



BOOK OF ABSTRACTS: POSTER SESSIONS

MCAA ANNUAL
CONFERENCE,
5-7 MARCH 2021

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MY SUPER SCIENCE HEROES



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FOREWORD

Dear Members,

This Book of Abstracts collects the posters presented at the Annual Conference of the Marie Curie Alumni Association which took place online on 5-7 March 2021.

For each poster, a page includes an abstract, an image of the poster, and information about the author(s) and their organisation(s). Posters are categorised under nine areas:

- Chemistry
- Economics
- Engineering
- Environmental Sciences
- Life Sciences
- Mathematics
- Physics
- Social Sciences, Humanities & Arts
- MCAA Chapters

The MCAA wishes to thank everyone who showcased their posters at the first-ever online Annual Conference event. All members and non-members are encouraged to submit posters for future Annual Conferences and General Assemblies.

The abstract authors may be contacted via the MCAA web portal.

Sincerely,
The MCAA 2021 Conference Committee



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CHEMISTRY

Conformation of immune stimulatory single stranded DNA by biomolecular simulations and NMR

Cancer immunotherapy requires a novel type of delivery system with specifically tailored adjuvants to activate immune responses. Among immune stimulators of microbial origin, oligodeoxynucleotides (ODNs) represent the most advanced potential adjuvants. ODNs are unmethylated single-stranded DNA (ssDNA) sequences with CpG-motifs, which are able to activate the innate immune system by binding to TLR9 receptors. Adjuvant effects are optimised by maintaining ODNs and vaccine antigens in close proximity, which can be achieved by loading the immune stimulator and the antigen cargo to an appropriate carrier such as inorganic nanoparticles.

The immobilisation of ODN immune stimulators onto the surface of nanoparticles while maintaining multivalent presentation to TLR9 receptors requires knowledge of their conformational properties. De novo modelling of ssDNA conformation, opposed to that of double-stranded DNA, is challenging due to multiple reasons. ssDNA lacks stable structures and can only be described as an ensemble of interconverting conformations, thus methods for adequate sampling of the conformational space need to be applied. Force fields for the simulation of DNAs were, however, developed by testing them on structured DNA and their ability to reproduce conformations of ssDNA is unclear. In this regard, modelling of ssDNA likely faces similar challenges as modelling of Intrinsically Disordered Proteins.

We set out to test the accuracy of existing DNA force fields using atomistic molecular dynamics (MD) simulations and NMR spectroscopy. Translational diffusion coefficients were obtained from diffusion experiments and compared to translational diffusion coefficients, the radius of gyration and end-to-end distances calculated from MD

simulations. Furthermore, we analysed secondary structure formation and descriptors of dynamic behaviour. The outcome of comparisons for different DNA force fields are discussed.

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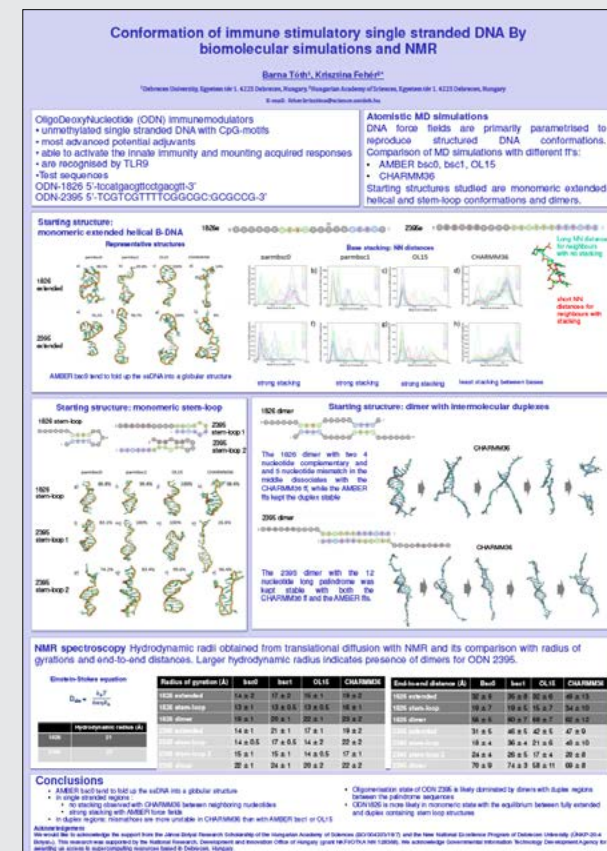
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CHEMISTRY

Metal-Organic Frameworks as efficient Detoxifying Agent

In human health risk assessment, ingestion of food and water is considered a major route of exposure to many contaminants. Moreover, therapeutic misadventures, illicit drug ingestion or attempted suicide by using harmful substances is a major worldwide public health problem that causes both a significant cost and severe health problems, even death. Unfortunately, for the vast majority of these poisoning, there are no specific antidotes and currently available detoxification methods are weak and poorly prescribed. However, they are accused of being ineffective and even of causing unnecessary complications, inducing severe adverse effects, which limit their use. Therefore, a fast and effective detoxification treatment remains a challenge. In general, it is desirable to use adsorbents in the form of powders or fine particles exhibiting a larger surface area, because substances present a smaller diffusion velocity in the liquid phase than in the gaseous phase, and the adsorption velocity is consequently dependent on the adsorbent's surface area. These materials should act like "chemical sponges" and selectively adsorb the toxins in the gastrointestinal tract, thus preventing the uptake in the blood and subsequent distribution to target organs. In this context, a new class of crystalline porous materials known as Metal-Organic Frameworks (MOFs) has attracted increasing attention from academic and industrial domains. Compared to classical adsorbent materials such as organic or inorganic solids, MOFs present several advantages (versatile composition, large structural variability, important porosity, etc.) making them excellent candidates for the selective and important adsorption toxins.

Materials and Methods: In this study, we target the oral detoxification of aspirin (used as a toxin drug) with two biocompatible MOFs (MIL-127 and MIL-125-NH₂). Aside from their biocompatibility, these materials exhibit a high porosity associated with an important adsorption capacity and are stable at different pH values, even under gastrointestinal conditions.

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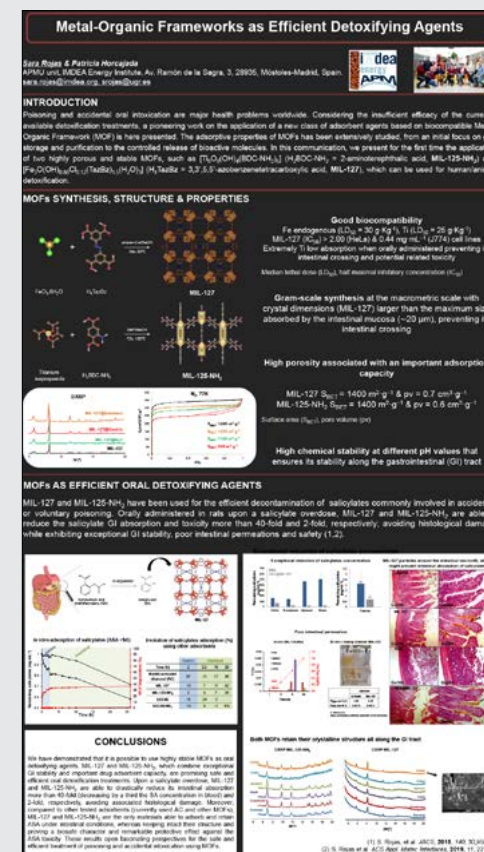
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CHEMISTRY

Catalytic production of green piezoelectric bioplastics

Mechanical Energy Harvesters (MEH) are miniature power generation devices based on the use of innovative piezoelectric materials which can convert a mechanical stimulus to electrical energy. Piezoelectric energy harvesters (PEHs) are regarded as promising independent renewable power sources for low-power electronic devices such as wireless sensors, portable devices, stretchable electronics and medical implants (biosensors). Green piezoelectric biopolymers optically active, such as poly(L-lactic acid) (PLLA) and Poly-B-hydroxybutyrate (PHB) and their copolymers, could represent an interesting alternative that has benefits regarding carbon footprint, decreasing the environmental impact of PEHs devices. Moreover, compared to other piezoelectric materials, optically active biopolymers do not need to be polarised by an electrical field as they reach the polarisation by direct mechanical stretching. However, the practical application of biopolymers is limited because of their low piezoelectric constant, although it can be engineered and improved since the magnitude of the piezoelectric constant is proportional to the degree of chain orientation and crystallinity of the polymer.

On the other hand, an attractive synthetic pathway for the production of aliphatic polyesters is the ring-opening polymerisation (ROP) of cyclic esters catalysed by metallic complexes. This process has the advantage of allowing effective control over the properties of the produced polymers. In fact, ROP continues to be the most versatile method of synthesis of major groups of bioplastics, particularly when big amounts are required.

This poster presentation will focus on the main objective of the GREENPEHs project, which aims to design and synthesise, by catalysed ROP, new bioplastics with

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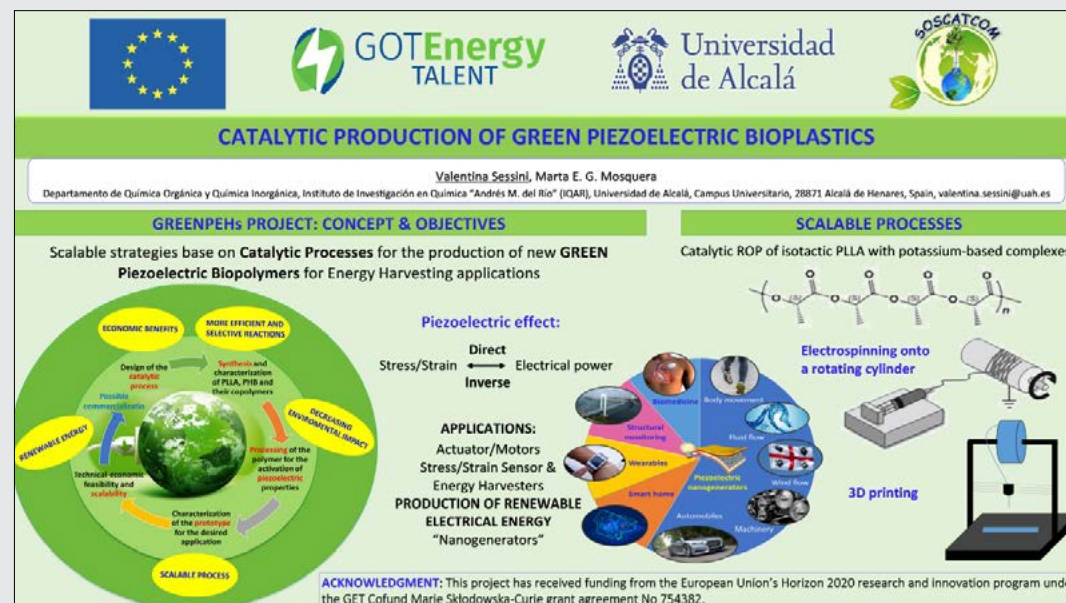
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piezoelectric properties for possible energy harvesting applications, in order to offer innovative industrial solutions in the field of smart energy. It will contribute to the smart energy area creating innovative green strategies and producing, by an energy, cost-efficient and scalable process, new advanced piezoelectric bioplastics capable to generate renewable energy.

CHEMISTRY

Exploring the host-guest chemistry of M₈L₁₂ self-assembled cages in the gas phase

The application of mass spectrometric techniques using M₈L₁₂ supramolecular cages as hosts is an area of host-guest chemistry that is yet to be explored in the Ward group. By utilising ESI-MS and TW-IMS-MS techniques, different guest binding behaviours were identified within a series of complexes featuring cycloundecanone, 4-methylcoumarin, and 7-amino-4-methylcoumarin as high-binding guests. Results showed that cycloundecanone binds inside the cage cavity, forming a 1:1 host-guest assembly, and the presence or absence of the amino-functional group on 4-methylcoumarin plays an important role in the formation of host-guest complexes using these containers.

