

## EDITORS

Ashish Avasthi, Gian Maria Greco,  
Polat Gotkas, Gledson Emidio

# 10<sup>th</sup> Annual Conference of the Marie Curie Alumni Association

February 24-25, 2023  
CÓRDOBA, Spain

# BOOK OF ABSTRACTS

## 2023 POSTER/TALK SESSIONS



MARIE CURIE  
ALUMNI  
ASSOCIATION





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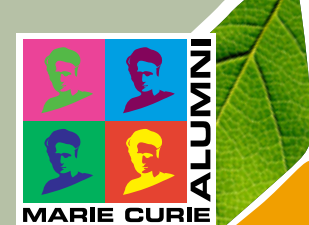
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# Introduction



The Annual Conference is a key event in the life of the Marie Curie Alumni Association (MCAA) for a variety of reasons. It is where members can meet in person, look together at past activities and plan future directions for the community as a community. It is also where the MCAA meets its stakeholders and non-MCAA researchers. For years now, the MCAA has been dedicating space within its annual conference for poster presentations by members and non-members. The poster sessions have always been one of the most engaging events at the conference; one that participants look forward to. This is because the poster sessions are where people can present their research and receive feedback from highly trained experts in a widely diverse range of disciplines, i.e., the MCAA members. Along with the poster session, this year we introduce a lightning talk session to the conference where researchers present their research on the dias/online using 3 slides in under 3 minutes.

This book gathers together the abstracts of the posters and lightning talks presented at the Annual Conference of the Marie Curie Alumni Association, which took place in Córdoba (Spain) as a hybrid event on 24-25 February 2023. After the selection of applications, proposals were categorised and divided into different areas, some approximately corresponding to the MSCA panels. After the selection of applications, proposals were categorised and divided into different areas. Some corresponded more or less to the MSCA panels and others, i.e. Career Development and Sustainable Research Practices, were two topics of great relevance for the association. Since the conference was going to be a hybrid event, authors had the possibility to either present in person or online. The presentational panel included posters from all the areas. As for the lightning talks panels (took place in hybrid format), some topics were merged into a single panel or spread over two panels for better organisation.

The final distribution of topics was the following:

- CD** Career Development
- CHE** Chemistry
- ENG** Engineering
- ENV** Environmental Sciences
- ES** Environmental Sustainability
- HA** Humanities and Arts
- LIF** Life Sciences
- PHY** Physics
- SRP** Sustainable Research Practice
- SSH** Social Sciences
- ECO** Economics

Each panel corresponds to a macro-section of this book. Within each macro-section, a page includes an abstract, an image of the poster or graphical abstract, and information about the author(s) and their organisation(s).

The abstracts collected in this book testify to the wealth of scientific and social interests within the MCAA and the Marie Skłodowska-Curie Actions programme. We encourage members and non-members to submit their posters or talks to future MCAA conferences.

## **The Editors**

Ashish Avasthi, Gian Maria Greco, Gledson Emídio, Polat Goktas



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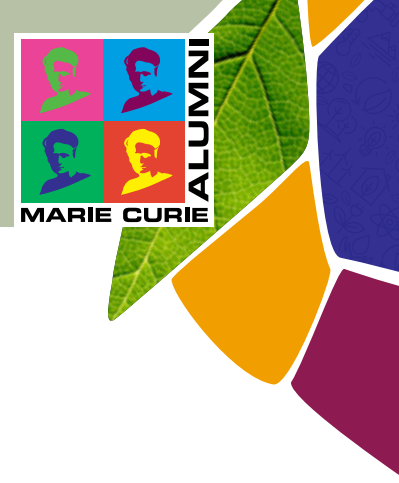




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# 2023 Awards



## Posters:

1. **Chidera Winifred Amazu**
2. **Mengyang Liu**
3. **Beatrice Musig**

## Lightning Talks:

### Session 1

#### **Environmental Sciences & Sustainable Research Practices**

**Giovanni Davide Barone**

### Session 2

#### **Life Sciences**

**Shaoshan Mai**

### Session 3

#### **Engineering, Chemistry, Physics**

**Houda Birwa**

### Session 4

#### **Career Development, Economics, Social Sciences, Humanities & Arts**

**Dora Keller**

There were 2 honorary mentions during the prize ceremony owing to the closely contested voting

1. **Süreyya Akyüz**
2. **Pablo Emiliano Tomatis**

# Presentials





# The importance of collaboration within pediatric oncology: a bottom-up approach boosted by an innovative personal development program

**Author(s):** Celina Szanto, Ingrid Valks, Marcel Kool, Annette Künkele, Gudrun Schleiermacher, Frank Speleman, Jan Molenaar

**\*Presenter:** Celina Szanto, Princess Máxima Center for Pediatric Oncology, Utrecht University, Utrecht, The Netherlands, [c.l.szanto-2@prinsesmaximacentrum.nl](mailto:c.l.szanto-2@prinsesmaximacentrum.nl)

## Abstract:

About 75% of new drug development fail in early development and 9 out of 10 clinical trials fail in pediatric cancer. This is caused by multiple factors:

1. Cancer in children is rare, making study groups small and investments unattractive
2. Lack of pediatric cancer specific biology driven approach in which target identification and validation is key
3. Data sharing between academic and industry is inefficient and there is a lack of multidisciplinary scientist for pediatric targeted drug development

There is a strong need for a new generation of creative, entrepreneurial scientist that will become Europe's next generation of leading researchers that will develop novel strategies in pre-clinical drug development and bridge the gap between academia and industry.

The VAGABOND ITN, consisting of 12 academic and 6 non-academic partners from 8 European countries, aims to create a multidisciplinary and multi-sectoral program to validate new therapeutic interventions in paediatric cancer and train a new generation of multidisciplinary scientist. Within pediatric oncology industry, pharma and academia collaborate within multiple initiatives (e.g. ITCC-P4, ACCELERATE), but these initiatives are organized top down and lack physical interactions between academia and industry. Here we apply a bottom-up method where the ESRs interact with pharma, industry and academia and thereby warrant implementation of interaction between these entities on the work floor. To take care of the well-being of the ESRs, their mental health and ensure optimal work-life balance within this ambitious program we introduced an

innovate personal development program BeyondU, developed by Ingrid Valks. Within BeyondU, the ESRs develop human-skills, increase their self-awareness and boost their social emotional intelligence and professional influence. BeyondU consists of six personal development pillars and continuous development of new human-skills. Each masterclass is a live experience and is the kick off of each pillar. Masterclasses include reflection and are centred around activities activating the body (experience, feel, listen), the mind (learn, understand, talk), and the heart (discover, connect, be). During the online interactive programme, ESRs receive a mixture of educational and motivational messages and assignments in alignment with the respective pillar. The ultimate objective is behavioural change and integration of insights into daily personal and professional life.

With this presentation the authors want to share their experiences on including personal development within an ITN training program. Besides the positive effects on the well-being of the ESRs, the BeyondU program had a strong impact on collaboration. From the start of the program, the ESRs formed a very close group, despite the cultural differences and being physically located in different European institutes. The ESRs are halfway through the program and we notice new collaborations between pediatric research groups and integration of academic expertise across Europe.

In conclusion offering courses on personal development and practicing well-being not only sets a foundation for your researchers to tackle stress, improve work-life balance and boost their professional influence, but also strongly improves collaboration within academia and industry.

**Scientific Area:** CD Career Development

**Acknowledgement:** The VAGABOND project received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 956285



# Synergy of non-thermal plasma with Ni/CeO<sub>2</sub> catalysts for CO<sub>2</sub> recycling

**Author(s):** Beatrice Musig, Jairo Barauna, Tomas Garcia, Maria Elena Galvez, Maria Victoria Navarro

**\*Presenter:** Beatrice Musig, Instituto de Carboquímica ICB-CSIC

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## Abstract:

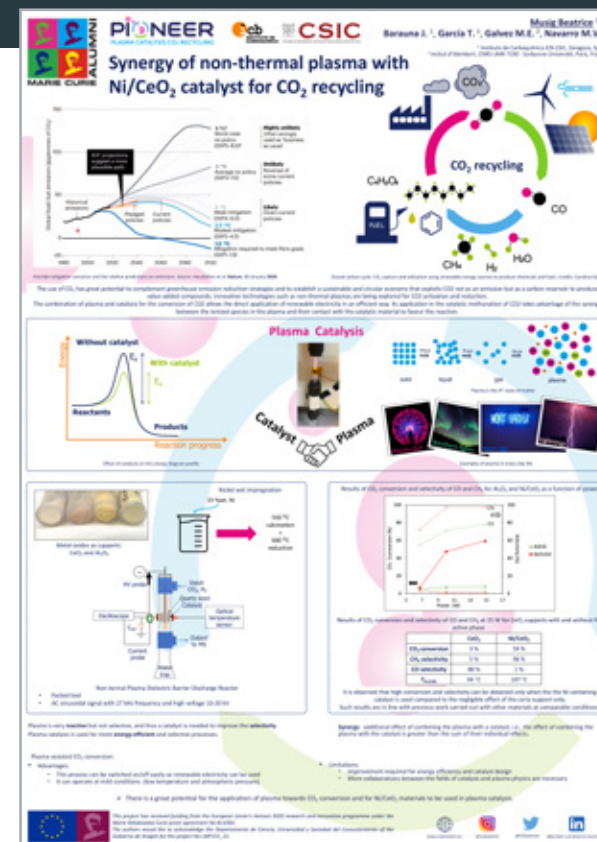
The use of CO<sub>2</sub> has great potential to complement greenhouse emission reduction strategies and to establish a sustainable and circular economy that exploits CO<sub>2</sub> not as an emission but as a carbon reservoir to produce value-added compounds. Innovative technologies such as non-thermal plasmas are being explored for CO<sub>2</sub> activation and reduction. The combination of plasma and catalysis for the conversion of CO<sub>2</sub> allows the direct application of renewable electricity in an efficient way. Its application in the catalytic methanation of CO<sub>2</sub> takes advantage of the synergy between the ionized species in the plasma and their contact with the catalytic material to favor the reaction.

In this work, plasma-assisted catalytic methanation has been studied in a fixed bed Dielectric Barrier Discharge (DBD) reactor supplied by a high voltage, alternating current power source with 27 kHz frequency and 20 kV peak-to-peak voltage. Several materials were tested in

this DBD reactor, including CeO<sub>2</sub> support and Ni/CeO<sub>2</sub> catalyst.

An optimization of the physicochemical properties of the catalysts used in plasma-assisted reactions is required in order to exploit the synergy between catalyst and plasma, as small particle size, high specific surface area, optimal basicity for CO<sub>2</sub> adsorption, oxygen vacancy formation, and low dielectric permittivity.

It is observed that high conversion and selectivity can be obtained at temperatures around 200 °C when the Ni containing catalyst is used compared to the negligible effect of the ceria support only. Such results are in line with previous work carried out with other materials at comparable conditions. It can be concluded that Ni/CeO<sub>2</sub> materials are promising catalysts for plasma-assisted CO<sub>2</sub> methanation, which proves to be more efficient than the conventional thermal catalysis process.



**Scientific Area:** CHE Chemistry

**Acknowledgement:** The authors would like to thank MSCA ITN grant N° 813393 and the Departamento de Ciencia, Universidad y Sociedad del Conocimiento del Gobierno de Aragón for Project LMP151\_21.





# Plasma Catalysis in liquid water for CO<sub>2</sub> conversion using Manganese Oxide catalysts

**Author(s):** Jairo Barauna, Tomás García, Vasile Parvulescu

**\*Presenter:** Jairo Barauna, CSIC - Instituto de Carboquímica

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## Abstract:

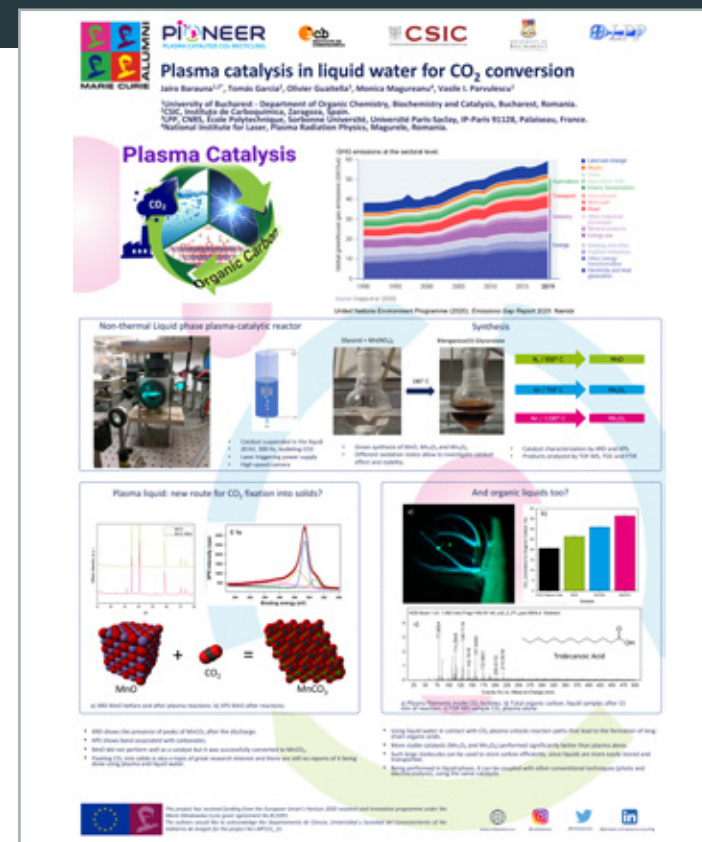
Reacting CO<sub>2</sub> with water using plasma can be a reliable, cost-effective and environmentally friendly way to recycle this greenhouse gas, especially if the products are liquids since these are easier to store and transport. However, when this reaction is performed in gas-phase plasma, it doesn't usually lead to significant liquid production, producing mostly CO + H<sub>2</sub>. On the other hand, by using liquid water, even in the absence of catalysts, the reaction of CO<sub>2</sub> + H<sub>2</sub>O is able to produce longer molecules, mainly organic acids. Based on the prospect of producing higher oxygenates, we studied the effect of suspended MnO and Mn<sub>2</sub>O<sub>3</sub> and Mn<sub>3</sub>O<sub>4</sub> catalysts in liquid water while bubbling CO<sub>2</sub> plasma.

The plasma-catalytic experiments associated to the measurement of the Total Organic Carbon (TOC) showed, indeed, an effective conversion of CO<sub>2</sub> into liquid organic phases like Tridecanoic Acid. Furthermore, conversion is higher in the presence of catalysts and the highest activity is the obtained with Mn<sub>2</sub>O<sub>3</sub>, followed by Mn<sub>3</sub>O<sub>4</sub> and MnO, this is related with the energy necessary to subtract lattice oxygen, creating oxygen vacancies that are crucial for the catalytic process. To assess the change in the selectivity, organic phases were separated by evaporation of the solvent and analyzed by Fourier Transform Infrared spectroscopy. Those spectra showed the presence of linear monomer-like compounds and organic acids in the presence of catalysts. Accordingly, the presence of the solid catalysts changes

the selectivity of the reaction to compounds with more C=O and C-O bonds.

The absence of C=O or C-O bonds in the case where no solids were used is evidence that oxygen is more importantly obtained from mechanisms involving the lattice oxygen in the metal oxides present. We then propose that the complete CO<sub>2</sub> breakage leads to the creation of \*HC radicals that can react with \*OH, ultimately chaining to (-CH<sub>2</sub>-)X as a result from the unique plasma-liquid interface. This mechanism is responsible for creating monomer-like linear molecules which grow by a process similar to radical polymerization, with the successive addition of radical blocks.

The same process occurs when solid particles are present but, in that case, there is the participation of CO<sub>2</sub> adsorbed species on the surface of the solids. The oxygen donated by the oxide increases the amount of carbon-oxygen bonds in the final product, explaining the difference in the products. Finally, it is possible to conclude that performing CO<sub>2</sub> conversion using liquid water as the hydrogen source is a promising technique to produce organic liquids especially with the addition of manganese oxides. Using two different catalysts it was possible to correlate the results with the lattice oxygen mobility and conversion was increased up to 75%, while also changing the selectivity towards the production of organic acids.



**Scientific Area:** CHE Chemistry

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 813393.





# Ensemble Machine Learning Model to Predict SARS-CoV-2 T-Cell Epitopes as Potential Vaccine Targets

**Author(s):** Amit Jain, Ehtishamul Haq, Abolfazl Mehbodniya, Julian Webber

**\*Presenter:** Abolfazl Mehbodniya, University Institute of Computing, Chandigarh University  
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## Abstract:

An ongoing outbreak of coronavirus disease 2019 (COVID-19), caused by a single-stranded RNA virus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused a worldwide pandemic that continues to date. Vaccination has proven to be the most effective technique, by far, for the treatment of COVID-19 and to combat the outbreak. Among all vaccine types, epitope-based peptide vaccines have received less attention and hold a large untapped potential for boosting vaccine safety and immunogenicity. Peptides used in such vaccine technology are chemically synthesized based on the amino acid sequences of antigenic proteins (T-cell epitopes) of the target pathogen. Using wet-lab experiments to identify antigenic proteins is very difficult, expensive, and time-consuming. We hereby propose an ensemble machine learning (ML) model for the prediction of T-cell epitopes (also known as immune relevant determinants or antigenic determinants) against SARS-CoV-2, utilizing physicochemical properties of amino acids. To train the model, we retrieved the experimentally determined SARS-CoV-2

T-cell epitopes from Immune Epitope Database and Analysis Resource (IEDB) repository. The model so developed achieved accuracy, AUC (Area under the ROC curve), Gini, specificity, sensitivity, F-score, and precision of 98.20%, 0.991, 0.994, 0.971, 0.982, 0.990, and 0.981, respectively, using a test set consisting of SARS-CoV-2 peptides (T-cell epitopes and non-epitopes) obtained from IEDB. The average accuracy of 97.98% was recorded in repeated 5-fold cross validation. Its comparison with 05 robust machine learning classifiers and existing T-cell epitope prediction techniques, such as NetMHC and CTLpred, suggest the proposed work as a better model. The predicted epitopes from the current model could possess a high probability to act as potential peptide vaccine candidates subjected to in vitro and in vivo scientific assessments. The model developed would help scientific community working in vaccine development save time to screen the active T-cell epitope candidates of SARS-CoV-2 against the inactive ones.

**An Ensemble Machine-Learning Technique to Predict T-Cell Epitopes of SARS-CoV-2 virus as Potential Vaccine Candidates**

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**Abstract**

Vaccination has proven to be the most effective technique, by far, for the treatment of COVID-19 and to combat the outbreak. Among all vaccine types, epitope-based peptide vaccines have received less attention. Using wet-lab experiments to design such vaccines is difficult, expensive, and time-consuming. We hereby propose an ensemble machine learning (ML) model for the prediction of T-cell epitopes against SARS-CoV-2, utilizing physicochemical properties of amino acids.

**Introduction**

An infection outbreak caused by a novel coronavirus has proliferated rapidly around the world. The World Health Organization (WHO) designated the disease as COVID-19 [1,2]. Coronaviruses (CoV) are members of the Coronaviridae family of viruses. They are enveloped viruses with extremely long single-stranded RNA genomes ranging from 26 to 32 kilobases in length [3]. The SARS-CoV-2 infection triggers both innate and adaptive immune responses [4]. Cytotoxic CD8+ T cells are essential players in the immune response to viral infections because they directly participate in viral clearance [5]. Compared to conventional vaccine design techniques, it becomes vital to apply an epitope-based strategy that is cost-effective, safe, and takes less time where in selecting antigenic T-cell epitopes is required which if done using wet lab is difficult. With Machine Learning (ML) techniques the T-cell epitopes can be predicted with high accuracy. It would also save more physical experimental time and effort for speedy vaccine development compared to wet-lab techniques. This study proposes an ensemble machine learning model to predict T-cell epitopes of the SARS-CoV-2 virus. The predicted T-cell epitopes can act as potential vaccine targets for developing an epitope-based peptide vaccine against this pathogen.

**Methods and Materials**

**a) Retrieval of SARS-CoV-2 Peptide Sequences:** The experimentally determined peptide sequences (T-cell epitopes and non-epitopes) were retrieved from IEDB [24].

**b) Proposed Methodology:** The proposed methodology for building the proposed ensemble model is depicted in Figure 1 above and proposed model in Figure 2.

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**Table 2: Repeated five (05) fold cross-validation results**

Iteration	Acc	Spec	Sens	F1	Prec	AUC	Gini
1	98.24	98.21	97.88	98.19	97.89	0.991	0.982
2	97.35	97.87	97.65	98.02	97.80	0.990	0.981
3	98.15	98.15	98.76	97.98	97.80	0.991	0.982
4	98.09	98.32	97.65	98.21	98.02	0.991	0.982
5	97.70	98.30	97.96	97.98	97.82	0.990	0.981
<b>Mean Acc. / Iteration (A)</b>	<b>98.00</b>	<b>98.17</b>	<b>97.98</b>	<b>97.93</b>	<b>97.86</b>	<b>0.990</b>	<b>0.981</b>

**Figure 5: Accuracy plot of repeated 5-fold cross validation**

**Table 3: Comparison with existing benchmark techniques**

SARS-CoV-2 Peptide Sequence	Actual class	Binding capacity by NetMHC	Predictions by CTLpred	Predictions by the proposed model
AKVAVDQ	1	37	1	1
DAVYDQ	1	58	1	1
DAVYDQAVAVR	1	62	-	1
LPVAVAVR	0	89	0	0
LVAVYDQ	1	37	0	0
PLVAVAVR	0	61	0	0

**Figure 2: Proposed Ensemble Machine Learning Model**

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**Results**

**a) Performance metrics based Results:** The metrics used for evaluating the performance of the proposed model and existing classifiers as well as their values when evaluated on test set are given in Table 1.

**Table 1: Results of proposed and existing models**

Model	Accuracy (%)	AUC	Gini	Sensitivity	Specificity	F-score	Precision
<b>NetMHC</b>	95.86	0.983	0.980	0.959	0.971	0.950	0.959
<b>CTLpred</b>	96.81	0.978	0.929	0.979	0.959	0.970	0.959
<b>SVM</b>	96.32	0.982	0.992	0.983	0.946	0.957	0.948
<b>RandomForest</b>	97.21	0.983	0.990	0.985	0.941	0.964	0.971
<b>AdaBoost</b>	95.87	0.989	0.978	0.982	0.957	0.958	0.976
<b>Proposed Model</b>	98.20	0.991	0.994	0.982	0.971	0.990	0.981

**Figure 3: ROC curve of the proposed ensemble model**

**Figure 4: Accuracy bar chart**

**b) Result Analysis of Repeated K-fold Cross Validation**

The accuracies obtained iteration-wise is described in Table 2 and Figure 5 depicts the accuracies plot of all iterations as recorded in a repeated 5-fold CV.

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**References**

1. WHO. Coronavirus disease (COVID-19) outbreak. *WHO Weekly Epidemiol. Rec.* 2020; 25: 1-10.

2. WHO. Coronavirus disease (COVID-19) outbreak. *WHO Weekly Epidemiol. Rec.* 2020; 25: 1-10.

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5. WHO. Coronavirus disease (COVID-19) outbreak. *WHO Weekly Epidemiol. Rec.* 2020; 25: 1-10.

**Conclusions**

In this study, an ensemble ML model to predict SARS-CoV-2 virus T-cell epitopes based on the majority vote of five random forest models has been proposed and achieved an accuracy, AUC, Gini, sensitivity, specificity, F-score, and precision of 98.20%, 0.991, 0.994, 0.982, 0.971, 0.990, and 0.981, respectively, when evaluated on the test set. The results indicate that the proposed ensemble model performs better than the existing classification models. The performance of the proposed model is practically linear and a mean accuracy of 97.99% was recorded in 5-fold cross validation and when compared with NetMHC and CTLpred server, using a blind dataset clearly indicate that the proposed model performs much better than existing techniques. In conclusion, it is clear that epitope-based vaccines have a tremendous potential and should be considered in the race for rapid development of protective vaccines against SARS-CoV-2.

**Scientific Area:** ENG Engineering

**Acknowledgement:** This work was partially supported by the Kuwait Foundation for Advancement of Sciences (KFAS) under Grant #PR19-13NH-04.

Book of Abstracts - Posters

13

**Author(s):** Ana Kramar, Javier Gonzalez-Benito

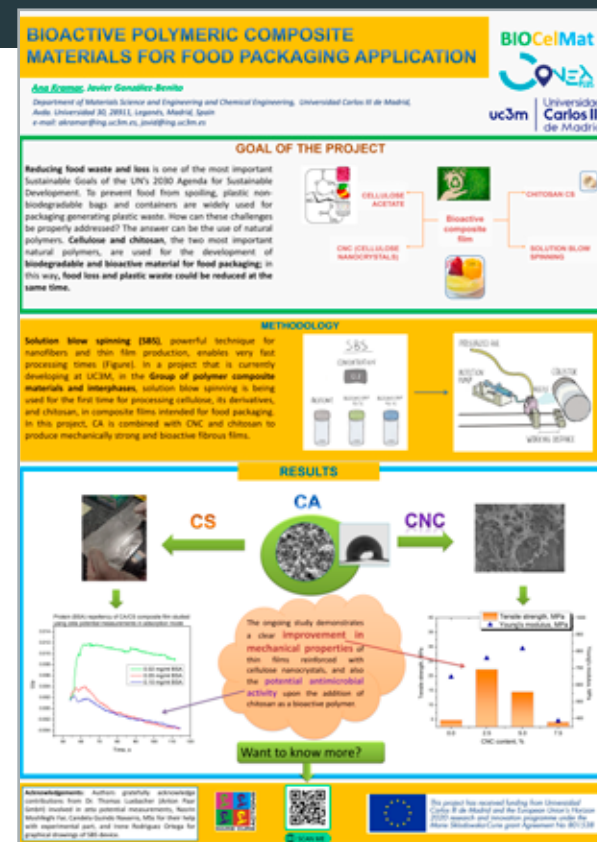
**\*Presenter:** Ana Kramar, Department of Materials Science and Engineering and Chemical engineering and Instituto Tecnológico de Química y Materiales “Álvaro Alonso Barba”, Universidad Carlos III de Madrid, Avda. Universidad 30, 28911 Leganés, Spain

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## Abstract:

Reducing food waste and loss is one of the most important Sustainable Goals of the UN's 2030 Agenda for Sustainable Development, especially in a world where hunger in many countries is a very serious issue. To prevent food from spoiling, plastic non-biodegradable bags and containers are widely used for packaging; however, this generates a threat to the environment in a form of increasing plastic waste. How can these challenges be properly addressed? The answer can be the use of natural polymers that have outstanding properties besides their possibility of being non-toxically biodegraded to avoid negative environmental impact. Cellulose and chitosan, the two most important natural polymers, are proposed to be used for the development of biodegradable and bioactive material for food packaging; in this way, food loss and plastic waste could be reduced at the same time. One of the ways to tailor the properties of biopolymers is by the control of morphology, for instance through their preparation in the form of non-woven mats constituted by nanofibers or very thin films with a high surface-to-volume ratio. For example, a fibrous cellulose ester, cellulose acetate, is more hydrophobic when constituted from nanofibers compared to its bulk counterpart. Similarly, nanofibrous chitosan shows an outstanding

antimicrobial effect, much higher than some conventional antibiotics. The preparation of biopolymeric nanofibers and thin films can be performed by employing various spinning methods, such as electrospinning and solution blow spinning. Solution blow spinning, a more recent method for nanofibers and thin film production, has some advantages compared to electrospinning. With solution blow spinning, a short processing time can be achieved, without the need to apply high electric fields thus making this technique more eco-friendly. In a project that is currently developing at Universidad Carlos III de Madrid, in the Group of polymer composite materials and interphases, solution blow spinning is being used for the first time for processing cellulose, its derivatives, and chitosan, in composite films intended for food packaging. In this project, an ester of cellulose is combined with cellulose nanocrystals and chitosan to produce mechanically strong and bioactive fibrous films. The ongoing study demonstrates a clear improvement in the mechanical properties of thin films reinforced with cellulose nanocrystals and also the potential antimicrobial activity upon the addition of chitosan as a bioactive polymer.



**Scientific Area:** ENG Engineering

**Acknowledgement:** This work is financed by CONEX-Plus program of UC3M and European Commission through the MSCA COFUND Action (G.A. No. 801538).



# Towards a risk-based decision framework for decision support in HITL process control rooms

**Author(s):** Chidera Winifred Amazu, Houda Briwa, Micaela Demichela, Davide Fissore, Maria Chiara Leva

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## Abstract:

In safety-critical systems like several process plants, safety is known to be of paramount importance. Safety is compromised by many factors, of which human error is considered one of the leading contributors. Despite in recent years, the attention on human errors has been raised, both in relation to risk assessment and in risk management, there are still recognised gaps. These result from the need for more explicit inclusion of human and organisational factors as sources of errors, but also as recovery means. Operators have now to deal with increasing process and equipment complexity, and automation; a lighter physical contribution of operators is counter-balanced by an increased cognitive load.

This is particularly relevant in control rooms, where an increasing number of alarms, especially in abnormal situations and system failures, forces the cognitive load of control room operators. A human-centred approach to safety analysis based on human-in-the-loop (HITL) configurations would be ideal to face these incoming issues. Such an approach should address gaps in current efforts to assess human performance through human reliability methods. This research aims to develop an innovative methodological framework and the related tools to support operators' decisions in critical

process safety..

Achieving this goal entails; 1. capturing the detailed tasks and error modes during operator-system interaction, 2. including detailed cognitive load data into the analysis through new monitoring techniques, 3. optimising the data analysis and integration methods for subsequent human and system behaviour analysis and prediction, 4. identifying the key factors and performance indicators for process control and safety monitoring in such configurations, 5. optimising process control and elements in control rooms of process plants, such as the human system interfaces and troubleshooting procedures, while taking into account the risks.

The framework will be verified and validated through expert analysis and experimental studies using industry-related scenarios. Though developed considering process plants, the framework is proposed for adaptation in energy infrastructure and non-control room but safety-critical facilities. This work is under development within the collaborative intelligence for safety Critical systems project (CISC). The CISC project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie grant agreement no. 955901.

**Towards a risk-based decision framework for decision support in HITL process control rooms**

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Politecnico di Torino, Italy and Technological University Dublin, Ireland\*

**Abstract**

In safety-critical systems like several process plants, safety is known to be of paramount importance. Safety is compromised by many factors, of which human error is considered one of the leading contributors. Despite in recent years the attention on human errors has been raised, both in relation to risk assessment, and in risk management, there are still recognised gaps. These result from the need for more explicit inclusion of human and organisational factors as sources of errors, but also as recovery means. Operators have now to deal with increasing process and equipment complexity, and automation; a lighter physical contribution of operators is counter-balanced by an increased cognitive load. This is particularly relevant in control rooms, where an increasing number of alarms, especially in abnormal situations and systems failures, forces the cognitive load of control room operators. A human-centred approach to safety analysis based on human-in-the-loop (HITL) configurations would be ideal to face these incoming issues. Such an approach should address gaps in current efforts to assess human performance through human reliability methods. This research aims to develop an innovative methodological framework and the related tools to support operators' decisions in critical process safety.

