chemical pollutants such as nitrous oxides (NO_x), ammonia (NH_3), methane (CH_4), sulfur oxides (SO_x), perfluorocarbons (CxF_y) and carbon dioxide (CO_2) from industrial, agricultural and automotive activities are responsible for many phenomena, including acid rain, air quality degradation, climate change and the thinning of the ozone layer.
The monitoring of the composition of the surrounding environment helps to anticipate and prevent environmental impacts caused by these emissions. It is also necessary to understand the origin of these sources in order to better control them.
The instruments based on tunable laser absorption spectrometry techniques have already demonstrated their sensing ability for numerous species, including those above-mentioned, especially in the infrared range. These devices are known to be faster and more accurate than common sensors, without any calibration. Two field-deployable laser spectrometers have been developed in GSMA. The first one is based on a pulsed quantum cascade laser, emitting in the mid-infrared and the other one on a continuous-wave near infrared laser diode. Each of these two instruments are equipped with a custom dense pattern multipass cell, which enhances their sensitivity thanks to an effective path-length of 15 m and 30 m, respectively, for a can-like sampling volume of 250 cm³. These cells have the particularity to be completely open to the outside, allowing the surrounding air to freely flow inside for a minimum response time. An illustration of the system is shown below (Figure 1).

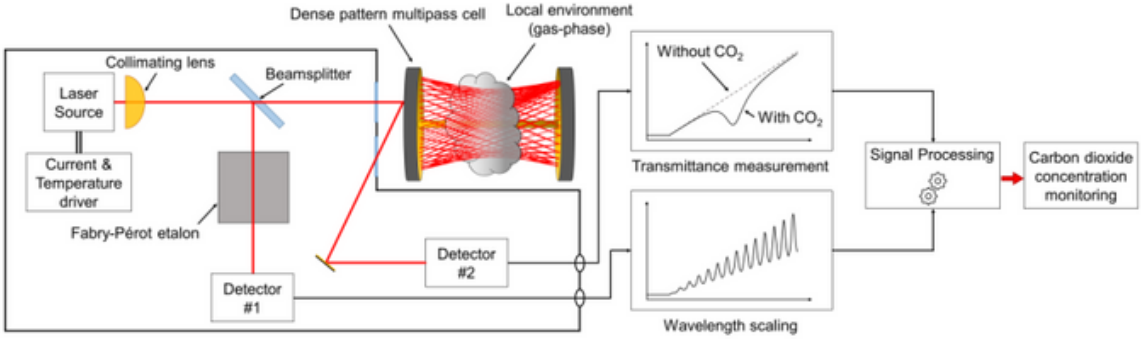

Figure 1: Illustration of the detection scheme

Each system currently allows a local measurement with an acquisition rate up to 100 measures per second and a limit of detection of 2 ppm with a 4 s integration time. An outdoor measurement campaign was managed by the INERIS (Institut National Environnement Industriel et Risques), which consist of a massive city-scale gas release in the presence of reference instruments. In this framework, we were invited to test our sensors. The experimental setup will be detailed and the results of this campaign will also be presented.

Clément Jacquemin
University: University of Reims Champagne-Ardenne
PhD title: Emission stabilization of quantum cascade laser sources for gas detection with high resolution and sensivity.
Thesis year: 3rd
Doctoral School (for URCA PhD students only): Digital and Engineering Sciences

Influence of organic amendments from date-palm residues on soil water retention and carbon mineralisation of arid and semi-arid soils.