Author(s):

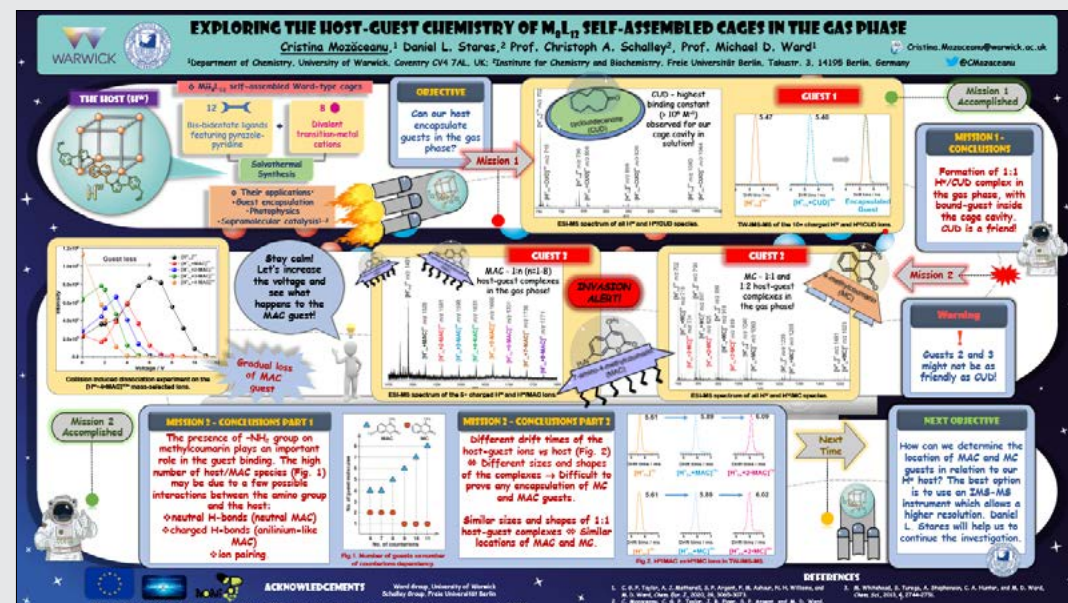
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CHEMISTRY

Inkjet printing for biosensor application.

Progress report

Lectins are carbohydrate-binding proteins capable of recognising and binding glycan/sugar moieties present on a range of biomolecules including cells, viruses and proteins.

Lectins functionalised biosensor (LFB) platforms present exciting opportunities as enhanced diagnostic tools enabling simple, rapid, real-time, label-free detection, analysis and quantification of biological analytes with high sensitivity using small sample volumes. The use of high throughput LFB platforms could facilitate applications in biopharmaceutical product development or act as Process Analytical Technology tools to enhance the fidelity and efficiency of production processes. While the technology of immobilising lectins on silica particles for chromatography applications has been well established by the industrial partner the ability to immobilise biological molecules such as lectins in predefined, highly concentrated and structurally organised orientations in an array format presents many challenges. Such challenges must be overcome if the benefits of LFB technology are to be fully exploited.

We plan to produce biosensors by ink-jet printing of specific LFBs in a highly structured form to enable their use as a point of care diagnostic devices and screening arrays for biopharmaceutical production.

This work is a progress report and demonstration of inkjet printing possibilities.

We have shown by the photoluminescence method that lectin Concanavalin A affinity to carbohydrate remains intact after printing. 2) We have found the method of fixing lectin on the substrate. 3) We have demonstrated the possibility of printing high ordered arrays using commercially available printer Epson.

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Inkjet printing for biosensor application. Progress report

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Lectin base biosensors
Lectins are carbohydrate binding proteins capable of recognizing and binding glycan/sugar moieties present on a range of biomolecules cells, viruses and proteins. Can be used as

Lectin functionalized biosensor (LFB)
> Enhanced diagnostic tools
> Rapid real time and label free detection
> Analysis and quantification of biological analytes
> High sensitivity in small sample volumes

LFB platforms could facilitate applications in biopharmaceutical product development

Concanavalin A (Con A) a lectin originally extracted from the jack-bean, Caracalla ensiformis.
> A member of the legume lectin family
> Highly specific for various sugars, glycoproteins, and glycolipids groups
> A model object for this project

ConA is a model object - next step is using recombinant prokaryotic lectins (RPL) from bacteria. RPL are providing by industrial partner GlycoSelect, Dublin

Main AIM
To produce functioning lectin-based biosensors by the high-resolution printing of RPL onto electroactive and surface functionalized substrates

Devices
Printer: Epson SX125
Optical microscope: Carl Zeiss AXIO
Scanning Electron microscope: FEI Helios G4 CX
Photoluminescence: NTGIRA-Spectra Hybrid Nanoscope
Viscosimeter: Brookfield DV2T
Contact angle analyser: First Ten Angstroms CAM

Inkjet printing
Commercial available printer: inkjet piezo printing (no heating)
Printing technique: 4-10 pL
Drop volume: 80-90 µm (on the surface)
Drop diameter: ~20 µm
Positioning accuracy: 1-5 µm
Ink viscosity: 20-50 mPa·s
Ink surface tension: 1-2 mN/m
Minimum ink volume: 1-2 nL

Inks composite
Water: main medium
Chitosan: creates film, fix lectin molecules on the substrate, regulate viscosity
Acetic acid: dissolving chitosan
Additives: ions for adjusting lectin and buffer for protecting
Surfactants: regulate surface tension and clean the nozzles
Substrates: polished SiO₂ wafer, glass slides, PET film, glass covered conductive FTO, etc.

Check the affinity. Photoluminescence response
Laser 332 nm
FITC-Dextran
Ink medium
Lectin
Substrate
Intensity a.u.
Wavelength, nm
Good affinity, strong signal

Next steps
1. Change commonly used ConA to the RPL from GlycoSelect
2. Change Photoluminescence method to impedance spectroscopy or electrochromatic method to work in liquids and increase the sensitivity
3. Create the prototype of the device

Example of printing
Individual drops printed on SiO₂ wafer
200 µm intervals Without additives
15 µm
15 µm
200 µm
200 µm
Different fillings printed on PET film
Full overlap and merger
Partial overlap and merger

Logos: European Union, Enterprise Ireland, GlycoSelect, NTGIRA-Spectra Hybrid Nanoscope

CHEMISTRY

Large-Scale Soft-Lithographic Patterning of Plasmonic Nanoparticles

The application of plasmonics in solid-state devices is often limited to the impossibility of patterning single plasmonic objects on arbitrary substrates using standard self-assembly methods. Herein, we demonstrate the patterning of gold metal nanoparticles through a scalable, and straightforward chemical patterning technique, termed chemical lift-off lithography (CLL), a soft lithographic technique capable of generating micro- and nanoscale patterned gold monolayers on a polydimethylsiloxane (PDMS) stamp that is conformally contacted with a mercaptoalkanol self-assembled monolayer (SAM) on a gold substrate. The procedure is modified, substituting the gold substrate with a monolayer of mercaptoalkanol-functionalised gold nanoparticles, that are lifted-off from the PDMS, generating patterned plasmonic nanostructures. The capability of CLL to access feature sizes below 100 nm opens the possibility to achieve single-particle patterning resolution, enabling the precise positioning of single plasmonic objects on arbitrary substrates over large scales (wafer-size). In conclusion, the developed approach allows the organisation of gold nanoparticles into nanoscale patterns on arbitrary oxide substrates. The procedure holds the potential to combine the unmatched optical properties of nanoparticle colloidal suspension, with the possibility of precisely locating them on a surface.

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Large-Scale Soft-Lithographic Patterning of Plasmonic Nanoparticles
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ABSTRACT: Nanoparticle chemical lift-off lithography (NP-CLL) combines concepts from colloidal chemistry, self-assembly, and subtractive soft lithography for the scalable fabrication of functional plasmonic materials. Leveraging chemical interactions between the capping ligands of pre-synthesized gold colloids and a polydimethylsiloxane stamp, we demonstrate patterning of gold nanoparticles over centimeter-scale areas with a variety of micro- and nanoscale geometries, including islands, lines, and chiral structures.

Nanoparticle chemical lift-off lithography
An activated polydimethylsiloxane (PDMS) stamp is conformally contacted to a self-assembled monolayer of gold nanoparticles coated with [11-mercaptoundecyl]hexa(ethylene glycol) (MUEG@AuNPs).
MUEG@AuNPs + Activated PDMS → Patterned AuNPs + Negative Image

A condensation reaction (1) between the hydroxyl terminations of the PDMS stamp and the ones of the MUEG ligands leads to the formation of strong covalent bonds (2). The subsequent removal of the stamp "lift-off" (3) the bonded MUEG@AuNPs from the self-assembled monolayer, breaking the weak van der Waals (VdW) interactions between adjacent (4), and resulting in a patterned AuNP monolayer on the PDMS stamp.

Increasing nanoparticle dimension relative to the contact area with the PDMS stamp (i.e. the pattern feature size) we demonstrate the possibility of few-to-single nanoparticle "lift-off" and spatial 3D manipulation of plasmonic objects.

CONCLUSIONS
NP-CLL enables the organization of AuNPs into micro- and nano-scale patterns on arbitrary oxide substrates, combining the optical properties of nanoparticles prepared in colloidal suspension with the capability to precisely position them on a surface.
In the future, the chiral optical activity can be improved using smaller and more defined spirals in the nanoscale regime. Moreover, the described procedure can be extended to different nanoparticle shapes and compositions, expanding the accessible wavelength range. The possibility to achieve collective plasmonic activity on demand enables applications in plasmon lasing, remote sensing, photonic crystals, metamaterials, and catalysis.



CHEMISTRY

In silico binding affinity, ADME prediction of selected biorelevant small molecules as hLDHA inhibitors

Biorelevant Small molecules isolated from natural products are important bioactive compounds and drug candidates due to their chemical structure and pharmacokinetic properties. Natural products offer diverse therapeutic alternatives possessing a wide range of biological activities. The hLDHA enzyme catalyses the conversion of pyruvate to lactate coupled with the cofactor NADH. It attracts significant attention because it exists at the bifurcation point from where selective starvation of cancer cells is possible. In this work identified a potential natural product that showed significant binding affinities with hLDHA and could be a lead candidate for further drug development.

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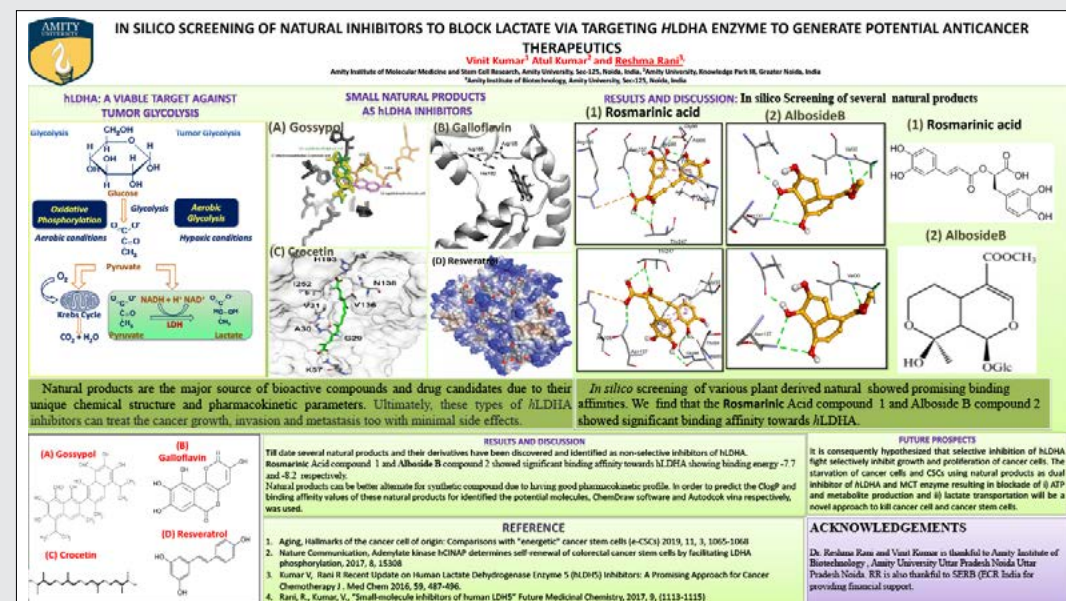
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CHEMISTRY

Nano-design of zeolite-based catalysts for selective conversion of biomass into chemical

The design of the catalytic properties and structure of zeolite materials plays a key role for the efficient transformation of biomass to sustainable chemicals. We were interested in designing a theoretical and experimental approach for the production of i) lactic acid and alkyl lactates from glucose and dihydroxyacetone (DHA), ii) acrylic acid (AA) from lactic acid (LA).

The essential part of the project was the preparation of zeolites for biomass transformation. Zeolites were prepared using several methodologies: 1) as delivered commercial zeolites 2) synthesised using different recipes, 3) natural zeolite: clinoptilolite. All types of zeolites were transferred into mesoporous form by hierarchisation. All obtained zeolite catalysts were characterised using standard experimental techniques (XRD, XRF, BET, UV-Vis, IR, SEM, EDS, TPD, TPR). The all-zeolite catalysts were imaged and analysed using the SEM/EDS and XRD techniques. As a next important part of the project, the tests of catalytic performances of zeolite catalysts were managed. The catalysts were tested in the following conditions: (i) in gaseous phase using a fixed bed, continuous flow tubular reactor, (ii) in liquid phase using periodic reactors or autoclave. In the theoretical studies density functional theory calculations have been performed. We studied ideal and hierarchical structure of zeolites (MFI, BEA, FAU). The role of different defects in zeolites on the formation of hierarchical structure was studied theoretically. The mechanism of direct lactic acid dehydration at metal supported zeolites has been successfully found above metallic dimers, M-O-M.