**Introduction**

Changing human-in-the-loop configurations and issues [1].

1. Loss physical activities
2. Prolonged monitoring
3. Out-of-the-loop effect
4. Impact on cognitive states

**Methodological Framework**

Section in orange represents the current point in the research. The steps comprise scenario/process safety event selection to be used as case study for operator task modelling. Subsequent steps include monitoring the operator-machine interaction on these safety-critical tasks, and subsequently modelling their performance with the associated risk.

**Objective (s)**

1. Identify critical human, organisational and technical factors
2. Optimise method for data collection, integration and analysis in HITL process control configurations
3. Optimise tools for decisions support in the human-machine interface configurations and increase situational awareness; specifically Procedures and HMI
4. Define process safety and control performance indicators
4. Process safety data modelling

**Case Study and Future Work**

Figure 1: Experimental scenario to address the research objectives and test the research method using same case study. Figure 2: Experimental setup and interface layouts for the human-in-the-loop interaction. Interface design is adopted from [2] and redesigned by Gabriele Baldoiseo specifically for this study. Figure 3: Data collection phases.

**References**

- [1] Amazu, C. W., Demichela, M., Fissore, D. (2022). "Human-in-the-Loop Configurations in Process and Energy Industries: A Systematic Review". Proceedings of the 32nd European Safety and Reliability Conference (ESREL 2022). Published by Research Publishing, Singapore. 8 Pages. ISBN: 978-981-18-5183-4. doi: 10.360/978-981-18-5183-4\_33\_01\_072
- [2] Demichela, M., Baldoiseo, G., Cammelli, G. (2017). Risk-Based Decision Making for the Management of Change in Process Plants. Scientific of Integrating Probabilistic and Parametrical Analysis. Industrial Engineering Chemistry Research 2017 56 (50), 14873-14887. DOI:10.1021/acs.iecr.7b00709

**About the project: CISC**

This work is under development within the collaborative intelligence for safety critical systems project (CISC), which is funded under H2020-MSCA-ITN-2020 with grant agreement no. 955901.

Go to know more!

**Scientific Area:** ENG Engineering

**Acknowledgement:** This work is under development within the collaborative intelligence for safety Critical systems (CISC). The CISC project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie grant no. 955901.



# Human performance model for alarm handling: Toward a sustainable risk assessment

**Author(s):** Houda Briwa, Chidera Winifred Amazu, Maria Chiara Leva, Micaela Demichela

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## Abstract:

In the process industry, alarm systems are the first hard layer in a multi-layered safety strategy and are designed to help the operator by drawing his attention toward plant conditions requiring timely assessment or action. A good alarm management system can help bring the operating process closer to its optimal operating ranges, resulting in lower production costs, higher quality, and ultimately safer operations. Poor alarm management, on the other hand, causes downtime, unsafe situations, and may even result in industrial tragic occurrences. Despite the advances in technology and the effort put through extensive testing and validation of safety-critical systems, costly and tragic accidents still happen (Ahmed & Onan Demirel, 2020). Human error was amongst the most frequently cited major causes of Fire and explosion accidents in the petrochemical industry (Duma et al., 2021), a dominant contributor to chemical plant accidents (Iqbal & Srinivasan, 2018) and a main causal factor of over 70% of the accidents in the process industry (Leveson, 2004). Thus, it is useful to investigate not only the types of human errors that can occur but also the management systems that influence them by looking into the influences that enhance or degrade human performance (Center for Chemical Process Safety, 2015). In process safety assessment, many efforts were made to provide a comprehensive model with the evidence-based causal relations between different Human Factors issues and common circumstances affecting human performance or performance shaping factors (PSFs)

in human reliability assessment (HRA), developing data-driven PSFs assessment models with enough transparency between models and source data, to deal with data scarcity and the uncertainty of expert judgments is still yet to be investigated for oil & gas operations (Liu et al., 2021). In this context, the Bayesian network (BN) has recently received the attention of researchers. In literature and in relation to HRA in control rooms, BN was applied for organizational factors' modelling, analysis of the relationships among failure influencing factors, assessment of human failure events, assessment of situation awareness and as an extension of existing HRA methods. An analysis of these research works has shown that the systematic investigation of all potential factor combinations or of the majority of combinations with appropriate simulator settings and the gathering of statistically meaningful data could be a very challenging objective to attend for many HRA models using PSFs. The analysis also demonstrated the need for more systematic frameworks to combine the various information sources pertinent to HRA (cognitive models, empirical data, and expert judgment) (Mkrtychyan et al., 2015) In this contribution, we present a conceptual framework of a human performance model for alarm handling in abnormal situation that explicitly represents causal factors that impact the performance. This framework is based on a case study built within our EU-funded CISC project (Collaborative Intelligence for Safety Critical Systems) and combines cognitive studies, operating experience, simulator data.

**Human performance model for alarm handling: Toward a sustainable risk assessment**

**Authors:** Houda Briwa\*, Chidera Winifred Amazu, Maria Chiara Leva, Micaela Demichela

**Affiliations:** Technological University of Dublin, Ireland; Technological University of Coimbra, Portugal

**What are the current challenges?**

**Alarm Management:** Although the EEMUA guideline suggests that a simulator can be used as a 25% simulator per hour, 100 alarms per day in practice this number is 100 times greater. In reality, the number of alarms is over 14,000 alarms every day on average (O'Brien, L., & Wals, D., 2004).

**Human Performance:** Like emotion, thought, and attitude, human performance is inherently situational. It is heavily influenced by the context as experienced and believed by the operators involved at the time. Thus, it is important to understand the relationship between the relevant factors influencing the operator's performance.

**Human factors:** Developing data-driven Performance Shaping Factors (PSFs) assessment models with enough transparency between models and source data, to deal with data scarcity and the uncertainty of expert judgments, is still yet to be investigated for oil & gas operations (Liu, J. et al. (2021)) and alarm handling for control room operators.

**Objective:** The current study aims at presenting a conceptual framework of human performance assessment for alarm handling for control room operators that explicitly represents causal factors that impact the performance, and combining cognitive studies, operating experience and simulator data.

**Human performance framework**

**Simulator Experiment:** The framework will be based on a simulator experiment selected from a formalized production simulator (Demichela M. et al., 2021), where the operator will have to respond to critical alarms in 3 scenarios with different levels of complexity (low number of alarms, messages, and alarm floods); task consisted of monitoring the process using 3 interfaces as presented in figure 1.

**Performance Shaping Factors:** All Human activities carried out in process operations, are impacted by specific working conditions or task situations (Kim, I. W. & Jung, W. 2003). For process safety assessment, such circumstances affecting human performance are referred to differently depending on the human reliability assessment (HRA) method. In this framework, the PSFs taxonomy is selected from IPRAH and applied to the experiment scenario. The factors are classified according to 3 dimensions: human related, task related and interface related.

**Data collection:** In a control room, the operator is subject to highly complex cognitive tasks. A cognitive task analysis (CTA) as defined by Glaser and Bellotti (2001) is the description of the cognitive skills needed to perform a task and identify the approach used to solve the question: What information must be extracted for monitoring and action process inside the plant-machine interacting process. After gathering data, a preprocessing and preliminary analysis using statistics will be performed before feeding the data to the model.

**Modeling:** In literature and in relation to HRA in control rooms, Bayesian Network (BN) was applied for organizational factors' modeling, assessment of human failure events, assessment of situation awareness and as an extension of existing HRA methods (Mkrtychyan, L. et al., 2015). Bayesian networks are interpretable by design and enable post-hoc explanation methods. Thus, in this framework, we are using an explainable-by-design model, Bayesian Network for prediction.

**Conclusion:** In this contribution, we presented a conceptual framework of a human performance model for a more human-centred alarm handling approach in control room operations. The simulator experiment besides the challenge of insufficient data in this field while the cognitive task analysis helps us understand from each phase of the process: the operator's performance and how we can collect the data to build our model using Bayesian Network.

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**Scientific Area:** ENG Engineering

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# Hourly marginal electricity mixes and their relevance for assessing the environmental performance of installations with variable load or power

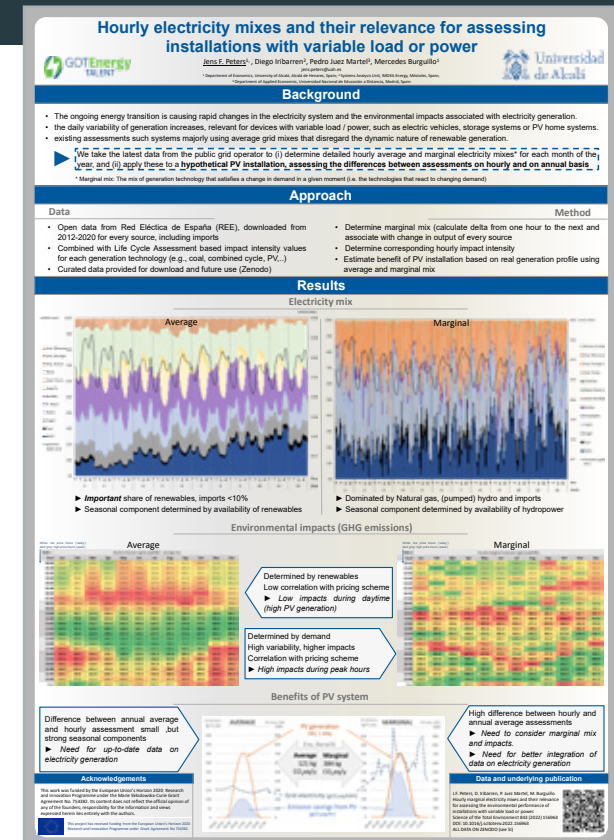
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## Abstract:

The ongoing energy transition is causing rapid changes in the electricity system and, in consequence, the environmental impacts associated with electricity generation. In parallel, the daily variability of generation increases with higher shares of renewable energies. This affects the potential environmental impacts or benefits of devices with variable load or power, such as electric vehicles, storage systems or photovoltaic home systems. However, environmental assessments of the actual benefit of such systems majorly rely on average grid mixes that are frequently outdated and disregard the dynamic nature of renewable generation. This presentation shows the differences between hourly average and marginal electricity mixes for Spain for each month of the year. These are then combined with specific life-cycle emission factors for each generation technology to determine the hourly environmental impact of electricity. Main drivers for the impacts of the marginal mix turn out to be natural gas plants and imports, but also pumped hydropower due to its comparably low storage efficiency. Applied to a hypothetical photovoltaic rooftop installation, the differences between environmental assessments on hourly and on annual basis are found to be surprisingly low when assuming that the generated electricity replaces the average grid mix, but substantial when considering the marginal generation mix (i.e., the generation technologies that respond to a change in demand at a given time). This highlights the importance of considering the dynamics of the electricity system and the corresponding marginal electricity mixes when optimizing flexible load or generation technologies under environmental aspects.



**Scientific Area:** ENG Engineering

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# Non-invasive imaging of chronic venous insufficiency using optical coherence tomography angiography

**Author(s):** Julia Deinsberger, Kristen Meibruger, Lisa Krainz, Lukasz Bugyi, Benedikt Weber, Rainer Leitgeb, Wolfgang Drexler, Mengyang Liu

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## Abstract:

Chronic venous insufficiency (CVI) is the precursor of skin ulcer, which affects a great amount of elderly people worldwide. Early screening and accurate diagnosis can significantly reduce the global health burden induced by CVI and skin ulcer. Thus far, the clinically available screening method is Doppler-ultrasonography, which is limited in resolution, resulting in detection of only deep and big vessels. Knowing that early stage CVI may only manifest in small and superficial vessels, there is an urgent need for a better and more accurate diagnosis method. Optical coherence tomography angiography (OCTA), being a non-invasive optical imaging method, may fit this clinical niche well. Based on the concept of low coherence interferometry, OCTA boasts capillary level resolution and fast scanning speed. We designed and characterized an OCTA device which features a field of view over 1 square centimeter with an imaging penetration depth up to 1 mm. All the microvasculature can be resolved using our OCTA system within just 10 seconds. An articulated probe with all degrees of freedom is designed to image various body parts of human. Using this system, we recruited patients from various stages of CVI as well as skin ulcer patients. The imaging results are quantitatively and qualitatively analyzed and compared. From our results, we can see that different stages of CVI have unique vascular patterns. Our statistical analysis confirms that OCTA can be used as a safe and accurate tool for CVI and skin ulcer screening and diagnosis. With more patients being recruited and hence an ever-increasing data pool, more accurate quantitative analysis can be performed and deep learning can be used for automatic CVI staging and skin ulcer diagnosis.

Linking Cutaneous Vasculature with Skin Diseases Using Optical Coherence Tomography Angiography  
Giulia Rotunno<sup>1,2</sup>, Julia Deinsberger<sup>3</sup>, Lisa Krainz<sup>2</sup>, Lukasz Bugyi<sup>1</sup>, Benedikt Weber<sup>3</sup>, Richard Handl<sup>1</sup>, Kristen Meibruger<sup>2</sup>, Leopold Schmetterer<sup>1,4</sup>, Wolfgang Drexler<sup>1,4</sup>, Mengyang Liu<sup>1,4</sup>

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**Abstract**  
Skin diseases are extremely common. Almost everybody has suffered from a certain type of skin disease at some point and some population suffer from chronic skin diseases. Despite the prevalence of skin diseases, their negative effects on patients and on the healthcare system have been underestimated. Dermatological experts have long been looking for more accurate and more efficient tools to screen, diagnose, and treat skin conditions. Currently, ultrasonography and dermoscopy are the two widely used non-invasive screening and diagnostic tools for skin ulcer and skin cancer, respectively. However, both tools have their inherent limitations such as poor resolution and shallow imaging depth, making them incapable of replacing the invasive and time-consuming medical procedures. Knowing that both skin ulcer and skin cancer alter the cutaneous vasculature, this study tries to use optical coherence tomography angiography (OCTA) to image a variety of skin diseases and give a direct visual comparison between the pathological cutaneous vasculature to vasculature from the health control subjects. The unique vascular patterns are associated with different skin diseases, and therefore may further be used as an indicator for skin disease screening and diagnosis using OCTA.

**Methods**  
This photo shows how the lower extremities can be imaged using the OCTA probe. This photo shows the key components of the OCTA probe used for imaging. This is a reconstructed OCTA volume. The red color marks the cutaneous vessels resolved using this imaging method. The semi-transparent grey color indicates the structure of skin.

**Results**  
The figure displays a grid of OCTA images comparing healthy skin, skin cancer, and skin ulcer. The top row shows healthy skin with regular vessel patterns. The middle row shows skin cancer with thicker vessels. The bottom row shows skin ulcer with a dotted vessel pattern. Each image is labeled with its depth range (e.g., OCT 0.38 - 0.87 mm).

**Discussion**  
The OCTA imaging results from healthy, skin cancer, and skin ulcer subjects have discernable features in vasculature. For the healthy case, the vessels are distributed in plexuses, forming regular vessel patterns. When the imaging depth goes beyond the superficial plexus, thicker vessels such as the venules and arterioles can be seen. In the skin cancer patient, the vessels have a peculiar patchy distribution in the pathological region. For skin ulcer, the vasculature shows a dotted pattern. When we investigate the slightly deeper-seated vessels, they do not form a plexus but rather some short segments.

**Conclusion**  
OCTA is demonstrated to visualize the cutaneous vascular patterns in a non-invasive way. These patterns are associated with different types of skin diseases. A quantitative analysis from the OCTA results may open a new door to skin disease screening and diagnosis.

This project is funded by the H2020-MSCA-IF-2019 project SkinOptima with Grant Agreement ID 894325.

**Scientific Area:** ENG Engineering

**Acknowledgement:** This work is funded by the H2020-MSCA-IF-2019 project SkinOptima with Grant Agreement ID 894325.



# Development of Actuator-Amplifier Systems for the Active Vibration Control of Gearboxes

**Author(s):** Sherif Okda, Mauro Fontana, Sven Herold, Rainer Nordmann, Tobias Melz

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## Abstract:

The general objective of the LIVE-I project is to make breakthrough technological progress in the design of lightweight gear transmission, reduce the vibration and noise emissions, and improve the efficiency of gear transmissions. The focus of the researcher is on using active vibration control (AVC) technologies and on developing smart concepts in accordance with vibroacoustic comfort. This requires powerful and efficient actuators and power electronics. The developed actuators and power amplifier are targeting to control the vibrations of the transmission system housing. They are designed to be efficient, economic, light weight and highly integrated. Simulations are established to tackle this optimization. A mock-up system with a simplified automotive transmission system is constructed. The aim of the mock-up system is to demonstrate the efficiency of the active vibration control system, comprising the novel developed actuators and power electronics. The mock-up is optimized regarding manufacturing costs and weight. One of the promising concepts, which is to use inertial mass actuators to control the housing, has been manufactured and tested on the test setup. The vibrations on the gearbox housing are reduced significantly with the usage of the developed inertial mass actuator. Yet other concepts are being investigated, which are more integrated in the system. In addition, a more dedicated power amplifier is being developed for the automotive transmission AVC system.

**LIVE-I**  
**Sherif Okda- ESR 9**  
**Development of Actuator-Amplifier Systems for Active Vibration Control of Gearboxes**

S. Okda<sup>1</sup>, M. Fontana<sup>2</sup>, S. Herold<sup>3</sup>, R. Nordmann<sup>4</sup>, and T. Melz<sup>1,5</sup>  
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<sup>3</sup>Fraunhofer LBF, Germany

<p><b>Topic Overview</b></p> <p>The general objective of the LIVE-I project is to make breakthrough technological progress in the design of lightweight gear transmission, reduce the vibrations and noise emissions, and improve the efficiency of gear transmissions. The focus of the researcher is on using active vibration control (AVC) technologies and on developing smart concepts in accordance with vibroacoustic comfort. This requires powerful and efficient actuators and power electronics.</p> <p><b>Research Objectives</b></p> <ul style="list-style-type: none"> <li style="background-color: #FFD700; padding: 2px;">Develop highly integrated economic actuators for active vibration control system.</li> <li style="background-color: #90EE90; padding: 2px;">Design a powerful, efficient, economic power amplifier for automotive application.</li> </ul> <p style="font-size: small; text-align: center;">Design and build a proof-of-concept test-rig for validation.</p> <p><b>Active Vibration Control System</b></p> <p>An active vibration control (AVC) system mainly comprises sensors to sense the sound or vibration levels, a controller to send a corrective signal, power electronics to amplify the power of the control signal, and actuators to generate forces to reduce the vibrations. The actuators and power electronics are being designed to be efficient, economic, light weight and highly integrated.</p> <p><b>Power amplifier Development</b></p> <p>Power electronics amplify the weak electrical signal waveform and reproduce a similar stronger waveform at the output by using an external power source. A switching amplifier is being developed for the AVC system. Switching amplifiers are beneficial for mobile systems, due to their energy efficiency, size compactness, and light weight.</p>	<p><b>Gearbox Mock-up System</b></p> <p>One work package of this project is to build the proof of concept test-rig. The mock-up is optimized regarding manufacturing costs and weight. A mock-up system with a simplified automotive transmission system is constructed at Powerflex SRL in Italy.</p> <p>The proposed test setup consists of a simplified gear train of the dual-clutch gearbox (Magna-Detrag 7DC7300). However, there is no rotation in the gear train and a new type of actuator is used to induce the vibrations into the system, which is a piezoelectric stack actuator.</p> <p><b>Actuator Development</b></p> <p>The vibration level of an automotive gearbox has been studied and an inertial mass actuator (IMA) has been designed to control the housing vibrations of the transmission system. The IMA has been manufactured and tested on the test setup, and the vibrations on the gearbox housing were reduced significantly.</p> <p><b>Future Research plan</b></p> <ul style="list-style-type: none"> <li>• Testing the AVC system using the IMA on the gearbox housing.</li> <li>• Integrating the actuator in the gearbox housing.</li> <li>• Power amplifier modeling, design, and testing.</li> </ul> <p><b>Acknowledgements</b></p> <p>This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska Curie grant agreement No 860243. This communication/dissemination reflects only the author's view and the European Commission is not responsible for any use that may be made of the information it contains.</p>
<p><b>Beneficiaries</b></p> <p><b>Partner organizations</b></p> <p><b>Project data</b></p> <ul style="list-style-type: none"> <li>• Funding of 2.3 m€ over 48 months from March 1<sup>st</sup> 2020</li> <li>• <b>Contacts:</b> Prof. Mohamed Ichchou <a href="mailto:mohamed.ichchou@tc-tu-darm.de">mohamed.ichchou@tc-tu-darm.de</a>              Dr. Pascal Fossat <a href="mailto:pascal.fossat@ec-lyon.fr">pascal.fossat@ec-lyon.fr</a></li> <li>• <b>Website:</b> <a href="http://live1.fr">live1.fr</a></li> </ul>	

**Scientific Area:** ENG Engineering

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# Data Analysis of Challenges in Science Diplomacy and Sustainable Development Through Text Mining in Social Media

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## Abstract:

Science diplomacy (SD) has the potential to support sustainable development in several ways, including through international collaboration on research and technology related to sustainability, the exchange of knowledge and expertise on sustainable development, and the use of science to inform policy-making on issues such as climate change. However, there are some challenges. As social media have become a pervasive platform to share users' thoughts and opinions, the shared content across these platforms can be used to analyze significant global issues, including science diplomacy and sustainable development. This study presents the results of a Twitter data study and sentiment analysis on the challenges facing science diplomacy and sustainable development. With the help of machine learning and natural language processing techniques, our analysis of tweets related to these fields revealed several key themes, including the importance of international collaboration, the need for action on climate change, and the role of science in policy-making. This study also shows the trends in the count of tweets about SD, extracts top frequency words from different attitudes, and analyzes the impact of tweets on the global view of SD and sustainable development. Overall, this study highlights the complex and multifaceted nature of the challenges facing science diplomacy and sustainable development, and the importance of leveraging social media platforms to facilitate discussions and facilitate progress in these areas.

### Data Analysis of Challenges in Science Diplomacy and Sustainable Development Through Text Mining in Social Media

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#### Abstract

Science diplomacy (SD) has the potential to support sustainable development in several ways, including through international collaboration on research and technology related to sustainability, the exchange of knowledge and expertise on sustainable development, and the use of science to inform policy-making on issues such as climate change. However, there are some challenges. As social media have become a pervasive platform to share users' thoughts and opinions, the shared content across these platforms can be used to analyze significant global issues, including science diplomacy and sustainable development. This study presents the results of a Twitter data study and sentiment analysis on the challenges facing science diplomacy and sustainable development. With the help of Machine Learning (ML) and Natural Language Processing (NLP) techniques, our analysis of tweets related to these fields revealed several key themes, including the importance of international collaboration, the need for action on climate change, and the role of science in policy-making. Moreover, our classification model shows a strong prediction potential (86%) to predict sentiment from these tweets. Overall, this study highlights the complex and multifaceted nature of the challenges facing science diplomacy and sustainable development and the importance of leveraging social media platforms to facilitate discussions and facilitate progress in these areas.

#### Twitter Dataset

The Twitter data was collected by the **ENSCRAPER** [1] which is a Python library for accessing the Twitter API by using relevant hashtags such as #sustainabledevelopment, #sciencechange, #globalwarming, etc. and the dataset has 48,534 observations and 7 variables. The dataset was composed of tweets that were posted by different users, and was included metadata fields such as the date and time the tweet was posted, the tweet ID, the content of the tweet, the username of the person who posted the tweet, the number of likes, the number of retweets, and hashtags used in the tweet. The majority of the data was collected from 2015 until 10<sup>th</sup> January, 2023.

Figure 1: Word Cloud of the Most Frequent Words From Tweets

#### Methods

- Topic Modeling:** Latent Dirichlet Allocation (LDA) [2] was used for topic modeling. It is a technique used to identify latent topics in a large corpus of texts. This LDA is a generative probabilistic model that assumes that each document in the corpus is a mixture of a fixed number of latent topics, and each topic is a probability distribution over words.
- Sentiment Classification:**
  - Sentiment scores were obtained by applying the **VADER** [3] library on the tweets. It is a lexicon and rule-based sentiment analysis tool that is specifically oriented to sentiments expressed in social media and works well on texts from other domains. Tweets were labeled based on the score (positive, negative, or neutral). Neutral tweets were filtered out, leaving only positive and negative tweets for further analysis.
  - The transformer-based pre-trained sentence embedding model **word\_embeddings\_glove\_6b\_v1.9** [4] was used to obtain embeddings for each tweet. It maps sentences or paragraphs to a 300-dimensional dense vector space. This model was trained on over 1 Billion sentence pairs, and it is intended to be used as a sentence and short paragraph encoder. Since a tweet can have a maximum 280-character length and the model's maximum input length is 256-word pieces, it is a suitable choice for encoding tweets.

The tweets were first preprocessed and cleaned to use it for analysis for their respective tasks.

- Basic data cleaning tasks were performed such as removing URLs, usernames or mentions, extra whitespace from the tweets to use for VaderSentiment scoring and creating tweet embeddings.
- For topic modeling, in addition to basic preprocessing techniques, some additional cleaning were used, such as:
  - Hashtags, carriage and special characters were removed from tweets, emojis were replaced by their counterpart words using **emojify** [5] python library, and all tweets were converted to lowercase.

#### Topic Modeling

Table 3 presents the extracted 5 major topics from the tweets:

- Global warming.
- Science diplomacy and policy-making.
- Renewable energy.
- Global cooperation.
- Environmental crisis.

Topic A	Topic B	Topic C	Topic D	Topic E
climatechange	sciencechange	climatechange	climatechange	climatechange
climate	science	energy	climate	news
climateaction	diplomacy	sustainability	change	climatefinance
climatecrisis	research	environment	scientists	2022
globalwarming	global	need	scientific	year
climate	international	newsletters	cooperation	weather
carbon	great	check	world	pollution
change	policy	solar	people	water
know	innovation	renewableenergy	global	india
emissions	single	book	industry	through

Table 1: Word Cloud of the Most Frequent Words From Tweets

#### Sentiment Classification

For the classification task, the 384-dimensional embeddings of 38,212 tweets were used as the input variables, while the sentiment of the tweets (positive or negative) served as the target variable. The labels were assigned numerical values, and the embeddings were standardized. As the dataset was imbalanced with 72% of tweets being classified as positive, the data was re-sampled (oversampling) to address this imbalance before running ML models. We performed ML models such as Random Forest, XGBoost, and LightGBM. Additionally, deep learning models such as a dense neural network, LSTM, and Bi-LSTM were also performed. XGBoost performed the best among all the models.

ML Models	Cross Validation Train (85%)				Test (20%)	
	AUC	Accuracy	F1	AUC	Accuracy	F1
Random Forest	0.895	0.833	0.893	0.725	0.832	0.883
XGBoost	0.919	0.841	0.896	0.868	0.863	0.897
LightGBM	0.922	0.862	0.907	0.864	0.861	0.907

Table 2: Machine Learning Algorithms Performance Results

Deep Learning Models	Train (85%, Validation 10%)			Test (20%)		
	AUC	Accuracy	F1	AUC	Accuracy	F1
Dense NN (baseline)	0.963	0.909	0.939	0.909	0.883	0.901
LSTM	0.908	0.846	0.893	0.898	0.832	0.884
Bi-LSTM	0.987	0.979	0.985	0.982	0.944	0.990

Table 3: Deep Learning Model Performance Results

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**Scientific Area:** ENG Engineering

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# IRTEMS project: a system to model instantaneous road traffic emissions for cities

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## Abstract:

Road transport is often the main source of air pollution in urban areas worldwide. Many efforts have been aimed at reducing emissions from this sector achieving significant abatements. Nevertheless, emission reductions have been lower than expected due to the heavy growth of transport in the last decades. IRTEMS, Instantaneous Road Traffic Emission Modelling System for cities (H2020-MSCA-IF-2019-GA-896417), is a 3-year currently on-going project funded by the European Union. It is coordinated by Universidad Politécnica de Madrid (Spain), in collaboration with North Carolina State University (USA). The main focus of the project is on the road transport sector since it continues to be one of the main contributors to air pollution in many cities around the world. To estimate emissions from the road transport sector, there are several methods and approaches that are useful for different scales of analysis. To understand the spatial and temporal distribution of the emissions, typically, regional traffic emission models are used for the compilation of urban inventories and usually those are the most detailed data available at city scale. This level of detail is not

enough to understand the high pollutant concentrations that occur on specific urban highly polluted microenvironments (hotspots). In recent years many actions have been undertaken to solve air quality problems on these traffic hotspots. But, to accurately understand the influence of these very local high concentrations on the real exposure of the population, there is a need to estimate the contribution of road traffic to atmospheric emissions at city level but in great detail. For that, an integrated multi-scale approach is needed. To achieve this goal, IRTEMS aims at developing a useful simulation system to provide microscale city-wide emission results. It will be developed by means of the implementation of a traffic emission modelling system with high resolution at city scale. The integrated approach can provide city-wide traffic emission estimations with high resolution in time and space. This system can help to understand the real implication of air quality policy actions and to analyze the potential of local abatement measures. This is an essential resource for local and central governments that are exploring different strategies to tackle the impacts of air pollution in urban areas.

MCMA Annual Conference and General Assembly  
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### IRTEMS PROJECT: A SYSTEM TO MODEL INSTANTANEOUS ROAD TRAFFIC EMISSIONS FOR CITIES

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#### Abstract - Project introduction

IRTEMS (Instantaneous Road Traffic Emissions Modelling System for cities) is a scientific programme funded by the European Commission (H2020-MSCA-IF-2019-GA896417). This research project aims to contribute to drastically improve our knowledge to estimate the contribution of road traffic to atmospheric emissions at the city level and in great detail. The expected output from this research effort is a significant contribution to atmospheric science with a decided focus on providing useful information and tools to air quality managers and decision-makers, so that the project is also relevant policy-wise, providing knowledge-based answers for measures to be implemented for good air quality in cities. The project is been coordinated by Universidad Politécnica de Madrid (UPM) located in Madrid (Spain) with North Carolina State University (NCSU) located in Raleigh (USA) as a partner organization. The project duration is of 3-years from Feb 15, 2021 to Feb 14, 2024.

#### Goals

Main goal is to develop an instantaneous road traffic emission modelling system for its application at city scale by coupling a hybrid traffic model with an microscale emission model to provide highly detailed data for air quality simulations. This is done by means of:

- Quantify individual vehicle trip emissions at high resolution by means of an road traffic emission modelling system.
- Validate modelled vs. measured individual trip emissions.
- Quantify spatial and temporal variation of emissions at the city level.
- Integrate city scale road traffic emissions into microscale air quality models.

#### Methodology

Fig. 1. Methodology flowchart: traffic data for traffic and emission simulation at high resolution to obtain emission results at city scale to be introduced in microscale air quality models.

#### Results

Fig. 2. Hybrid emission results at city scale with areas of interest for air quality at high resolution.

#### Conclusion

Ongoing project to generate a useful modelling system to analyze road traffic emissions at city scale with great detail to help to provide knowledge-based answers for measures to be implemented for good air quality in cities.