Elie Le Guyader[1], Xavier Morvan[1], Maxime Gommeaux[1] , Vincent Miconnet[1], Béatrice Marin[1], Mohamed Moussa[2] , Nissaf Karbout[2] , Ines Rahma Zoghlami[2] , Houda Oueriemmi[2], Diego Intrigliolo[3] , María José Delgado[4]

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2- Institute of arid regions, Medenine, Eremology and Combating Desertification Lab. (LR16IRA01) - 4100, Medenine, Tunisia
3- Spanish National Research Council (CSIC), Desertification Research Center (CIDE), 46113, Moncada, Valencia, Spain
4- Department of Agricultural Chemistry, Geology and Edaphology, University of Murcia, Campus Espinardo 4021, 30080 Murcia, Spain

The cultivated dryland soils of North Africa present low fertility and productivity, mainly due to low organic matter content. Date palm residues are an abundant resource in these regions and only a minor part of residues is valued in oasian agroecosystems. The European project ISFERALDA aims at developing the use of organic amendments produced from date palm residues by traditional processes (composting and slow pyrolysis) as a key tool to improve soil fertility and properties.

Experiments were conducted in the laboratory to evaluate the effects of compost and/or biochar amendments on soil water retention properties. A soil with properties close to oasis soil was collected in a semi-arid area of southeast Spain. In addition, soil sand content was artificially increased by supplementing the natural soil (sandy loam texture) with washed quartz sand in order to further test the influence of soil texture. The different types of organic amendments (compost and/or biochar) were tested at a dose of 60 t/ha: compost alone, biochar alone and mixture of compost and biochar (50:50 in weight). Water retention curves were obtained using pressure membrane apparatus at nine different matric potentials (pF), ranging from the saturation to the permanent wilting point. The results showed that water retention was generally improved in soil with organic amendments regardless the pF and the soil type. The higher the sand content was, the more significantly the available water capacity increased with organic amendments. The increase ranged between 4 and 25% in the natural soil and the sand enriched soil (loamy sand texture), respectively.

The soil respiration and nitrogen mineralisation dynamics were measured in a soil incubation experiment. A cultivated sandy soil from a Tunisian oasis was amended with compost (60 t/ha) and/or biochar at different doses (18 and 36 t/ha). All combinations of organic amendments increased soil carbon mineralisation compared to non-amended soil. The highest mineralisation rates were observed in soil amended with compost and biochar, followed by compost alone. CO2 emission were lower if compost + biochar were subjected to a two-week activation period before application to the soil.

Those two experiments showed that organic amendments can improve oasian soil properties (water retention and mineralisation of organic matter) and are a relevant way to value local agricultural residues.

Elie Le Guyader
University: University of Reims Champagne-Ardenne
PhD title: Characterization and impact of organic amendments from date palm residues on some soil properties in arid and semi-arid zones.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Agriculture, Food, Biology, Environment, Health

Development of luminescent nanoparticles for the detection of pathogen-related diseases in plants.

Ana Brinca-Moreira[1,2,3,4], António José Fernandes[1], Alexandre Faia Carvalho[1], Teresa Monteiro[1], Vincenzo Mondello [4], Càtia Pinto[2], Rita Branquinho[3], Florence Fontaine [4], Florinda Mendes Costa[1]

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2- Associação SFCOLAB - Laboratório Colaborativo para a Inovação Digital na Agricultura, 2560-312 Torres Vedras, Portugal
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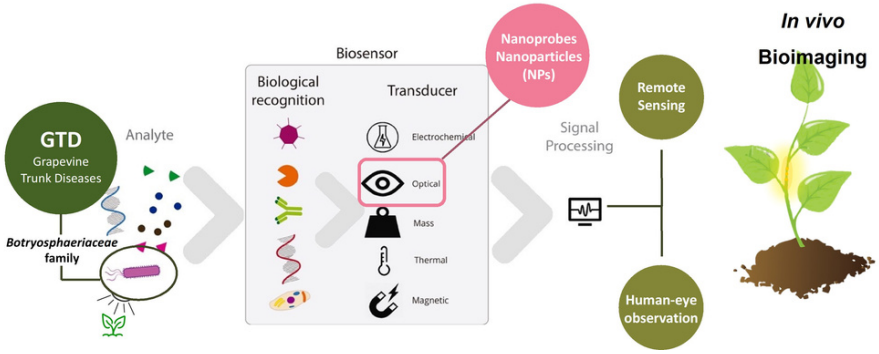
The early and accurate detection and diagnosis of plant diseases are of utmost importance in plant production and food security. This becomes even more relevant when concerns deadly plant pathogens (mainly fungi, bacteria and viruses), since it leads to significant production losses, compromising the economic viability of the crop. It is estimated that 20-40% of worldwide production losses are due to plant infection, annually. Therefore, nanoscience and nanotechnology are becoming emergent topics in plant and agriculture related issues and opportunities for sensing technologies envisaging minimal invasive early-stage pathogen diseases detection and management.