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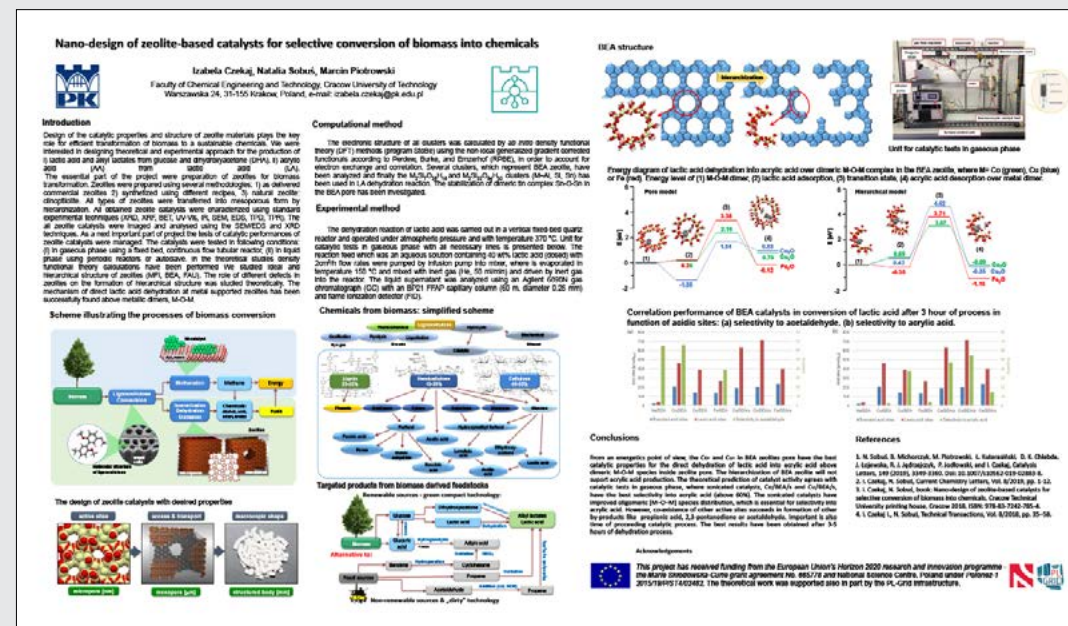
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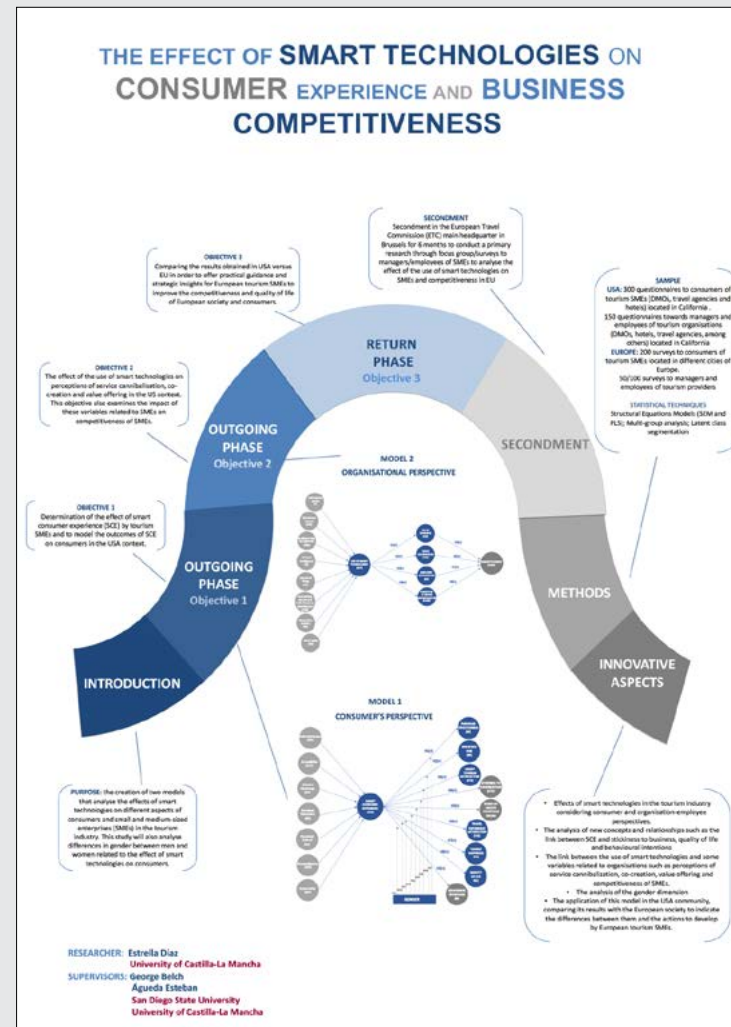


ECONOMICS

The Effect of Smart Technologies on Consumer Experience and Business Competitiveness

This poster examines the main aspects of the SMARTOURISM project developed between the United States and Europe. Specifically, this project analyses two innovative models that reflect the effects of smart technologies on different aspects of consumers and small and medium-sized enterprises (SMEs) in the tourism industry. This study will also analyse differences in gender between men and women related to the effect of smart technologies on consumers.

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ECONOMICS

CONSUMEHealth. Using consumer science to improve healthy eating habits

This poster presentation aims to present the overview of a Marie Skłodowska-Curie Action (MSCA) project titled “CONSUMEHealth” Using consumer science to improve healthy eating habits. This MSCA will deal with healthy eating habits, a key issue for the EU in contributing to safe, healthy and nutritious food for preserving life and making a positive impact on health and society.

In fact, although today’s consumers can make informed decisions about which foods, and in what quantities, are best for a healthy lifestyle, in recent years in the European Union there has been an increase of diet-related health problems caused by unhealthy and over-consumption of food (e.g., overweight, obesity, and other chronic diet-related diseases).

The objective of this MSCA was twofold: (1) understand what drives consumers to make healthier food choices and (2) provide evidence-based recommendations for stakeholders and policymakers to develop and communicate innovative win-win solutions to improve eating habits.

2021 MCAA Annual Conference themed "Research in times of crisis"
 March 5-7, 2021

UNIVERSITÀ DI PARMA

CONSUMEHealth.
 Using consumer science to improve healthy eating habits
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Introduction & Objective
 Although modern consumers can make informed decisions about the types and quantity of food which are best for a healthy lifestyle an increase in unhealthy eating behaviour among children, adolescents, and young has been recorded. Better understanding the link between diet and health is important for developing programs and behavioral change strategies to improve people's lifestyle in general and to reduce diet-related diseases. The objective of this Marie Skłodowska-Curie Action (MSCA) is to understand what drives consumers to make healthier food choices and to provide evidence-based recommendations for stakeholders and policy-makers.

Host Institution: University of Parma, Main Partner Organization: Cornell University;
 Other Partner Organization: Michigan State University Secondment: European Food Safety Authority (EFSA)
 Period: 2017-2020

Qualitative Techniques
 • Healthy eating & students habits study
 Aim: to explore barriers and enablers that US and Italian college students perceived as influencing healthy eating behaviors.
 Methods: In person interviews, Focus Groups and Nominal Group Techniques

Nudging Research
 • Health messages & pasta choice study
 Aim: to test the impact of labelling whole grain pasta with a health message descriptor displayed at the point-of-purchase.
 Methods: controlled field experiment in a college dining venue, over a nine-week period.

Consumer Behavior Theories
 • Whole grain pasta study
 Aim: to understand the role of health benefit communication (different framing and sources) about whole grain pasta consumption.
 Methods: survey among US college students using the Theory of Planned Behavior and the Elaboration Likelihood Model.
 • Blended burgers study
 Aim: to explore the factors influencing acceptance and intention to consume a mushroom-beef burger.
 Methods: survey among US college students, with a follow-up survey to evaluate behavior after one month.

Choice Experiments & Sensory Analysis
 • Plant-based burgers study
 Aim: to investigate consumer preferences for different types of burger in a blind Expected- informed condition.
 Methods: sensory test + survey with different measures such as: item choice, emotion profile, animal welfare, meat consumption, choice questions.
 • Consumer value of food labels study
 Aim: to understand consumers' preferences for different breakfast cereals food labels and styles.
 Methods: online survey with US representative sample including choice questions.

Main Publications, Conference Presentations, Communication & Teaching Activities, et al.

Publication
 Sogari, G., Viora-Rapicani, C., Gomez M., and MIRA, C. (2020) College Students and Eating Habits: A Study Using an Ecological Model for Healthy Behavior, *Behavior*, 38, 1873

Publication
 Sogari, G., et al. (2020). The Influence of Health Messages in Reducing Consumption of Beef. *Food Policy*, *103*, 2891.

Poster
 Sogari, G., 2019. School and Education. The importance of Healthy Eating. *Journal Public Economics*, New York, NY, September 13th, 2019.

Publication
 Sogari, G., Li, J., Williams, M., Huang, S., Mera, C., O'Brien, M., (2019). Factors Influencing Consumers' Acceptance of a New Meat-Substituted Burger. *Health Paper Session at the AEA Annual Meeting*, July 21-23 2019, Atlanta, USA.

Invited Lecture
 Invited Lecture for the International Conference on Education and Culture (IPEC 2019) at the 2019 Italian Association of Agricultural & Food Economics (IAFFE) Conference, Washington DC, USA, May 30-31, 2019.

Invited Lecture
 Invited Lecture at the Department of Agricultural, Food and Resource Economics, Michigan State University, East Lansing, USA, June August 2020.

Lecture
 Lecture of the course in "Consumer Research: Food Choices and Healthy Eating Behavior" in University of Parma.

Invited Lecture
 Invited Lecture at the Department of Food Choice and Health Behavior (IPEC) at the University of Parma.

Invited Lecture
 Invited Lecture at the Department of Food Choice and Health Behavior (IPEC) at the University of Parma.

Invited Lecture
 Invited Lecture at the Department of Food Choice and Health Behavior (IPEC) at the University of Parma.

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ECONOMICS

Does Biology Drive Child Penalties? Evidence from Biological and Adoptive Families

We investigate if the impact of children on the labour market outcomes of women relative to men – child penalties – can be explained by the biological links between mother and child. We estimate child penalties in biological and adoptive families using event studies around the arrival of children and almost forty years of adoption data from Denmark. Short-run child penalties are slightly larger for biological mothers than for adoptive mothers, but their long-run child penalties are virtually identical and precisely estimated. This suggests that biology is not a key driver of child-related gender gaps.

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Does Biology Drive Child Penalties? Evidence from Biological and Adoptive Families

Henrik Kleven, Camille Landais & Jakob Søgaard

Abstract: We investigate if the impact of children on the labor market outcomes of women relative to men – child penalties – can be explained by the biological links between mother and child. We estimate child penalties in biological and adoptive families using event studies around the arrival of children and almost forty years of adoption data from Denmark. Short-run child penalties are slightly larger for biological mothers than for adoptive mothers, but their long-run child penalties are virtually identical and precisely estimated. This suggests that biology is not a key driver of child-related gender gaps.

Figure 1 - Child Penalties in Biological vs. Adoptive Families

The figure shows the impact of children on the earnings of men and women in biological and adoptive families, respectively. The average female wage falls by the age of the adoption at arrival. The sample of biological parents is restricted to childless parents at arrival in the year. The long-run child penalty is indicated as the average difference in the impact of children between men and women across event time 0 to 10.

Long-Run Child Penalty:
Biological: -0.170 (0.016)
Adoptive: Age 0-1: -0.155 (0.021)
Adoptive: Age 1-2: -0.158 (0.022)
Adoptive: Age 3+: -0.167 (0.022)

Specifically, we estimate separately for men and women, and for those with biological and adopted children

$$Y_{it} = \alpha + \beta_1 D_{it}^{male} + \beta_2 D_{it}^{female} + \gamma D_{it}^{adoptive} + \epsilon_{it}$$

where Y_{it} is the outcome (e.g., earnings) of individual i at event time t relative to the arrival of a child. We convert level effects from equation (1) into percentage effects by calculating

$$\% \Delta = 100 \times \beta_j / E(Y_{it})$$

where Y_{it} is the predicted outcome when omitting the contribution of the event dummies.

Finally, we deal with the differential selection into parenthood and adoption by reweighting the sample of biological parents so that they exactly match the adoptive parents on (i) year of arrival of the first child, (ii) years to second child, (iii) the number of children, (iv) the mother's age at first child, (v) the mother's pre-child education and (vi) earnings.

Results

Figure 1 shows that adoptive families are affected by parenthood in much the same way as biological families. The earnings of adoptive parents evolve in parallel before having children and then diverge sharply and persistently after having children.