#### Acknowledgements

IRTEMS project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 896417.

Disclaimer: The information here presented reflects the author(s) view. It does not necessarily reflect the views or policy of the European Commission and REA which are not responsible for any use that may be made of the information it contains.

For more information, please visit our website: [irtems.industriales.upm.es](http://irtems.industriales.upm.es)

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**Scientific Area:** ENV Environmental Sciences

**Acknowledgement:** IRTEMS project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 896417.



# Chemotactic transport and cell motility of *Pseudomonas putida* G7 in engineered porous media

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## Abstract:

The study of bacterial motility and chemotactic behavior has been largely investigated for many decades, what generated a wide knowledge on mathematical chemotaxis modelling and the development of macroscopic transport equations. Most of bacterial motility and chemotaxis studies are based on macroscopic observations either in capillaries or porous media, but only a few focused on the characterization of individual cell behavior, and, to our knowledge, none aimed to characterize the behavior of cells in heterogeneous pores at the microscale, by means of microscopic analysis of individual cell motility.

The aim of this study is, on the one hand, to review the traditional methods for bacterial motility and chemotaxis characterization (in bulk and capillaries), and to check the validity of those widely used modelling equations and parameters to characterize bacterial dispersion through and inside pores (in bioreactors and microfluidic devices). The final objective was to determine how bacterial movement was modified according to pore sizes, in order to update modelling of bacterial dispersion in porous media.

To our knowledge this is the first study that characterizes in vivo the motility and chemotactic behavior of individual cells of *Pseudomonas putida* G7 in micro-sized pores of homogeneous and heterogeneous engineered porous media. This study sets the basis for further investigation on modelling of bacterial dispersion in porous media.

**Chemotactic transport and cell motility of *Pseudomonas putida* G7 in engineered porous media**

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**ABSTRACT**

The study of bacterial motility and chemotaxis has been largely investigated for many decades, what generated a wide knowledge on mathematical chemotaxis modelling and the development of macroscopic transport equations. Most of studies are based on macroscopic observations, either in capillaries or porous media [1, 2], but only a few focused on the characterization of individual cell motility [3]. To our knowledge, none aimed to characterize the behaviour of cells in heterogeneous pores at the microscale, by means of microscopic analysis of individual cell motility.

The aim of this study was to check the validity of bacterial motion equations and parameters to characterize bacterial dispersion through and inside pores (in bioreactors and microfluidic devices), in order to determine how bacterial movement was modified according to pore sizes.

To our knowledge this is the first study that characterizes in vivo the motility and chemotactic behaviour of individual cells of *Pseudomonas putida* G7 in micro-sized pores of homogeneous and heterogeneous engineered porous media. This study sets the basis for further investigation on modelling of bacterial dispersion in porous media.

**MATERIALS AND METHODS**

The total mass flux of bacteria ( $B$ , cell  $cm^{-2}$ ) moving in a fluid phase ( $\mu$ ) includes two terms, one due to "random walk" motility and another for the motility "bias" due to chemotaxis:

$$J = -D \frac{dB}{dx} + v_c B$$

$D$ , random motility coefficient ( $cm^2 s^{-1}$ )  
 $v_c$ , chemotactic velocity ( $cm s^{-1}$ )

These two parameters (cell and population scale) were calculated using the following experiments.

**A) Characterization of individual cell motility**

**PDMS MICROFLUIDIC DEVICES**

- Filled with mineral medium (control) or 10 mM chemoeffector (sodium salicylate, SAL, or  $\gamma$ -aminobutyric acid, GABA) + *P. putida* G7 cells.
- Cell motion analysis in bulk and pores of different sizes using a phase-contrast inverted microscope (Zeiss) and LaTrack software.

**B) Characterization of population bacterial motility**

**BIOREACTORS**

- UC: control medium or chemoeffector (SAL or GABA).
- Membranes: 3.5 and 12  $\mu m$  of pore size.
- LC: *P. putida* G7 suspension.
- Measurement of cell density in UC every hour.

**CONCLUSIONS**

- The size of the pore had a significant influence on cell motility patterns.
- Chemotaxis, especially to strong chemoeffectors, provided a higher cell dispersion through pores, compared to the absence of carbonaceous sources or to the presence of weak chemoeffectors.
- Random motility and chemotaxis should be characterized in pore-restriction conditions in order to more accurately simulate cell dispersion in natural porous media.

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**RESULTS**

**A) Individual cell motility under isocratic conditions**

The motility characteristics of *P. putida* G7 cells in microfluidic devices were characterized using randomly selected locations and pore spaces of different sizes (Figure 1).

Figure 1. Example of motion analysis of *P. putida* G7 cell trajectories inside a pore of the microfluidic device: A) location of the pore; B) selection of pore geometry and determination of size; and C) cell trajectories.

Table 1. Random motility coefficients ( $\mu$ ) of *P. putida* G7 cells in selected pores of a microfluidic device saturated with mineral media (control).

Membrane	Pore volume ( $\mu m^3$ )	$\mu$ ( $cm^2 s^{-1}$ )
Control	$6.99 \cdot 10^3$	$9.59 \cdot 10^{-4}$
Pore 1	$2.91 \cdot 10^3$	$1.16 \cdot 10^{-4}$
Pore 2	$2.39 \cdot 10^3$	$1.27 \cdot 10^{-4}$
Pore 3	$2.31 \cdot 10^3$	$1.78 \cdot 10^{-4}$
Pore 4	$1.06 \cdot 10^3$	$1.90 \cdot 10^{-4}$
Pore 5	$0.95 \cdot 10^3$	$0.35 \cdot 10^{-4}$
Pore 6	$0.93 \cdot 10^3$	$0.14 \cdot 10^{-4}$

Generally, cell swimming patterns were modified according to the pore size. This led to lower  $\mu$ , and therefore a more restricted cell dispersion (Table 1).

**B) Population bacterial motility under gradient conditions**

**Random motility (control, without chemoeffector)**

Accordingly to the observations obtained with the microfluidic devices, cell swimming and random dispersion through the 3 pores of bioreactors was more restricted the smaller the pore size of the membranes (Figure 2).

Figure 2. Influence of the membrane pore size on random motility coefficient ( $\mu$ ) of *P. putida* G7 cells in bioreactors.

**Chemotactic motility (with chemoeffector)**

The computed chemotactic velocity was higher in the presence of stronger chemoeffectors (ABA) and in the presence of higher pores, indicating a favoured chemotaxis under those conditions (Table 2).

Scenario	Chemoeff. SAL	$v_c$ ( $cm s^{-1}$ )
Bioreactor 5 $\mu m$	SAL	$1.97 \cdot 10^{-4}$
	GABA	$3.82 \cdot 10^{-4}$
Bioreactor 12 $\mu m$	SAL	$3.68 \cdot 10^{-4}$
	GABA	$6.21 \cdot 10^{-4}$

SAL, sodium salicylate; GABA,  $\gamma$ -aminobutyric acid.

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**SCOPING INFO**

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**Scientific Area:** ENV Environmental Sciences

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Book of Abstracts - Posters

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# The Many Languages of Oceanic Navigation in the Early Modern Period

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## Abstract:

The stable and regular crossing of the earth's oceans on a global, planetary scale in the Early Modern period is considered an Iberian achievement. However, like the result, which was global and prompted the emergence of global concepts about the earth, the premises were, if not global, at least multicultural. Travelers of very different social strata, nations and cultures were boarding on a ship sailing from Lisbon or Seville to the Indies. Hiring foreigners was a necessity, especially in Portugal. Onboard the ships, crews were composed of sailors from different nations: Portuguese, Spanish, Italians, Greek, French, etc. In an international environment where social conventions and differences did not exist anymore, during long months of navigation, travelers lived together and socialized with people they would have never met under normal circumstances. Linguistic exchanges were so intensified that even very technical nautical texts, like rutters and logbooks, would include glossaries or long, detailed descriptions of distant places, animals, people, or technical matters. Inevitably, this international maritime experience produced texts written and/or translated in many different languages, reaching publics that did not personally witness the oceanic voyage. But it was more than that. The establishment of oceanic routes, in

fact, rather than the successful achievement of two empires, must be considered the synthesis of centuries of multicultural traditions. The interaction with local and regional pilots was indispensable at every turn of the expeditions and gave an international and traditional character to the "new" and "Iberian" routes. This was particularly dramatic across the Extended Indian Ocean, where the Portuguese would not even have reached their primary destinations without expert assistance through the Arabian Sea and the South China Sea, from pilots who spoke Arabic, Gujarati, Tamil, Malay or other languages. Given this, one would expect that relevant research on the topic was carried on considering multilingual sources of nautical knowledge. But on the contrary and astonishingly, most of the related research is based exclusively on English and Dutch sources, ignoring large documental bodies in any other languages. The ERC project RUTTER (<https://rutter-project.org>) is engaged in filling this gap through the study of still poorly known technical documents (nautical rutters and ship's logbooks) in Portuguese and Spanish and Arabic texts, while engaging in conversation with colleagues from hitherto under-represented textual traditions.

**The Many Languages of Oceanic Navigation in the Early Modern Period**  
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**RUTTER** MAKING THE EARTH GLOBAL  
The ERC RUTTER project (<https://rutter-project.org>) aims at writing a narrative of the scaling up of a scientific description of the earth in the sixteenth and seventeenth centuries using Early Modern nautical rutters (sailing directions). Here we consider aspects within the research lines devoted to [textual genres of maritime technical literature](#) and to [Indian Ocean navigation](#).

Travelers of very different social strata, nations and cultures worked on board. Crews were composed of sailors from different nations: Portuguese, Spanish, Italians, Greek, French, etc. This international maritime experience produced texts written and/or translated into many different languages.

The establishment of oceanic routes was the synthesis of centuries of multicultural traditions. The interaction with local and regional pilots was indispensable at every turn of the expeditions. This was particularly dramatic across the Extended Indian Ocean, where the Portuguese had aid from pilots who spoke Arabic, Gujarati, Tamil, Malay or other languages.

The stable and regular crossing of the earth's oceans on a planetary scale in the Early Modern period must be therefore considered not an Iberian endeavor, but a multicultural achievement that prompted the emergence of global concepts about the earth.

This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 833438).

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**Scientific Area:** HA Humanities and Arts

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# GABARPET project: Developing immunoPET probes to detect specific inhibitory ion channels inside the *in vivo* brain to understand the molecular basis of mental illness

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## Abstract:

Changes in GABA receptors, inhibitory ion channels, are known hallmarks for numerous neurological diseases such as schizophrenia. This severe psychiatric disorder has profound effects on both the individual affected and society. However, a diagnosis of schizophrenia is complex due to the loss of highly specific biomarkers. Previous research has suggested that the differential expression of GABA-A receptors in the brain is associated with this mental disease. For instance, GABA-A  $\alpha 1$  mRNA expression was lower in some cerebral cortex layers in schizophrenia patients. However, the current evidence on GABAergic abnormalities in schizophrenia is mainly based on postmortem studies because the density of GABA-A receptors in schizophrenia does not appear abnormal in radioligand studies. In this sense, *in vivo* measurements of GABA-A receptor subunits can reveal additional insights.

We are creating antibody fragment-based positron emission tomography (PET) radioligands to specifically detect  $\alpha 1$  subunit from the GABA-A receptor. This approach is known as immunoPET. For this, we are using 1F4 antibody as well as designing our own antibody fragments against the  $\alpha 1$  subunit from scratch with phage display technology. To do this, we produce different antibody fragment formats (di-scFv and scFv-Fab), which cross the blood-brain barrier (BBB) to study the central nervous system. In these formats, one arm is against the transferrin receptor to allow for the crossing of the BBB, while another arm is against the GABA-A receptor. In addition, antibody fragments, which do not cross the BBB (scFv and Fab), are created to study the peripheral nervous system. After antibody fragments characterization, we radiolabel using fluorine-18. Finally, we use PET scanning to detect our

immunoPET probes in healthy mice and rodent models of schizophrenia. ScFv1F4 and di-scFv1F4 were successfully produced in mammalian cells, and these were demonstrated to not aggregate. In addition, non-GABA-A receptor binding antibody fragments were produced as a control. ScFv1F4 demonstrated pharmacological activity by reducing GABA-A receptor activity and di-scFv1F4 was found to cross the BBB and bind to different brain areas. Then, we used a pre-targeting strategy to label our fragments with TCO, and 18F-labeled tetrazine. We studied its distribution with PET scans in mice. In addition, new antibody fragments targeting  $\alpha 1$  subunits are being developed using a phage display approach. We performed 2 rounds of phage display against specific  $\alpha 1$  subunit peptides with success. In addition, we transformed our round 2 scFv libraries into Fab libraries. Now, we aim to do new rounds with the  $\alpha 1$  subunit to get the best antibody fragments. Finally, we want to follow the same process as previously described for 1F4 antibody fragments. Antibody imaging provides a specific and sensitive, noninvasive means for molecular characterization of the cell surface phenotype *in vivo*. Therefore, immunoPET could be an interesting approach to studying brain illnesses, such as schizophrenia, or other pathologies. The overall objective of GABARPET (the European Union's Horizon 2020 research and innovation programme under the MSCA grant 891455) is to open a new research line of GABA-A receptor subunits expression patterns and their association with normal and pathological behavior.

## GABARPET project: Developing immunoPET probes to detect specific inhibitory ion channels inside the *in vivo* brain to understand the molecular basis of mental illness

Ángel García de Lucas<sup>1,2,3</sup>, Luciana Kovacs<sup>1,2</sup>, Olli Moisio<sup>4</sup>, Niina Chaar<sup>2,3,5</sup>, Sanna Soini<sup>6</sup>, Anu Airaksinen<sup>7</sup>, Urpo Lamminmäki<sup>2</sup> and Francisco López-Picón<sup>1,2</sup>

### Abstract

Changes in GABA receptors, inhibitory ion channels, are known hallmarks for numerous neurological diseases such as schizophrenia. This severe psychiatric disorder has profound effects on both the individual affected and society. However, a diagnosis of schizophrenia is complex due to the loss of highly specific biomarkers. Previous research has suggested that the differential expression of GABA-A receptors in the brain is associated with this mental disease. For instance, GABA-A  $\alpha 1$  mRNA expression was lower in some cerebral cortex layers in schizophrenia patients. However, the current evidence on GABAergic abnormalities in schizophrenia is mainly based on postmortem studies because the density of GABA-A receptors in schizophrenia does not appear abnormal in radioligand studies. In this sense, *in vivo* measurements of GABA-A receptor subunits can reveal additional insights.

We are creating antibody fragment-based positron emission tomography (PET) radioligands to specifically detect  $\alpha 1$  subunit from the GABA-A receptor. This approach is known as immunoPET. For this, we are using 1F4 antibody as well as designing our own antibody fragments against the  $\alpha 1$  subunit from scratch with phage display technology. To do this, we produce different antibody fragment formats (di-scFv and scFv-Fab), which cross the blood-brain barrier (BBB) to study the central nervous system. In these formats, one arm is against the transferrin receptor to allow for the crossing of the BBB, while another arm is against the GABA-A receptor. In addition, antibody fragments, which do not cross the BBB (scFv and Fab), are created to study the peripheral nervous system. After antibody fragments characterization, we radiolabel using fluorine-18. Finally, we use PET scanning to detect our immunoPET probes in healthy mice and rodent models of schizophrenia.

**Methods**  
Antibody fragments design against GABA-A receptors  
1F4 antibody fragments  
Antibody fragment formats  
Phage display technology  
Antibody characterization  
Fluorine-18 radiochemistry with "click" chemistry  
In-house labeling  
Direct labeling  
PET studies  
MOLECULES PET and CT scanners for imaging studies

**Results**  
1F4 antibody fragments  
Phage display technology  
Brain cortex immunohistochemistry with A) di-scFv $\alpha 1$  (control) and B) di-scFv1F4 (target) against  $\alpha 1$  subunit of GABA-A receptor.  
Immunosay results from 2 rounds of phage display panning against the middle peptide (red) from  $\alpha 1$  subunit (green) of GABA-A receptor. Enrichment of specific  $\alpha 1$  subunit can be seen in round 2.  
Electrophysiology experiments.  
A) Experimental setup. B) GABA<sub>A</sub> receptor was injected and, after 5 h, <sup>35</sup>S-tetrazine (10  $\mu$ M GABA + 1  $\mu$ M di-scFv1F4 (blue) and 50  $\mu$ M GABA.  
PET images from mice. A) [<sup>18</sup>F]-scFv1F4 with indirect labeling approach. TCO-scFv1F4 was injected and, after 5 h, <sup>18</sup>F-tetrazine was injected. B) <sup>18</sup>F-tetrazine was injected alone as a negative control. C) [<sup>18</sup>F]-scFv1F4 with direct labeling injected. Heart is marked with a red circle where signal can be seen.

**Conclusions**  
• ScFv1F4 and di-scFv1F4 can be used to measure specifically  $\alpha 1$  subunit from GABA-A receptors inside peripheral (heart) or central (brain) nervous system using PET.  
• Phage display technology can help us to create new antibody fragments from scratch. In this way, we can select any new target, such as  $\alpha 1$  subunit, to create our own immunoPET probes.  
• ImmunoPET could be an interesting approach to studying brain illnesses, such as schizophrenia, or other pathologies.

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## Scientific Area: LIF Life Sciences

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 891455





# From Caterpillar to BUTTERFLY: supporting transformation of DCs in a pediatric oncology network

**Author(s):** Annemarie Rietman, Celina Szanto, Martina O'Flaherty, Jan Molenaar, Marcel Kool

**\*Presenter:** Annemarie Rietman, Princess Máxima Center for Pediatric Oncology

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## Abstract:

Every year, around 600 children in the Netherlands get cancer and one in four children dies from this illness. Several years ago, a group of parents and healthcare professionals in the Netherlands started working towards one national children's cancer centre that could accelerate advances in treatment by centralizing all patient care and research in one building. Those efforts led to the creation of the Princess Máxima Center for pediatric oncology: a unique center that brings together all the highly complex care and research for children with cancer in the Netherlands. This concentration and integration of specialized pediatric oncology reflects our mission: 'To provide a cure for every child with cancer while maintaining an optimal quality of life'. Only with innovative research we will be able to improve survival and quality of life for children with cancer. Our research covers the entire spectrum: from fundamental research to expose genetic and molecular characteristics of tumour cells to clinical trials to test improved treatment options. And from translational experiments to develop personalized therapy to psychosocial studies that monitor the wellbeing of the whole family. Collaborations within our center, between researchers and clinicians, but also partnerships with other institutes, nationally and internationally, academic and non-academic, are crucial to reach our goals. For a successful implementation and to achieve a radical change in the society, the work needs to be translated to the academic community, the industry, health policy makers, regulatory authorities, insurance companies, doctors, patients, patients advocates,

and the general public. To contribute to this effort, the Máxima Butterfly program will train the next generation of multi-disciplinary scientists in the field of paediatric oncology. Here we will present a unique and comprehensive training program for DCs in the field of pediatric oncology. The Máxima Butterfly program shall run from 2023-2027. The program duration is 60 months and will have one competitive international recruitment call. A unique feature of the recruitment is the transparent and unbiased selection of the DCs, candidates who will be invited for the interviews will be selected anonymously. Applicants can choose among 52 PhD projects from 26 supervisors; 28 candidates will be awarded a contract. All DCs will be recruited for 48 months. Butterfly is unique in its sense that all DCs will be trained at the Maxima in the field of pediatric oncology within an international scientific and cultural environment. The program includes a dedicated training in all pre(clinical) aspects of pediatric oncology, training in transferable skills (such as IP, knowledge transfer, entrepreneurship), an innovative program for personal development and a plan based on the 'EU Green Deal'. Many external (inter)national academic and industrial partners are connected to Butterfly who are strongly involved at all stages of the project, by joining supervisory meetings, providing intersectoral training opportunities and training in research in another academic or commercial environment. Each DC is expected to spend at least three months at an industry partner for their project.

**Máxima Butterfly Program**

- PhD program in pediatric oncology
- Fundamental, translational, clinical and psychosocial projects
- Doctoral Candidates (DCs) can choose from 52 projects
- 28 PhD positions will be filled
- Duration 48 months (2023-2027)
- Mobility rule applies (candidates did not live in NL for more than 12 mo in the past 36 mo)

**Princess Máxima Center**

- Our mission is to cure every child from cancer with optimal quality of life
- In NL, ~600 children get cancer every year
- 1 out of 5 die, survivors have an increased risk of getting late effects
- In 2018, all pediatric cancer care and research became centralized at the Princess Máxima Center, Utrecht Science Park, The Netherlands
- This makes the Princess Máxima Center a highly specialized center with great facilities for care and research (e.g. A large biobank, parent-child rooms, dummy CT and MRI, trial and data center)
- Outreach Program in low and middle income countries
- Survivors are followed their entire lives at the "LATER"-Pool
- All new (parents of) patients are asked permission to store left over materials for research purposes in our biobank

**Transparent and unbiased selection of candidates**

- Each DC can select up to 3 projects
- DCs invited for interviews, will be anonymously selected by a selection committee
- Selection committees consist of the involved group leader, an independent group leader and an independent external reviewer
- Every candidate will be scored according to a scheme
- Candidates will be informed individually on their scoring

**PhD Training Program includes:**

- 3 months internship at an other academic institute
- 3 months internship at an industrial partner
- Dedicated training in all aspects of (pre)clinical pediatric oncology research
- Training in transferable skills (e.g. IP, knowledge transfer, entrepreneurship)
- Personal Development program
- A total of 8 summer and winterschools will be organized and open for other interested PhD candidates.

**Research at the Princess Máxima Center**

- Fundamental, translational, clinical and psychosocial research
- State-of-the-art research facilities (imaging, single cell genomics, organoids, flow cytometry, high throughput screening, etc)
- 35 research groups
- 130 PhD students
- 53 Postdocs
- 52 technicians
- 41 nationalities; average age 35 years, 71% female

Contact: [Butterfly@prinsesmaximacentrum.nl](mailto:Butterfly@prinsesmaximacentrum.nl)

[www.prinsesmaximacentrum.nl](http://www.prinsesmaximacentrum.nl)

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** The Maxima-Butterfly program received funding from Horizon Europe Marie Curie Cofund program under grant agreement no. 101081481



# LiMaBio – Lichen Diversity in Maranhão: source for Bioindicators and Bioactive compounds

**Author(s):** Leonardo DallAgnol

**\*Presenter:** Leonardo DallAgnol, Federal University of Maranhão

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## Abstract:

Lichens are complex communities of symbiotic organisms and associated microbiota, composed of a major heterotrophic fungus (mycobiont), photosynthetic autotrophic organisms such as algae and cyanobacteria (photobionts), and other fungi, bacteria, and viruses. In this association, the mycobiont provides a physical structure that surrounds and protects the photobionts and associated microbiota, in addition to producing secondary metabolites that may have pharmaceutical and biotechnological importance, in addition to being able to serve as bioindicators of environmental quality and climate change. When compared to their mycobiont partner, photobionts are poorly investigated, with their identities known for less than 2% of the lichen species studied. It is noteworthy that there is still little literature on the diversity, physiology and ecology of these organisms, mainly in Brazil and Latin America. Furthermore, due to the slow growth rate, lichens are susceptible to high extinction rates, mainly due to habitat destruction/alteration. It is, therefore, essential to carry out a study of diversity and bioprospecting, before this biotechnological potential is lost. This proposal involves an interdisciplinary team from three regions of Brazil (North, Northeast and Southeast) and five research institutions (UFMA, UEMASul, ITV DS, USP, University of Helsinki). The general objective of the network is to analyze the structural and functional diversity of lichens from anthropized and conserved areas in the Maranhão state, aiming at the biomonitoring and investigation of these organisms as sources of secondary metabolites of biotechnological importance. For this, integrative taxonomy, microbiome, metagenomics, metabolomics and bioinformatics techniques will be used with high potential for training and innovation.

**LIMABIO – LICHEN DIVERSITY IN MARANHÃO: SOURCE FOR BIOINDICATORS AND BIOACTIVE COMPOUNDS**

RAMOS, E. C. DALL'AGNOL, L. T.

\*Grupo de Pesquisa em Biodiversidade, Bioprospecção e Biotecnologia (GB<sup>3</sup>), Universidade Federal do Maranhão

\*Corresponding author: leonardo.td@ufma.br

**Abstract**

Lichens are complex communities of symbiotic organisms and associated microbiota, composed of a major heterotrophic fungus (mycobiont), photosynthetic autotrophic organisms such as algae and cyanobacteria (photobionts), and other fungi, bacteria, and viruses. In this association, the mycobiont provides a physical structure that surrounds and protects the photobionts and associated microbiota, in addition to producing secondary metabolites that may have pharmaceutical and biotechnological importance, in addition to being able to serve as bioindicators of environmental quality and climate change. When compared to their mycobiont partner, photobionts are poorly investigated, with their identities known for less than 2% of the lichen species studied. It is noteworthy that there is still little literature on the diversity, physiology and ecology of these organisms, mainly in Brazil and Latin America. Furthermore, due to the slow growth rate, lichens are susceptible to high extinction rates, mainly due to habitat destruction/alteration. It is, therefore, essential to carry out a study of diversity and bioprospecting, before this biotechnological potential is lost. This proposal involves an interdisciplinary team from three regions of Brazil (North, Northeast and Southeast) and five research institutions (UFMA, UEMASul, ITV DS, USP, University of Helsinki). The general objective of the network is to analyze the structural and functional diversity of lichens from anthropized and conserved areas in the Maranhão state, aiming at the biomonitoring and investigation of these organisms as sources of secondary metabolites of biotechnological importance. For this, integrative taxonomy, microbiome, metagenomics, metabolomics and bioinformatics techniques will be used with high potential for training and innovation.

**Graphical Abstract**

**Expected results**

- Characterize the species diversity of lichens in the state of Maranhão.
- Identify and characterize the associated microbiome.
- Evaluate the biotechnological potential of the secondary metabolites.
- Contribute with taxonomic data for the understanding of environmental indicators and climate change and microbiome.
- Evaluate the biotechnological potential of the secondary metabolites.
- Promote the training of future researchers in the area of microbiome and metabolomics.

**Acknowledgements**

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** FAPEMA





# Lipid Droplets: a Novel Cellular Target for Cancer Radioresistance

**Author(s):** Luca Tirinato

**\*Presenter:** Luca Tirinato, University Magna Graecia of Catanzaro

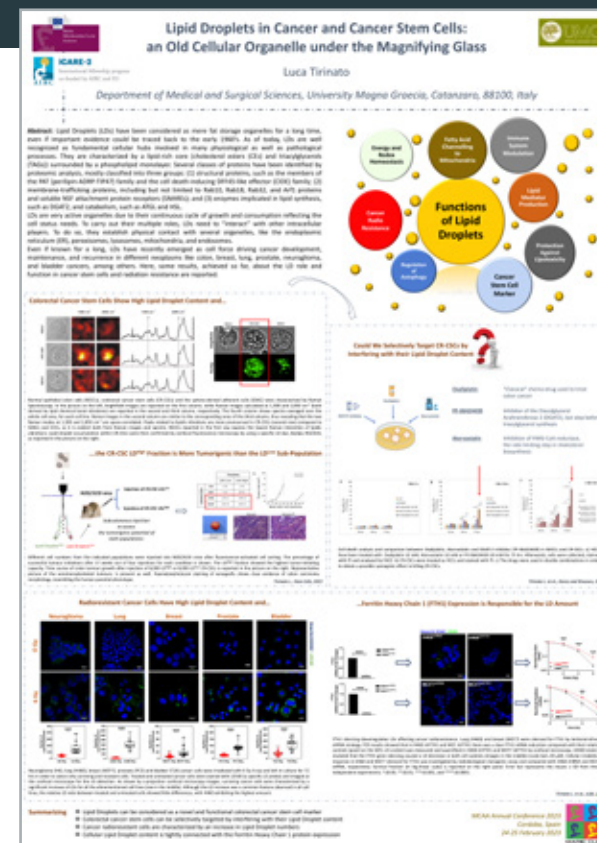
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## Abstract:

Since its first application in cancer treatment, radiotherapy has greatly improved from both a technical and a bio-clinical point of view, significantly increasing the treatment options and patient survival. Ionizing radiations (X-rays) work by damaging cell biomolecules, mostly DNA, which eventually induce cell death. The molecular mechanisms activated by cancer cells in response to ionizing radiation are extensively investigated and many advances have been made so far. However, considerably many questions are still unanswered and much remains poorly understood. Cancer cell radioresistance (RR) makes different tumor types difficult to treat. In this regard, the presence within the tumor mass of a small cell subpopulation called Cancer Stem Cells (CSCs) or Cancer Initiating-Cells (CICs) as well as their particular lipid rearrangements seems to represent some of the driving forces contributing to tumor resistance and recurrence after radiotherapy treatments.

In particular, an increase of small lipid organelles inside cancer cells, namely lipid droplets (LDs), has been shown to correlate with a CSC-like phenotype in the colon, ovary, breast, and glioblastoma.

On this point, we discovered that 6 Gy X-ray resistant human breast, bladder, lung, neuroglioma, and prostate cancer cells were characterized by an increase in LD number and that the cells containing the highest LD content showed the highest clonogenic potential after irradiation. Moreover, we observed that LD amount was tightly connected with the iron metabolism and in particular with the presence of the ferritin heavy chain (FTH1). In fact, breast and lung cancer cells silenced for the FTH1 gene showed a reduction in the LD number and, by consequence, became radiosensitive. On the contrary, FTH1 overexpression as well as the treatment with an iron-chelating agent (Deferoxamine) were able to restore the LD amount and RR. Overall, these results provide evidence of a novel mechanism behind RR in which LDs and FTH1 are tightly connected to each other, a synergistic effect that might be worth deeply investigating in order to make cancer cells more radiosensitive and improve the efficacy of radiation treatments.



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** Luca Tirinato has received funding from AIRC and the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie grant agreement n. 800924.