Luminescent nanomaterials have promising advantages in bioimaging, empowering real-time *in vivo* monitoring with enhanced sensitivity and depth, avoiding tissue autofluorescence. A similar approach is proposed foreseeing the development of bio-compatible functionalized luminescent silicate-based nanoparticles (NPs), obtained by pulsed-laser ablation in liquid (PLAL), targeting specific phytopathogens.

The present work aims to develop early-stage nanodiagnostic probes targeting the *Neofusicoccum parvum* and *Diplodia seriata* phytopathogens, responsible for the grapevine trunk diseases (GTDs). GTDs are considered to constitute the main cause of vine decline, representing one the main sources of yield and quality loss in viticulture and a threat to the viability of the viticulture heritage.

To achieve these nanodiagnostic probes for GTDs, it is intended to cover all the development from luminescent NPs (LNPs) synthesis and characterization, functionalization and bioperformance evaluation via in vitro and in vivo analysis, through a deeper interaction between nanoparticle-phytopathogen-plant.



Ana Brinca-Moreira
Universities: Universidade de Aveiro and University of Reims Champagne-Ardenne
PhD title: LightMyPath - Phytonanodiagnostic probes using luminescent nanoparticles for the early-stage detection of pathogen-related diseases in plants.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Agriculture, Food, Biology, Environment, Health

Behaviour of ciprofloxacin and Cu(II) in biosolid-amended soils.

Ghinwa Mortada, Emmanuel Guillon , Stéphanie Sayen

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Fluoroquinolone antibiotics are contaminants of emerging concern detected in biosolids, manure and wastewater treatment plant effluents, and thus widely encountered in the environment especially in soils and waters via amendments and/or irrigation. Once in soils, depending on their mobility, these contaminants can be transferred to the water bodies and taken up by crop plants. One of the first steps needed to assess the transfer risk of these pharmaceuticals and predict their fate in the environment is to understand their retention/release behaviour at the soil/water interface which is governed by their sorption. Metallic trace elements (MTE) which are naturally present in soils or originate from industrial wastes and various agricultural treatments, can significantly modify the antibiotics sorption properties since they are likely to interact together by complexation. It is thus important to bring knowledge in this sense in a context of multi-contamination as it is the case in the real environment.

In this context, this study focused on ciprofloxacin (CIP), a fluoroquinolone antibiotic widely used in human medicine, and Cu(II) as MTE present in soils and biosolids. Their adsorption was studied on two soils (one acidic and one alkaline) of different composition and physico-chemical properties (texture, organic carbon and carbonate contents, CEC) using the batch technique. The same experiments were carried out onto amended-soils (prepared by mixing different biosolids with the selected soils) in order to study the impact of the amendment on both contaminant behaviour. Finally, similar experiments were conducted for bi-adsorbate systems (CIP and Cu) in order to study the influence of antibiotic and MTE co-presence on their respective retention/mobility in soils and amended-soils. The objectives of this study are to identify the most (and least) risky conditions in terms of contaminant transfer.

Ghinwa Mortada
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PhD title: Resilience: retention and transfer of antibiotics and metallic trace elements on amended-soils: influence of their co-presence on their respective behaviour.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Agriculture, Food, Biology, Environment, Health

Uncertainty estimation of scenarios for greenhouse gas mitigation in the meat and milk industry.