Furthermore, the penalties on adoptive mothers feature surprisingly little heterogeneity by their child's age at arrival.

The short-run earnings impacts are somewhat smaller in adoptive families than in biological families, but the long-run impacts are virtually the same.

Figure 2 decomposes the earnings impact into the impacts on labor market participation, hours worked and wage rate. For hours worked and the wage rate, we find virtually identical penalties in biological and adoptive families.

The participation penalty on the other hand, is larger in biological families during the initial years of parenthood. This implies that the short-lived differences in earnings penalties can be explained by differences in estimates margin responses that last for 3-4 years and then dissipate.

These findings provide evidence against the importance of the biological link between mother and child for explaining the gendered impacts of children.

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MCAA

ECONOMICS

Distributional Impacts of Low-Carbon Policies in USA and Spain: Does One Size Fit All?

Distributional impacts of environmental policies have become an increasingly important consideration in policymaking, but current studies have focused on just a few countries individually. To evaluate the country-specific impacts of carbon pricing with different revenue recycling schemes, we integrate national economic models for the USA and Spain with household microdata that provides consumption patterns and other socio-economic characteristics for thousands of households in each country. Using these combined models, we explore the applicability of results from one country to other countries by focusing on different revenue recycling schemes. We find that, with some exceptions, the USA and Spain overall show similar patterns of distributional impacts for the two revenue recycling schemes, despite their differences in size, existing tax structure, energy sources and prices, level of income inequality, consumption patterns, etc. We find that in both countries an equal household rebate has progressive welfare impacts that are positive for the majority of income ventiles while the payroll tax reduction tends to be proportional or slightly regressive. We also explore welfare impacts for different household classifications, the impact of the policy design on overall inequality, and the role of inequality aversion on the social welfare implications of the policy design.

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Distributional Impacts of Low-Carbon Policies in USA and Spain: Does One Size Fits All?

XAQUIN GARCIA MUROS^{1,2}, JENNIFER MORRIS¹ and SERGEY PALTSEV¹


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Abstract

Distributional impacts of environmental policies have become an increasingly important consideration in policymaking, but current studies have focused on just a few countries individually. To evaluate the country-specific impacts of carbon pricing with different revenue recycling schemes, we integrate national economic models for the USA and Spain with household microdata that provides consumption patterns and other socio-economic characteristics for thousands of households in each country. Using these combined models, we explore the applicability of results from one country to other countries by focusing on different revenue recycling schemes. We find that, with some exceptions, the USA and Spain overall show similar patterns of distributional impacts for the two revenue recycling schemes, despite their differences in size, existing tax structure, energy sources and prices, level of income inequality, consumption patterns, etc. We find that in both countries an equal household rebate has progressive welfare impacts that are positive for the majority of income ventiles while the payroll tax reduction tends to be proportional or slightly regressive. We also explore welfare impacts for different household classifications, the impact of the policy design on overall inequality, and the role of inequality aversion on the social welfare implications of the policy design.

Reasons for Policy Reluctance

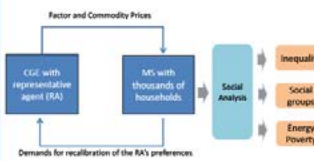


Mail Goal



Methodology


Inclusion of micro data in a CGE model



Scenarios

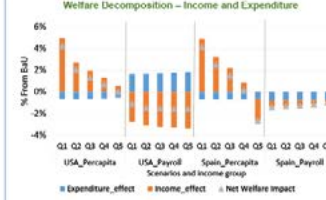
Countries	CO ₂ price	Recycling scenarios and acronyms.
USA	40\$/ton of CO ₂	Payroll: Indirect refunding of revenues via a proportional reduction in payroll taxes
Spain	Per-capita:	Direct rebates from revenues to households via lump-sum transfers

Results




Results

Welfare Decomposition – Income and Expenditure



Social Welfare Impacts



Conclusions

Hurdles to green tax reform: fairness and viability. The potential of carbon taxation is relevant, but has been ignored in Spain.

Ecobonus as a means for making the greener and fairer (acceptance dividends). An environmental tax reform with direct reimbursements to households will have a clearly progressive effect and would not affect households at risk of energy poverty.

Paradigma shift: From efficiency to incidence? – "A Matter of Social Choice"

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ECONOMICS

Assessing elderly user preference for telehealth solutions in Shenzhen, Hangzhou, Wuhan and Yichang, China

COVID-19 has rendered the elderly the vulnerable group. Telehealth solution usage has been accelerated during COVID. Yet the trust of elderly users with telehealth solutions is thin with many face difficulties in reality to access and use such tools.

To assess elderly user preference for telehealth solutions, a questionnaire has been distributed in Shenzhen, Hangzhou, Wuhan and Yichang among elderly more than 50 years old in 2019. 390 valid responses were collected. A multi-nominal regression model was able to predict 80% of participants' preferences. Health-related motivations have a statistically positive relationship with user preference while trust over data accuracy of telehealth solutions have a statistically negative relationship with user preference. The top four factors inducing telehealth solution preferences are, lowering health risk, raising health awareness, accessing healthcare (lack of community health services), following doctors' prescription.

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Elderly user preference analysis for the use of telehealth solutions – With elderly from Shenzhen, Hangzhou, Wuhan and Yichang, China

University of Macerata, Marie Curie Fellow – Heart Project
Nuoya Chen

Aim and user benefits

To understand if elderly in China are willing to use telehealth solutions in the next 5-10 years

To understand what motivates elderly in China to use telehealth solutions

Do the elderly in China use telehealth solution for sleep monitoring?

Do the elderly in China use telehealth solutions for nutrition monitoring?

Do the elderly care about price, privacy risk, design of the solution?

Do the elderly use telehealth solution because of social image or social influence?

Do the elderly use telehealth solution because of lack of community level healthcare in China?

Are the elderly covered by commercial insurance programs willing to use free device offered by the company?

Initial Results

Table 2. Ranking of factors affecting the willingness to use telehealth solutions among elderly users

Factor	Mean	Ranking
Lower health risk	4.26	1
Following doctor's prescription	4.20	2
Accessing healthcare	4.17	3
Raising health awareness	4.17	4
Following doctor's prescription	4.17	5
Lower health risk	4.17	6
Following doctor's prescription	4.17	7
Lower health risk	4.17	8
Following doctor's prescription	4.17	9
Lower health risk	4.17	10

Data Collection

In the distribution stage, questionnaires were disseminated with an ethnic minority among residents of more than 50 years old in Shenzhen, Hangzhou, Wuhan and Yichang with the help of Beijing Zhong Gongshang. More than 400 questionnaires are distributed, and 402 questionnaires were collected, with a recovery rate of 80%. Among them, 390 are completed and valid questionnaires, accounting for 97% of the questionnaire issued and 10% of all the questionnaires returned. The other 12 questionnaires were not used in data analysis because they do not provide complete information and deemed to have not been filled correctly.

Table 1. Disposable Income in Shenzhen, Hangzhou, Wuhan and Yichang. Source: CFMC, 2020 National Bureau of Statistics, 2020;

City	Year	Unit	Percentage of total disposable income
Shenzhen	2019	100	100%
Hangzhou	2019	100	100%
Wuhan	2019	100	100%
Yichang	2019	100	100%

Table 3. Principal component results

Component	Factor 1	Factor 2	Factor 3
Component 1	0.808	0.584	0.174
Component 2	0.192	0.416	0.826
Component 3	0.000	0.000	0.000

Table 4. One-way analysis of variance and two-sample T test of control variables. **p<0.1; ***p<0.05; ****p<0.01

Control Variable	Factor 1	Factor 2	Factor 3
Gender	0.128	0.000	0.000
Age	0.000	0.000	0.000
Education	0.000	0.000	0.000
Income	0.000	0.000	0.000
City	0.000	0.000	0.000
Health status	0.000	0.000	0.000
Insurance	0.000	0.000	0.000
Trust	0.000	0.000	0.000
Health awareness	0.000	0.000	0.000
Accessing healthcare	0.000	0.000	0.000
Lower health risk	0.000	0.000	0.000
Following doctor's prescription	0.000	0.000	0.000

Methods

The questionnaire consists of 21 questions with 5 Likert scale variables regarding reasons why elderly users are willing to use telehealth solutions.

Considering that the dependent variable (the willingness to use telehealth solutions) is an ordered discrete variable, the ordered logit model is used for regression. Four models were designed to assess the impact of each factor.

$$F = \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \quad (1)$$

$$F = \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \quad (2)$$

$$F = \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \quad (3)$$

$$F = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 \quad (4)$$

Model (1) is used to test the impact of factor 1, model (2) and model (3) are used to test the impact of factor 2 and 3. Model (4) considers the influence of the above three factors.

To measure the discriminative value for the willingness to use telehealth solutions (Y) in the original application, the specific designed for preference level is shown. To (1) preference for telehealth health solutions (low to high), corresponding, the preference for telehealth solutions (2) represents control variables such as demographic factors, including basic data (age, gender, education level, health condition, income, living situation, living conditions, regional social services and regional activity).

To avoid heterogeneity issues, the KMO and Bartlett test was used to examine the correlation between the latent variables. Then the principal component analysis was used to reduce the dimension of the variables and the correlation between variables. With the factor loading for each factor confirmed, the latent variable variables are then created based on the mean value of each variable in the same step as to test. A descriptive factor loadings are shown in the table below identified by the principal component analysis. The same table with MAXVAR and Trust.

The modeling process started with correlation matrix (Pearson) correlation and Kaiser-Meyer-Olkin (KMO) coefficient to test if data for each regression. From the Cronbach's alpha test in the same table with control variables. In the final step of the modeling, all participants were randomly selected to use if the prediction preference score reached chosen made by the practitioners.

1 represents the factor has an impact on the willingness of the user to use telehealth health solutions and 2 represents the factor has an impact on the willingness of the user to use telehealth solutions. It is neutral.

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Confidential

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MCAA

ENGINEERING



Imaging genetic: Brain age estimation

Brain age inferred from neuroimaging data could reveal important information about the evolution of structural and functional cerebral features across the life span. This has important implications for understanding healthy aging and for identifying Imaging-Derived Phenotypes (IDPs) that characterise age-related neurodegenerative illnesses, such as Alzheimer's and Parkinson's disease. The so-called brain age delta refers to the difference between image-derived brain age and chronological age. Accelerated aging (positive delta) or resilience to aging (negative delta) have been found to be useful correlates of factors such as disease and cognitive decline. Genetic and Environmental factors play critical roles in brain aging. The aim of such studies is to uncover the impacts of genetic and daily lifestyle on the process of brain development during life span in both healthy and patients populations.

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Imaging genetic Brain age estimation



Introduction
Brain aging is one of the recent active field of science that helps to monitor the progress and development of brain during life course. Moreover, it could be used as a biomarker to predict brain diseases such as Alzheimer's and Parkinson's diseases.
Different kind of data is used to estimate and monitor brain age such as features extracted from brain MRI modalities, genetic data to reveal their contribution in brain aging and daily life measures to uncover the role of environment in brain aging.







Image Derived Phenotypes
1- Structural MRI IDPs: These are features that represent volumetric, thickness, area measures of region of interests.
2- Diffusion MRI IDPs: These features representing the motion of molecular water within brain tissue. The motion is represented in different kind of measures such as fractional anisotropy and mean diffusivity.
3- Functional MRI IDPs: Measures brain activity by detecting changes associated with blood flow within anatomical structures of brain.




Brain age estimation
Different supervised machine learning models can be used to estimate brain age. The features are fit to the model as independent variables while the actual age is used as the outcome variable because the true brain age is unknown. The models could be:
1- Simple model: Multilinear regression.
2- Complex model: Deep neural network or Convolutional neural network where the raw MRI images are used in the model.




Motivations
Why we estimate brain age?
1- It helps to monitor the progress of brain during lifespan.
2- It could help to reveal the impacts of daily lifestyle on brain aging.
3- Estimating brain age helps to uncover the influence of genetic factors on brain diseases.
4- It could be used as a biomarker to predict a neurodegenerative disease.



Methods
The method to estimate brain age is as follows:
1- Extract image derived phenotypes (IDPs) from brain MRI modalities.
2- A supervised machine learning model to predict brain age using the IDPs as independent variable and the actual age as dependent variable.
3- Calculate brain age delta which is the actual age subtracted from the estimate brain age.
4- Use a classical machine learning model or advanced explainability methods to identify the significant features in the model to estimate brain age.
5- Perform an association between brain age delta and genetic variations.
6- Associate brain age delta with daily-life style to explain how they affect brain aging.



Genetic and Environmental factors
Genome Wide Association Studies (GWAS) to identify the genetic variations that contributed more in brain aging.
Association of daily life measures such as sleeping habits, smoking and alcohol intake, dietary habits, using electronic devices, exercises, etc. with brain aging to highlight their effects.