# Complexes of human IFIT proteins in the regulation of the innate immune response

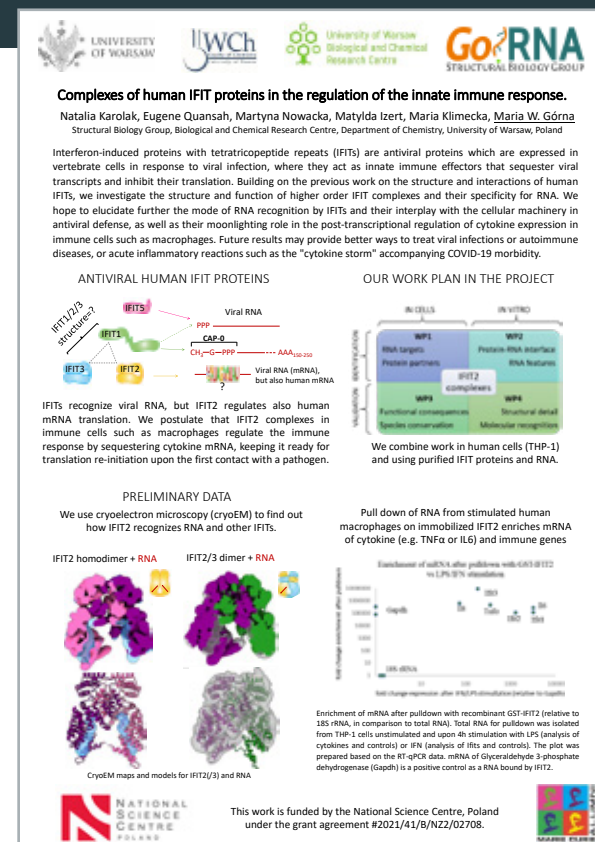
**Author(s):** Eugene Otu Quansah, Martyna Nowacka, Matylda Izert, Maria Klimecka, Maria Górna

**\*Presenter:** Maria Górna, Biological and Chemical Research Centre, Department of Chemistry, University of Warsaw

[mwgorna@gmail.com](mailto:mwgorna@gmail.com)

## Abstract:

Interferon-induced proteins with tetratricopeptide repeats (IFITs) are antiviral proteins which are expressed in vertebrate cells in response to viral infection, where they act as innate immune effectors that sequester viral transcripts and inhibit their translation. Building on the previous work on the structure and interactions of human IFITs, we investigate the structure and function of higher order IFIT complexes and their specificity for RNA. We hope to elucidate further the mode of RNA recognition by IFITs and their interplay with the cellular machinery in antiviral defense, as well as their moonlighting role in the post-transcriptional regulation of cytokine expression in immune cells such as macrophages. Future results may provide better ways to treat viral infections or autoimmune diseases, or acute inflammatory reactions such as the “cytokine storm” accompanying COVID-19 morbidity.



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** This work is funded by the National Science Centre, Poland under the grant agreement 2021/41/B/NZ2/02708.





## Data collection for Neurovascular health studies

**Author(s):** Senol Piskin

**\*Presenter:** Senol Piskin, Department of Mechanical Engineering, Faculty of Engineering and Natural Sciences, Istinye University, Istanbul, Turkey  
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**Abstract:**

The objective of this presentation is to discuss the data collection survey for the current MSCA individual fellowship project of the author. These data include publicly available open data and private data that is being collected. The project proposal of the MSCA individual fellowship aims to develop computational tools to assess cerebrovascular health and early detection of cognitive diseases. Furthermore, the prognosis of the disease after the diagnosis is another objective of the proposal. Imaging modalities and simulation tools will be used together to achieve the objectives. Data from magnetic resonance imaging (MRI)/computer tomography (CT)/ultrasound (US) will be interpreted to obtain information about the anatomy and flow. Computational simulation tools will be used to generate detailed hemodynamic data and derive abstract indices.

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** Piskin S. has received funding from the European Research Executive Agency, Marie-Skłodowska Curie Actions - Global Individual Fellowship (101038096) and from Istinye University, BAP project (2019B1).





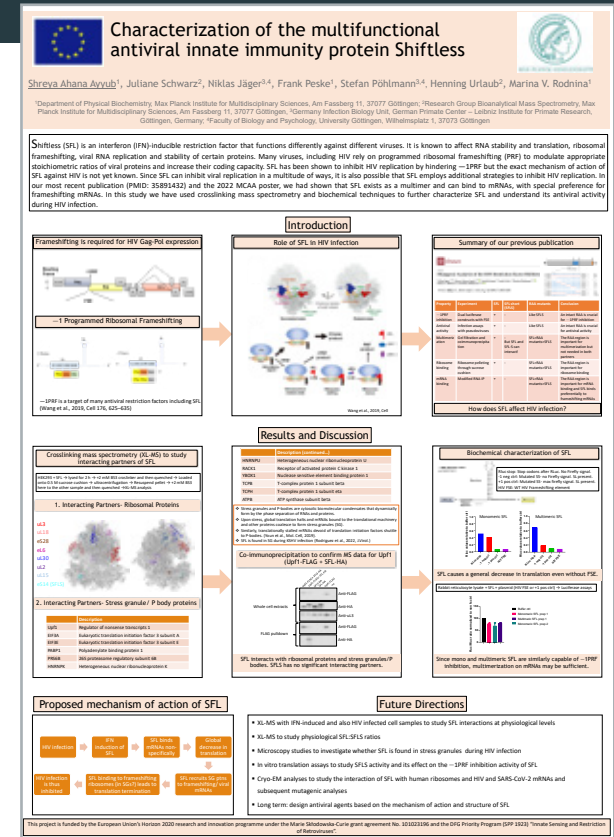
# Characterization of the multifunctional antiviral innate immunity protein Shiftless

**Author(s):** Shreya Ayyub, Olexandr Dybkov, Frank Peske, Henning Urlaub, Marina Rodnina

**\*Presenter:** Shreya Ayyub, Max Planck Institute for Multidisciplinary Sciences  
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## Abstract:

Shiftless (SFL) is an interferon-inducible restriction factor that functions differently against different viruses. It is known to affect RNA stability and translation, ribosomal frameshifting, viral RNA replication and stability of certain proteins. Many viruses, including HIV rely on programmed ribosomal frameshifting (PRF) to modulate appropriate stoichiometric ratios of viral proteins and increase their coding capacity. SFL has been shown to inhibit HIV replication by hindering -1PRF but the exact mechanism of action of SFL against HIV is not yet known. Since SFL can inhibit viral replication in a multitude of ways, it is also possible that SFL employs additional strategies to inhibit HIV replication. In our most recent publication (PMID: 35891432) and the 2022 MCAA poster, we had shown that SFL exists as a multimer and can bind to mRNAs, with special preference for frameshifting mRNAs. In this study we have used crosslinking mass spectrometry and biochemical techniques to further characterize SFL and understand its antiviral activity during HIV infection.



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** This project is funded by the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 101023196.





# Whole brain dynamics drive adaptive sequences of changes in fear-related behavioural states in the larval zebrafish

**Author(s):** Thomas Soares Mullen, Joaquim Conradsnaças, Edite Figueiras, Michael Orger

**\*Presenter:** Thomas Soares Mullen, Neuroscience Unit, Champalimaud Research Foundation, Lisbon, Portugal  
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## Abstract:

Animals are constantly interacting with their environment. They receive sensory information about the state of their environment and perform actions to achieve goals. However, behaviour is not completely predictable. This variation can be explained by randomness within the brain, or persistent differences in the network state of the brain that influence behavioural output. The latter is described as an internal state. A challenge with understanding the neural systems that define internal states is that they are often not localised to one region of the brain; rather there are changes in a brain-wide network of areas that affect behaviour at many levels. Zebrafish are a powerful model to study such distributed networks, because they have small transparent brains, in which we can record activity in all neurons simultaneously. At the same time their brain is similar to those of other vertebrates, and they show complex behaviours like foraging and threat avoidance, which are influenced by internal motivational states. We developed an assay in which the fish cycle through a stereotyped sequence of behavioural states after presentation of a brief aversive stimulus. The stimulus is delivered in a temporally precise way by using a photosensitive chemical, optovin, which, on exposure to UV light, activates neurons in the skin of the fish that sense noxious touch. In response to a 0.1s stimulation, the fish initially perform a series of

fast tail movements, a typical avoidance response. After the stimulus has passed, the larvae enter a sustained period of immobility, before slowly ramping up into a period of rhythmic forward swimming, distinct from their routine locomotor behaviour. The transitions between these different behavioural strategies occur in the absence of a stimulus, and therefore reflect dynamic changes in internal brain states. To identify the network states associated with different behavioural states and the neural mechanisms that drive transitions, we use calcium imaging where a fluorescent indicator reports neuronal activity in the brain at high resolution. We recorded whole brain neuronal activity and used methods such as dimensionality reduction to identify the most relevant features of the population activity. By mapping the distribution of these features within the recorded neural population, we can identify the key brain regions involved, and shed light on the underlying circuit organisation. We hope to gain an understanding of how ongoing brain dynamics allows for adaptive sequences of changes in behavioural state, and how this process changes over repeated stimulation cycles. Many of the neural systems involved are conserved throughout vertebrate animals, so this work has potential relevance to understanding similar brainwide processes in humans, including psychiatric disorders which are due to abnormal adaptive switches in behaviour states such as clinical depression and schizophrenia.


**Characterise adaptive behaviour sequences in the larval zebrafish**  
Thomas Soares Mullen\*, Joaquim Conradsnaças, Edite Figueiras, Michael Orger  
Champalimaud Neuroscience, Champalimaud Research, Champalimaud Center for the Unknown, Lisbon, Portugal  
\*email: thomasmullen@research.champalimaud.org

### 1. Abstract

Animals are constantly interacting with their environment. They receive sensory information about the state of their environment and perform actions to achieve goals. However, behaviour is not completely predictable. This variation can be explained by randomness within the brain, or persistent differences in the network state of the brain that influence behavioural output. The latter is described as an internal state. A challenge with understanding the neural systems that define internal states is that they are often not localised to one region of the brain; rather there are changes in a brain-wide network of areas that affect behaviour at many levels. Zebrafish are a powerful model to study such distributed networks, because they have small transparent brains, in which we can record activity in all neurons simultaneously. At the same time their brain is similar to those of other vertebrates, and they show complex behaviours like foraging and threat avoidance, which are influenced by internal motivational states. We developed an assay in which the fish cycle through a stereotyped sequence of behavioural states after presentation of a brief aversive stimulus. The stimulus is delivered in a temporally precise way by using a photosensitive chemical, optovin, which, on exposure to UV light, activates neurons in the skin of the fish that sense noxious touch. In response to a 0.1s stimulation, the fish initially perform a series of fast tail movements, a typical avoidance response. After the stimulus has passed, the larvae enter a sustained period of immobility, before slowly ramping up into a period of rhythmic forward swimming, distinct from their routine locomotor behaviour. The transitions between these different behavioural strategies occur in the absence of a stimulus, and therefore reflect dynamic changes in internal brain states. To identify the network states associated with different behavioural states and the neural mechanisms that drive transitions, we use calcium imaging where a fluorescent indicator reports neuronal activity in the brain at high resolution. We recorded whole brain neuronal activity and used methods such as dimensionality reduction to identify the most relevant features of the population activity. By mapping the distribution of these features within the recorded neural population, we can identify the key brain regions involved, and shed light on the underlying circuit organisation. We hope to gain an understanding of how ongoing brain dynamics allows for adaptive sequences of changes in behavioural state, and how this process changes over repeated stimulation cycles. Many of the neural systems involved are conserved throughout vertebrate animals, so this work has potential relevance to understanding similar brainwide processes in humans, including psychiatric disorders which are due to abnormal adaptive switches in behaviour states such as clinical depression and schizophrenia.

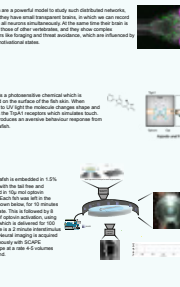
### 2. Introduction

Unpredicted changes in environmental signals threaten the ability of an organism to maintain its internal state. Animals have evolved strategies to respond to such changes, such as foraging, threat avoidance, and other behaviours that help to maintain the state of the organism. It is important to understand how these behaviours are controlled by the brain, and how they change in response to environmental changes. The brain state influences a behavioural response to optimize survival. The initial response to a stimulus is a stereotyped sequence of behaviours, which is followed by a period of immobility, before slowly ramping up into a period of rhythmic forward swimming, distinct from their routine locomotor behaviour. The transitions between these different behavioural strategies occur in the absence of a stimulus, and therefore reflect dynamic changes in internal brain states.




### 3. Experimental Set-up

Zebrafish are a powerful model to study such distributed networks, because they have small transparent brains, in which we can record activity in all neurons simultaneously. At the same time their brain is similar to those of other vertebrates, and they show complex behaviours like foraging and threat avoidance, which are influenced by internal motivational states. We developed an assay in which the fish cycle through a stereotyped sequence of behavioural states after presentation of a brief aversive stimulus. The stimulus is delivered in a temporally precise way by using a photosensitive chemical, optovin, which, on exposure to UV light, activates neurons in the skin of the fish that sense noxious touch. In response to a 0.1s stimulation, the fish initially perform a series of fast tail movements, a typical avoidance response. After the stimulus has passed, the larvae enter a sustained period of immobility, before slowly ramping up into a period of rhythmic forward swimming, distinct from their routine locomotor behaviour. The transitions between these different behavioural strategies occur in the absence of a stimulus, and therefore reflect dynamic changes in internal brain states. To identify the network states associated with different behavioural states and the neural mechanisms that drive transitions, we use calcium imaging where a fluorescent indicator reports neuronal activity in the brain at high resolution. We recorded whole brain neuronal activity and used methods such as dimensionality reduction to identify the most relevant features of the population activity. By mapping the distribution of these features within the recorded neural population, we can identify the key brain regions involved, and shed light on the underlying circuit organisation. We hope to gain an understanding of how ongoing brain dynamics allows for adaptive sequences of changes in behavioural state, and how this process changes over repeated stimulation cycles. Many of the neural systems involved are conserved throughout vertebrate animals, so this work has potential relevance to understanding similar brainwide processes in humans, including psychiatric disorders which are due to abnormal adaptive switches in behaviour states such as clinical depression and schizophrenia.




### 4. Characteristic behaviour

The initial response to a stimulus is a stereotyped sequence of behaviours, which is followed by a period of immobility, before slowly ramping up into a period of rhythmic forward swimming, distinct from their routine locomotor behaviour. The transitions between these different behavioural strategies occur in the absence of a stimulus, and therefore reflect dynamic changes in internal brain states. To identify the network states associated with different behavioural states and the neural mechanisms that drive transitions, we use calcium imaging where a fluorescent indicator reports neuronal activity in the brain at high resolution. We recorded whole brain neuronal activity and used methods such as dimensionality reduction to identify the most relevant features of the population activity. By mapping the distribution of these features within the recorded neural population, we can identify the key brain regions involved, and shed light on the underlying circuit organisation. We hope to gain an understanding of how ongoing brain dynamics allows for adaptive sequences of changes in behavioural state, and how this process changes over repeated stimulation cycles. Many of the neural systems involved are conserved throughout vertebrate animals, so this work has potential relevance to understanding similar brainwide processes in humans, including psychiatric disorders which are due to abnormal adaptive switches in behaviour states such as clinical depression and schizophrenia.



### 5. Competing Defense Strategies

Figure 1 shows a short period of the behavioural experiment, where the fish in the left angle one stimulus (0.1s) and then immediately enters a period of immobility. The fish generally enter a period of immobility, before slowly ramping up into a period of rhythmic forward swimming, distinct from their routine locomotor behaviour. The transitions between these different behavioural strategies occur in the absence of a stimulus, and therefore reflect dynamic changes in internal brain states. To identify the network states associated with different behavioural states and the neural mechanisms that drive transitions, we use calcium imaging where a fluorescent indicator reports neuronal activity in the brain at high resolution. We recorded whole brain neuronal activity and used methods such as dimensionality reduction to identify the most relevant features of the population activity. By mapping the distribution of these features within the recorded neural population, we can identify the key brain regions involved, and shed light on the underlying circuit organisation. We hope to gain an understanding of how ongoing brain dynamics allows for adaptive sequences of changes in behavioural state, and how this process changes over repeated stimulation cycles. Many of the neural systems involved are conserved throughout vertebrate animals, so this work has potential relevance to understanding similar brainwide processes in humans, including psychiatric disorders which are due to abnormal adaptive switches in behaviour states such as clinical depression and schizophrenia.



### 6. Future Direction

We hope to gain an understanding of how ongoing brain dynamics allows for adaptive sequences of changes in behavioural state, and how this process changes over repeated stimulation cycles. Many of the neural systems involved are conserved throughout vertebrate animals, so this work has potential relevance to understanding similar brainwide processes in humans, including psychiatric disorders which are due to abnormal adaptive switches in behaviour states such as clinical depression and schizophrenia.

### 7. Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. #813457

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. #813457

# Involvement of the Translin-like protein in the non-canonical RNA degradation pathway of *Mucor lusitanicus*

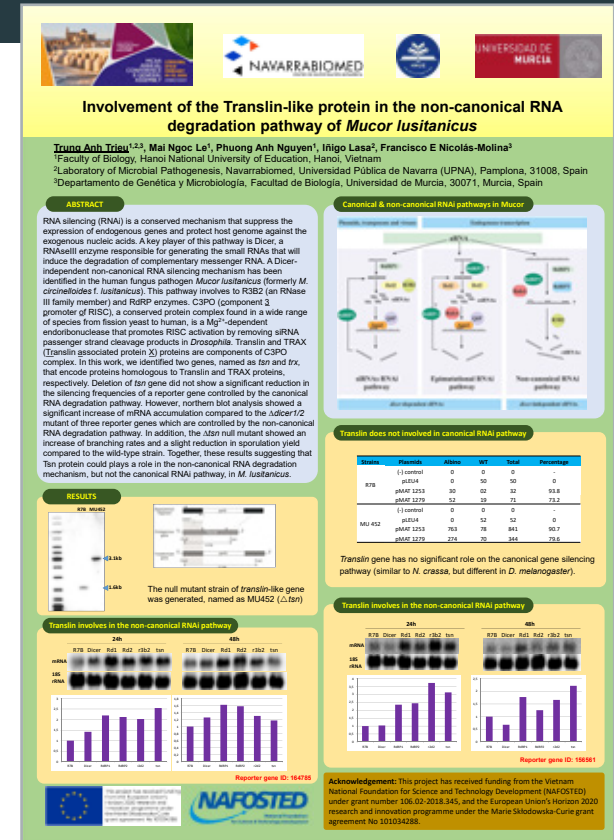
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**Abstract:**

RNA silencing (RNAi) is a conserved mechanism that suppress the expression of endogenous genes and protect host genome against the exogenous nucleic acids. A key player of this pathway is Dicer, a RNaseIII enzyme responsible for generating the microRNAs that will induce the degradation of complementary messenger RNA. A Dicer-independent non-canonical RNA silencing mechanism has been identified in the human fungus pathogen *Mucor lusitanicus* (formerly *M. circinelloides* f. *lusitanicus*). This pathway involves to R3B2 (an RNase III family member) and RdRP enzymes. C3PO (component 3 promoter of RISC), a conserved protein complex found in a wide range of species from fission yeast to human, is a Mg<sup>2+</sup>-dependent endoribonuclease that promotes RISC activation by removing siRNA passenger strand cleavage products in *Drosophila*. Translin and TRAX (Translin associated protein X) proteins are components of C3PO complex. In this work, we identified two genes, named as *tsn* and *trx*, that encode proteins homologous to Translin and TRAX proteins, respectively. Deletion of *tsn* gene did not show a significant reduction in the silencing frequencies of a reporter gene controlled by the canonical RNA degradation pathway. However, northern blot analysis showed a significant increase of mRNA accumulation compared to the  $\Delta$ dicer1/2 mutant of three reporter genes which are controlled by the non-canonical RNA degradation pathway. In addition, the  $\Delta$ tsn null mutant showed an increase of branching rates and a slight reduction in sporulation yield compared to the wild-type strain. Together, these results suggesting that Tsn protein could plays a role in the non-canonical RNA degradation mechanism, but not the canonical RNAi pathway, in *M. lusitanicus*.



**Involvement of the Translin-like protein in the non-canonical RNA degradation pathway of *Mucor lusitanicus***

**Trung Anh Trieu<sup>1,2,3</sup>, Mai Ngoc Le<sup>1</sup>, Phuong Anh Nguyen<sup>1</sup>, Iñigo Lasa<sup>2</sup>, Francisco E Nicolás-Molina<sup>3</sup>**  
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**ABSTRACT**

RNA silencing (RNAi) is a conserved mechanism that suppress the expression of endogenous genes and protect host genome against the exogenous nucleic acids. A key player of this pathway is Dicer, a RNaseIII enzyme responsible for generating the small RNAs that will induce the degradation of complementary messenger RNA. A Dicer-independent non-canonical RNA silencing mechanism has been identified in the human fungus pathogen *Mucor lusitanicus* (formerly *M. circinelloides* f. *lusitanicus*). This pathway involves to R3B2 (an RNase III family member) and RdRP enzymes. C3PO (component 3 promoter of RISC), a conserved protein complex found in a wide range of species from fission yeast to human, is a Mg<sup>2+</sup>-dependent endoribonuclease that promotes RISC activation by removing siRNA passenger strand cleavage products in *Drosophila*. Translin and TRAX (Translin associated protein X) proteins are components of C3PO complex. In this work, we identified two genes, named as *tsn* and *trx*, that encode proteins homologous to Translin and TRAX proteins, respectively. Deletion of *tsn* gene did not show a significant reduction in the silencing frequencies of a reporter gene controlled by the canonical RNA degradation pathway. However, northern blot analysis showed a significant increase of mRNA accumulation compared to the  $\Delta$ dicer1/2 mutant of three reporter genes which are controlled by the non-canonical RNA degradation pathway. In addition, the  $\Delta$ tsn null mutant showed an increase of branching rates and a slight reduction in sporulation yield compared to the wild-type strain. Together, these results suggesting that Tsn protein could plays a role in the non-canonical RNA degradation mechanism, but not the canonical RNAi pathway, in *M. lusitanicus*.

**RESULTS**

The null mutant strain of translin-like gene was generated, named as MU452 ( $\Delta$ tsn)

**Translin does not involved in canonical RNAi pathway**

Strain	Plasmids	Active	WT	Total	Percentage
R78	(-) control	0	0	0	-
	pM44	0	30	30	0
	pM41 1213	30	0	32	93.8
MU 452	(-) control	0	0	0	-
	pM44	0	52	52	0
	pM41 1213	753	75	843	90.7

Translin gene has no significant role on the canonical gene silencing pathway (similar to *N. crassa*, but different in *D. melanogaster*).

**Translin involves in the non-canonical RNAi pathway**

Reporter gene ID: 164783

**Acknowledgement:** This project has received funding from the Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 106.02-2018.345, and the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101034288.

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** The Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 106.02-2018.345, and the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101034288





# Atmospheric pressure plasma skirt jet– a sustainable method for development of biopolymeric thin films

**Author(s):** Andrada Lazea-Stoyanova, Ana Díez Bermejo

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## Abstract:

Biopolymeric films are generally obtained via chemical methods, which are wet processes, require a high consumption of water and/or energy, use increased temperature and complicated set-ups, etc. Hereby, we propose a physical synthesis method based on low temperature atmospheric pressure plasma working at room temperature and in open-air atmosphere generated by radiofrequency (RF). Our plasma-based method has the advantages that is a dry method, requires low processing time and is user-friendly and energy efficient [1].

In this study we present the plasma synthesis of biopolymeric films obtained using a liquid precursor obtained from renewable, plant-based sources (castor oil urethane dimetacrylate (CO-DMA)) [2]. Scanning Electron Microscopy (SEM) and Energy-Dispersive X-ray Spectroscopy (EDS) were used to analyze the obtained layers. A correlation between the films properties and the plasma characteristics was possible due to Optical Emission Spectroscopy (OES) data. In conclusion, we proved that our innovative physical plasma based method is suitable for biopolymers films fabrication.

Ref: [1] H.-S. Kim S. C. Min, Food Sci. Biotechnol 2017, DOI 10.1007/s10068-017-0110-6

[2] V. Melinte, T. Buruiana, I. Rosca, A. L. Chibac, Chemistry Select 2019, 4, 5138, <https://doi.org/10.1002/slct.201803930>

**Atmospheric pressure plasma – a sustainable method for development of biopolymeric thin films**

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**Novelty**  
 Biopolymeric films are generally obtained via chemical methods, which are wet processes, require a high consumption of water and/or energy, use increased temperature and complicated set-ups, etc. Hereby, we propose a physical synthesis method based on low (cold) temperature atmospheric pressure plasma working at room temperature and in open-air atmosphere generated by radiofrequency (RF). Our plasma-based method has the advantages that is a dry method, requires low processing time and is user-friendly and energy efficient [1].

This is the first study that presents the plasma synthesis of biopolymeric films obtained using a liquid precursor obtained from renewable, plant-based sources (castor oil urethane dimetacrylate (CO-DMA)) [2].

**What is man-made plasma and why to use it?**

We have learned in physics and chemistry classes that plasma is the fourth state of matter, is an ionized gas, and commonly encountered natural plasmas are the Sun and other stars, lightning, the Aurora borealis, the solar wind, flames or interstellar nebulae. Natural plasma exist at very high temperatures, whereas artificial plasmas can be man-made, have lower temperatures and the most popular are neon signs, plasma balls, etc. As mentioned in the scientific literature, artificial plasmas are chemically active media consisting of electrons, ions and neutrals. Depending on their working conditions and their generated “temperatures”, artificial plasmas can also be classified into cold or thermal plasmas. Exactly due to their wide range of temperature, artificial plasmas can be used in various applications, ranging from surface coatings, to liquid and gas waste treatments, to material synthesis, and so on.

To avoid disadvantages created by the usage of thermal plasmas or cold plasmas that operate under vacuum, more sustainable plasma types are nowadays preferred: cold atmospheric pressure plasmas. Our poster aims to present a cold plasma source, working at atmospheric pressure, developed in our lab and used for biopolymeric films synthesis. Hence, we prove that temperature sensitive materials, such as biopolymers, can be successfully obtained using renewable, plant-based liquid precursors.

**Plasma parameters & Results**

Element	Atomic %
C	75.83
O	17.00
N	12.23
K	0.52

**Experimental details:**  
 ~2x2cm<sup>2</sup> Si (100)-oriented substrates  
 plant-based sources liquid precursor (castor oil urethane dimetacrylate (CO-DMA))  
 13.56MHz RF plasma DBD type source <sup>100W</sup> in air  
 2 minutes exposure time  
 1 mm sample to plasma distance  
 Ar gas (2000 – 3000 sccm)  
 0-15 W

**Conclusions**  
 As it presented above, using an RF atmospheric pressure plasma source leads to polymerization of a liquid precursor obtained from renewable, plant-based sources. Hence, a biopolymeric thin film is obtained without toxic photo-initiator addition and without the need to control the process atmosphere (i.e. no oxygen free atmosphere).

**Acknowledgements**  
 This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS - UEFISCDI, project number PN-III-P2-2.1-PED-2021-272 within PNCDI III.

**Literature cited:**  
 [1] H.-S. Kim S. C. Min, Food Sci. Biotechnol 2017, DOI 10.1007/s10068-017-0110-6  
 [2] V. Melinte, T. Buruiana, I. Rosca, A. L. Chibac, Chemistry Select 2019, 4, 5138, <https://doi.org/10.1002/slct.201803930>  
 [3] <https://www.mfp.com/2073-4362/10/111249>

**Scientific Area:** PHY Physics

**Acknowledgement:** This work was supported by a grant of the Romanian Ministry of Education and Research, CNCS - UEFISCDI, project number PN-III-P2-2.1-PED-2021-272 within PNCDI III.





# Iberus Experience MSCA-COFUND Programme: 11 postdoctoral researchers at Campus Iberus

**Author(s):** Joaquin Capablo

**\*Presenter:** Joaquin Capablo, Campus Iberus

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## Abstract:

Iberus Experience is an H2020 Marie Skłodowska-Curie Action Cofund programme for Experienced Researchers, managed by Campus Iberus, the Campus of International Excellence (CEI) of the Ebro Valley promoted in strategic aggregation by the public universities of the Autonomous Communities of Aragon and La Rioja, of the Foral Community of Navarra, as well as that of the province of Lleida in Catalonia.

Iberus Experience is an International Fellowship Programme for talent attraction, consolidation and retention at the Campus of International Excellence of the Ebro Valley offering 11 postdoctoral 3-years contracts to excellent researchers to develop individual and freely selected research projects in one of the five areas of specialization of Campus Iberus (Agrofood and Nutrition, Health Technologies, Energy and Sustainability, Social and Territorial Development and Circular Bio-economy) in order to produce a positive effect in terms of excellent science with impact at the regional level. The programme is run in collaboration with the 4 Universities of Campus Iberus as recruiting institutions, the University of Lleida (engaging 4 researchers), the Public University of Navarre (3 researchers), University of Zaragoza and University of La Rioja (2 researchers each). 5 female researchers out of 11 participate in the program, with the recruited researchers being of 7 different nationalities from 4 continents (Argentina, Brasil, India -2-, Italy, Nigeria, Philippines, Spain -3-, Vietnam). The postdoctoral researchers engaged at the Iberus Experience programme are Cristina Blanco (Spain), Joan Oñate Narciso (Philippines), Lauren Yabuki (Brasil) and Saqib Gulzar (India) joining the University of Lleida, Anand Shrivastav (India), Lucas Castellani (Argentina) and Trung Anh Trieu (Vietnam) being incorporated at the Public University of Navarre, Ana Rua

(Spain) and María Batuecas (Spain) as part of the University of Zaragoza, and Mattia Ghirardello (Italy) and Rine Reuben (Nigeria) being selected for the University of La Rioja.

These outstanding researchers at the Iberus Experience programme receive attractive conditions based on the principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, as well as the EU Principles for Innovative Doctorate Training. Campus Iberus Universities hold or have adhered to the Human Resources Strategy for Researchers – HRS4R seal, which openly demonstrate their commitment to act in a responsible and respectable way and to provide fair framework conditions to the researchers.

Among the benefits, the researchers have available both administrative and financial support for international research costs, training and network participations, or tailored training and personalized mentoring: they define and follow a Personal Career Development Plan at the beginning of their contract, having access to a variety of training options and workshops on relevant scientific and transferable skills along their recruitment period. Moreover, several activities are planned to promote their integration in the local Campus Iberus life and cultural activities.

Additionally, numerous international Universities and non-academic participating organizations (companies, research centers and hospitals) are committed with the Iberus Experience programme to offer secondments, visits, collaborations and networks, as well as other opportunities to enhance the researcher's career and guarantee an attractive ecosystem for the incoming researchers.