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2- Food and Agriculture Organization of the United Nations, Rome, Italy

Meat and milk industry accounts almost 7 billion tons of CO2eq. It represents almost 14 percent of the global anthropogenic emissions. The livestock sector is considered as an important actor for climate change and the scientific community is aware that the increase of animal demand associated with an increase of population, has several implications over the production systems with severe consequences over the environment. Global demand for livestock products is projected to double by 2050 in developing countries and to grow by 10 percent in developed countries, increasing pressure on ecosystems that are already stretched.

To estimate the environmental impacts of meat and milk industry, FAO (Food and Agriculture Organization of the United Nations) has developed the Global Livestock Environmental Assessment Model (GLEAM). GLEAM is a computational model based on the Intergovernmental Panel on Climate Change (IPCC) guidelines on a Tier-2 life cycle assessment, that uses spatial data to generate baselines of greenhouse gasses emissions (GHG) from livestock systems and to evaluate mitigation scenarios related to the production, processing, and transport of livestock related products.

GLEAM has been used by several countries to calculate and report the GHG emissions associated to the livestock sector, as part of their climate actions plans. However, the model produces uncertain results due to the IPCC emission factors used in the process, and the procedure to collect, manipulate and process data. Our research focuses on the calculation of uncertainty and sensitivity analysis for GLEAM, for which, simulations to determine the spread of errors due to uncertainties in the model and the data will be processed using the Monte Carlo model.

Additionally, the research will generate sensitivity analysis to determine, through modelling, the impact associated with each of the individual input parameters to the total GHG estimations. This will point to priority areas for data collection and model improvement. For this, a new methodology is proposed to restructure GLEAM with a new processing software that can reduce global processing times, and will be used by FAO in the publication of the new model update 4.0

Armando Rivera
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PhD title: Greenhouse gas mitigation options in livestock systems: A study of uncertainty in estimates.
Thesis year: 4th

Effects of dietary mercury on proteome and metabolome in *Dreissena polymorpha*, a sentinel of our aquatic environment.

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Our aquatic environment faces many pollutants of great concern and their bioaccumulation continues to grow. Bioaccumulation of methylmercury (MeHg) in the food chain is a recognized health risk, yet studies on effects of inorganic Hg (IHg) at high concentrations through direct water contamination are predominant in the literature. This study aimed to identify and compare IHg and MeHg molecular toxicity pathways in the zebra mussel (*D.polymorpha*) by diet. *Microalgae Nannochloropsis* sp were exposed to 20 fg/cell of IHg and MeHg during 2h and then, zebra mussels were fed with 1.108 cell/ml of microalgae. Effects after 24h of exposure were measured by proteomic and metabolomic non targeted approaches in gills and digestive gland of *D.polymorpha*: 190 proteins were modulated by IHg in gills and 102 in the digestive gland.

These proteins are mainly involved in signaling pathways and energy metabolism. MeHg modulated 314 proteins in gills and 133 in the digestive gland, involved in glycerolipids metabolism and genetic material repair (DNA and proteins). 21 metabolites are modulated independently from the condition of exposure and the organs. MeHg stands out by modulating 22 metabolites in the digestive gland, 9 in the gills while IHg is involved in common responses. Moreover, IHg and MeHg decrease the catalase activity in the digestive gland, 1.29x and 2.86x respectively while the gene expression of the catalase is increasing in the digestive gland (2.41x) and the gills (2.57x).

IHg increase the expression of gst gene in the gills (2.21x) and the digestive gland (5.37x). Overall, the results showed that IHg and MeHg have different molecular toxicity pathways and MeHg caused a higher alteration than IHg in non-targeted responses while it is mixed in targeted responses. Our work highlights the need for improving our understanding of the effects of mercury through trophic transfer among primary producers and consumers.