Machine Learning Explainability
Machine learning explainability can be exploited to understand how the model estimated brain age, especially complex model. It also helps to highlight the significant features in the model that have more influences on the model decision. Significant features can be identified globally for all subjects in the model or locally for a specific instance.

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1- Ahmed, Salih, et al. "Multi-modal brain age estimation: a comparative study confirms the importance of microstructure." Computational Diffusion MRI (CDMRI) Workshop - MICCAI 2020.
2- Smith, Stephen M., et al. "Estimation of brain age delta from brain imaging." NeuroImage 200 (2019): 528-539.

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ENGINEERING

Wireless communication's robustness as one of the keys to bring safety to autonomous systems

With the current rise of interest in autonomous systems, we have to solve a lot of problems, one of which is communication quality. Communication impairment can lead to casualties. One way of detecting wireless communication weak points is by using the reverberation chamber. Such a test facility can relatively easily identify the main key performance indicators of wireless communication protocols.

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Wireless communication's robustness as one of the keys to bring safety to autonomous systems

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Plans for the deployment of Autonomous Systems (AS):

Ubiquitous implementation

Consequences of unsuccessful deployment:

All the problems endanger humans' life
↓
Trust and safety problems

The SAS Project

Safer Autonomous Systems

Goal: make autonomous systems safer

Objectives:

Work Packages (WPs)

<p>WP1</p> <p>To integrate guaranteed safe behaviour directly into the architecture/design of the autonomous system</p>	<p>WP2</p> <p>To prove by model-based safety-analysis techniques that the behaviour of an autonomous system remains safe under all possible conditions</p>
<p>WP3</p> <p>To ensure that the safety-assurance strategies that combine the architectural design measures with the evidence allow to have trust in the autonomous system, which is very likely to be learning and evolving</p>	

WP1 → Early-stage researchers (ESRs): ESR1, ESR2, ESR3, ESR4

↓

ESR5:

Electromagnetic disturbance (EMD) → Impaired communication → Safety-critical issue

Personal Travel Assistant, DAB, PDA, laptop, GSM, UWB, WLAN, Bluetooth, ...

Objectives: Increase the robustness of different wireless communication protocols for different types of EMD

Expected results: Novel software and/or hardware-based techniques and measures; Dependable wireless connectivity that is fault-tolerant or even fault-operational under diverse types of environmental stress

Reverberation chamber as a main tool to make wireless communication more resilient

Allows to

Possibility to test many of the potential wireless protocols to be used in AS:

Obtain main communication key performance indicators (KPIs):

- Packet Error Rate (PER)
- Communication latency
- Data throughput

Perform wireless co-existence tests

Acknowledgement

This project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon 2020 under Grant Agreement No. 812.788.



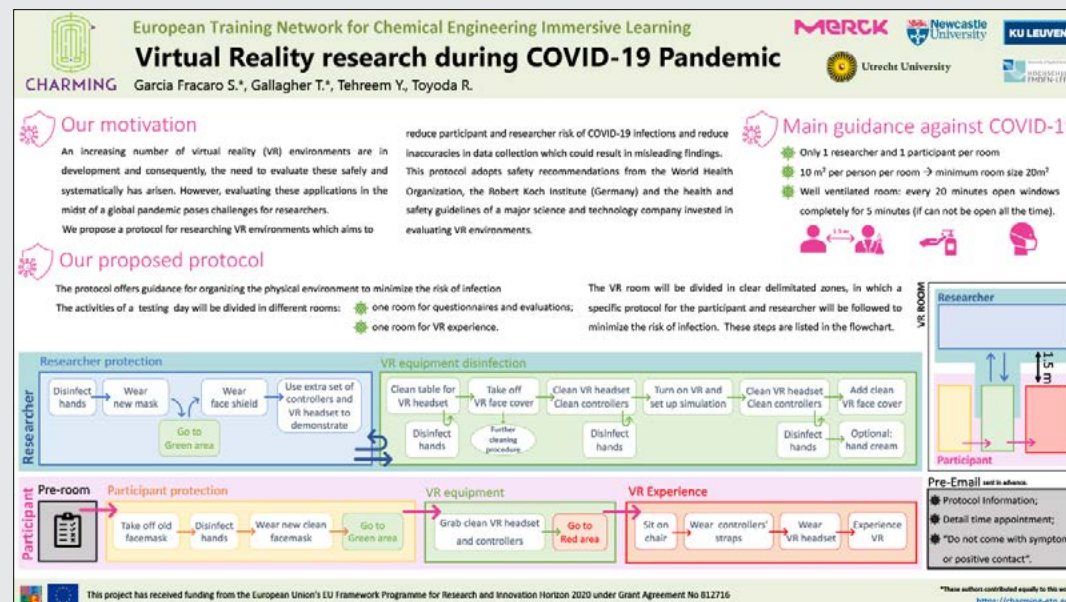
ENGINEERING

Virtual Reality research during COVID-19 Pandemic

An increasing number of virtual reality (VR) environments are in development and consequently, the need to evaluate these safely and systematically has arisen. However, evaluating these applications in the midst of a global pandemic poses challenges for researchers. To our knowledge, no systematic methods for evaluating VR environments exist which address both the safety and methodological issues related to this type of research. To address this gap, we propose a protocol for researching VR environments that aims to reduce participant and researcher risk of COVID-19 infections, and reduce inaccuracies in data collection which could result in misleading findings. This protocol adopts safety recommendations from the World Health Organisation, the German Government's central scientific institution in the field of biomedicine, the Robert Koch Institute and the health and safety guidelines of a major science and technology company invested in evaluating VR environments.

The protocol offers guidance for organizing the physical environment to minimise the risk of infection. For example, only one participant and one researcher should be present in the same room at the same time and should maintain a distance of at least 1.5 meters, the room should meet the minimum size requirements suggested by local regulations, and the room should be well ventilated. Furthermore, the protocol stipulates the need to divide the research room into pre-defined areas with safety markings on the floor. This precaution aims to reduce the risk of contamination through proximity between researcher and participant. In addition to physical environment guidelines, guidance for personal safety behaviour is also included. For example, FFP2 class face masks must be always worn by both researcher and

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participant, they must sanitise their hands at crucial stages of the research, and the researcher must ensure that the VR head-mounted display and controllers are clean for the participant prior to use.



ENGINEERING

Electromagnetic Time Reversal to Locate Partial Discharges

Energy is crucial for the developing world and must be provided when needed to avoid a serious impact on society.

Electricity is becoming the increasingly central energy source, strongly demonstrated in the current pandemic, allowing people to remain in contact and to work from home.

Electricity security is the power system's capability to withstand disturbances/contingencies with an acceptable service disruption and represents a crucial concern for policy decision making at all levels.

Usually, service disruption is due to cables' insulation damage, often caused by partial discharges (PDs) that are localised electrical discharges that partially bridge the insulation between conductors. Since PD is one of the best early-warning indicators of insulation damage, the on-line PD location is the most suitable method to prevent faults, enhancing network reliability.

Most location methods are traveling wave-based techniques, using the principle that PD produces electromagnetic waves which are measured at different line points. The difference in the times of their arrival allows the PD localisation. However, their implementation is difficult due to the need for synchronisation and their accuracy is influenced by the PD signals distortion and the presence of electromagnetic interference on networks.

This project proposes a new method to locate PDs using the electromagnetic time reversal (EMTR) theory. It is based on the time reversibility of the wave propagation equations and on the spatial correlation property of the EMTR theory that allows

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2021 MCAA Annual Conference 5 – 7 March 2021

ELECTROMAGNETIC TIME REVERSAL TO LOCATE PARTIAL DISCHARGES

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WHAT IS A PARTIAL DISCHARGE (PD)?
"Partial Discharge is a localised electrical discharge that only partially bridges the insulation between conductors" - IEC 60270

WHAT DOES PD PRODUCE?

- Cable premature failure within 3 years of operation
- Interruption of power supply
- Reduction of power quality and customer satisfaction
- Reduction of Electricity Security

NEED OF ON-LINE PARTIAL DISCHARGE LOCATION
On-line PD location is a desired feature in modern protection schemes of power transmission and distribution networks because it guarantees:

- An improvement of networks resilience and reliability developing a fault preventive action,
- A continuous monitoring condition of grid integrity
- An increase of equipment lifetime
- An increase of plant productivity reducing the operating costs
- An improvement of power quality, customer satisfaction and life quality, reducing the outage duration of supply
- An improvement of Electricity Security

ELECTROMAGNETIC TIME REVERSAL THEORY

Electromagnetic Time Reversal (EMTR) methods in source location identification take advantage of the time reversibility of Maxwell's equations and the spatial correlation property of the time-reversal theory to refocus the TR back-propagated electromagnetic waves into the original disturbance location. Time reversal implies making the substitution $t \rightarrow -t$ and the change $\mathbf{E} \rightarrow -\mathbf{E}$ in Maxwell's equations.

Maxwell's equations

$$\nabla \cdot (\epsilon(\mathbf{r}) \nabla \Phi(\mathbf{r}, t)) = \rho(\mathbf{r}, t)$$

$$\nabla \cdot (\mu(\mathbf{r}) \nabla \mathbf{A}(\mathbf{r}, t)) = 0$$

$$\nabla \times \mathbf{E}(\mathbf{r}, t) = -\mu(\mathbf{r}) \frac{\partial \mathbf{J}(\mathbf{r}, t)}{\partial t}$$

$$\nabla \times \mathbf{H}(\mathbf{r}, t) = \epsilon(\mathbf{r}) \frac{\partial \mathbf{E}(\mathbf{r}, t)}{\partial t} + \mathbf{J}(\mathbf{r}, t)$$

Time reversal Maxwell's equations

$$\nabla \cdot (\epsilon(\mathbf{r}) \nabla \Phi(\mathbf{r}, -t)) = \rho(\mathbf{r}, -t)$$

$$\nabla \cdot (\mu(\mathbf{r}) \nabla \mathbf{A}(\mathbf{r}, -t)) = 0$$

$$\nabla \times \mathbf{E}(\mathbf{r}, -t) = \mu(\mathbf{r}) \frac{\partial \mathbf{J}(\mathbf{r}, -t)}{\partial t}$$

$$\nabla \times \mathbf{H}(\mathbf{r}, -t) = \epsilon(\mathbf{r}) \frac{\partial \mathbf{E}(\mathbf{r}, -t)}{\partial t} + (-\mathbf{J}(\mathbf{r}, -t))$$

EMTR-BASED METHOD TO LOCATE PARTIAL DISCHARGE

Telegrapher's Equations are invariant under time reversal in non-dissipative power line. Time reversal implies making the substitution $t \rightarrow -t$ and the change $\mathbf{E} \rightarrow -\mathbf{E}$ in the Telegrapher's Equations, that describes the PD signals propagation:

Telegrapher's equations

$$\frac{\partial v(x, t)}{\partial x} + L \frac{\partial i(x, t)}{\partial t} = 0$$

$$\frac{\partial i(x, t)}{\partial x} + C \frac{\partial v(x, t)}{\partial t} = 0$$

Time reversal Telegrapher's equations

$$\frac{\partial v(x, -t)}{\partial x} + L \frac{\partial i(x, -t)}{\partial t} = 0$$

$$\frac{\partial i(x, -t)}{\partial x} + C \frac{\partial v(x, -t)}{\partial t} = 0$$

The designed EMTR method uses the Transmission Line Matrix (TLM) method to solve the propagation equations both in the direct time and in the time-reversed domain.

EMTR-based method for the on-line localization of PDs

- Measuring PD signals $i(t)$ at the observation point of the power network.
- Time-reversing the PD signals $i(t) \rightarrow i(-t)$.
- Using a TLM method to propagate the time-reversed signals $i(-t)$ back to the source location.
- Refocusing the time-reversed signals $i(-t)$ back to the source location.
- Identifying the location of the PD source based on the source location $i(-t)$.
- Validating the PD location. Key case.

For a 150m MV line with a PD source at 150m from the left end, the collected PD signal during the TR process, the TR signal and the estimation of the PD location of the line are given by:

Error in the PD source localization < 1%

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 101019718

RAGUSA MSCA-IF-2020-011111
Electromagnetic Time Reversal for On-Line Partial Discharge Location in Transmission and Distribution Networks

Supervisor: Alistair Duffy, Research Fellow, Antonella Ragusa

PARTNERS: DE MONTFORT UNIVERSITY, IREDA, HYPED

refocussing the time-reversed back-propagated PD signals into their original location. The method has been designed in simulation using the Transmission Line Matrix method and experimentally validated on real MV networks. It is able to locate PDs using only one observation point in the harsh electromagnetic environment of real networks with an accuracy of >99%.