**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101034288





# Sustainability activities of the Spain-Portugal MCAA Chapter

**Author(s):** Joaquin Capablo

**\*Presenter:** Joaquin Capablo, MCAA Spain-Portugal Chapter, [jcapablo@yahoo.es](mailto:jcapablo@yahoo.es)

## Abstract:

From the Spain-Portugal MCAA Chapter, we would like to highlight some of the activities and events undertaken along the year 2022, especially the ones focused on the topic “Sustainability in Science”. In March 2022, the Annual Conference – General Assembly of the Marie Curie Alumni Association was held on Lisbon, with “Sustainability and the post-pandemic Workplace” as main theme. Among participation of our members in several sessions, in cooperation with other Chapters and Working Groups, we also had a mentoring event in collaboration with ANEIS (Associação Nacional para o Estudo e a Intervenção na Sobredotação), an association for gifted children in Portugal. Furthermore, we presented in a poster the dissemination activity for the 11F - International Day of Women and Girls in Science, in which a 10-questions quiz was prepared to highlight the role of women researchers in science and awaken scientific vocations from a early age. In addition, taking advantage of the quiz, a special dish was prepared as the prize of a physical contest taking place in a bar in Zaragoza. An atomic structure was designed using Kimchi sauce and spices, in the middle of which a ball of cream cheese was placed, from which chips came out in various directions. The result was not only amazing but also delicious! Moreover, we have collaborated in the organization of some events with other MCAA Working Groups and Chapters. For example, we co-organized with the “Bridging Science and Business” Working Group two online Workshops on “Entrepreneurial skills for researchers”, (26/04 & 18/05), and the “Researchers Meet Innovators 2022”, taking place in Istanbul, in collaboration with the MCAA Turkey Chapter too. <https://www.mariecuriealumni.eu/events/researchers-meet-innovators-turkey-chapter-annual-meeting-2022> In terms of the Sustainability of the Researchers Career we worked together with the MCAA Career Development Working Group in the proposal of sessions for the AC-GA MCAA 2023, to be held in Córdoba (Spain), Challenges in Science

Diplomacy & Sustainable Development. Further collaborations in 2022 were in the “Careers after the MSCA fellowship” festival from the MCAA UK Chapter (November 2022) and in the online event “Expanding researchers opportunities: life beyond academia” from the MCAA Italy Chapter and Find Your Doctor (19/10). <https://www.linkedin.com/feed/update/urn:li:activity:6986633197048479744/> Furthermore, we participated in a Science Communication school (in Montagnana, Italy, 10-13/10), co-organized by the MCAA Italy Chapter. <http://www.sciencecommunicationschool.org/> and in the Alongline Summer School (in Rome) 27/08–04/09, about Sustainability. <https://no-city.org/SUMMER-SCHOOL> We also collaborated with the Romanian Chapter in the Webinar: What is research ethics / integrity and why is it important? (06/05) <https://www.mariecuriealumni.eu/mcaa-events/webinar-what-research-ethics-integrity-and-why-it-important> In terms of Sustainable Science we co-organized with Communication Working Group the webinar on Science Advice to Policy Makers (13/05) <https://www.youtube.com/watch?v=-Q4UHvwkP4c> and last but not least we organized some contests to bring art and science together, and let us going out of our comfort zone in four different disciplines: Photography (ART & SCIENCE), Scientific Short Poetry (LOVE TO SCIENCE), Master-Cooking (TRADITIONAL COOKING), Scientific Anecdotes (CONFUSCIENCE: Confusion in Science). The winners works are available in our Twitter (@SpainPortugalMC) and in the Spain-Portugal MCAA Chapter website (<https://www.mariecuriealumni.eu/groups/spain-portugal-chapter>)

**Sustainability Activities of the Spain-Portugal MCAA Chapter**  
 Joaquin Capablo Sesé  
 Chair of Spain-Portugal Chapter MCAA

<p><b>PHOTOGRAPHY: Art &amp; Science</b>        Cuando la ciencia embellece la naturaleza</p>  <p>Leyre Catalán</p>	<p><b>SHORT POETRY: Love to Science</b>        The Eclipse - Anne Swensky Lyle        The sun and the moon, two lovers who only meet during the eclipse.        The sun and the moon, they suffer, never be in one time.        That's why they love eclipses.        The sun and the moon, waiting for the conspiracy of time,        making love,        only to separate to opposite directions.        By the earth, they cried.        Because of the earth, they are blocked.        Do you know what did moon leave for the sun?        He left a kiss through the shadow of dawn,        when the sun was trying to lift itself on the horizon.        In return, the sun left its light to the billions of stars,        for the moon to accompany its night.        That's love, darling.        They do it over and over again, tirelessly,        through dawn and dusk, the message of love spread across the universe.        By the sun, moon, stars, and stars.        I am far waiting for the eclipse, with you,        without ever being separated again.        With you, darling, we'll create our own eclipse,        waiting for the message of love that you left through the universe.</p>	<p><b>COOKING: Traditional Recipes</b>        Homemade Pasta with meatball sauce from Centre Italy</p>  <p>Chiara Ciccioppo</p>
<p><b>ANECDOTES: Confuscience</b>        Ashish Asasthi - The confusing power of "yes".        So, this episode happened during Christmas days when I was working in the lab alone while my colleagues were on holidays.        I was asked to implant tumors in animal (rats) by a colleague as a favor.        When I went in animal house, there were a few different species of rats. However, since the said colleague never told me the purpose of the experiment, I didn't know which species was I supposed to implant. So, I treated the person, "They, do you need me to implant spring-dawley, wistar or long-eared species of rats?" to which the person's response was: "YES".        I was speechless, laughing hysterically but at the same time couldn't be more confused with a response that read yes.        Ever since then, I have incorporated this habit of replying to questions as a confusing yes and I couldn't be more happy :)</p>		 
<p><b>NEW ACTIVITIES ARE COMING IN 2023!! ENJOY!!</b></p> 		

@SpainPortugalMC www.mariecuriealumni.eu/groups/spain-portugal-chapter spain-portugal.chapter@mariecuriealumni.eu

**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** MCAA Spain-Portugal Chapter



# OLS: capacity building in open science in peer-led global and diverse community

**Author(s):** Mayya Sundukova

**\*Presenter:** Mayya Sundukova, Open Life Science

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## Abstract:

Widening inequality in access to scientific and technological resources is a hindering factor in achieving the United Nations Sustainable Development Goals. Open science, by making the research process more transparent, reproducible, and inclusive, is being increasingly recognised as an essential contributor to sustainable research practice. Indeed, UNESCO has been supporting the shift to open science by consulting multiple stakeholders and issuing the Recommendation on Open Science (adopted in November 2021), providing a framework with a universal definition, shared standards, values and principles of open science. Furthermore, in the summer of 2022, UNESCO launched a Global Call for Best Practices in Open Science.

New norms and behaviours often arise in bottom-up or grassroots initiatives, inciting and complementing top-down policy changes in building the culture change. Open Life Science (OLS) is a community-oriented non-profit organisation that promotes open, inclusive and equitable research [1]. OLS was incubated via the Mozilla Open Leaders initiative in 2019, and in 2022, is an internationally recognised training and mentoring platform to gather structured training and mentoring for academics, researchers, undergraduates, and other stakeholders working on participatory projects. For that, OLS provides resources, peer networks, and expert consulting to build open projects, establish/lead teams and become multipliers of open research in their networks. The essential requirement for joining this free program is a curiosity for open science and collaborative/ team science.

In this submission, we would like to discuss how capacity building in open science looks like by presenting our 16-week mentoring and training program [1,2]. As of 2022, OLS has 400+ community members across six continents and countries across the Global South and North and is currently opening the call for application to its seventh cohort. All participants - often teams and research groups - will work on an open science project with guidance from dedicated mentors and experts from the community. Secondly, we would like to share the current practices OLS developed to address inequities and increase sustainability, e.g., ensuring inclusive remote participation, sharing the recordings of the training calls and other educational resources, and narratives of the OLS grant applications with a wide audience [3,4]. Thirdly, we would like to share some examples of collective action, e.g., how OLS as a global community responded [5] to the UNESCO call for best practices to highlight the importance of grassroots initiatives in strengthening society-science-policy relationships.

- <https://openlifesci.org/>
- Open Life Science Community. Open Life Science - Training and Mentoring programme - Website release. Zenodo. (2021). <https://doi.org/10.5281/zenodo.5636584>
- <https://youtube.com/@OpenLifeSci>
- <https://zenodo.org/communities/openlifesci/>
- Sharan et al Open Life Science (OLS) response to UNESCO global call for best practices in open science. Zenodo. (2022). <https://doi.org/10.5281/zenodo.6841873>

**Open Life Science (OLS): CAPACITY BUILDING IN OPEN SCIENCE IN PEER-LED GLOBAL AND DIVERSE COMMUNITY**

**Introduction**

Widening inequality in access to scientific and technological resources is a hindering factor in achieving the United Nations Sustainable Development Goals. Open science, by making the research process more transparent, reproducible and inclusive, is being increasingly recognised as an essential contributor to sustainable research practice. Indeed, UNESCO has been supporting the shift to open science by consulting multiple stakeholders and issuing the Recommendation on Open Science (adopted in November 2021), providing a framework with a universal definition, shared standards, values and principles of open science. Furthermore, in the summer of 2022, UNESCO launched a Global Call for Best Practices in Open Science.

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**OLS community**

Who OLS really is:  
Our 400+ members, mentees, facilitators, and expert speakers.

**OLS training and mentoring program structure**

**Capacity building journeys for mentees and mentors**

Defining journey and process: Joy, Sam

Providing guidance and support: Sam

**Sustainable practices by OLS and deliverable actions**

1. Diversity, Equity & Inclusion DEI  
2. Open Educational Resources OER  
3. Priority engagement for culture change

**TLDR (Too long, didn't read!)**

OLS capacity building in open science in peer-led global and diverse community

13 mentoring  
Training calls on Open Science  
Open Sci. Community  
Training for mentors  
OLS is running near 100+ applications opens in June

Practicing  
Sharing  
Connecting  
Empowering

Current and previous funders: W, OER Commons, The Alan Turing Institute, Clean Technology Institute

**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** Open Life Science



# ECO-valuation : ECOlogy and ECOlogy

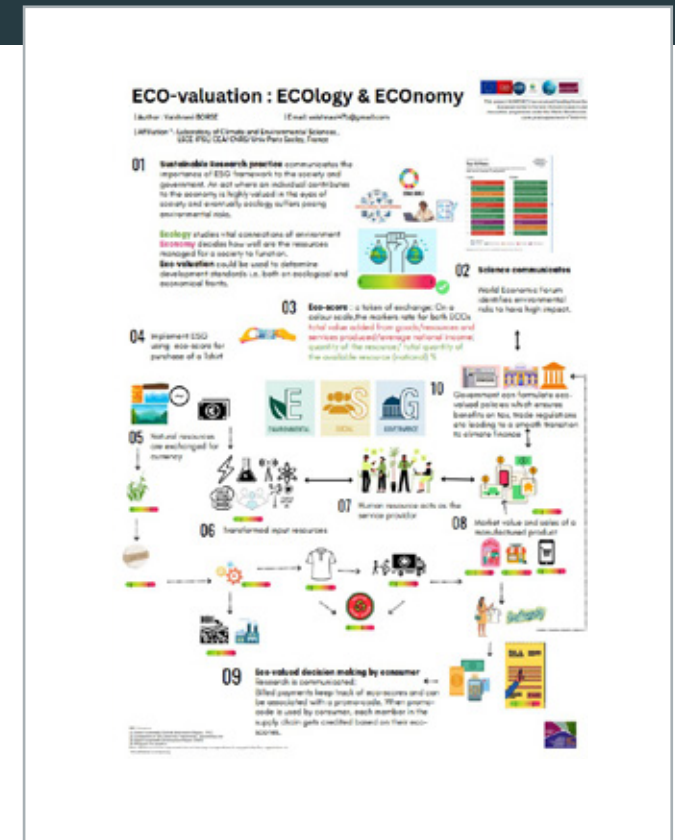
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**Abstract:**

Ecology brings the understanding of vital connections of the environment and economy decides how well are the resources managed for a community to function.

An act where an individual contributes to the economy is highly valued in the eyes of the community. All action happens with regards to economic domain and eventually ecology suffers a compromise, be it policy making, choice of career etc. Eco-valuation could be used to determine development standards i.e both on ecological and economical fronts. The spin-off to the tale would come when the community is eco-conscious. Introducing payslip which credits the ecology points as bonus for the employee, it's a win-win situation as misuse of resources becomes individual responsibility and profit margin raises for employers too. Sustainable growth still stands a eco-valued chance.



**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** LSCE, CEA/ CNRS (self-funded)



# Whistleblowing within academia and its impact on academics' mental health

**Author(s):** Francisco Valente Goncalves, Carolina Oliveira Borges, Darragh McCashin, Sandra Mateus

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## Abstract:

Recently in Europe, all Member States have been working towards to adopt and transpose the European Directive of Whistleblowing, for which the deadline was last December 2021. This legislation, that some Member States have transposed already, requires that all organizations within European countries with more than 50 people must protect whistleblowers in the event of these reporting an irregularity that they suffered or identified. The European Directive is extremely precise in regards of protecting and ensuring that whistleblowers shall not fear to report an irregularity at all times throughout the process. Furthermore, organizations such as the Association of Certified Fraud Examiners (ACFE) or Transparency International (TI) have been advocating the implementation of whistleblower channels that prevent retaliations of any type to the authors of reports (ACFE, 2022) as well as best practices to implement these integrity tools (Transparency International, 2020). Nevertheless, the strategies that organizations such as the cited ones have been disseminated broadly within the corporative context mostly. Other professional environments such as the academic one

have been failing to address the topic of reporting unethical issues seriously creating the gap to trigger victimization states (Dussuyer & Smith, 2018) that ultimately are more challenging to handle either by academic institutions and individuals. The academic context has observed a variety of unethical issues such as fraud, abuse of power, integrity flaws as well as harassment, gender violence and other types of brutal discrimination. In its 2020 report, the European Anti-Fraud Office (OLAF, 2020) identified that €293m were misused in public funding related to EU research grants. Other unethical behaviors, such as bullying or harassment, have also been reported within academia. For instance, the Kifinfo Report (The Norwegian Association of Higher Education Institutions, 2020) identified that universities in European countries did not have any measures to counter and prevent harassment. Some specifications within the Kifinfo report also identified that mobile researchers may suffer even bigger risks due to their lack of emotional support. Academia is a demanding and stressful work context, with a negative impact on the wellbeing of researchers (Badri, 2019). Several

studies have shown that academic staff such as postgraduate researchers are particularly at high risk of experiencing psychological distress such as severe anxiety and severe depression. In this study, it was investigated the presence of whistleblowing channels within academic institutions and the perception that academics have regarding the act of reporting unethical behaviours and its impact on their mental health. Three research tasks were performed: (1) content analysis of 96 academic institutions websites, (2) quantitative survey related to students perceptions (n=258) and (3) focus groups with researchers (n=15). Results showed that a significant number of academic institutions do not make available whistleblowing channels, and that students' perceptions regarding the act of reporting unethical behaviours are associated with fear of reprisals and insecurity. Moreover, results also demonstrated that researchers aim to have whistleblowing channels available as well as strategies that cover for their mental health whenever they need to report unethical behaviours.

Scientific Area: SSH Social Sciences







# Mining ethical ambiguities within global interconnections

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## Abstract:

In global supply chains (GVCs), multinationals and lower tier suppliers that adhere to socio-environmental initiatives commit to such standards with a cascading effect along GVCs. However, while the latter facilitate market access for countries and industries, doubts arise as to whether fragmented production ensures positive and lasting socio-environmental effects. Some scholars have recently criticised the superficial nature of academic and political-economic debates on sustainability and ethicality, arguing them more as a fad than as rigorous areas for the development of social-environmental policies and welfare initiatives. Certification systems, alongside the use of digitisation to share information (blockchain) along the supply chain, often increase a public consensus by exploiting rhetorical appeals about the protection of the environment, workers and human rights in general. In many cases, however, they continue to reproduce the gap between theory and implementation of ethical-sustainable intentions in certain socio-productive contexts in GVCs. Empirical research can show the flaws in the local functioning of transnational ethical-sustainable standards and the results can be useful for reconfiguring corporate-political goals. Mining is among the industries most overwhelmed by concerns about pollution and unethical management in the organisation of work and human rights. In the mining industry, especially diamonds have been the target of controversy by activists and researchers who have denounced harassment especially in the African mining context. Faced with the threat of financial losses due to international boycotts, and due to the positive economic impact of the diamond industry in certain countries such as Canada, companies in the sector were presented with the possibility, through a

certification of ethicality, of sponsoring diamond mining and trade practised in an absolutely legal manner while respecting the indigenous peoples, workers and protecting the environment. However, this objective is difficult to achieve as socio-economic asymmetries continue to emerge between actors involved in the mining industry. These dynamics create ambiguities between the implementation of socio-environmental policies, welfare initiatives, and the dissemination of global narratives of ethically sustainable extractive practices and their actual impacts in local contexts. These paradoxes should be read within global interconnections from extractive contexts to retail contexts. Drawing inspiration from the visual problem of presbyopia, we can state that, in many cases, despite the presence of ethical-sustainable certifications, the further one moves away from mining contexts, the sharper the concepts of ethicality and sustainability related to production practices and corporate welfare become due to advertising narratives that appeal to global stakeholders and consumers geographically and culturally distant from the mining context. Whereas, the closer one gets to the latter, the more the concepts of ethicality and sustainability can become blurred and, therefore, difficult to understand. While, in the case of diamonds, consumers may believe the veracity of advertising rhetoric about ethical and sustainable mining practices embedded in certifications, the same rhetoric may prove less appealing to residents and workers in the mining context to the point of even prompting them to mute behaviour in order not to expose themselves to discourses that might cast doubt on the proper functioning of such practices.



**Scientific Area:** SSH Social Sciences

**Acknowledgement:** H2020-MSCA-IF-2018 Grant agreement ID: 837190



# CHALLENGING THE CONCEPT OF SUSTAINABILITY TO PERFORM GLOBAL ACTIONS: ROTTERDAM AS A CASE STUDY

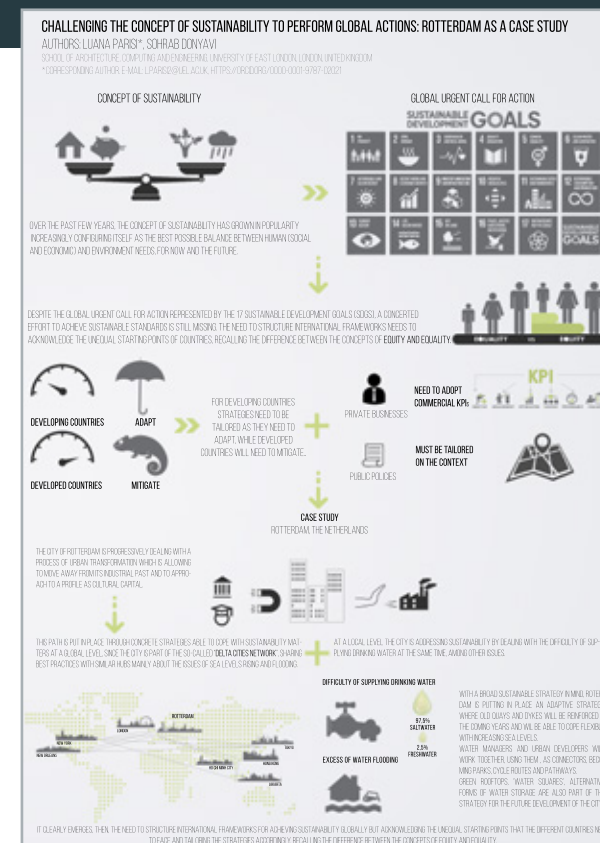
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## Abstract:

Over the past few years, the concept of sustainability has grown in popularity increasingly configuring itself as the best possible balance between human (social and economic) and environment needs, for now and the future. A Venn diagram with three interlocking rings referring to the aforementioned areas has been widely accepted as the main scheme able to put sustainability at its core. Despite the global urgent call for action represented by the 17 Sustainable Development Goals (SDGs), though, a concerted effort to achieve sustainable standards is still missing and this gap brought inevitably to start challenging the said concept of sustainability. The research intends to explore this scenario, by deepening the context of the city of Rotterdam (the Netherlands) as a case study. The city is progressively dealing with a process of urban transformation which is allowing it to move away from its industrial past and to approach to a profile as cultural capital. This path is put in place through concrete strategies able to cope with sustainability matters both at a global level, since the city is part of the so-called “Delta Cities Network”, sharing best practices with similar hubs mainly about the issues of sea levels rising and flooding, and at a local level, dealing with the difficulty of supplying drinking water at the same time, among other issues. It clearly emerges, then, the need to structure international frameworks for achieving sustainability globally but acknowledging the unequal starting points that the different countries need to face and tailoring the strategies accordingly, recalling the difference between the concepts of equity and equality. Useful lessons will be drawn in encouraging planners and policymakers towards structuring these global frameworks but implementing tailored initiatives, which are paramount for improving the liveability of the whole city system and coping with sustainable matters.



**Scientific Area:** SSH Social Sciences



# ENCOUNTER: Experiences of Youth in Natural Mentoring Relationships and application in Formal Youth Mentoring Interventions

**Author(s):** Tereza Brumovská

**\*Presenter:** Tereza Brumovská, Charles University, Faculty of Humanities

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## Abstract:

The poster will introduce the project's ENCOUNTER results and related activities related to application of these results into formal youth mentoring practice.

**FACULTY OF HUMANITIES**  
Charles University

**MENTORING**  
*Encounter*

EUROPEAN UNION

**Project ENCOUNTER: EXPERIENCES OF YOUTH IN NATURAL MENTORING RELATIONSHIPS (2021-23)** has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 101027291.

MSCA IF Research Fellow: Tereza Javornicky Brumovska, Ph.D.  
Institution: Faculty of Humanities, Charles University in Prague, Czech Republic

**1 Research aim**  
Project ENCOUNTER addresses experiences and perceptions of natural mentoring relationships in general population of current young people (12-15 years) in the Czech/EU context.

**Objectives**

- To examine the characteristics, dynamics, and perceived benefits of the natural mentoring relationships (NMRs) experienced by young people (12-15 years) in the Czech and European context.
- To contrast the functions, characteristics, and dynamics of natural mentoring among gender; and the features of NMRs experienced by young adolescents in the CZ and in an international context.
- To conceptualize the theoretical, interdisciplinary youth-centred framework on youth mentoring phenomena.
- To recommend the set of tools for use of natural mentoring in the secondary schools and social services of youths in the Czech Republic and beyond.

**ENCOUNTER Partners and participants**  
50 YP and 5 YP together with their mentors (12-16 years) are selected from 7 secondary schools, 1 mentoring programme and 1 art youth group.

**2 Research methods**  
A youth-centred qualitative approach with focus on youth experiences. In-depth semi-structured interviews and open-ended questionnaires. Art-based methods and photo-elicitation method applied.

An animated video based on the literature review on NMRs shown to YP as a scaffold to the exploration of their natural mentoring experiences.

In-depth thematic analysis using OSR NVivo 12 software is applied to 500 open-ended questionnaires and 50 in-depth semi-structured interviews with YP.

**Scientific Area:** SSH Social Sciences

**Acknowledgement:** Department of Psychology



# Environmental Sciences & Sustainable Research Practices





# IRTEMS project: a system to model instantaneous road traffic emissions for cities

**Author(s):** Christina Quaassdorff, Rafael Borge, Andrew Grieshop

**\*Presenter:** Christina Quaassdorff, Universidad Politécnica de Madrid

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## Abstract:

Road transport is often the main source of air pollution in urban areas worldwide. Many efforts have been aimed at reducing emissions from this sector achieving significant abatements. Nevertheless, emission reductions have been lower than expected due to the heavy growth of transport in the last decades. IRTEMS, Instantaneous Road Traffic Emission Modelling System for cities (H2020-MSCA-IF-2019-GA-896417), is a 3-year currently on-going project funded by the European Union. It is coordinated by Universidad Politécnica de Madrid (Spain), in collaboration with North Carolina State University (USA). The main focus of the project is on the road transport sector since it continues to be one of the main contributors to air pollution in many cities around the world.

To estimate emissions from the road transport sector, there are several methods and approaches that are useful for different scales of analysis. To understand the spatial and temporal distribution of the emissions, typically, regional traffic emission models are used for the compilation of urban inventories and usually those are the most detailed data available at city scale. This level of detail is not enough to understand the high pollutant concentrations that occur on specific urban highly polluted microenvironments (hotspots). In recent years many actions have been undertaken to solve air quality problems on these traffic hotspots. But, to accurately understand the influence of these very local high concentrations on the real exposure of the population, there is a need to estimate the contribution of road traffic to atmospheric emissions at city level but in great detail. For that, an integrated multi-scale approach is needed.

To achieve this goal, IRTEMS aims at developing a useful simulation system to provide microscale city-wide emission results. It will be developed by means of the implementation of a traffic emission modelling system with high resolution at city scale. The integrated approach can provide city-wide traffic emission estimations with high resolution in time and space. This system can help to understand the real implication of air quality policy actions and to analyze the potential of local abatement measures. This is an essential resource for local and central governments that are exploring different strategies to tackle the impacts of air pollution in urban areas.

The poster features the IRTEMS logo at the top left, which includes a city skyline and a car. Text on the poster includes: '2023 MCAA conference and general assembly', 'MCAA Lightning Talks', 'February 24-25, 2023. Córdoba, Spain.', and logos for NC State University, Universidad Politécnica de Madrid, and the European Union. The main title is 'IRTEMS project: a system to model instantaneous road traffic emissions for cities'. Below the title is a circular graphic showing a city skyline with a car on a road in the foreground, with the IRTEMS logo and a European Union flag below it. The authors' names are listed at the bottom: Christina Quaassdorff<sup>1,2</sup>, Rafael Borge<sup>1</sup>, Andrew Grieshop<sup>2</sup>. Footnotes provide affiliations for the authors.

**Christina Quaassdorff<sup>1,2</sup>, Rafael Borge<sup>1</sup>, Andrew Grieshop<sup>2</sup>**

<sup>1</sup> Escuela Técnica Superior de Ingenieros Industriales. Universidad Politécnica de Madrid.

<sup>2</sup> Department of Civil, Construction and Environmental Engineering. North Carolina State University.

**Scientific Area:** ENV Environmental Sciences

**Acknowledgement:** IRTEMS project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 896417.



# Sustainable biotechnology with sun, bacteria, and enzymes

**Author(s):** Giovanni Davide Barone

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## Abstract:

Over the past 60 years, the annual rate of increased atmospheric carbon dioxide (CO<sub>2</sub>) is 100 times faster than previous natural increases. Furthermore, the potential of the sun is still not yet properly exploited towards more sustainable and eco-friendly societies. The utilization of the solar energy plus CO<sub>2</sub> is a green approach to manufacture different commercialized products. Bacteria capable to perform photosynthesis have emerged as efficient tools to produce biochemicals. Among these, cyanobacteria are very interesting cells present in different ecosystems able to perform photosynthesis in parallel with CO<sub>2</sub> fixation. These also represent an alternative source of nutrients for different organisms, being part of diets for human and several animals. Furthermore, the electrons from photosynthesis can be deviated in wildtype and engineered strains towards the sustainable production of biofuels and other. In details, this type of approach is associated with the terms “photo-biotransformations”: the synthesis of compounds with enzymes under light irradiation. Still regarding sustainable biotechnology, the role of single species or microalgal-bacterial consortia against microplastic pollution has been recently recognized as a potential method of in-situ plastic degradation.

The recent developments in the production and utilization of photosynthetic microorganisms for food applications are summarized in this lightning talk. Furthermore, studies with cyanobacteria for the bioremediation of ecosystems polluted by plastic debris and sustainable approaches based on biocatalysis are also mentioned.

The slide features a background illustration of a building facade. It includes the following logos and text:

- TU Graz** logo (top right) with the tagline "SCIENCE PASSION TECHNOLOGY".
- PhotoBioCat** logo (center).
- U. PORTO** logo (center) with "FACULDADE DE CIÊNCIAS UNIVERSIDADE DO PORTO" below it.
- ALUMNI** logo (center) with "MARIE CURIE" below it.
- TU Graz** logo (left).

**Sustainable biotechnology with sun, bacteria, and enzymes**

Ph.D. Giovanni Davide Barone

Annual Conference MCAA, 24<sup>th</sup> February

**Scientific Area:** ENV Environmental Sciences

**Acknowledgement:** Some of the works were achieved during the PhD, funded by the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 764920, and others supported by TU Graz Open Access Publishing Fund.



# Retrofit of early 20th century heritage buildings based on local culture against earthquake, flood & fire disasters

**Author(s):** Maria Bostenaru Dan, Adrian Ibric, Cerasella Craciun, Mara Popescu

**\*Presenter:** Maria Bostenaru Dan, "Ion Mincu" University of Architecture and Urbanism

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## Abstract:

The planer of today has to deal with challenging building within the area of the city and reusing the existing heritage. Several decades ago retrofitting this pre-code building stock treated the buildings as common buildings. In the 21st century the scientific approached changed, and the importance of the heritage dimension, in this case architectural, was emphasized. The first author and PI of the project conducted a FP6 Marie Curie Intra-European Fellowship project which was a forerunner for this. This was continued by a Marie Curie European reintegration grant in the home country, on which the current project, this time a team project in the home project, builds. The project group is subject of a Horizon Results Booster common dissemination frame.

The architectural heritage of early 20th century will be reviewed across Europe highlighting the geographic differences which build on the local, vernacular culture. In this context for the Art Nouveau movement the accent is on Eastern Europe, a less investigated heritage. This heritage was sourced in this area (Hungary, Finland, Letonia etc) in vernacular architecture leading the current of so-called National Romantic. Also Romania featured New Romanian movement. An example is that in Kecskemet in Hungary such a heritage was subject of an early earthquake. Instead, the Modernist heritage will be investigated for the Mediterranean basin. For example the architecture of the Cyclades was source of inspiration for this. Also here there is a pendant for Romania in the architecture of cula. An example in this case is the earthquake

of Santorini. While earthquakes are in the most advanced state of investigation currently for the project, for fire and flood the dimension of environmental sustainability is even more important. Earthquakes hit punctually the more vulnerable buildings, while for floods the vulnerability has an urban dimension. The location of the buildings, many times at the urban periphery, is important for the vulnerability at the urban-water and respectively urban-wildland interface. An important contribution is done in this context by mapping. This dimension is approached in recent projects, together with the increased computing power to simulate disasters and resilience measures on computer. Mapping can be done not only for location for vulnerability (rapid visual screening for earthquakes, location for flood and fire) but also for perception of heritage in order to drive resilient reconstruction based on the landmark value in a psycho-geographic or image of the city approach. The project deals particularly with this dimension. Earthquakes are not left behind, since research is done in combining seismic retrofit with energy efficiency. A possible approach is the use of fibre reinforced polymers, which may isolate and strengthen at the same time. The same geosynthetics can be used also against the other disasters. The contribution will present the general frame of the project, the research question as explained above, and the progress towards the objectives after the conclusion of the first phase out of three phases. This includes dissemination initiatives such as calls for journal special issues, conference calls, and also collaboration with COST networks.

MCAA Annual Conference 2023  
Challenges in science diplomacy & sustainable development

## Retrofit of early 20th century heritage buildings based on local culture against earthquake, flood & fire disasters

Maria BOȘTENARU DAN, Research Department,  
Adrian IBRIC, Research Department  
Cerasella CRĂCIUN, Urbanism and Landscape Design Department  
"Ion Mincu" University of Architecture and Urbanism, Bucharest  
Mara POPESCU, Architecture, Faculty of Engineering and Information Technology  
"George Emil Palade" University of Medicine, Pharmacy Science and Technology of Târgu-Mureș  
& "Ion Mincu" University of Architecture and Urbanism

Córdoba, Spain, February 24-25 2023, hybrid event

**Scientific Area:** ES Environmental Sustainability

**Acknowledgement:** Project financed by UEFISCDI following the PCE competition - Exploratory Research Projects 2021, through PNCDI III, sub-programme P4 Fundamental and frontier research, Grant agreement no. PN-III-P4-PCE-2021-0609.