Clarisse Séguin
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PhD title: Fate and impact of mercury in aquatic food chains.
Thesis year: 1st
Doctoral School (for URCA PhD students only): Agriculture, Food, Biology, Environment, Health

The Artificial Intelligence-Based Vibratory Simulator for Rotating Machinery.

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Digital twin technology has emerged as a powerful tool for optimizing energy usage, reducing waste, and improving efficiency, all of which are critical for reducing environmental impact across a range of industries. Digital twins can be applied to various systems, including buildings, factories, transportation networks, and energy grids, to help achieve environmental sustainability goals. In the context of maintenance 4.0, digital twins can address the challenge of insufficient historical data by simulating different operating modes using machine learning algorithms, specifically through classification-based diagnosis.

However, to achieve reliable diagnosis, the optimal use of both historical and simulated data on a hybrid database needs to be determined. This optimization would greatly enhance the value of digital twins in the context of maintenance 4.0, enabling businesses to optimize maintenance strategies and reduce operational costs. In this paper, a digital twin is developed to generate data with an outer race default signature using a discrete element model (DEM) and a finite element model (FEM).

The generated data, which include five sizes of defaults, are measured on a test bench and used to train a MSVM classification algorithm. Predictions are made on historical data describing the same operating modes as the generated data, demonstrating an improvement in classification accuracy with the model integrating flexibility compared to the existing literature model.

In conclusion, digital twin technology has immense potential to revolutionize maintenance 4.0 and reduce environmental impact across a range of industries. By simulating real-world conditions and monitoring performance in real-time, digital twins can identify inefficiencies and suggest improvements that can lead to significant reductions in energy consumption and greenhouse gas emissions. Achieving optimal use of both historical and simulated data on a hybrid database is essential for ensuring the most reliable diagnosis and maximizing the value of digital twins.

Souleymane Sow
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PhD title: The Artificial Intelligence-Based Vibratory Simulator for Rotating Machinery.
Thesis year: 2nd
Doctoral School (for URCA PhD students only): Digital and Engineering Sciences

Innovative feeds for *Oreochromis niloticus* reared in aquaponic systems.

Isabella Tucciarone, Giulia Secci, Giuliana Parisi

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Introduction:
The combination of hydroponics and aquaculture is called aquaponics, and this represents a rapid and efficient method to obtain both plant and fish products. This method provides that, after feed administration, the sludge produced by fish is then metabolised by bacteria contained in a biofilter, thus providing nutrients useful for plant growth. This uptake is also necessary to purify water, making it suitable again for fish life. As a result, aquaponics resembles a natural biological cycle minimising both plant and fish farm inputs (such as fertilizer and water) and reducing soil utilisation. However, even in this virtuous system, feed is required. In this regard, the economic and environmental impacts of feed ingredients (such as fish and soybean meal and oils) are well known, so that research is increasingly investigating innovative, environmentally friendly feeds as viable substitutes.

Objectives:
The primary aim of the project will be to highlight the existence of a positive impact, given by the use of non-conventional feeds (*Hermetia illucens* meal, *Arthrospira platensis* meal, vegetable waste meal, and poultry slaughter by-product meal), on the chemical and physical characteristics of fish reared in aquaponic systems. In addition, the effects that unconventional feeds could have on the quality of the waste created by the fish (unswallowed feed, faeces, excretions) and the impact that this would consequently have on water quality will be considered. The project also proposes the evaluation of the quality of the plant obtained.