ENGINEERING

Predicting emotional state using behavioural markers derived from passively sensed data

Nowadays, it is common to carry a multitude of sensors in our pockets in the form of smartphones and different tools such as Fitbit, Garmin, etc. These sensors collect information about usage as well as the owner's daily activity. The availability of this type of data opens up a plethora of possibilities, one of which is the analysis of individual behaviour.

In this project, we worked on a generic machine learning-based approach for emotional state prediction using passively collected data from mobile phones and wearable devices, and self-reported emotions by patients. Emotional state prediction and forecasting could be used as early warning signs in clinical treatment. Detecting major affective episodes risk could help catch the early onset of major depressive or manic phases that can be addressed and handled in time, which could reduce the severity of symptoms and the degree of treatment.

We applied probabilistic latent variable models (Mixture Model (MM) and Hidden Markov Model (HMM)) for data averaging and feature extraction on the regularly sampled, but frequently missing and heterogeneous time series data. The extracted features were then combined with a classifier to provide emotional state predictions. Furthermore, we proposed a personalised Bayesian model to improve the performance, which considers the individual differences in the data by applying a different classifier bias term for each patient.

Probabilistic generative models proved to be good as pre-processing and feature extractor tools for data with large percentages of missing observations. Models

which took into account the posterior probabilities of the MM/HMM latent states outperformed those which did not, suggesting that the underlying behavioural patterns identified were meaningful for individuals' overall emotional state. Moreover, the proposed personalised models demonstrated that accounting for individual differences through a simple hierarchical model substantially improves emotional state prediction performance without relying on previous days of data.

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PREDICTING EMOTIONAL STATE USING BEHAVIOURAL MARKERS DERIVED FROM PASSIVELY SENSED DATA
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INTRODUCTION
One of the most exciting mobile sensing applications is the monitoring of individual behaviour, especially in the area of mental health care. Mood-related mental health issues, such as mood disorders, depressions, and elation, seriously impact people's quality of life. Due to the complexity and unstableness of personal emotional state, assessing and analysing its daily evolution presents a significant challenge in mental health care. Measuring mental well-being with mobile sensing poses a great opportunity for healthcare.

RESULTS & DISCUSSION
Mixture Models (MM) and Hidden Markov Models (HMM) proved to be good as pre-processing and feature extractor tools for data with large percentages of missing observations. Models which took into account the posterior probabilities of the MM/HMM latent states outperformed those which did not, suggesting that the underlying behavioural patterns identified were meaningful for individuals' overall emotional state.

OBJECTIVE
The project aimed to apply machine learning algorithms to predict mood states based on passively sensed behavioural patterns. The proposed methods must cope with high-dimensional, heterogeneous time-series data with a large percentage of missing observations.

METHODS
Probabilistic latent variable models were applied for data averaging and feature extraction. The extracted features were then combined with a classifier to provide mood predictions. Finally, we proposed a personalised Bayesian model, which considers the individual differences in the data.

DATA
The study was conducted on data collected via eBZ MiniCare, a clinically-validated e-health platform. The data set is very noisy and incomplete, containing a large percentage of missing observations.

DATA
Moreover, the proposed personalised models demonstrated that accounting for individual differences can substantially improve performance without relying on previous days of data.

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Universidad Carlos III de Madrid | MLFPM | European Union



ENGINEERING

Professional development under MC-IAPP fellowship

BRIDGE SMS is one of the projects funded under the Marie Curie Industry-Academia Partnerships and Pathways Scheme in the period from 2015-2018. Through participation in the BRIDGE SMS project, researchers and professional staff employed by the partner organisations had the opportunity to participate in Marie Curie mobility actions. This paper shows how knowledge sharing and inter-sector mobility activities within BRIDGE SMS project contributed to the professional development of MC fellow and resulted in successful project application to the Croatian Science Foundation under which R3PEAT (Remote Real-time Riprap Protection Erosion Assessment on large rivers) project is funded. Under BRIDGE SMS an open-source cloud-based intelligent decision support system for the assessment and management of the hydraulic vulnerability of bridges over water was developed. The inception of the R3PEAT project idea was based on training conducted as experienced researcher during the secondment period in a total duration of 8.5 months. Marie Curie fellowship contributed to an innovative idea of real-time monitoring system of scour development on large rivers during the flood – ScourBuoy. Under the project, three young researchers will develop their careers, each of them developing skills and conducting research ultimately leading to the PhD degree.

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Professional development under MC-IAPP fellowship

BACKGROUND

BRIDGE SMS - funded under Marie Curie Industry-Academia Partnerships and Pathways Scheme (2015 – 2018)

Open-source cloud based intelligent decision support system for the assessment and management of the hydraulic vulnerability of bridges over water was developed

R3PEAT

The goal of the R3PEAT project (Remote Real-time Riprap Protection Erosion Assessment on large rivers) is to bridge the gap between the real-time scour hole development and flow environment through development of real-time scour monitoring system.

<http://www.grad.hr/r3peat/>

OUTCOMES

Mobility: 8.5 months over 3 years

Published scientific papers:
<https://www.researchgate.net/profile/Gordon-Gilja-2>

Participation on conferences:
ESOF 2016
MCAA 2017
WMHE 2017
RiverFlow 2018
IAHR Europe 2018

Collaborations:
University of Glasgow
University of Southampton
MAREI
University College Dublin

Marie Curie fellowship contributed to an innovative idea of real-time monitoring system of scour development on large rivers during the flood – R3PEAT

RESEARCH OBJECTIVES

The research objectives of the project are:

- (1) develop ScourBuoy prototype
- (2) calibrate the physical model
- (3) improve existing empirical equations for equilibrium scour hole development
- (4) investigate the dependence between turbulent flow characteristics and temporal scour hole development;
- (5) investigate dependence between turbulent conditions and incipient motion of sediment particles.

YOUNG RESEARCHERS

Under the project three young researchers will develop their careers, each of them developing skills and conducting research ultimately leading to the PhD degree

MOBILITY

Using Erasmus+
Development of PhD theses in collaboration with University of Glasgow

*** Acknowledgment:**
This work has been supported in part by Croatian Science Foundation under the project R3PEAT (UIP-2019-04-4046)

ENGINEERING

QoE-centric implementation of SDN platform for OpenFlow-based network path selection

Software Defined Networking (SDN) provides the ability to make any control-related decisions centrally, which transforms legacy network devices to simple forwarding elements. In this new architecture, the decisions are made from an application that acts as a strategic control point in the network and manages the flow control for improved network management and application performance. This poster aims at presenting the development of a novel SDN platform that monitors the network and makes changes in the paths to achieve better performance in the network in the case of video streaming. More specifically, the developed SDN packet loss controller periodically monitors a networking parameter on the video packets transmission path and collects statistics, based on which, it performs network path selection. As a result, the Quality of Experience (QoE) for the end-users is increased, as compared to a standard SDN controller.

QoE-centric implementation of SDN platform for OpenFlow-based network path selection

Eirini Liotou and Athanasia Alexiou
National & Kapodistrian University of Athens



Software-Defined Networking (SDN)

Advantages:

- Separation of control and data plane
- Centralized intelligence
- Global view of the network
- Easy to operate and monitor provision

Application Programming Interfaces (APIs):

- Northbound (Applications)
- Southbound (Network devices)

OpenFlow protocol

- Defined in the OpenFlow Switch Specification by Open Networking Foundation (ONF)
- Describes the communication between the OpenFlow switches and the SDN Controller
- Implemented on both sides of the interfaces between network devices and the SDN Controller

POX controller

- The "brain" of the SDN architecture
- Maintains rules and performs network tasks
- Neighbour discovery
- Processes packets
- Gathers statistics
- Provides APIs and analytics
- Defines interfaces (with protocols/legacy flow writers)
- Python based open source SDN controller
- Installed with the official Mininet Virtual Machine (VM) and simple-to-use

Packet loss controller and Mininet topology

- One controller (sd) [Diagram]
- 5 switches (s1,s2,s3,s4,s5)
- 3 hosts (h1,h2,h3)
- Packets sent from h1 to h2
- There are two possible paths to send packets from h1 to h2
- Normally, the path that will be selected to send the packets from h1 to h2 host is the main path h1-s1-s2-s4-s2, which is the shortest path
- There is also an alternative path through h1-s1-s3-s4-s2 [Diagram]

Packet loss controller logic

Prerequisites:

- Introduce loss link parameter in path s1-s2 in custom topology
- Create traffic with video streaming using **ffmpeg** tool

Functionality:

- Change the forwarding rule if packet loss rate is greater than 2%
- Packets from h1 host are sent through the alternative path to h2 host [Diagram]

Video streaming over Mininet - Measure the packet loss rate

Link loss parameter set to 10% in s1-s2 [Graph]

Link loss parameter set to 20% in s1-s2 [Graph]

Video streaming over Mininet - Quality metric: Peak Signal to Noise Ratio (PSNR)

- PSNR values for different link loss parameters, bandwidth=1000kbits, skellyn=10ms
- PSNR values are higher for the new POX component packet loss controller compared to stock components [Graph]

Conclusions

- SDN architecture decouples the control from the data plane providing the ability to make any control-related decisions centrally and transform legacy network devices to simple forwarding elements
- Packet loss controller is a new POX component SDN platform that
 - Monitors the network and reduce the packet loss rate with path selection
 - Improves the performance metric PSNR and as a result the quality of video streaming
- Future work
 - The adoption of the current implementation with a more complex topology
 - Extended performance evaluation of the component using more video-streaming specific QoE metrics rather than PSNR
 - The monitoring of different linking parameters such as delay and bandwidth
 - Create adaptive video streaming traffic

This research is co-financed by Greece and the European Union (European Social Fund- ESF) through the Operational Programme «Human Resources Development, Education and Lifelong Learning» in the context of the project "Reinforcement of Postdoctoral Researchers - 2nd Cycle" (MIS-5033021), implemented by the State Scholarships Foundation (IKY).

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ENGINEERING

Development of lightweight 3D printed concrete wall system

Additive manufacturing (AM), also referred to as 3D printing, is a technology that allows building physical components of a three-dimensional object in a layer-by-layer manner. It is one of the most rapidly developing fields in civil engineering and is considered one of the key pillars of the Industry 4.0. AM technology provides both innovative designs in concrete manufacturing and efficient use of materials. Building envelopes have to meet tightening thermal performance requirements to follow EU zero-energy buildings strategy. Therefore, composite building envelopes consisting of materials with low thermal conductivity are the focus of work. Additionally, AM technology enables the realisation of wall systems with complex architecture. However, to achieve this goal there is a strong need to balance between cavities and 3D printed material as well as an appropriate in-fill material. The purpose of this work is to develop a sustainable 3D printable wall system composed of lightweight and ultra-lightweight cementitious composites. For this purpose, printable lightweight aggregate concrete (load-bearing material) as well as ultra-lightweight foam concrete (in-fill material) were developed. Through incorporation of waste material (glass cullets) as well as lightweight filler materials with reasonable mechanical and thermal performances were developed. Comprehensive material characterisations (i.e., fresh and hardened properties) of developed concrete mixtures were carried out to determine their suitability for 3D printing application. Subsequently, various wall configurations were designed and their thermal performance was evaluated. Through experimental and numerical simulation studies, the most thermally-effective wall system was developed to meet the thermal transmittance values regulated by EU towards applying them as building envelopes.

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DEVELOPMENT OF LIGHTWEIGHT 3D PRINTED CONCRETE WALL SYSTEM

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INTRODUCTION

Additive manufacturing (AM), also referred to as 3D printing, is a technology that allows building physical components of a three-dimensional object in a layer-by-layer manner. It is one of the most rapidly developing fields in civil engineering and is considered one of the key pillars of the Industry 4.0 concept. AM technology provides new freedom in concrete design with a resource-efficient use of materials of the same time. Building envelopes have to meet tightening thermal performance requirements in order to follow EU nearly zero-energy buildings strategy. Therefore, composite building envelopes consisting of materials with low thermal conductivity are encouraged. AM technology enables to develop wall systems with complex topologies; however, to achieve this goal there is a strong need to balance between cavities and 3D printed material as well as to choose an proper in-fill material.

AIM OF THE RESEARCH AND EXPERIMENTAL PLAN

The purpose of this work is to develop a sustainable 3D printable wall system composed of lightweight and ultra-lightweight cementitious composites. For this purpose printable lightweight aggregate concrete (load bearing/structural material) as well as ultra-lightweight foam concrete (in-fill material) were developed.

DEVELOPMENT OF ULTRA-LIGHTWEIGHT IN-FILL MATERIAL

As an in-fill material ultra-lightweight foamed concrete mixtures composed of cement, silica fume, nanosilica, by ash and foam were developed.

Figure 1. Thermal conductivity (a), compressive strength (b) and pore structure (c) of de-aired ultra-lightweight foamed concrete (F₁ - control, F₂ - mix containing by ash, F₃ - mix containing nanosilica, F₄ - mix containing silica fume).