# Fully construction and demolition waste-based geopolymer mortars suited for structural purposes

**Author(s):** Gurkan Yildirim, Ashraf Ashour

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## Abstract:

Portland cement (PC)-based traditional concrete is the second mostly used material globally after water. However, cement industry alone is responsible for nearly 9% of total man-made CO<sub>2</sub> emissions. Furthermore, current construction practice of materials' overproduction, insufficient longevity of concrete structures and accumulation of construction and demolition waste (CDW) are becoming increasingly unacceptable and wasteful. CDW industry is one of the largest global solid waste producers, accounting for 30–40% of total urban waste, requiring high demand for proper handling not only to lower CDW going to clean landfills endangering health of people and environment, but also to reduce concrete production that will be, otherwise, used to construct, renovate, repair, and maintain new/existing infrastructure. To tackle the drawbacks of concrete production, achieve truly effective/easily applicable/uncommon solutions for CDW problem and advance beyond the current state-of-the-art, CodeDEMO project aims to manufacture 100% CDW-based PC-free “green” concretes (from 100% CDW-based geopolymer binders/recycled aggregates) to be incorporated in the development of demountable structural elements that do not create additional waste, do maximize reductions in energy needs (>50%) and CDW upcycling and promote circularity in novel civil engineering materials/structures. As part of the ongoing works within the scope of CodeDEMO project, development and characterization of ambient-cured mortars with

mixed CDW-based geopolymer binders and untreated fine recycled concrete aggregates suited for structural purposes were aimed. As source material for the geopolymer binder production, a mixture of roof tile, red clay brick, hollow brick, concrete, and glass was used, while in some mixtures, ground granulated blast furnace slag was partly replaced with the mixed CDW-based source material. Compressive strength, parameters related to long-term performance (i.e., drying shrinkage, water absorption and efflorescence) microstructure and materials sustainability of the developed mortars were investigated. According to the results, compressive strength in the range of 30–50 MPa was obtained. While the drying shrinkage of the developed mixtures is slightly higher than that of conventional cementitious/geopolymeric systems, its influence on the compressive strength seems negligible, and water absorption values remain comparable with the literature. Via further tailoring of the mixture designs, efflorescence is possible to be eliminated almost completely. Results of compressive strength and durability-related characteristics were also found concordant with the microstructural analyses performed validating the influence of different mixture design parameters. CDW-based geopolymer mortars outperforms the PC-based mortars in terms of CO<sub>2</sub> emissions and energy requirement suggesting that completely CDW-based geopolymer mortars developed through proper mixture design optimization can be promising alternatives to PC-based counterparts.



**Scientific Area:** ES Environmental Sustainability

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No [894100].





# ResearchAbility: a international initiative by and for young researchers with disabilities

**Author(s):** Alexandra Nothnagel, Gaëlle Vitali-Derrien, Gian Maria GRECO, Carlo ANTONINI

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## Abstract:

The higher the studies, the smaller the proportion of people with disabilities [1]. This leads to an underrepresentation of people with disabilities in research, especially at the beginning of their academic careers. Indeed, researchers with disabilities often become disabled along the way, while students and young researchers struggle to fulfil all the academic requirements [2]. Over the past few years, the investigation of discrimination against students and researchers based on disability has become increasingly prominent, and it has broadened into a whole series of new perspectives and implications. Within this context, organisations, institutions, and individuals have been promoting several actions for contrasting discriminatory bias and fostering a more inclusive environment for researchers and students with disabilities [3]. One of the initiatives born in the wake of this movement is ResearchAbility, a multi-association initiative launched in 2018 that has become a subgroup of the Marie Curie Alumni Association and a working group of PhDs, Post Docs and engineers with disabilities in the French federation 100% Handinamique, both since 2019. The main mission of ResearchAbility is threefold: (a) to support the careers of students and researchers with disabilities, (b) to promote

accessibility and disability studies research and (c) create awareness on disability and inclusive culture in the academic environment. To our knowledge, there is no other international movement dedicated to young researchers with disabilities, and especially no other international gathering across field. Meanwhile, research on people with disabilities is often conducted without their active participation. According to the famous UN motto “Nothing about us without us” [4], the ResearchAbility initiative aims to help and encourage people with disabilities to participate in research on their health-related topics and everyday accessibility requirements; and in any field they are working on. Finally, this initiative also creates a safe space allowing to discuss and shed light on the many barriers and issues this sub-group of the academic population is facing: the combined difficulties of being a young researcher, facing discrimination while dealing with accessibility barriers and health problems that often get justified by academics with the widespread academic pressure and ableist attitudes. After introducing the general context and mentioning data about students and staff with disabilities in academic institutions, the talk introduces the ResearchAbility initiative, and describes some of its past achievements,

international influence and future areas of action.

[1] French ministry of research and graduate studies: [https://publication.enseignementsup-recherche.gouv.fr/eesr/FR/EESR15\\_ES\\_14/les\\_etudiants\\_en\\_situation\\_de\\_handicap\\_dans\\_l\\_enseignement\\_superieur/](https://publication.enseignementsup-recherche.gouv.fr/eesr/FR/EESR15_ES_14/les_etudiants_en_situation_de_handicap_dans_l_enseignement_superieur/) (consulted 5/1/2022)

[2] Emilie Marcovici. Quelle place pour l'enseignant-chercheur en situation de handicap au sein des universités ?. AJFP. Actualité juridique. Fonctions publiques, 2022. ?hal-03661549?

[3] The ResearchAbility initiative: Towards a more inclusive environment in research in Volume 397 - The Ninth Annual Conference on Large Hadron Collider Physics (LHCP2021) - Outreach and diversity. Consulted at <https://pos.sissa.it/397/115/>; DOI: <https://doi.org/10.22323/1.397.0115>

[4] UN website: <https://www.un.org/development/desa/disabilities/international-day-of-persons-with-disabilities-3-december/international-day-of-disabled-persons-2004-nothing-about-us-without-us.html> (consulted 5/1/2022)



**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** 100% Handinamique and MCAA



# Iberus Experience MSCA-COFUND Programme: 11 postdoctoral researchers at Campus Iberus

**Author(s):** Joaquin Capablo

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## Abstract:

Iberus Experience is an H2020 Marie Skłodowska-Curie Action Cofund programme for Experienced Researchers, managed by Campus Iberus, the Campus of International Excellence (CEI) of the Ebro Valley promoted in strategic aggregation by the public universities of the Autonomous Communities of Aragon and La Rioja, of the Foral Community of Navarra, as well as that of the province of Lleida in Catalonia.

Iberus Experience is an International Fellowship Programme for talent attraction, consolidation and retention at the Campus of International Excellence of the Ebro Valley offering 11 postdoctoral 3-years contracts to excellent researchers to develop individual and freely selected research projects in one of the five areas of specialization of Campus Iberus (Agrofood and Nutrition, Health Technologies, Energy and Sustainability, Social and Territorial Development and Circular Bio-economy) in order to produce a positive effect in terms of excellent science with impact at the regional level. The programme is run in collaboration with the 4 Universities of Campus Iberus as recruiting institutions, the University of Lleida (engaging 4 researchers), the

Public University of Navarre (3 researchers), University of Zaragoza and University of La Rioja (2 researchers each). 5 female researchers out of 11 participate in the program, with the recruited researchers being of 7 different nationalities from 4 continents (Argentina, Brasil, India -2; Italy, Nigeria, Philippines, Spain -3; Vietnam). The postdoctoral researchers engaged at the Iberus Experience programme are Cristina Blanco (Spain), Joan Oñate Narciso (Philippines), Lauren Yabuki (Brasil) and Saqib Gulzar (India) joining the University of Lleida, Anand Shrivastav (India), Lucas Castellani (Argentina) and Trung Anh Trieu (Vietnam) being incorporated at the Public University of Navarre, Ana Rua (Spain) and María Batuecas (Spain) as part of the University of Zaragoza, and Mattia Ghirardello (Italy) and Rine Reuben (Nigeria) being selected for the University of La Rioja. These outstanding researchers at the Iberus Experience programme receive attractive conditions based on the principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, as well as the EU Principles for Innovative Doctorate Training. Campus Iberus Universities hold or have adhered

to the Human Resources Strategy for Researchers – HRS4R seal, which openly demonstrate their commitment to act in a responsible and respectable way and to provide fair framework conditions to the researchers. Among the benefits, the researchers have available both administrative and financial support for international research costs, training and network participations, or tailored training and personalized mentoring: they define and follow a Personal Career Development Plan at the beginning of their contract, having access to a variety of training options and workshops on relevant scientific and transferable skills along their recruitment period. Moreover, several activities are planned to promote their integration in the local Campus Iberus life and cultural activities. Additionally, numerous international Universities and non-academic participating organizations (companies, research centers and hospitals) are committed with the Iberus Experience programme to offer secondments, visits, collaborations and networks, as well as other opportunities to enhance the researcher's career and guarantee an attractive ecosystem for the incoming researchers.



**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101034288



# OLS: capacity building in open science in peer-led global and diverse community

**Author(s):** Mayya Sundukova

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## Abstract:

Widening inequality in access to scientific and technological resources is a hindering factor in achieving the United Nations Sustainable Development Goals. Open science, by making the research process more transparent, reproducible, and inclusive, is being increasingly recognised as an essential contributor to sustainable research practice. Indeed, UNESCO has been supporting the shift to open science by consulting multiple stakeholders and issuing the Recommendation on Open Science (adopted in November 2021), providing a framework with a universal definition, shared standards, values and principles of open science. Furthermore, in the summer of 2022, UNESCO launched a Global Call for Best Practices in Open Science.

New norms and behaviours often arise in bottom-up or grassroots initiatives, inciting and complementing top-down policy changes in building the culture change. Open Life Science (OLS) is a community-oriented non-profit organisation that promotes open, inclusive and equitable research [1]. OLS was incubated via the Mozilla Open Leaders initiative in 2019, and in 2022, is an internationally recognised training and mentoring platform to gather structured

training and mentoring for academics, researchers, undergraduates, and other stakeholders working on participatory projects. For that, OLS provides resources, peer networks, and expert consulting to build open projects, establish/lead teams and become multipliers of open research in their networks. The essential requirement for joining this free program is a curiosity for open science and collaborative/ team science.

In this submission, we would like to discuss how capacity building in open science looks like by presenting our 16-week mentoring and training program [1,2]. As of 2022, OLS has 400+ community members across six continents and countries across the Global South and North and is currently opening the call for application to its seventh cohort. All participants - often teams and research groups - will work on an open science project with guidance from dedicated mentors and experts from the community. Secondly, we would like to share the current practices OLS developed to address inequities and increase sustainability, e.g., ensuring inclusive remote participation, sharing the recordings of the training calls and other educational resources, and narratives of the OLS grant applications with a wide

audience [3,4]. Thirdly, we would like to share some examples of collective action, e.g., how OLS as a global community responded [5] to the UNESCO call for best practices to highlight the importance of grassroots initiatives in strengthening society-science-policy relationships.

1. <https://openlifesci.org/>
2. Open Life Science Community. Open Life Science - Training and Mentoring programme - Website release. Zenodo. (2021). <https://doi.org/10.5281/zenodo.5636584>
3. <https://youtube.com/@OpenLifeSci>
4. <https://zenodo.org/communities/openlifesci/>
5. Sharan et al Open Life Science (OLS) response to UNESCO global call for best practices in open science. Zenodo. (2022). <https://doi.org/10.5281/zenodo.6841873>

**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** Open Life Science





# ECO-valuation: ECOmy and ECOlogy

**Author(s):** Vaishnavi BORSE

**\*Presenter:** Vaishnavi BORSE, Laboratory of Climate and Environmental Sciences , LSCE-IPSL/ CEA/ CNRS/ Univ Paris Saclay, France  
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**Abstract:**

Ecology brings the understanding of vital connections of the environment and economy decides how well are the resources managed for a community to function. An act where an individual contributes to the economy is highly valued in the eyes of the community. All action happens with regards to economic domain and eventually ecology suffers a compromise, be it policy making, choice of career etc. Eco-valuation could be used to determine development standards i.e both on ecological and economical fronts. The spin-off to the tale would come when the community is eco-conscious. Introducing payslip which credits the ecology points as bonus for the employee, it's a win-win situation as misuse of resources becomes individual responsibility and profit margin raises for employers too. Sustainable growth still stands a eco-valued chance.

**ECO-valuation: ECOlogy and ECOmy**

Speaker: Vaishnavi Borse | Email: vaishnavi47b@gmail.com

**Ecology** studies vital connections of **environment**. **Economy** decides how well are the resources managed for a **society** to function.

**“ An act of exchange of natural resource/ service for currency “**

**How is it perceived ? Is it sustainable?**

Recognition by **society** -> favours contribution to **economy**  
->career choices

Development standards defined by **governments** -> favours contribution to **economy** -> Gross Domestic Product

Research shows that these ECOs are closely related.  
The World **Economic** Forum identifies **environmental** risks to have high impact.

Rank	Risk	2 years	10 years
1	Loss of biodiversity	High	High
2	Extreme weather events	High	High
3	Artificial intelligence	Medium	Medium
4	Water stress and scarcity	Medium	Medium
5	Technological unemployment	Medium	Medium
6	Global supply chain disruption	Medium	Medium
7	Global economic slowdown	Medium	Medium
8	Global health crises and pandemics	Medium	Medium
9	Global inequality and social tensions	Medium	Medium
10	Global environmental degradation	Medium	Medium

**Scientific Area:** SRP Sustainable Research Practice

**Acknowledgement:** LSCE, CEA/ CNRS (self-funded)



# Life Sciences







# From Caterpillar to BUTTERFLY: supporting transformation of DCs in a pediatric oncology network

**Author(s):** Annemarie Rietman, Celina Szanto, Martina O'Flaherty, Jan Molenaar, Marcel Kool

**\*Presenter:** Annemarie Rietman, Princess Máxima Center for Pediatric Oncology

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## Abstract:

Every year, around 600 children in the Netherlands get cancer and one in four children dies from this illness. Several years ago, a group of parents and healthcare professionals in the Netherlands started working towards one national children's cancer centre that could accelerate advances in treatment by centralizing all patient care and research in one building. Those efforts led to the creation of the Princess Máxima Center for pediatric oncology: a unique center that brings together all the highly complex care and research for children with cancer in the Netherlands. This concentration and integration of specialized pediatric oncology reflects our mission: 'To provide a cure for every child with cancer while maintaining an optimal quality of life'.

Only with innovative research we will be able to improve survival and quality of life for children with cancer. Our research covers the entire spectrum: from fundamental research to expose genetic and molecular characteristics of tumour cells to clinical trials to test improved treatment options. And from translational experiments to develop personalized therapy to psychosocial studies that monitor the wellbeing of the whole family. Collaborations within our center, between researchers

and clinicians, but also partnerships with other institutes, nationally and internationally, academic and non-academic, are crucial to reach our goals. For a successful implementation and to achieve a radical change in the society, the work needs to be translated to the academic community, the industry, health policy makers, regulatory authorities, insurance companies, doctors, patients, patients advocates, and the general public. To contribute to this effort, the Máxima Butterfly program will train the next generation of multi-disciplinary scientists in the field of paediatric oncology.

Here we will present a unique and comprehensive training program for DCs in the field of pediatric oncology. The Máxima Butterfly program shall run from 2023-2027. The program duration is 60 months and will have one competitive international recruitment call. A unique feature of the recruitment is the transparent and unbiased selection of the DCs, candidates who will be invited for the interviews will be selected anonymously. Applicants can choose among 52 PhD projects from 26 supervisors; 28 candidates will be awarded a contract.

All DCs will be recruited for 48 months. Butterfly is unique



Annemarie Rietman<sup>1</sup>, Celina Szanto<sup>1</sup>, Martina O'Flaherty<sup>1</sup>, Jan Molenaar<sup>1</sup>, Marcel Kool<sup>1,2</sup>

<sup>1</sup> Princess Máxima Center for pediatric oncology, Utrecht, the Netherlands; <sup>2</sup> Hopp Children's Cancer Center (KiTZ), German Cancer Research Center DKFZ, Germany

in its sense that all DCs will be trained at the Maxima in the field of pediatric oncology within an international scientific and cultural environment. The program includes a dedicated training in all pre(clinical) aspects of pediatric oncology, training in transferable skills (such as IP, knowledge transfer, entrepreneurship), an innovative program for personal development and a plan based on the 'EU Green Deal'. Many external (inter)national academic and industrial partners are connected to Butterfly who are strongly involved at all stages of the project, by joining supervisory meetings, providing intersectoral training opportunities and training in research in another academic or commercial environment. Each DC is expected to spend at least three months at an industry partner for their project.

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** The Maxima-Butterfly program received funding from Horizon Europe Marie Curie Cofund program under grant agreement no. 101081481

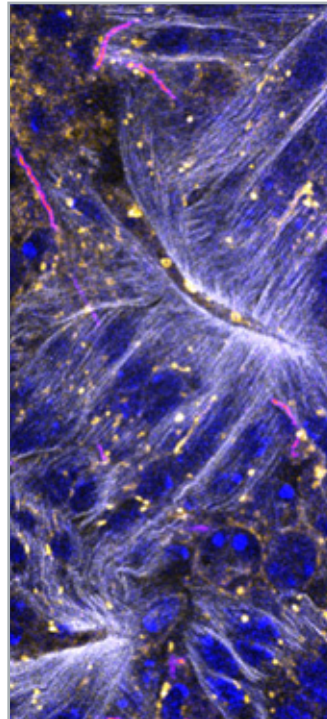


**Author(s):** Daniel Rios-Barrera, Mariana Barrera Velázquez, Philippe Bun

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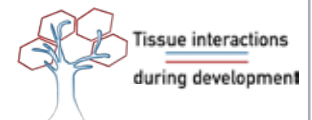
**Abstract:**

For organs to be functional, the cells and tissues that constitute them must effectively communicate with each other and coordinate their behaviors. Halfway during fruit fly embryogenesis, two lateral epidermal sheets stretch to fuse at the dorsal midline; concomitant with this, the main tubes of the respiratory system also shift towards the dorsal side of the embryo. What mechanisms coordinate these processes have not been studied but given that the epidermis and the tracheal tubes are separated by a thin layer of extracellular matrix (ECM), it is possible that the behavior of both tissues is mechanically coupled. In this work, we study this using genetics and in vivo imaging. Using particle image velocimetry and cross-correlation analyses, we show that epidermal and tracheal displacements, as well as ECM remodeling, are highly coordinated. Perturbing adhesion complexes in the tracheal system or expressing matrix metalloproteases in the epidermis result in tracheal defects that persist until larval development. We are currently studying the subcellular mechanisms that drive the coordination between the rearrangement of both tissues.



## Mechanical coordination of tracheal and epidermal remodeling during *Drosophila* embryogenesis

Daniel Ríos Barrera  
 Instituto de Investigaciones Biomédicas, UNAM



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** Funded by PAPIIT/UNAM grant #IA201921 and ICGEB Early career return grant #CRP/MEX21-04\_EC





# Inspired by Nature: Investigations into Synthetic Analogues of the Natural Product Cornexistin

**Author(s):** David Barber, Aldo Tancredi, Christoph Habiger, Christina Diederich, Jan Kramer, Anna Reingruber, Bernd Laber, Jörg Freigang, Gudrun Lange, Dirk Schmutzler, Anu Machettira, Gilbert Besong, Thomas Magauer

**\*Presenter:** David Barber, Bayer AG, Crop Science Division  
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## Abstract:

Natural products often provide extremely desirable lead structures for the pharmaceutical and crop protection industries owing to their complex chemical architectures, unique modes of action and low environmental impact. As a result, research teams are more frequently turning to natural products for inspiration in the hunt for their next blockbuster molecule. Cornexistin is one such natural product that has been of high interest to the crop protection research community for a number of years, primarily due to its interesting herbicidal spectrum and excellent corn selectivity profile. We therefore started a research program into the design, synthesis and biological evaluation of fully synthetic analogues of cornexistin. Guided by an X-Ray co-crystal structure, we attempted to identify the key interactions that are necessary for good biological efficacy. This resulted in the preparation of a number of simplified cornexistin analogues that were then examined in greenhouse trials. One novel analogue maintained a good level of biological activity and could provide researchers insights in how to further optimize the structure of cornexistin and thus deliver a sustainable crop protection solution for the future.



**Inspired by Nature:  
Investigations into  
Synthetic Analogues of the  
Natural Product Cornexistin**

**MCAA Annual Conference**

///////

Christian Steinborn,<sup>[a]</sup> Aldo Tancredi,<sup>[a]</sup> Christoph Habiger,<sup>[a]</sup> Christina Diederich,<sup>[b]</sup> Jan Kramer,<sup>[b]</sup> Anna Reingruber,<sup>[b]</sup> Bernd Laber,<sup>[b]</sup> Jörg Freigang,<sup>[b]</sup> Gudrun Lange,<sup>[b]</sup> Dirk Schmutzler,<sup>[b]</sup> Anu Machettira,<sup>[b]</sup> Gilbert Besong,<sup>[b]</sup> Thomas Magauer<sup>✉</sup> and David M. Barber<sup>✉</sup>

24-25<sup>th</sup> February 2023

<sup>[a]</sup> Leopold-Franzens-University Innsbruck (Austria)  
<sup>[b]</sup> Bayer AG, Crop Science Division, Frankfurt (Germany)



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** This work was supported by Bayer AG and the Center for Molecular Biosciences (CMBI) at the University of Innsbruck.





# Dose-responses for mortality from cerebrovascular and heart diseases in atomic bomb survivors: 1950-2003

**Author(s):** Helmut Schöllnberger

**\*Presenter:** Helmut Schöllnberger, Helmholtz Zentrum München

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## Abstract:

We analyzed the latest publicly available Life Span Study (LSS) data for the detrimental health outcome of cerebrovascular diseases (CeVD) and heart diseases. The cohort comprises 86611 Japanese atomic bomb survivors. In the primary analysis (Shimizu et al. 2010), these data were analyzed using a stratified baseline model combined with the LNT model and quadratic, linear-quadratic and linear-threshold models as excess relative risk (ERR) models. Their main results were based on the LNT model. In the present analysis, a larger series of radio-biologically motivated nonlinear dose-response models were applied to the data in combination with a parametric baseline model either as ERR or EAR (excess absolute risk) models. The models were weighted according to their quality of fit using a multi-model inference (MMI) method. It was found that for CeVD, the dose-response curve from MMI is located below the linear no-threshold model at low and medium doses (0–1.4 Gy). At higher doses MMI predicts a higher risk compared to the LNT model. A sublinear dose-response was also found for heart diseases (0–3 Gy). The analyses provide no conclusive answer to the question whether there is a radiation risk below 0.75 Gy for CeVD and 2.6 Gy for heart diseases. MMI suggests that the dose-response curves for CeVD and heart diseases in the Lifespan Study are sublinear at low and moderate doses. The present study used a comprehensive and flexible approach by analyzing the data

with a variety of different linear and nonlinear models including those that exhibit flexible threshold-doses without applying artificial cut-points at certain doses and without relying on LNT as a foregone conclusion. Our analysis appeals to the more complex picture that arises from analyzing aggregate endpoints and their possibly different radiobiological mechanisms. Together with the sublinearity this may be a hint that different biological mechanisms may operate at low and medium doses compared to high doses. Our study provides an elegant way to analyze radio-epidemiological data sets, which comprise a number of similar biological endpoints. The MMI method can similarly be applied to other aggregate health outcomes with aggregated endpoints such as all solid cancers or all leukaemias. Because the internationally applied guidelines for radiation protection largely rely on analyses of the LSS data and the LNT model, our findings have important implications for risk assessment of ionizing radiation in the context of medical applications (such as CT scans, radiotherapy and low-dose anti-inflammatory radiotherapy), nuclear energy production, accident related long-term risks and international radiation protection practices in general. The study was published by Schöllnberger et al. (*Radiat Environ Biophys* 57(1), 17-29, 2018); a summary appeared in Milder et al. (*Int J Radiat Biol* 97(6), 866-873, 2021).

Helmholtz Zentrum münchen  
German Research Center for Environmental Health

Department of Radiation Sciences

Institute of Radiation Medicine

## Dose-responses for mortality from cerebrovascular and heart diseases in A-bomb survivors: 1950-2003

H Schöllnberger

MCAA Annual Conference 2023 – February 24-25 2023



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** The research leading to these results has received funding from the Euratom Seventh Framework Program: Grant Agreement no. 295823 (PROCARDIO), no. 249689 (DoReMi).





## Bioinforming the youth

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**\*Presenter:** Marco Anteghini, Wageningen University & Research

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### Abstract:

The careers of young students interested in science are often hampered by a lack of science promotion and a cogent orientation structure. The problem is particularly relevant in tourist areas where the economy is not driven by science, innovation and technology. In 2021, we conducted a survey among young students in Montenegro (106 in total) where we identified that 53% of them were rarely or never exposed to the application of mathematics, computational or natural sciences. Nevertheless, 54% of the students also express high interest towards training schools in Bioinformatics. As an international group of PhD students in Bioinformatics, we funded a non-profit organization called Bioinformatika (Bioinform) where we aim to offer free-access training to young students in bioinformatics, facilitating their future choice of higher education studies. More precisely, we offer one-week training schools to show the participants the most relevant topics in bioinformatics and stimulate their curiosity. In addition, we create educational blog posts for the lay public in bioinformatics and science in general. Furthermore, we offer continuous mentoring to all participants of our training schools and interested students in general. The direct beneficiaries of our initiatives are high school students (ages 16-19). In addition, we plan to extend our training schools to more advanced audiences, such as undergraduate students in natural sciences and computer science. Our projects will (1) contribute to science promotion, (2) provide free access to high-quality courses and education, (3) align with the positive trend of business investments promoting research in industry, (4) facilitate networking and exchange opportunities at the European level, and (5) bring visibility to the nonprofit sector. In the context of the Annual MCAA meeting, we would like to present our initiatives and extend our network, thus increasing our community of trainers.

*"I have already had experience with science schools, but none of them was as much useful, meaningful and well planned. We got the most out of these 5 days for sure!"*

*"I really appreciate how amazingly this training school was organized and even though I was online I could talk and collaborate with other participants."*

# BioINForm

*"Everything was really great and interesting, especially the part where we were able to work in pairs and solve the mystery case."*

Katarina Elez  
Marco Anteghini  
Selle Bandstra



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** NVO Bioinformatika - Bioinform



# We are losing the battle against bacterial antibiotic resistance. Why?

**Author(s):** Pablo Emiliano Tomatis, Guillermo Bahr, C. R. Bethel, Maria F. Mojica, Magdalena Rodriguez, Graciela Mahler, Robert A.

Bonomo, Alejandro Vila

**\*Presenter:** PABLO EMILIANO TOMATIS, Instituto de Biología Molecular y Celular de Rosario, UNR-CONICET, Argentina

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## Abstract:

Infections are caused when a pathogenic microorganism, mainly bacteria, invades the body. In general, a bacterial infection can be eradicated with antibiotics. Unfortunately, pathogenic bacteria developed mechanisms of resistance to antibiotics, rendering them ineffective and useless.

Consequently, antibiotic resistance has become a major public health risk. There are even multi-resistant bacteria, especially in gram-negative bacteria, imposing a significant clinical challenge, as few drugs are currently available to overcome resistance.

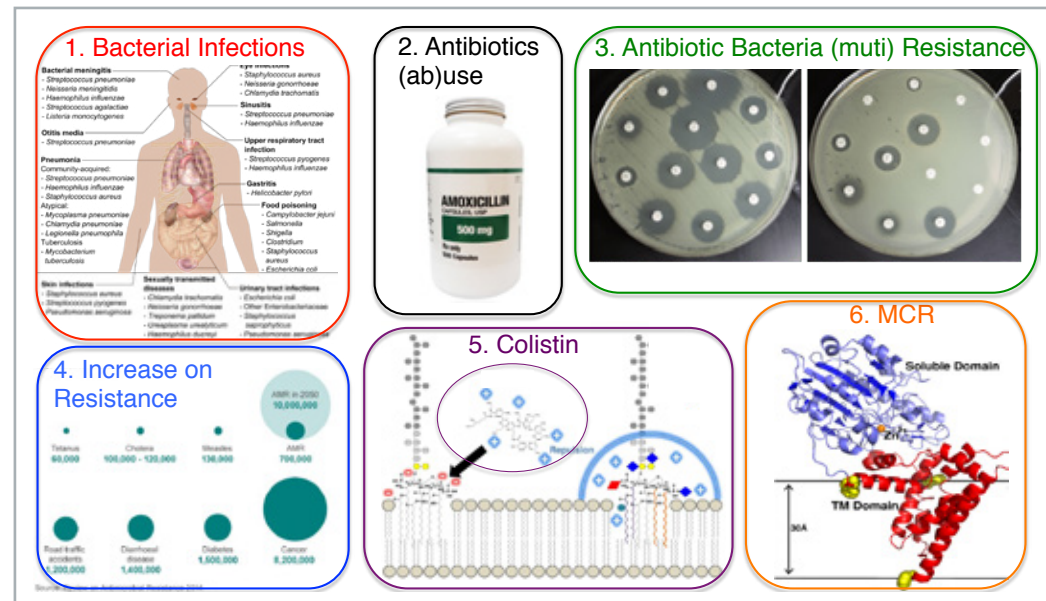
For example, carbapenem antibiotics used as a last resort to treat serious infections lose their effectiveness due to the worldwide spread of resistant Gram-negative bacteria.

Novel compounds/ antibiotics are urgently needed to stem the human and economical toll of MDR bacteria. The principal mechanism of antibiotic resistance is due to the action of  $\beta$ -lactamases, produced by a wide spectrum of bacteria. These enzymes hydrolyze and inactivate many  $\beta$ -lactam antibiotics. Currently, more than 7800  $\beta$ -lactamases are known. The selection pressure exerted by the introduction of the latest generation cephalosporins and carbapenems has accelerated the selection of more bacterial resistant variants with a greater spectrum of resistance, capable of also hydrolyzing these antibiotics.

Metallo- $\beta$ -lactamases (MBLs) are Zn(II)-dependent enzymes that can hydrolyzed most of  $\beta$ -lactam antibiotics, including carbapenems which are used as last-resource drugs for the treatment of resistant pathogens. Genes coding for M $\beta$ Ls are present in mobile genetic elements, to that they have been spread worldwide among opportunistic and pathogenic organisms.

Among them, NDM-1 MBL has arisen as a major worldwide problem for the health systems due to its rapid dissemination on pathogenic strains.

The main goal of our research group is to elucidate the structural determinants of function in these MBLs enzymes by means of biochemical, structural, mechanistic and evolutionary studies, with the ultimate goal of designing a clinically useful inhibitor.



**Scientific Area:** LIF Life Sciences

**Acknowledgement:** CONICET, Agencia I+D+i, NIH



# Effects of nanoparticle drugs in crosstalk between platelets and pancreatic cancer

**Author(s):** shaoshan Mai

**\*Presenter:** shaoshan Mai, Medical University of Gdansk

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## Abstract:

Pancreatic ductal adenocarcinoma (PDAC) is a disease with high death rate, short lifetime and lack of effective treatment. To explore new treatment of nanoparticle drugs for PDAC is a prospective direction. We synthesized silver nanoparticles conjugate with Gemcitabine. We compared the effects of Ag-PEG-Gem that using polyethylene glycol (PEG) to increase their biocompatibility, with the effect of Ag-Cys-Gem with anisotropic shapes that have near infrared light (NIR) absorption by using model of 3D culture patient-derived organoids, human blood platelets, pancreatic cancer cell line and normal pancreatic cells.