Materials and methods:
Based on the assumptions listed above, this project proposes the implementation of aquaponic systems that will allow to compare the effect of 4 different feeds (as listed above) on the chemical and physical characteristics of *Oreochromis niloticus*, the main fish species farmed in aquaponic systems. The feeds under study will be isoproteic, isolipidic and isoenergetic; they differ in terms of the protein source present. The plant element to be cultivated will be basil (*Ocimum basilicum*), a plant found in many typical and popular preparations. In order to achieve the envisaged objectives, the chemical characteristics of the ingredients that make the feeds peculiar will be analysed as well as the chemical composition of the formulated feeds; the zootechnical performance on the farm (growth, mortality, fish feed conversion ratio), and the quality of the farm water will be monitored and analysed; both physical (length, pH, colour, WHC, total weight, weight of organs, texture) and chemical (moisture, ash, crude protein, total lipids, carbohydrates, amino acid profile, fatty acid profile, mineral profile, total carotenoid content, DPPH, TBARS) properties will be analysed on the fish/fillets obtained, the results of which will then be compared to study the differences and, if any exist, to identify their causes. Instead, parameters such as pH, temperature, redox potential, dissolved oxygen and electrical conductivity will be monitored to study water quality. Finally, the plant biomass, elemental composition of the biomass and the total phenolic content of the plant product will also be determined.

Expected results: What is expected from this study is represented by beneficial results for both fish quality and the environment, with the aim to realize a sustainable production. For example, *A. platensis* could produce fillets rich in PUFA N-3 (whose positive effects on human health are well known), vegetable waste could lead to fillets rich in phenolic compounds (excellent antioxidants) and finally *H. illucens* and poultry slaughter waste as feed ingredients could produce fillets with a high protein content. About the environmental benefits associated with the choice of these ingredients replacing fishmeal, these will undoubtedly increase the sustainability of this system which, given its circularity, is already highly sustainable. Furthermore, the use of waste from other food chains (vegetable and animal waste) will limit the significant environmental impact associated with their disposal and also the loss of these valuable resources which, instead of being thrown away, become the starting point of a new production cycle.

Isabella Tucciarone
University: Università degli studi di Firenze
PhD title: From land to water: circularity for the development of a zero-waste food supply chain.
Thesis year: 1st

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SOCIAL EVENT

Social event will take place on **Thursday March 30, 2023 at 6 p.m.**

We offer you a guided tour of **Reims Cathedral**
followed by a cocktail reception at **La Caserne Chanzy**.

One hour guided tour of the cathedral will start at 6 p.m.
(participants should meet at 5:45 p.m. in front of the cathedral), visit will be available in English or French.

Cocktail reception will start at 7 p.m.

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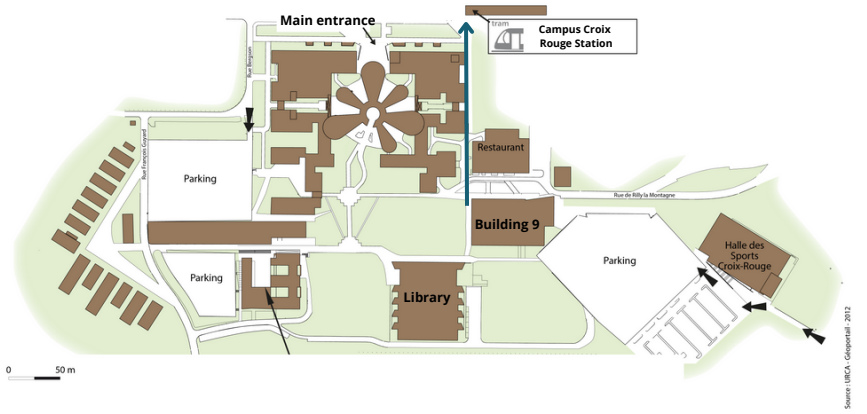
La Caserne Chanzy was a fire station until 1993, it became a four-stars hotel in 2019.

La Caserne Chanzy in 1993 and 2023.

Address: Place du Cardinal Luçon, 51100 Reims (cathedral) - 18 Rue Tronsson Ducoudray, 51100 Reims (La Caserne Chanzy)

Direction by tram:
Follow direction bellow to reach "Campus Croix Rouge" tram station



Take line A B going to "Neufchatel", exit at "Opera Cathedral", Reims Cathedral is located at 3 minutes walking distance.

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