DEVELOPMENT OF PRINTABLE LIGHTWEIGHT CONCRETE

Eco-friendly 3D printable lightweight concrete mixture containing binder composed of cement and limestone filler, waste glass aggregate and expanded thermoplastic microspheres was developed (Figure 2). For comparison purposes reference concrete mixture containing blast aggregate was developed (Table 1).

Mix designations	Binder	Water	Expanded microspheres	Small aggregate	Waste glass aggregate	Reference C12*	Reference C12*
Normal-weight (N)	1	0.55	0	0.44	0	0.7	0.3
Lightweight (L)	1	0.27	0.28	0	0.44	0.7	0.3

* in accordance

Figure 2. 3D printing process of specimens (a) and (b) and flexural strength determination (c).

Figure 3. Thermal conductivity of coated specimens (determined by Guarded Hot Plate Source (GHP) method) as a function of oven-dry density (left) and compressive strength (14 d) of specimens as a function of oven-dry density (right).

THERMAL PROPERTIES OF WALL SYSTEM

Figure 4. Types of evaluated wall systems.

Types of in-fill materials evaluated:

- AC
- Ultra-lightweight foamed concrete
- polystyrene foam

Figure 5. Heat flux density of the most thermal effective variant (A, E) designed with permeable lightweight structural layer.

Figure 6. Thermal transmittance of wall systems with 3D printable normal-weight (mix 1) and lightweight (mix 2) structural layer and various in-fill materials.

Figure 7. Screenshot of the 3D printed lightweight structural element (vapour E).

CONCLUSIONS

Various wall configurations were designed and their thermal performance was evaluated, through experimental and numerical simulation studies, the most thermally-effective wall system was developed in order to meet the thermal transmittance values regulated by EU towards applying them as a building envelopes.

ACKNOWLEDGEMENT

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Project website: www.3dlight3d.com



ENGINEERING

Exploring in silico the influence of local mechanical stimuli on vertebrate joint shape

Biomechanical forces play a critical role in regulating chondrocytes during vertebrate skeletal development. Yet, how physical stimuli drive the shaping of the joints in vivo is still unclear. A better understanding of the mechanisms regulating these processes could help inform therapies to correct joint deformities in humans, as well as contribute to the development of preventive strategies for congenital defects.

Axolotl salamanders can regrow limbs throughout life, their joints are morphologically similar to human joints, and regeneration uses the same biological rubrics as morphogenetic growth. Computational models built on an experimental basis allow to test experimental hypotheses and explore “what-ifs” scenarios of normal and pathological joint development.

We developed a poroelastic finite element model of tissue growth based on in vivo data from axolotl forelimb regeneration. Combining experimental analyses at whole joint, tissue and molecular levels with computational modelling, we are exploring how mechanical stimuli induced by limb motion may regulate humerus bone rudiment growth and determine final elbow joint shape.

Our preliminary results support the notion that bone rudiment tissue responds to biomechanical stimuli during joint formation. Local loading induces increased cell proliferation and tissue growth, which results in a more pronounced final joint shape. However, our in silico experiments seem to indicate that morphogenetic factors have a fundamental role in establishing the basic geometry of joints. We are currently working on confirming these findings and further elucidating the relationship between mechanics, biology and joint morphology.

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Abstract
Biomechanical forces play a critical role in regulating joint development. Understanding the mechanisms regulating these processes could help inform therapies to correct joint deformities and contribute to the development of preventive strategies for congenital defects. Computational models based on experimental data allow us to explore the biophysical stimuli that regulate joint development. We developed a poroelastic finite element model of tissue growth based on in vivo data from axolotl forelimb regeneration. Axolotl salamanders can regrow limbs throughout life, their joints are morphologically similar to human joints, and regeneration uses the same biological rubrics as morphogenetic growth. Combining experimental analyses at whole joint, tissue and molecular levels with computational modelling, we are exploring how mechanical stimuli induced by limb motion may regulate humerus bone rudiment growth and determine final elbow joint shape. Our preliminary results support the notion that bone rudiment tissue responds to biomechanical stimuli during joint formation. Local loading induces cell proliferation and tissue growth, which influences the final joint shape. Our in silico models allow us to explore possible biophysical stimuli regulating this process. We are currently working on determining these stimuli and validating our findings in order to further elucidate the relationship between mechanics, biology and joint morphology.

Research Goal
During limb development, joints appear through a process known as cavitation. They then undergo morphogenesis to acquire their final form. Movement-induced mechanical stimuli are known to condition chondrocyte differentiation and proliferation during this stage. We want (1) to quantify how limb motion during joint morphogenesis regulates humerus bone rudiment shape, and (2) identify potential mechanical stimuli driving tissue growth and, thus, dictating joint shape.

Findings to Date
(1) a. Proliferative cell count in mechanosensitivity-impaired joints is consistently lower than in control ones.
(1) b. Initial analyses indicate that mechano-sensitivity impaired humeri exhibit differences in joint shape compared to normally-developing joints.
(2) Trends predicted with our computational model using interstitial pressure as mechanical stimuli for growth agree with these experimental observations.

Modeling & Simulations
Cartilage tissue of the developing joint is assimilated to a biphasic material consisting in a fluid-saturated porous solid [2]. Continuum growth is modeled within a finite element (FE) framework via the multiplicative decomposition of the deformation gradient tensor of the solid component [3]. We hypothesize that growth is given by the sum of a biological contribution, proportional to chondrocyte density, and a mechanical contribution, proportional to the compressive fluid pressure induced by the loading on the humerus' surface.

Experimental Data
After 21 days of regrowth, we analyzed joint shape and cellular activity using light sheet fluorescent microscopy (LSFM) and a novel 3D whole mount staining approach [1]. We are working on developing a method for the rigorous quantification of bone shape and cell proliferation in order to compare normal and mechanosensitivity-impaired joints.

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Collaborators: Jose J. Merco, Johannes E. Farkas, Timothy J. Duarte, Eun Kyung Jo, Thomas Mueller, Gina Steinberg.
National Science Foundation - Grant #1727518.

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ENGINEERING

Safety monitoring of ML-based perception tasks of autonomous systems

Machine learning (ML) provides no guarantee of safe operation in safety-critical systems such as autonomous vehicles.

ML decisions are based on data that tends to represent a partial and imprecise knowledge of the environment.

Such probabilistic models can output wrong decisions even with 99% of confidence, potentially leading to catastrophic consequences.

Therefore, a fault tolerance mechanism, such as a safety monitor (SM), should be applied to guarantee the property correctness of these systems.

However, applying an SM for ML components can be complex in terms of detection and reaction.

Thus, aiming at dealing with this challenging task, this work presents a benchmark architecture for testing ML components with SM, and the current work for dealing with specific ML threats.

We also highlight the main issues regarding monitoring ML in safety-critical environments.

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Safety monitoring of ML-based perception tasks of autonomous systems
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Introduction
 Machine learning (ML) provides no guarantee of safe operation in safety-critical systems such as autonomous vehicles. ML decisions are based on data that tends to represent a partial and imprecise knowledge of the environment. Such probabilistic models can output wrong decisions even with 99% of confidence, potentially leading to catastrophic consequences. Therefore, a fault tolerance mechanism, such as a safety monitor (SM), should be applied to guarantee the property correctness of these systems. However, applying an SM for ML components can be complex in terms of detection and reaction. Thus, aiming at dealing with this challenging task, this work presents a benchmark architecture for testing ML components with SM, and the current work for dealing with specific ML threats. We also highlight the main issues regarding monitoring ML in safety-critical environments.

Research challenges
 For complex applications, designing an SM can be intractable due to the need to verify millions or even billions of parameters generated by the ML model. Therefore, this research tries to answer four research questions (RQ):
 1. What type of ML threats can be detected at runtime?
 2. How to monitor ML threats at runtime?
 3. How to benchmark different runtime monitors?
 4. How to intervene after the detection?

Benchmarking perception tasks of autonomous systems
 For RQ1, we chose to focus on image classification tasks at runtime. There are several threats for this task at design or runtime as illustrated at Figure 1.

Figure 1: ML threats for image classification tasks.

Regarding RQ2, this thesis compares different SM techniques by using an experimental framework based on the FARM[1] methodologies illustrated in Figure 2.

Figure 2: Benchmark architecture.

For RQ4, there are promising alternatives for reacting when a detection is made. For example, using a modified simplex architecture [2] with two controllers or synthesizing safety rules just for critical counterexamples [2].

Preliminary results for novelty class detection
 Six metrics: Matthews coefficient correlation (MCC), false positive rate (FPR), false negative rates (| FN|), precision, recall and micro-F1.
 Three image datasets, varying between in-distribution data (ID), or out-of-distribution data (OOD): German Traffic Sign (GTSD), CIFAR-10 and Belgium Traffic Sign (BTSC).
 Four SMs: three variants of outside-of-the-box [3] (OOB, OOB ISMAP, OOB PCA), and out-of-distribution image detector (OODIN) [4].

Table 1: Comparing data-based monitors for GTSD as ID dataset, and BTSC as OOD dataset.

Method	MCC	FPR	FNR	Precision	Recall	Micro-F1
OODIN	0.16	0.73	0.11	0.21	0.9	0.4
OOB ISMAP	0.19	0.06	0.81	0.41	0.19	0.8
OOB PCA	0.04	0.99	0.02	0.84	0.98	0.5
OODIN	-0.07	1.0	0.07	0.17	0.98	0.06

According to preliminary results, the performance of current monitors based on data are insufficient for monitoring these tasks.

3 year thesis work plan

1st year: Literature review and necessary building
 2nd year: Benchmarking Runtime Monitor
 3rd year: Concluding the proposal

RFR: Recruitment of Toulouse, Germany
 Jark: Recruitment at project, UK

Figure 3: PhD Plan.

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ENGINEERING

New architectural devices to increase our connection to Nature from interior dwelling space: from our architectural heritage

Due to the increase in global population, there is a growing potential for losing regular “contact with Nature”; diminishing access to the documented wide range of associated human health and wellbeing benefits of daily interaction with the natural world. This leads us to a sensorily deprived built environment and to an increasing placelessness. Alienation from nature is not an inevitable consequence of modern life but rather a failure in how we have deliberately chosen to design and develop our world. In order to maximise dwellers’ connectivity to the natural environment in new and existing communities, new architectural design knowledge and useful creative strategies at all levels and scales of design, are urgently needed. Despite the increasing interest in this global concern, there exists limited knowledge and research into “how to integrate Nature with our interior dwelling space” and “how these solutions can enable their integration”.

To bridge these gaps, I develop an innovative research project that unfolds and analyses the underlying forms of knowledge behind exemplary post-war Danish and traditional Japanese buildings that offer exemplary sensory experiences of the natural world - not only by visual contact but by other complex mechanisms - to inform us of a sustainable contemporary interior design practice, through Landscape, Architectural Interior and Biophilic Design approaches. The main aim is to effectively enhance the health and wellbeing of communities through daily interaction with Nature in the urban areas of the future, an urgent challenge at EU and Global level.

The study opens a new research branch of Architectural Design and a new phase in the Biophilic design’s implementation for built environments. Moreover, it will make an important contribution to the EU-knowledge base on nature-based solutions.

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New architectural devices to increase our connection to Nature from interior dwelling space: through our architectural heritage

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5 KEY PARAMETERS •
Post-war Danish houses
Traditional Japanese buildings

CONTEXT TECTONIC SPACE DAYLIGHT MATERIALITY

INTRODUCTION:
There is a growing potential for losing regular “contact with Nature”; diminishing access to the documented wide range of associated human health and wellbeing benefits of daily interaction with the natural world. This leads us to a sensorily deprived built environment and to an increasing placelessness. There exists limited knowledge and research into “how to integrate Nature with our interior dwelling space” and “how these solutions can be implemented”

OBJECTIVES:

- To obtain new architectural devices to increase our connection to Nature from interior dwelling space and enable their integration.
- To produce a catalogue of potential sustainable practical devices and recommendations for the contemporary dwelling interior design practice.
- To change the attitude of researchers, design practitioners, policy-makers and society.

METHODOLOGY:

- A qualitative case-study of buildings in Denmark and Japan, analysed from Landscape, Architectural Interior and Biophilic Design approaches. Through 5 Key parameters and from 12 Biophilic design patterns: 1. Nature in space 1.1. Visual connection with Nature 1.2. Non-visual connection with Nature 1.3. Presence of water 1.4. Dynamic/diffuse light 1.5. Link to natural system. 2. Natural analogues: 2.1. Biomorphic forms/patterns 2.2. Material link to Nature 2.3. Complexity and order. 3. Nature of the space: 3.1. Prospect 3.2. Refuge 3.3. Mystery 3.4. Risk and peril.
- To consecutively apply research by design, a scientific methodology that links architectural research and practice

EXPECTED RESULTS: to effectively enhance the health and wellbeing of communities through daily interaction with Nature in urban areas, an urgent challenge at EU and Global level.