Ag-PEG-Gem and Ag-Cys-Gem were synthesized and characterized by transmission electron microscopy (TEM), UV-vis spectrometry and dynamic light scattering. We assessed viability of patient-derived organoids with Ag-PEG-Gem or Ag-Cys-Gem treatment by CellTiter-Glo 3D assay. Compared the cytotoxicity of Ag-PEG-Gem with Ag-Cys-Gem on pancreatic cancer cells (PANC-1, MIAPaCa2 and AsPc-1) and human pancreatic Nestin expressing cells (hTERT-HPNE) by CCK8 test. To observe the crosstalk between organoids and platelets with/without Ag-PEG-Gem or Ag-Cys-Gem treatment, we recorded Real-Time cell tracking video by high resolution fluorescence microscope. The effects of Ag-PEG-Gem or Ag-Cys-Gem on the aggregation of washed platelets was measured by light aggregometry. Immunofluorescence (IF) was used to determine expression of CD41 and P-selectin on platelets. Apoptosis was determined on PANC-1, MIAPaCa2 and AsPc-1 with Ag-PEG-Gem or Ag-Cys-Gem treatment by flow cytometry.

We found Ag-PEG-Gem and Ag-Cys-Gem can inhibit viabilities of pancreatic cancer organoids and cell lines in concentration depended way. We observed platelets aggregation as well as they helped organoids migration. However, Ag-PEG-Gem and Ag-Cys-Gem can inhibit aggregation and migration on patient-derived organoids with platelets. In addition, AgNPs-PEG or AgNPs-Cys improve stability, selectivity as well as alleviate side effects on normal cells, which develop a potential novel treatment of pancreatic cancer.

 PRECODE



Marie Skłodowska-Curie actions

## Effects of nanoparticle drugs in crosstalk between platelets and pancreatic cancer

Shaoshan Mai<sup>1</sup>, Stanisław Hać<sup>2</sup>, Elżbieta Megiel<sup>3</sup>, Michał Bieńkowski<sup>4</sup>, Michał A. Zmijewski<sup>5</sup>, Anna M. Olszewska<sup>6</sup>, Grzegorz Stasiój<sup>6</sup>, Magdalena Narajczyk<sup>7</sup>, Christian Pilarsky<sup>8</sup> and Iwona Inkielewicz-Stepniak<sup>8</sup>.

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**Scientific Area:** LIF Life Sciences

**Acknowledgement:** PRECODE Network (PancREatic Cancer Organoids rEsearch) from European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement N° 861196



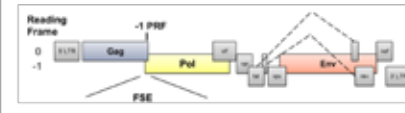
**Author(s):** Shreya Ayyub, Olexandr Dybkov, Frank Peske, Henning Urlaub, Marina Rodnina

**\*Presenter:** Shreya Ayyub, Max Planck Institute for Multidisciplinary Sciences  
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**Abstract:**

Shiftless (SFL) is an interferon-inducible restriction factor that functions differently against different viruses. It is known to affect RNA stability and translation, ribosomal frameshifting, viral RNA replication and stability of certain proteins. Many viruses, including HIV rely on programmed ribosomal frameshifting (PRF) to modulate appropriate stoichiometric ratios of viral proteins and increase their coding capacity. SFL has been shown to inhibit HIV replication by hindering -1PRF but the exact mechanism of action of SFL against HIV is not yet known. Since SFL can inhibit viral replication in a multitude of ways, it is also possible that SFL employs additional strategies to inhibit HIV replication. In our most recent publication (PMID: 35891432) and the 2022 MCAA poster, we had shown that SFL exists as a multimer and can bind to mRNAs, with special preference for frameshifting mRNAs. In this study we have used crosslinking mass spectrometry and biochemical techniques to further characterize SFL and understand its antiviral activity during HIV infection.

### Frameshifting is required for HIV Gag-Pol expression




—1 Programmed Ribosomal Frameshifting




—1PRF is a target of many antiviral restriction factors including SFL (Wang et al., 2019, Cell 176, 625–635)

### Summary of our previous publication




Property	Experiment	SFL	SFL short (SFLS)	RAA mutants	Conclusion
-1PRF inhibition	Dual luciferase constructs with PSE	+	-	Like SFLS	An intact RAA is crucial for -1PRF inhibition
Antiviral activity	Infection assays with pseudoviruses	+	-	Like SFLS	An intact RAA is crucial for antiviral activity
Multimerization	Gel filtration and coimmunoprecipitation	+	-	SFL+RAA mutants+SFLS	The RAA region is important for multimerization but not needed in both partners
Ribosome binding	Ribosome pelleting through sucrose cushion	+	-	SFL+RAA mutants+SFLS	The RAA region is important for ribosome binding
mRNA binding	Modified RNA IP	+	-	SFL+RAA mutants+SFLS	The RAA region is important for mRNA binding and SFL binds preferentially to frameshifting mRNAs

How does SFL affect HIV infection?



## Characterization of the multifunctional antiviral innate immunity protein Shiftless



Shreya Ahana Ayyub<sup>1</sup>, Juliane Schwarz<sup>2</sup>, Niklas Jäger<sup>3,4</sup>, Frank Peske<sup>1</sup>, Stefan Pöhlmann<sup>3,4</sup>, Henning Urlaub<sup>2</sup>, Marina V. Rodnina<sup>1</sup>

<sup>1</sup>Department of Physical Biochemistry, Max Planck Institute for Multidisciplinary Sciences, Am Fassberg 11, 37077 Göttingen; <sup>2</sup>Research Group Bioanalytical Mass Spectrometry, Max Planck Institute for Multidisciplinary Sciences, Am Fassberg 11, 37077 Göttingen; <sup>3</sup>Germany Infection Biology Unit, German Primate Center – Leibniz Institute for Primate Research, Göttingen, Germany; <sup>4</sup>Faculty of Biology and Psychology, University Göttingen, Wilhelmshofplatz 1, 37073 Göttingen

**Scientific Area:** LIF Life Sciences

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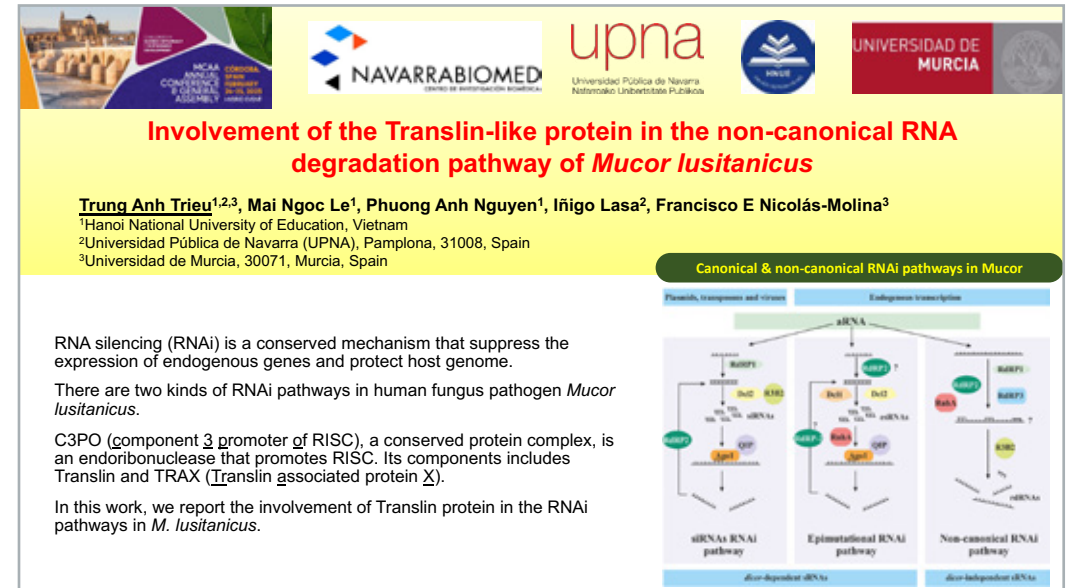
**Author(s):** Trung Anh Trieu, Mai Ngoc Le, Phuong Anh Nguyen, Iñigo Lasa, Francisco E Nicolás-Molina

**\*Presenter:** Trung Anh TRIEU, Hanoi National University of Education

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**Abstract:**

RNA silencing (RNAi) is a conserved mechanism that suppress the expression of endogenous genes and protect host genome against the exogenous nucleic acids. A key player of this pathway is Dicer, a RNaseIII enzyme responsible for generating the microRNAs that will induce the degradation of complementary messenger RNA. A Dicer-independent non-canonical RNA silencing mechanism has been identified in the human fungus pathogen *Mucor lusitanicus* (formerly *M. circinelloides* f. *lusitanicus*). This pathway involves to R3B2 (an RNase III family member) and RdRP enzymes. C3PO (component 3 promoter of RISC), a conserved protein complex found in a wide range of species from fission yeast to human, is a Mg<sup>2+</sup>-dependent endoribonuclease that promotes RISC activation by removing siRNA passenger strand cleavage products in *Drosophila*. Translin and TRAX (Translin associated protein X) proteins are components of C3PO complex. In this work, we identified two genes, named as *tsn* and *trx*, that encode proteins homologous to Translin and TRAX proteins, respectively. Deletion of *tsn* gene did not show a significant reduction in the silencing frequencies of a reporter gene controlled by the canonical RNA degradation pathway. However, northern blot analysis showed a significant increase of mRNA accumulation compared to the  $\Delta$ dicer1/2 mutant of three reporter genes which are controlled by the non-canonical RNA degradation pathway. In addition, the  $\Delta$ tsn null mutant showed an increase of branching rates and a slight reduction in sporulation yield compared to the wild-type strain. Together, these results suggesting that Tsn protein could plays a role in the non-canonical RNA degradation mechanism, but not the canonical RNAi pathway, in *M. lusitanicus*.



**Involvement of the Translin-like protein in the non-canonical RNA degradation pathway of *Mucor lusitanicus***

**Trung Anh Trieu<sup>1,2,3</sup>, Mai Ngoc Le<sup>1</sup>, Phuong Anh Nguyen<sup>1</sup>, Iñigo Lasa<sup>2</sup>, Francisco E Nicolás-Molina<sup>3</sup>**  
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**Canonical & non-canonical RNAi pathways in *Mucor***

RNA silencing (RNAi) is a conserved mechanism that suppress the expression of endogenous genes and protect host genome.

There are two kinds of RNAi pathways in human fungus pathogen *Mucor lusitanicus*.

C3PO (component 3 promoter of RISC), a conserved protein complex, is an endoribonuclease that promotes RISC. Its components includes Translin and TRAX (Translin associated protein X).

In this work, we report the involvement of Translin protein in the RNAi pathways in *M. lusitanicus*.

The diagram illustrates the pathways for siRNA and dsRNA. siRNA pathways include: 1) siRNA RNAi pathway (Dicer-dependent siRNAs) involving Dicer, R3B2, and R2D2; 2) Epigenetional RNAi pathway (Dicer-independent siRNAs) involving Dicer, R3B2, and R2D2; 3) Non-canonical RNAi pathway (Dicer-independent siRNAs) involving R3B2 and R2D2. Endogenous transcription is also shown to be regulated by these pathways.

**Scientific Area:** LIF Life Sciences

**Acknowledgement:** The Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 106.02-2018.345, and the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101034288

# Engineering, Chemistry, Physics







# Complementing Task Allocation in automation with Situational Awareness and Mental Workload prediction using AI

**Author(s):** Andrés Alonso Pérez, Maria Chiara Leva

**\*Presenter:** Andrés Alonso Pérez, Early Stage Researcher in TU Dublin, [andres.alonsoperez@tudublin.ie](mailto:andres.alonsoperez@tudublin.ie)

## Abstract:

From the design of Industrial environments to their monitoring for proper operation, it is critical to consider and understand the capabilities of the workers and the magnitude of the demand that the tasks require from the operators. When it comes to task allocation in automated environments, the system should be designed so that there is a balance between automated and manual tasks in terms of efficiency and operator well-being. In this regard (Coster, 2017) proposed that if the levels of Workload and Situational Awareness are balanced, there is a space in which task distribution can be performed. However, estimating those levels is a problem that has yet to be solved. Concerning Situational Awareness, it is widely accepted that it can only be obtained with either subjective evaluation from the worker or with external evaluation from an expert. Focusing on Mental Workload, there is a trend to employ EEG, with different features extracted from it, as indicators of Mental Workload (e.g., theta frontal power divided by alpha parietal power (Holm, Lukander, Korpela, Sallinen, & Müller, 2009)). Other research has focused on the idea of a feature capable of representing Mental Workload and being transportable between tasks (Yufeng, et al., 2021).

On the other hand, Deep Learning models have been recently applied to classify EEG signals on different tasks, including Mental Workload. Some examples of models that work for multiple EEG classification tasks are Conv-net for EEG (Schirrneister, et al., 2017) and EEGnet (Lawhern, et al., 2018).

This Research Project, as a part of CISC (Collaborative Intelligence for Safety Critical Systems) MSCA project, aims to develop a Deep Learning model, specifically designed to extract information from EEG signals and capable of assessing Mental Workload in real time. It then would use that model in simulated industrial scenarios where Situational Awareness is essential to its correct performance (for example, scenarios involving Alarm Management) or where the Mental Workload can be critical. The model will be compared to both models trained on conventional EEG features and to state-of-the-art AI methods for classifying EEG signals.

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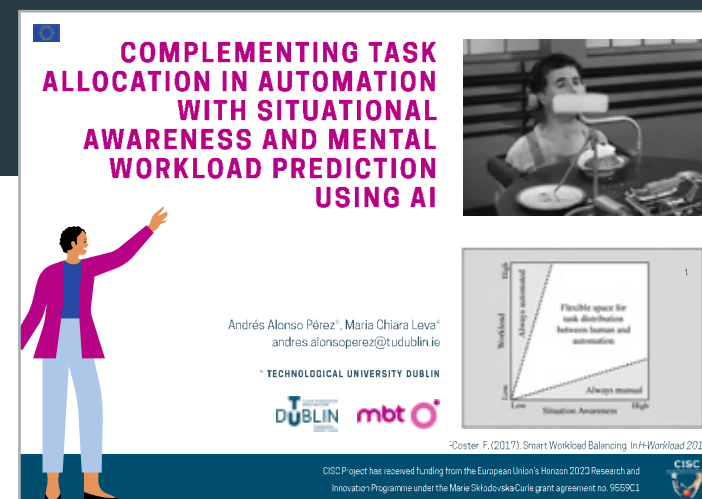
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**Scientific Area:** ENG Engineering

**Acknowledgement:** TU Dublin





# Hourly marginal electricity mixes and their relevance for assessing the environmental performance of installations with variable load or power

**Author(s):** Jens Peters

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## Abstract:

The ongoing energy transition is causing rapid changes in the electricity system and, in consequence, the environmental impacts associated with electricity generation. In parallel, the daily variability of generation increases with higher shares of renewable energies. This affects the potential environmental impacts or benefits of devices with variable load or power, such as electric vehicles, storage systems or photovoltaic home systems. However, environmental assessments of the actual benefit of such systems majorly rely on average grid mixes that are frequently outdated and disregard the dynamic nature of renewable generation. This presentation shows the differences between hourly average and marginal electricity mixes for Spain for each month of the year. These are then combined with specific life-cycle emission factors for each generation technology to determine the hourly environmental impact of electricity. Main drivers for the impacts of the marginal mix turn out to be natural gas plants and imports, but also pumped hydropower due to its comparably low storage efficiency. Applied to a hypothetical photovoltaic rooftop installation, the differences between environmental assessments on hourly and on an annual basis are found to be surprisingly low when assuming that the generated electricity replaces the average grid mix, but substantial when considering the marginal generation mix (i.e., the generation technologies that respond to a change in demand at a given time). This highlights the importance of considering the dynamics of the electricity system and the corresponding marginal electricity mixes when optimizing flexible load or generation technologies under environmental aspects.



## Hourly electricity mixes and their relevance for assessing installations with variable load or power

**MCAA Annual Conference 2023**  
24.-25.02.2023, Córdoba

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**Scientific Area:** ENG Engineering

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# Data Analysis of Challenges in Science Diplomacy and Sustainable Development Through Text Mining in Social Media

**Author(s):** Süreyya Akyüz, Qamar Ali Abdulridha Al-Shammari

**\*Presenter:** Süreyya Akyüz, Bahcesehir University, Department of Mathematics  
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## Abstract:

Science diplomacy (SD) has the potential to support sustainable development in several ways, including through international collaboration on research and technology related to sustainability, the exchange of knowledge and expertise on sustainable development, and the use of science to inform policy-making on issues such as climate change. However, there are some challenges. As social media have become a pervasive platform to share users' thoughts and opinions, the shared content across these platforms can be used to analyze significant global issues, including science diplomacy and sustainable development. This study presents the results of a Twitter data study and sentiment analysis on the challenges facing science diplomacy and sustainable development. With the help of machine learning and natural language processing techniques, our analysis of tweets related to these fields revealed several key themes, including the importance of international collaboration, the need for action on climate change, and the role of science in policy-making. This study also shows the trends in the count of tweets about SD, extracts top frequency words from different attitudes, and analyzes the impact of tweets on the global view of SD and sustainable development. Overall, this study highlights the complex and multifaceted nature of the challenges facing science diplomacy and sustainable development, and the importance of leveraging social media platforms to facilitate discussions and facilitate progress in these areas.

## Data Analysis of Challenges in Science Diplomacy and Sustainable Development Through Text Mining in Social Media

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2023 MCAA Annual Conference  
and General Assembly.  
February 24-25, 2023 Córdoba, Spain



**Scientific Area:** ENG Engineering

**Acknowledgement:** This study is supported by  
Bahcesehir University BAP Project No: 2022-02.32



# Human performance model for alarm handling: Toward a sustainable risk assessment

**Author(s):** Houda Briwa, Chidera Winifred Amazu, Maria Chiara Leva, Micaela Demichela

**\*Presenter:** Houda Briwa, Technological University of Dublin (TU Dublin)

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## Abstract:

In the process industry, alarm systems are the first hard layer in a multi-layered safety strategy and are designed to help the operator by drawing his attention toward plant conditions requiring timely assessment or action. A good alarm management system can help bring the operating process closer to its optimal operating ranges, resulting in lower production costs, higher quality, and ultimately safer operations. Poor alarm management, on the other hand, causes downtime, unsafe situations, and may even result in industrial tragic occurrences. Despite the advances in technology and the effort put through extensive testing and validation of safety-critical systems, costly and tragic accidents still happen (Ahmed & Onan Demirel, 2020). Human error was amongst the most frequently cited major causes of Fire and explosion accidents in the petrochemical industry (Duma et al., 2021), a dominant contributor to chemical plant accidents (Iqbal & Srinivasan, 2018) and a main causal factor of over 70% of the accidents in the process industry (Leveson, 2004). Thus, it is useful to investigate not only the types of human errors that can occur but also the management systems that influence them by looking into the influences that enhance or degrade human performance (Center for Chemical Process Safety, 2015).

In process safety assessment, many efforts were made to provide a comprehensive model with the evidence-based causal relations between different Human Factors issues and common circumstances affecting human performance or performance shaping factors (PSFs) in human reliability assessment (HRA), developing

data-driven PSFs assessment models with enough transparency between models and source data, to deal with data scarcity and the uncertainty of expert judgments is still yet to be investigated for oil & gas operations (Liu et al., 2021). In this context, the Bayesian network (BN) has recently received the attention of researchers. In literature and in relation to HRA in control rooms, BN was applied for organizational factors' modelling, analysis of the relationships among failure influencing factors, assessment of human failure events, assessment of situation awareness and as an extension of existing HRA methods. An analysis of these research works has shown that the systematic investigation of all potential factor combinations or of the majority of combinations with appropriate simulator settings and the gathering of statistically meaningful data could be a very challenging objective to attend for many HRA models using PSFs. The analysis also demonstrated the need for more systematic frameworks to combine the various information sources pertinent to HRA (cognitive models, empirical data, and expert judgment) (Mkrtchyan et al., 2015). In this contribution, we present a conceptual framework of a human performance model for alarm handling in abnormal situation that explicitly represents causal factors that impact the performance. This framework is based on a case study built within our EU-funded CISC project (Collaborative Intelligence for Safety Critical Systems) and combines cognitive studies, operating experience, simulator data.

**Scientific Area:** ENG Engineering

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# Development of Active Vibration Control in Gearbox Housings

**Author(s):** Sneha Rupa Nampally

**\*Presenter:** Sneha Rupa Nampally, Technical University of Darmstadt  
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## Abstract:

As the requirements of weight reduction in the automobile market increase, in addition to the optimization of the passive structure of the gearbox, it is intended to investigate the possibilities that a system for active vibration reduction can yield. The design of an active vibration control system to suppress unwanted vibration and noise caused by gear mesh and gear shift using high frequency actuators, vibration sensors and a control algorithm. The main advantage of the projected system consists of the opportunity to further reduce weight of the passive solutions and to loosen the manufacturing tolerances of the gears and thus reduce cost of production. The design goal of the systems is to have a small impact on the overall weight and cost of the gearbox as well as low energy consumption. Finally, one vision is that with the help of an AVC system the trade-off between NVH, weight or lifetime and efficiency in the conventional transmission design could be resolved. For this, 3 major actuator concepts are evaluated with the possibilities of total potential vibration reduction on the gearbox housing without adding any operation complexity. Selection of a suitable control approach with optimization of actuator positions, number of actuators, sensor positions, number of sensors, and Integration of method for design of active vibration reduction system into gearbox design dealing with uncertainties poses a great challenge when it comes to complicated gearbox geometries. The impact of the technology on system level will be assessed. Cost, weight and energy consumption of the active vibration reduction system are studied and evaluated in accordance to the demonstrated benefits of its implementation.

**Development of Active Vibration Control System for Gearbox Housings**  
**Sneha Rupa Nampally, Stephan Rinderknecht**  
*Technical University of Darmstadt, Germany*

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**Scientific Area:** ENG Engineering

**Acknowledgement:** H2020 Marie Skłodowska Curie Actions





# Wind energy exploitation in on-shore and urban environments

**Author(s):** Kartik Venkatraman

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**Towards a more efficient exploitation of on-shore and urban wind energy resources**

**Kartik Venkatraman**  
von Karman Institute for Fluid Dynamics  
Brussels, Belgium



H2020 MARIE SKŁODOWSKA-CURIE ACTIONS

The project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 860101



**Scientific Area:** ENG Engineering

**Acknowledgement:** European Commission H2020 zEPHYR  
Marie Skłodowska-Curie grant agreement No 860101





# Potential detection of Flavescence dorée, a grapevine disease, using Hyperspectral Imaging

**Author(s):** Marko Barjaktarovic, Massimo Santoni, Michele Faralli, Massimo Bertamini, Lorenzo Bruzzone

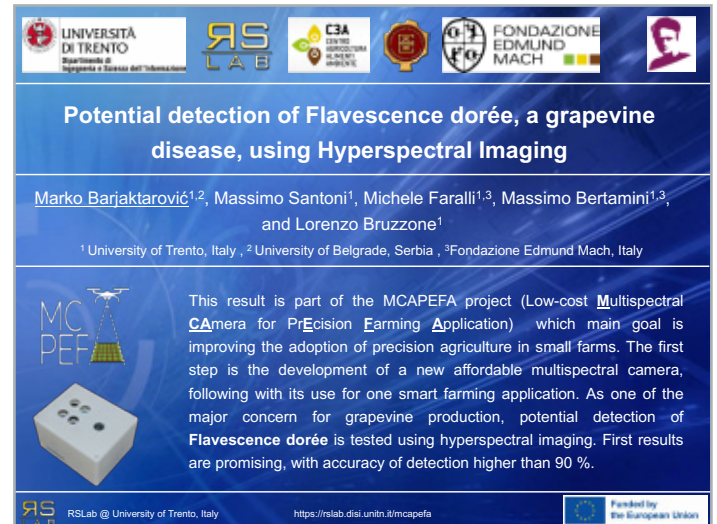
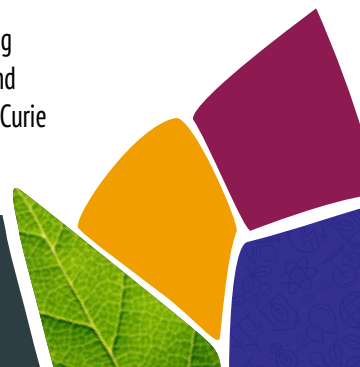
**\*Presenter:** Marko Barjaktarovic, Department of Information Engineering and Computer Science, University of Trento, Italy;  
University of Belgrade, Serbia

[marko.barjaktarovic@gmail.com](mailto:marko.barjaktarovic@gmail.com)

## Abstract:

Due to climate changes and spreading diseases, grapevine producers are under constant threat of yield reductions and additional financial losses. Flavescence Dorée (FD) is one of the most destructive diseases affecting grapevine in Europe, for example in 2005, 34 million Euro was given to Italian vine growers to compensate for losses caused by this disease. Due to its devastating consequences, Flavescence dorée is the only quarantine disease in the European region. The related mandatory control procedures include: informing the competent institutions, uprooting every infected plant, and when infection exceeds the threshold of 20% of all plants in one vineyard, the whole vineyard must be removed. This is resulting in a high economical loss not only in the current season but also in the future 3-5 years, how much is needed by new grapevine plants to ensure a significant yield. The main vector which spreads Flavescence Dorée is the leafhopper *Scaphoideus titanus* Ball. The symptoms are visually expressed in summer, usually a year after infection, and can be noticed on leaves (rolling downwards and becoming reddish or yellowish in red and white cultivars respectively), shoots (no lignification), and berries (wilting and drying out). Compared to healthy plants, infected ones have a reduction of yield between 51 % and 92 %. If there are no control measures, FD can spread rapidly and affect the entire vineyard in a few years, and contaminated plants are not possible to save due to the inability to directly attack the vector. Currently,

the only solution is to scout vineyards for infected plants, and this is carried out by trained agronomists and experts, which is time-consuming, and usually, each vineyard is controlled once in one or two years, leaving too much time for FD to spread around. To tackle this problem, a hyperspectral camera together with an in-house developed imaging device (MCAPEFA) were used to acquire data from two vineyards near Riva del Garda, Trentino, Italy, during the summer of 2022. MCAPEFA is an imaging device that contains a multispectral and a thermal camera, developed using affordable components with the aim to provide a low-cost solution for precision farming applications, which is the only way to make agriculture sustainable for providing enough food and other resources in the following decades. To detect each infected plant early as possible, the focus is not on spectral signatures for already discolored leaves, but to investigate differences in the reflectance spectrum of green leaves from plants assessed as infected and from healthy ones. Initial finding using linear discriminant analysis shows an accuracy of around 90 %. The next step is to reduce the number of bands needed for detection in order to use the developed low-cost imaging device. This approach will be tested in the following season, also using drone-based imaging which is a much faster solution for scouting one vineyard.



The screenshot shows a presentation slide with the following content:

- Title:** Potential detection of Flavescence dorée, a grapevine disease, using Hyperspectral Imaging
- Authors:** Marko Barjaktarović<sup>1,2</sup>, Massimo Santoni<sup>1</sup>, Michele Faralli<sup>1,3</sup>, Massimo Bertamini<sup>1,3</sup>, and Lorenzo Bruzzone<sup>1</sup>
- Affiliations:** <sup>1</sup> University of Trento, Italy, <sup>2</sup> University of Belgrade, Serbia, <sup>3</sup> Fondazione Edmund Mach, Italy
- Abstract:** This result is part of the MCAPEFA project (Low-cost Multispectral Camera for Precision Farming Application) which main goal is improving the adoption of precision agriculture in small farms. The first step is the development of a new affordable multispectral camera, following with its use for one smart farming application. As one of the major concern for grapevine production, potential detection of Flavescence dorée is tested using hyperspectral imaging. First results are promising, with accuracy of detection higher than 90 %.
- Logos:** UNIVERSITÀ DI TRENTO, RS LAB, C3A, FONDAZIONE EDMUND MACH, and a portrait of Marie Curie.
- Image:** A small image of the MCAPEFA device, a white rectangular box with a lens and a sensor.
- Footer:** RSLab @ University of Trento, Italy, <https://rslab.disi.unin.it/mcapefa>, and the European Union logo.

**Scientific Area:** ENG Engineering

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101028085

**Author(s):** Sidharth Dave, Stephan Rinderknecht


**\*Presenter:** Sidharth Dave, Technische Universität Darmstadt  
[sidharth.dave@tu-darmstadt.de](mailto:sidharth.dave@tu-darmstadt.de)

**Abstract:**


Weight reduction in a highly dynamic system, like a gearbox, and its performance in terms of Noise, Vibration and Harshness does not go hand-in-hand. Weight reduction is accompanied by a reduction in the structural stiffness and damping, which invariably leads to deteriorated NVH behaviour of the system. This behaviour is of significant concern during development of transmission systems for electric vehicles (EVs) and to an extent even hybrid electric vehicles (HEVs) that can drive in pure electric mode. The absence of a combustion engine the drive train of EVs makes the noise and vibration originating from the transmission system more prominent and results in poor in-cabin comfort of the vehicle. This limits the possibility of reducing the weight of the transmission system, and consequently the possibility of increasing the performance, efficiency and the range of the vehicle. The most prominent vibrations that are observed in transmission systems are not due to damaged components, but are rather an intrinsic part of the behaviour of the transmission system and are caused due to the meshing of the gears. As the gear teeth move in and out of the meshing region, the mesh stiffness varies periodically, leading to self-excitation. This results in Gear whine, which is a form tonal noise that arises from narrow band vibration concentrated at the gear mesh frequency and its harmonics. However, the predictable nature of its frequencies and its narrow band nature make it an ideal candidate for active vibration control strategies. Furthermore, EVs and HEVs hold the advantage of already having an integrated actuator in the powertrain i.e. the traction motor, that can be used for this purpose. This helps limit the cost and makes it easy to meet the packaging constraints, in addition to offering more flexibility to the designer in terms of material and design due to reduced NVH signature of the system. The lightning talk will focus on the NVH characteristics of gearboxes, their impact and how the electric traction motor can be used to mitigate these. The sensing and control approaches along with the advantages and challenges of using the traction motor for vibration attenuation will be presented.

## Active vibration control of a gearbox using the electric traction motor

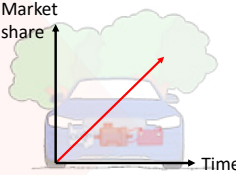
### Motivation



**Conventional vehicles using fossil fuels are a major source of CO<sub>2</sub> emissions.**




Electrified vehicles are the future of transportation!  
**Clean, Green and Efficient.**



Improved performance, efficiency and comfort, paired with lower cost can help **accelerate their market penetration.**

**Solution: Weight Reduction of Transmission System!**


Sidharth Dave | 2023 MCAA Annual Conference and General Assembly
1

**Scientific Area:** ENG Engineering

**Acknowledgement:** H2020 Marie Curie Grant





# Plasma Catalysis in liquid water for CO<sub>2</sub> conversion using Manganese Oxide catalysts

**Author(s):** Jairo Barauna, Tomás Garcia, Vasile Parvulescu

**\*Presenter:** Jairo Barauna, CSIC - Instituto de Carboquímica

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## Abstract:

Reacting CO<sub>2</sub> with water using plasma can be a reliable, cost-effective and environmentally friendly way to recycle this greenhouse gas, especially if the products are liquids since these are easier to store and transport. However, when this reaction is performed in gas-phase plasma, it doesn't usually lead to significant liquid production, producing mostly CO + H<sub>2</sub>. On the other hand, by using liquid water, even in the absence of catalysts, the reaction of CO<sub>2</sub> + H<sub>2</sub>O is able to produce longer molecules, mainly organic acids. Based on the prospect of producing higher oxygenates, we studied the effect of suspended MnO and Mn<sub>2</sub>O<sub>3</sub> and Mn<sub>3</sub>O<sub>4</sub> catalysts in liquid water while bubbling CO<sub>2</sub> plasma.

The plasma-catalytic experiments associated to the measurement of the Total Organic Carbon (TOC) showed, indeed, an effective conversion of CO<sub>2</sub> into liquid organic phases like Tridecanoic Acid. Furthermore, conversion is higher in the presence of catalysts and the highest activity is the obtained with Mn<sub>2</sub>O<sub>3</sub>, followed by Mn<sub>3</sub>O<sub>4</sub> and MnO, this is related with the energy necessary to subtract lattice oxygen, creating oxygen vacancies that are crucial for the catalytic process. To assess the change in the selectivity, organic phases were separated by evaporation of the solvent and analyzed by Fourier Transform Infrared spectroscopy. Those spectra showed the presence of linear monomer-like compounds and organic acids in the presence of catalysts. Accordingly, the

presence of the solid catalysts changes the selectivity of the reaction to compounds with more C=O and C-O bonds.

The absence of C=O or C-O bonds in the case where no solids were used is evidence that oxygen is more importantly obtained from mechanisms involving the lattice oxygen in the metal oxides present. We then propose that the complete CO<sub>2</sub> breakage leads to the creation of \*HC radicals that can react with \*OH, ultimately chaining to (-CH<sub>2</sub>-)X as a result from the unique plasma-liquid interface. This mechanism is responsible for creating monomer-like linear molecules which grow by a process similar to radical polymerization, with the successive addition of radical blocks.

The same process occurs when solid particles are present but, in that case, there is the participation of CO<sub>2</sub> adsorbed species on the surface of the solids. The oxygen donated by the oxide increases the amount of carbon-oxygen bonds in the final product, explaining the difference in the products. Finally, it is possible to conclude that performing CO<sub>2</sub> conversion using liquid water as the hydrogen source is a promising technique to produce organic liquids especially with the addition of manganese oxides. Using two different catalysts it was possible to correlate the results with the lattice oxygen mobility and conversion was increased up to 75%, while also changing the selectivity towards the production of organic acids.



**Scientific Area:** CHE Chemistry

**Acknowledgement:** This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 813393.

**Author(s):** Sabrina Rosoiu, Laura-Bianca Enache, Pavel Potorac, Mariana Prodana, Marius Enachescu

**\*Presenter:** Sabrina Rosoiu, Center for Surface Science and Nanotechnology, University Politehnica of Bucharest, Splaiul Independentei 313, 060042 Bucharest, Romania, [sabrinarosoiu@gmail.com](mailto:sabrinarosoiu@gmail.com)

## Abstract:

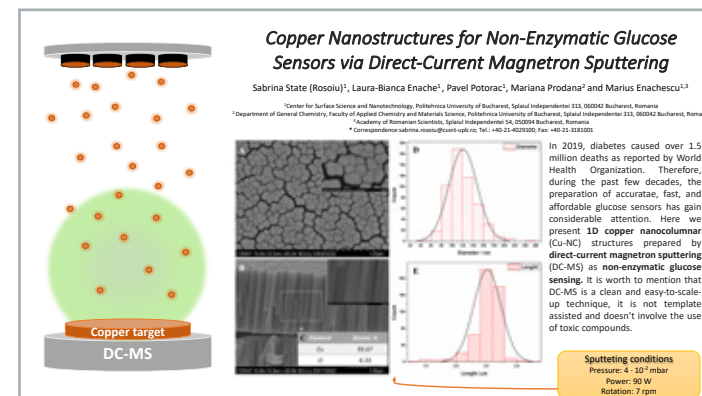
In 2019, diabetes caused over 1.5 million deaths as reported by World Health Organization[1]. Therefore, during the past few decades, the preparation of accurate, fast, and affordable glucose sensors has gain considerable attention. Enzymatic glucose sensors are problematic since the activity of glucose oxidase enzyme is influence by pH, temperature variation, poisoning not to consider the difficulties of enzyme immobilization and the high cost [2]. Non-enzymatic glucose sensors were developed in order to overcome the disadvantages of enzymatic-glucose sensors. Among non-enzymatic glucose sensors, metallic copper is popular because is economic and present good electrocatalytic activity for glucose oxidation. 1D nanostructures based on copper for glucose sensing were reported in literature mainly synthesized by electrodeposition using templates or by wet chemical methods [3–5]. The main disadvantage of using templates that assist the growth of the nanowires is related to the template removal. Regarding the wet chemical route the drawback its the use of toxic precursors or long reaction times.

Here we present 1D copper nanocolumnar (Cu-NC) structures prepared by direct-current magnetron sputtering (DC-MS) as non-enzymatic glucose sensing. It is worth to mention that DC-MS is a clean and easy-to-scale-up technique, it is not template assisted and doesn't involve the use of toxic compounds. Under the established conditions, the obtained Cu-NC present a mean size diameter of  $121.0 \text{ nm} \pm 27.2$  and a length of  $2.52 \text{ } \mu\text{m} \pm 0.23$ . The EDX analysis revealed that apart from Cu, a small content of Cu<sub>2</sub>O was also formed. The behavior of the

columnar structures in alkaline environment, NaOH, was asset by cyclic voltammetry. The amperometric response of the Cu-NC electrode toward successive addition of glucose in alkaline environment revealed a linear range up to 2 mM and a 5.2  $\mu\text{M}$  limit of detection.

In addition, to illustrate the suitability of the synthesized Cu-NC for their use as glucose sensor, the response of the electrode was investigated in the presence of chloride ions, dopamine, uric acid, ascorbic acid and acetaminophen, usually found in blood. Also, the electrodes were tested in the presence of other sugars such as fructose and sucrose at their physiological levels.

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**Scientific Area:** CHE Chemistry

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# 2D-2D Heterostructure Assisted Basal Plane Activation of MoS<sub>2</sub> for enhanced Photoelectrochemical Performance for Green H<sub>2</sub> Generation

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## Abstract:

Among the broad range of two-dimensional materials, TMDs, especially MoS<sub>2</sub>, have gained tremendous attention due to their wide application in catalysis, energy storage, electronics, spintronics, valleytronics, and optoelectronics. In catalysis, MoS<sub>2</sub> is one of the well-known catalysts for electrocatalytic hydrogen evolution reaction (HER), though only its edge sites are catalytically active, whereas its basal plane is inactive. Lots of previous research works have successfully addressed this issue by activating the catalytically inert basal plane. For basal plane activation, defect engineering by sulfur vacancies in MoS<sub>2</sub> is most sought after. However, sulfur vacancy in MoS<sub>2</sub> leads to defect-assisted huge recombination loss of photo-generated charge carriers, which is a hurdle for hydrogen generation via the photoelectrochemical (PEC) route which is considered a promising way to sustainable energy. This hurdle necessitates an alternative way of MoS<sub>2</sub> basal plane activation for PEC HER. Alternative ways of basal plane activation of MoS<sub>2</sub> are reported by various research groups. Charlie Ruffman et al. have shown enhanced basal plane activity of MoS<sub>2</sub> on 2D carbon-based support using density functional theory (DOI: 10.1039/d0nr07100e). Zhao et al. have studied the basal plane activity of MoS<sub>2</sub> at the interface of different polymorphs (2H/1T?) (DOI: 10.1021/acsami.9b11708). Enhanced HER catalytic activity of van der Waals heterostructured MoS<sub>2</sub> is studied from the first principle calculation by Ling et al. (doi.org/10.1038/s41524-019-0161-8). However, neither of these

studies has considered PEC HER nor experimentally achieved. We have endeavored to address this critical gap by heterostructuring MoS<sub>2</sub> with MoSe<sub>2</sub> experimentally with theoretical validation. Thus activation of basal plane of MoS<sub>2</sub> is essential to intensify the HER catalytic activity. Among various strategies, activation of MoS<sub>2</sub> basal plane includes defects engineering via sulfur vacancies and hetero-atom doping. However, for optimal activation, requirements of defect concentration become impractically high, which increases defect-assisted high charge carrier recombination loss in photoelectrochemical (PEC) HER. Herein, we report basal plane activation of MoS<sub>2</sub> by heterostructuring with two-dimensional (2D) MoSe<sub>2</sub> for enhanced photoelectrochemical HER. MoS<sub>2</sub>/MoSe<sub>2</sub> heterostructure grown on silicon nanowire (SiNW) array shows 1.2 times higher photocurrent density and 1.36 times higher incident photon-to-current efficiency (IPCE) than pristine MoS<sub>2</sub> grown on SiNW array along with 4.44 times higher H<sub>2</sub> evolution rate compared to pristine SiNW photocathode. Density functional theory calculations of heterostructure reveal that charge transfer from the MoSe<sub>2</sub> layer to the basal plane of MoS<sub>2</sub> increases overall electron density resulting in its increased affinity towards proton reduction, which supports the experimental findings. These findings will boost the strategy for basal plane activation by 2D heterostructuring for efficient photoelectrochemical HER.

Basal plane activation of 2D Materials for Photoelectrochemical H<sub>2</sub> Generation

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**Scientific Area:** CHE Chemistry

**Acknowledgement:** PK acknowledges financial support from the Department of Science and Technology (Grant NO: DST/TMD/HFC/2k18/138).



# Unraveling Spin-manipulated magneto-photoelectrochemical water splitting in Janus 2D-materials heterostructures

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## Abstract:

Manipulation of photogenerated electron-hole pairs towards low recombination and efficient transport is one of the key strategies to achieve high efficiency in photoelectrochemical water splitting. External magnetic fields have been reported for spin-to-charge conversion using either chiral molecules or magnetic elements-assisted photoelectrodes in spin-dependent electrochemistry (SDE). Herein we demonstrate a proof-of-concept for spin-manipulated charge transport in Janus MoSSe heterostructured with p-GaN as a photocathode under the influence of an external magnetic field. It is worthy of mentioning that we have neither used chiral molecules nor magnetic elements in the proposed photocathode. Our approach provides a new, effective, and affordable path-way to improve the catalytic performance of asymmetric 2D materials in PEC water splitting. Further, this proposed approach can be utilized for other asymmetric/disordered alloys for a wide range of applications. Among two-dimensional (2D) materials, asymmetric Janus structure (MoSSe, WSSe) has exhibited many exciting properties, such as a significant Rashba effect, out-of-plane piezoelectricity, and spatial isolation of charge carriers. However, the critical gap that remains to be addressed yet is whether the spin properties of these asymmetric 2D

materials can be combined with their optical and catalytic properties to establish more efficient photoelectrochemical (PEC) water splitting along with exploring some more fascinating science. Herein, we demonstrate a proof-of-concept for spin-manipulated PEC water splitting using Janus MoSSe. Magneto-photoelectrochemical properties have been critically investigated through lifting spin degeneracy by combined Rashba-Dresselhaus spin-orbit coupling and energy band splitting in Janus MoSSe/GaN heterostructure. Delaminated 2D-MXene (Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>) was decorated on top of MoSSe/GaN for efficient electron channeling. The optimized Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub>/MoSSe/GaN device showed ~35% photocurrent enhancement as well as ~40% enhancement in product (H<sub>2</sub>/O<sub>2</sub>) formation in PEC water splitting under a low applied magnetic field (0.4T). The external applied magnetic field helps spin manipulation even under unpolarized light by combining Zeeman and Rashba-Dresselhaus splitting by spin-to-charge conversion in Janus MoSSe/GaN heterostructure. Density functional theory (DFT) simulations were carried out to understand the role of the Rashba-Dresselhaus effect for efficient charge transport. This proposed concept of “spin manipulated charge transport” can be extended for various other asymmetric alloys for a wide range of applications, including

Addressing the spin-manipulated magneto-photoelectrochemical water splitting in Janus 2D-materials heterostructures

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selective CO<sub>2</sub> reduction, photodetection, photovoltaics, etc. Therefore opens new research domains like “Spin Manipulated Electrochemistry (SMPE)” using asymmetric materials.

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**Scientific Area:** PHY Physics

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# Career Development, Economics, Social Sciences, Humanities & Arts





# The importance of collaboration within pediatric oncology: a bottom-up approach boosted by an innovative personal development program

**Author(s):** Celina Szanto, Ingrid Valks, Marcel Kool, Annette Künkele, Gudrun Schleiermacher, Frank Speleman, Jan Molenaar

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## Abstract:

About 75% of new drug development fail in early development and 9 out of 10 clinical trials fail in pediatric cancer. This is caused by multiple factors:

- 1) Cancer in children is rare, making study groups small and investments unattractive
- 2) Lack of pediatric cancer specific biology driven approached in which target identification and validation is key
- 3) Data sharing between academic and industry is inefficient and there is a lack of multidisciplinary scientist for pediatric targeted drug development

There is a strong need for a new generation of creative, entrepreneurial scientist that will become Europe's next generation of leading researchers that will develop novel strategies in pre-clinical drug development and bridge the gap between academia and industry.

The VAGABOND ITN, consisting of 12 academic and 6 non-academic partners from 8 European countries, aims to create a multidisciplinary and multi-sectoral program to validate new therapeutic interventions in paediatric cancer and train a new generation of multidisciplinary scientist. Within pediatric oncology industry, pharma and academia collaborate within multiple initiatives (e.g. ITCC-P4, ACCELERATE), but these initiatives

are organized top down and lack physical interactions between academia and industry. Here we apply a bottom-up method where the ESRs interact with pharma, industry and academia and thereby warrant implementation of interaction between these entities on the work floor.

To take care of the well-being of the ESRs, their mental health and ensure optimal work-life balance within this ambitious program we introduced an innovate personal development program BeyondU, developed by Ingrid Valks. Within BeyondU, the ESRs develop human-skills, increase their self-awareness and boost their social emotional intelligence and professional influence. BeyondU consists of six personal development pillars and continuous development of new human-skills. Each masterclass is a live experience and is the kick off of each pillar. Masterclasses include reflection and are centred around activities activating the body (experience, feel, listen), the mind (learn, understand, talk), and the heart (discover, connect, be). During the online interactive programme, ESRs receive a mixture of educational and motivational messages and assignments in alignment with the respective pillar. The ultimate objective is behavioural change and integration of insights into daily personal and professional life.



With this presentation the authors want to share their experiences on including personal development within an ITN training program. Besides the positive effects on the well-being of the ESRs, the BeyondU program had a strong impact on collaboration. From the start of the program, the ESRs formed a very close group, despite the cultural differences and being physically located in different European institutes. The ESRs are halfway through the program and we notice new collaborations between pediatric research groups and integration of academic expertise across Europe. In conclusion offering courses on personal development and practicing well-being not only sets a foundation for your researchers to tackle stress, improve work-life balance and boost their professional influence, but also strongly improves collaboration within academia and industry.

**Scientific Area:** CD Career Development

**Acknowledgement:** The VAGABOND project received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 956285



# Turning great research ideas into high-impact societal solutions

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**Abstract:**

Researchers contribute to the creation and development of best ideas to societal problems, but these ideas do not always reach the lives of those around us.

Moving ideas from the laboratory to real world requires the researcher a new mindset, as well as a context of new policies, and mechanisms. When combined, they can quicken emerging inventions to have positive impact on the society.

Companies have started seeing research institutes as an essential technology partner to promote innovation. We, researchers, can be prepared to strengthen this collaboration and accelerate knowledge transfer to reach society.

This presentation intends to briefly share an European example of a technology transfer group and its researchers to inspire other researchers to think about their career development beyond the current collaborative framework between research institutes and industry.

## TURNING GREAT RESEARCH IDEAS INTO HIGH-IMPACT SOCIETAL SOLUTIONS

Carolina Madeira (Speaker)  
Joaquim Melendez Frigola  
eXiT - Universitat de Girona

ACCIO  
Generalitat de Catalunya  
Government of Catalonia

Tecniospring  
INDUSTRY

Universitat de Girona

The project has received funding from the European Union's Horizon 2020 research and innovation programme under Marie Skłodowska-Curie grant agreement No. 801342 (Tecniospring INDUSTRY) and the Government of Catalonia's Ag

**Scientific Area:** CD Career Development

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# Mental health in Academia: how can we be part of the change

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## Mental health in Academia: How can we be part of the change?

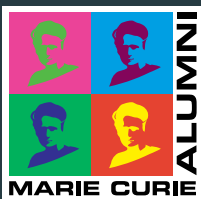
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25/02/2023

**Scientific Area:** SSH Social Sciences

**Acknowledgement:** MCAA ATTENTIVE 101028810





# Mining ethical ambiguities within global interconnections

**Author(s):** Linda Armano Linda Armano

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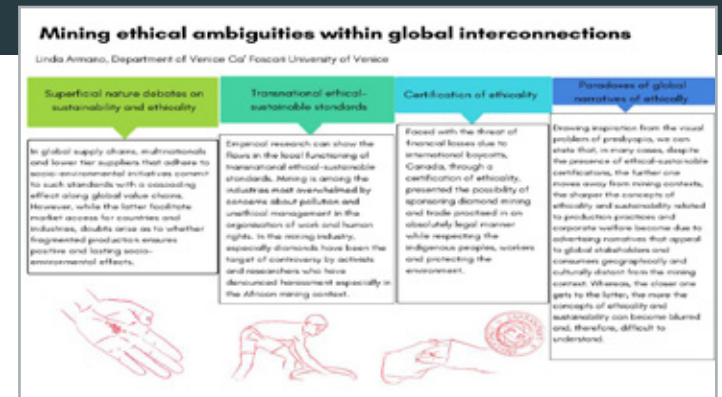
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### Abstract:

In global supply chains (GVCs), multinationals and lower tier suppliers that adhere to socio-environmental initiatives commit to such standards with a cascading effect along GVCs. However, while the latter facilitate market access for countries and industries, doubts arise as to whether fragmented production ensures positive and lasting socio-environmental effects. Some scholars have recently criticised the superficial nature of academic and political-economic debates on sustainability and ethicality, arguing them more as a fad than as rigorous areas for the development of social-environmental policies and welfare initiatives. Certification systems, alongside the use of digitisation to share information (blockchain) along the supply chain, often increase a public consensus by exploiting rhetorical appeals about the protection of the environment, workers and human rights in general. In many cases, however, they continue to reproduce the gap between theory and implementation of ethical-sustainable intentions in certain socio-productive contexts in GVCs.

Empirical research can show the flaws in the local functioning of transnational ethical-sustainable standards and the results can be useful for reconfiguring corporate-political goals. Mining is among the industries most overwhelmed by concerns about pollution and unethical

management in the organisation of work and human rights. In the mining industry, especially diamonds have been the target of controversy by activists and researchers who have denounced harassment especially in the African mining context. Faced with the threat of financial losses due to international boycotts, and due to the positive economic impact of the diamond industry in certain countries such as Canada, companies in the sector were presented with the possibility, through a certification of ethicality, of sponsoring diamond mining and trade practised in an absolutely legal manner while respecting the indigenous peoples, workers and protecting the environment. However, this objective is difficult to achieve as socio-economic asymmetries continue to emerge between actors involved in the mining industry. These dynamics create ambiguities between the implementation of socio-environmental policies, welfare initiatives, and the dissemination of global narratives of ethically sustainable extractive practices and their actual impacts in local contexts. These paradoxes should be read within global interconnections from extractive contexts to retail contexts. Drawing inspiration from the visual problem of presbyopia, we can state that, in many cases, despite the presence of ethical-sustainable



certifications, the further one moves away from mining contexts, the sharper the concepts of ethicality and sustainability related to production practices and corporate welfare become due to advertising narratives that appeal to global stakeholders and consumers geographically and culturally distant from the mining context. Whereas, the closer one gets to the latter, the more the concepts of ethicality and sustainability can become blurred and, therefore, difficult to understand. While, in the case of diamonds, consumers may believe the veracity of advertising rhetoric about ethical and sustainable mining practices embedded in certifications, the same rhetoric may prove less appealing to residents and workers in the mining context to the point of even prompting them to mute behaviour in order not to expose themselves to discourses that might cast doubt on the proper functioning of such practices.

**Scientific Area:** SSH Social Sciences

**Acknowledgement:** H2020-MSCA-IF-2018  
Grant agreement ID: 837190



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## Abstract:

The work analyzes the results of the Spanish Integrated Sustainable Urban Development Strategies (ISUDS), which are city strategies financed with EU funds through a competitive public call during the 2014-2020 programming period. There have been three ISUDS calls during the programming period (in 2015, 2016 and 2017) managed by the Ministry of Finance and Public Administration (now the Ministry of Finance). The research compares two strategies carried out by the cities of A Coruña and Logroño. The case study selection was based on three elements. The first element regards the analysis of cities that are currently elaborating their Local Action Plans in the frame of the Spanish Urban Agenda. The second one is the scope of the ISUDS, i.e. the inclusion of vulnerable areas that partially (A Coruña) or totally (Logroño) coincide with the ISUDS delimitation. The last one relies on two different scales of interventions. On the one hand, A Coruña, a large city of about 300,000 inhabitants, conceived its strategy as a compendium of actions to regenerate the whole municipality, while Logroño (approximately 150,000 residents) focused on a small-scale approach, with a specific intervention located in the vulnerable neighborhood of Villanueva.

The comparison of the two cases comprises two phases with specific features. The first phase is the analysis of the ISUDS proposal and comprises eight features: 1) the general data about the city and the ISUDS; 2) the description of the main city's issues and challenges in terms of urban regeneration, with emphasis on the urban vulnerability

factors; 3) the delimitation of the ISUDS; 4) the financing mechanisms, i.e. the City Council's funds and the ERDF that are included in the ISUDS' Implementation Plan, as well as other bodies' funds aimed to achieve the ISUDS' goals; 5) the Implementation Plan analysis with a table detailing the lines of action and corresponding thematic, strategic objective and investment priorities; 6) the governance model analyze the management process of the ISUDS and the participation mechanisms undertaken for the elaboration of the strategy; 7) the main synergies with the Spanish Urban Agenda shows the linkage of the Implementation Plan with the Spanish Urban Agenda; and 8) the relationship with the concept of integrated urban regeneration. The second phase regards the analysis of the current state of implementation of the ISUDS' actions. This study is divided in four section: 1) the urban regeneration actions already carried out; 2) the evaluation of the governance model in terms of management and participation; 3) the relationship of ISUDS with vulnerable neighborhoods; 4) the impact on the city's urban policy explains the role of ISUDS as a game changer of the existing urban policies.

To sum up, the analysis can be a primordial step to evaluate the impact of the Integrated Sustainable Urban Development Strategies in addressing urban regeneration issues at the city scale. The way to conduct the comparison helps to understand the state of implementation of this Spanish state-led program and its pivotal role in support the elaboration of new urban policies.



## How to develop urban regeneration? The case of the Integrated Sustainable Urban Development Strategies in Spain

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PROGRAMA DE INVESTIGACIÓN EN CIENCIAS SOCIALES Y HUMANIDADES (ICSH) DE LA UNIVERSIDAD DE VALLADOLID

**Scientific Area:** SSH Social Sciences

**Acknowledgement:** (1) This work presents the results of the research “InURBA: Metrópolis fracturadas. Vulnerabilidad, reequilibrio territorial e institucionalización de las estrategias de desarrollo urbano integrado. PID2019-108120RB-C33”, financed by “MICIU. Programa Estatal de I+D+i Orientada a los Retos de la Sociedad. Plan Estatal de Investigación Científica y Técnica y de Innovación 2017-2020. Agencia Estatal de Investigación. Convocatoria 2020.” (2) Federico Camerin has participated as co-author within the research project “Urban Regeneration as a new version of Urban Renewal Programmes. Achievements and failures”. This project is co-funded by Spanish Ministry of Universities, Recovery, Transformation and Resilience Plan, by the European Union – NextGenerationEU and Universidad de Valladolid



# The Many Languages of Oceanic Navigation in the Early Modern Period

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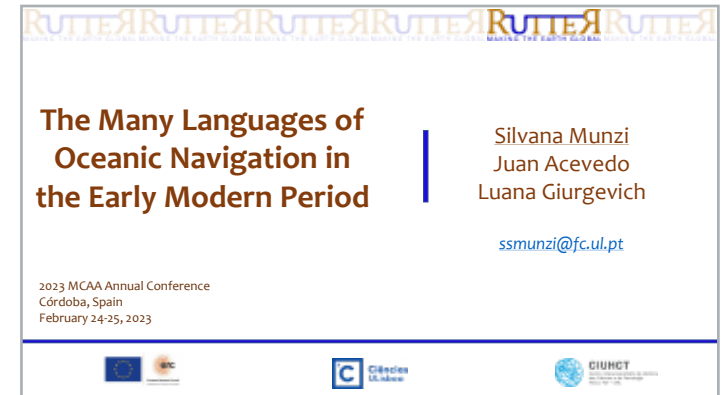
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## Abstract:

The stable and regular crossing of the earth's oceans on a global, planetary scale in the Early Modern period is considered an Iberian achievement. However, like the result, which was global and prompted the emergence of global concepts about the earth, the premises were, if not global, at least multicultural. Travelers of very different social strata, nations and cultures were boarding on a ship sailing from Lisbon or Seville to the Indies. Hiring foreigners was a necessity, especially in Portugal. Onboard the ships, crews were composed of sailors from different nations: Portuguese, Spanish, Italians, Greek, French, etc. In an international environment where social conventions and differences did not exist anymore, during long months of navigation, travelers lived together and socialized with people they would have never met under normal circumstances. Linguistic exchanges were so intensified that even very technical nautical texts, like rutters and logbooks, would include glossaries or long, detailed descriptions of distant places, animals, people, or technical matters. Inevitably, this international maritime experience produced texts written and/or translated in many different languages, reaching publics that did not personally witness the oceanic voyage. But it was more than that. The establishment of oceanic routes, in

fact, rather than the successful achievement of two empires, must be considered the synthesis of centuries of multicultural traditions. The interaction with local and regional pilots was indispensable at every turn of the expeditions and gave an international and traditional character to the “new” and “Iberian” routes. This was particularly dramatic across the Extended Indian Ocean, where the Portuguese would not even have reached their primary destinations without expert assistance through the Arabian Sea and the South China Sea, from pilots who spoke Arabic, Gujarati, Tamil, Malay or other languages.

Given this, one would expect that relevant research on the topic was carried on considering multilingual sources of nautical knowledge. But on the contrary and astonishingly, most of the related research is based exclusively on English and Dutch sources, ignoring large documental bodies in any other languages. The ERC project RUTTER (<https://rutter-project.org>) is engaged in filling this gap through the study of still poorly known technical documents (nautical rutters and ship's logbooks) in Portuguese and Spanish and Arabic texts, while engaging in conversation with colleagues from hitherto under-represented textual traditions.



**Scientific Area:** HA Humanities and Arts

**Acknowledgement:** The RUTTER project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No. 833438) and Fundação para a Ciência e a Tecnologia (UIDB/00286/2020)



# Unleashing the full potential of digitalization in energy: A cost-benefit analysis and system dynamics approach for energy firms

**Author(s):** Jose Angel Leiva Vilaplana, Guangya Yang

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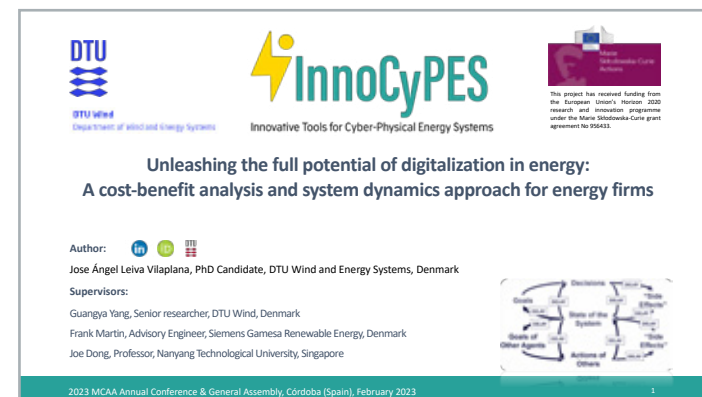
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## Abstract:

Digital transformation trends have the potential to enhance competitiveness and discover innovative business models in the energy industry. The integration of digital technologies into energy systems can bring about significant benefits in efficiency, reliability, and sustainability along the energy value chain. To quantify these benefits, cost-benefit analysis methods have been utilized for decades to evaluate a wide range of policies and investments. However, challenges related to data availability and quality, the complexity and dynamic nature of energy systems, and uncertainty may hinder the quantitative assessment of digital technologies and, therefore, the adoption of these promising technologies. This issue calls for a thorough investigation of digital business models for sustainability in the energy field, from a dynamic and uncertainty-based perspective.

In this research, the combined use of cost-benefit analysis and system dynamics has been explored to understand the potential benefits and costs of digital technologies in energy systems, particularly within the context of energy firms. Here, a multi-level approach has been adopted to advance the current understanding of the sustainable,

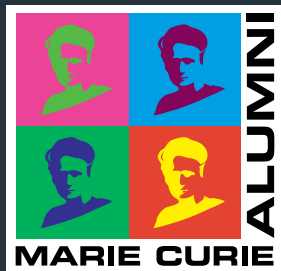
financial, and social dimensions that influence the value created for customers, the value captured by the firm, and the value creation capabilities within the company. Aspects such as the impact of cybersecurity and data management are studied along with key value drivers of digitalization, such as talent retention, increase in sales, risk reduction, and cost reduction. The links between these variables have been validated through a literature review and interviews with stakeholders from different energy domains. Using a case study approach, examples of the integration of digital technologies in energy companies are studied, covering crucial energy domains such as power distribution and offshore wind power generation. The analysis reveals that energy firms adopting specific cyber security and data management decisions can achieve sustainability while increasing their financial performance and competitiveness. This research provides a systems-based perspective and practical guidance for energy companies looking to optimize the benefits of digitalization and to understand the potential impacts and considerations of digital technology adoption.



**Scientific Area:** ECO Economics

**Acknowledgement:** This research is part of the InnoCyPES project, which has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska Curie Grant Agreement Number 956433.





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