Website: https://royaldanishacademy.com/nature/nature-Instagram-nature_in
Twitter: [_nature_in](#) Acronym: NATURE_IN

Acknowledgement: This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement number 806661

Royal Danish Academy
Architecture Design Conservation
royaldanishacademy.com



ENGINEERING

Run-time Management of Hardware Redundancy for Mixed-Critical Applications

Since electronics started to scale down, a growing concern about the reliability of these devices has emerged. At the same time, the increased demand for high performance in critical applications motivated a shift from the old reliable technologies to the new cutting-edge devices. In this work, we present a design that uses configurable redundancy in functional units to increase fault tolerance against soft faults. These units are managed by an operating system that can enable and disable redundancy on-demand, as the criticality of the application processes increases or decreases. As a result, we were able to perform such a redundancy configuration at run-time with only a small increase in execution time. Furthermore, besides the extra area for triplicating the functional units, little extra hardware was necessary for the control logic to enable such redundancy management.

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RESCUE
European Training Network

Run-time Management of Hardware Redundancy for Mixed-Critical Applications

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I. Introduction / Motivation

Electronics miniaturization: Transistor/area Device Area

Less occupied area
Higher frequency
Lower voltage

Soft Faults (radiation effects)
Self-Heating
Early wear out

- Increased amount of "smart" devices
 - Multi purpose devices
 - Multi-task
- Increased demand for performance
 - Mundane application domains (e.g., smart phones)
 - Safety-critical applications (e.g., aerospace and automotive industry)

II. Objectives

Focus in safety-mixed-critical scenarios:

- Use of processor units redundancy to minimize soft-fault effects (caused by particles heating the design).
- A compromise between full core and partial replication.
- On-demand reconfiguration capability minimizing power consumption.

III. HW/SW Co-Design

Software: Multiple Application Processes, Operating System Services, Extensions

Hardware: Processor Design (Monitors, Functional Units, Reconfiguration Logic, Status Registers)

IV. Design Space Exploration

Triple Redundancy (Unit, Unit, Unit) voter

Single Unit (Unit)

Double Redundancy (Unit, Unit) voter

High critical processes ↔ Run-time reconfiguration ↔ No critical

• Fault Tolerance • Power • Ageing • Latency

V. Conclusion

- Mixed critical scenarios can benefit from such reconfiguration flexibility:
 - Low latency to configure redundancy at run-time.
 - Increases fault tolerance for the critical tasks.
 - Minimizes power consumption while executing mundane work.

www.rescue-etn.eu

The RESCUE ETN project has received funding from the European Union's Horizon 2020 Programme under the Marie Curie-ERDF actions for research technological development and demonstration under grant n. 722326.

TUT, b-tu, IROC, TUP, TUDelft, cadence, INTRINSIC ID, BOSCH



ENGINEERING

Matlab2Trace: A Matlab to Trace translator to visualise and analyse concurrent system activities and execution traces

Matlab provides an environment to analyse and visualise data and develop algorithms. However, there is limited support for visualising and analysing system activities executing concurrently, for instance, on a multiprocessor platform. Trace (www.esi.nl/solutions/trace/index.dot) is software that specialises in visualising and analysing concurrent system activities and execution traces. We present a Matlab to Trace translator that directly generates a trace-input file from the Matlab environment. Concurrent system activities and execution traces of the algorithms developed inside the Matlab environment can be visualised and analysed in Trace using the generated trace-input file. The translator takes as input the logical or absolute starting and ending time of the algorithmic execution, and the number (and labels) of processing cores.

TRACE visualises concurrent activities in a Gantt-chart-like view which provides colouring, grouping and filtering options. TRACE also provides many analysis methods, which sets it apart from the many other Gantt-chart visualisation tools:

- i) Critical-path analysis can be used to detect tasks and resources that are bottlenecks for performance;
- ii) Distance analysis can be used to compare execution traces with respect to structure, e.g., to check a model trace against an implementation trace;
- iii) MTL checking provides a means to formally specify and verify properties of execution traces using Metric Temporal Logic. It is useful to express and check, for instance, performance properties such as ‘the processing latency is at most 50 ms’;
- iv) The streaming performance DSL is a domain-specific language that captures often-used performance properties for stream-processing systems (e.g., image or

video processing), and which eases the use of the MTL checker; and v) The resource usage feature can quickly give insight in the details of the resource usage.

The Matlab2Trace can be downloaded from <https://github.com/sajid-mohamed/Matlab2Trace>.

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Matlab2Trace: A Matlab to Trace tool translator
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1. TRACE tool

TRACE [1,2] (<https://www.research.tue.nl/trace/>) is a software that specializes in visualizing and analyzing concurrent system activities and execution traces.

2. Why Matlab2Trace?

- Matlab provides an environment to analyse and visualise data.
- However, there is limited support for visualising and analysing system activities executing concurrently, for instance, on a multiprocessor platform.
- The runtime behaviour of switched controllers in a multiprocessor platform [6,8,10] is difficult to visualise in Matlab. The challenge is compounded when there are variations in the timing behaviour [3, 5, 7, 9].
- Significant multiprocessor control systems implementation considering timing variations [6] is hard to visualise with Matlab.

3. Matlab2Trace

- We present Matlab to TRACE tool translator that directly generates a trace input file from the Matlab environment.
- Concurrent system activities and execution traces of the algorithms developed inside the Matlab environment can be visualised and analysed in TRACE tool using the generated trace-input file.
- Matlab2Trace translator takes as input the logical or absolute starting and ending time of the algorithmic execution, and the number (and labels) of processing cores.

4. TRACE advantages

- TRACE visualises concurrent activities in Gantt-chart-like view which provides colouring, grouping and filtering options.
- TRACE provides the following analysis methods:
 - Critical path analysis – to detect tasks and resources that are bottlenecks for performance.
 - Distance analysis – to compare execution traces with respect to structure, e.g. to check a model trace against an implementation trace.
 - Behavioral analysis – formally specify and verify properties of execution traces using Metric Temporal Logic. It is useful to express and check, for instance, performance properties such as “the processing latency is at most 50 ms”.
 - Resource usage analysis – gives quick insight into the details of the processor resource usage.

5. Accessing Matlab2Trace

Matlab2Trace: A Matlab to TRACE tool translator to visualise and analyse concurrent system activities and execution traces is open-sourced and can be accessed from <https://github.com/sajid-mohamed/Matlab2Trace>.

Acknowledgement

This work is part of the From the cloud to the edge-smart integration and Optimization technologies for highly efficient Image and Video processing Systems (IMOPS) project funded by the Electronic Components and Systems for European Leadership (ECSEL) joint Undertaking under grant number H2020-ECSEL-2017-2-783162.

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DEPARTMENT OF ELECTRICAL ENGINEERING / ELECTRONIC SYSTEMS GROUP



ENGINEERING

Development and validation of an in-silico tool for the study of therapeutic agents in 3D cell cultures

3D cell cultures are a more accurate representation of in vivo biology but their use is hampered by the increased complexity and the difficulty in predicting the effect of changing the experimental conditions on measurable outcomes.

Computational simulations constitute an effective strategy for addressing these limitations being able to test hypotheses regarding the molecular mechanisms behind specific macroscopic behaviours and predict measurable outcomes in untested conditions.

Within this context, we have developed SALSA (ScAfferLd SimULator), a hybrid continuous/discrete cellular automaton that effectively couples the study of the dynamic evolution of the status and position of the cells, with the representation over time of local changes in resources, drug availability and scaffold's mechanical properties.

This model was programmed to replicate the behaviour of a population of breast cancer cells (MDA-MB-231) cultured in collagen scaffolds and was then shown to be able to recapitulate the response of these cells to pharmacological treatment in both drug-sensitive and -resistant populations.

Additionally, these SALSA simulations were used to train a deep neural network to classify therapeutic outcomes. The calculation of class activation maps allowed for the identification of class-defining features and the definition of alternative treatment protocols. The simulation of these machine-learning optimised protocols led to a shift in the outcome distribution toward a more extensive response to treatment with

minimal or no increase in the overall amount of drug.

The integration of in-vitro and in-silico experimentation is becoming a key strategy for the effective characterisation of potential therapeutic agents or novel drug combinations. Within this context, the method here proposed holds great potential for the creation of a feedback loop between experimental and simulated results.

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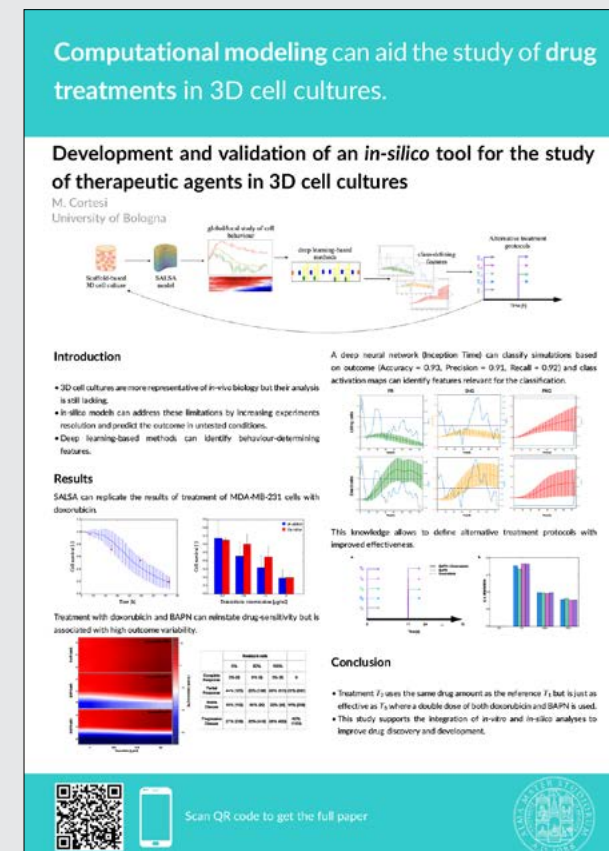
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ENVIRONMENTAL SCIENCES

Addressing Environmental Change through Emergent Integrated Environmental Observatories: A Case Study in the Czech Republic

A growing body of scientific evidence indicates that we have entered the Anthropocene Epoch. Many assert that society has exceeded sustainable ecological planetary boundaries and that altered biogeophysical processes are no longer reversible to natural rates of ecosystem functioning.

To properly and successfully address societal needs for the future, more holistic and complex methods need to be applied at various spatial and temporal scales. The increasingly interconnected nature of human and natural environments – from individuals to large megacities and entire continents and from cells through ecosystems to the biosphere as a whole (e.g., as seen in the carbon cycle)– demands new and often interdisciplinary and international approaches to address emerging global challenges.

With that perspective in mind, the Czech Republic’s National Climate Program was established in 1991 with the aim to understand the impact of global environmental change on society. The National

Climate Program was updated in 2017 to formulate a new Climate Protection Policy. Here, we outline the multifaceted problems that climate change poses for the Czech Republic, as well as a new scientific infrastructure and approaches directed to better understanding the effects of climate change on our ecosystems, water resources, urban environment, agriculture, human health, and the general economy.

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Addressing Environmental Change through Emergent Integrated Environmental Observatories: A Case Study in the Czech Republic

CzechGlobe Manuel Acosta, Alexander AČ, Marian Pavelka, Kateřina Havránková, Dalibor Janouš, Michal V. Marek.
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Background:
A growing body of scientific evidence indicates that we have entered the Anthropocene Epoch. Many assert that society has exceeded sustainable ecological planetary boundaries and that altered biogeophysical processes are no longer reversible to natural rates of ecosystem functioning. To properly and successfully address societal needs for the future, more holistic and complex methods need to be applied at various spatial and temporal scales.

Here, we outline a new scientific infrastructure and approaches directed to better understanding the effects of climate change on our ecosystems, water resources and agriculture.

Key Elements of Research Infrastructure:
Generally, the overall challenge to the society is to monitor (quantify), understand (attribute), and predict (project) the evolution of the changing environment in the context of the whole Earth's system processes. This demands a new scientific approach and synthesis that crosses disciplinary and geographic boundaries while placing particular emphasis on the changing environment.

The CzechGlobe climate change infrastructure includes a network of ecosystem stations, with technological instrumentation for ecophysiological, plant physiological, and micrometeorological studies, along with estimation of GHG emissions under field conditions. It provides an observational framework within which other studies can be conducted (Figure 1).

From these sites, CzechGlobe can provide a wide range of data, including matter and energy fluxes using eddy covariance and chamber techniques (inclusive of data from soil CO₂ and woody-tissue CO₂ efflux automated systems), micrometeorological data, inventory data, remote-sensing data, and more.




Figure 1. Location of the ecosystem stations in the Czech Republic.




Figure 2. Flonheim forest - UK.

Station Name (Abbreviation)	Ecosystem/Flonheim (n = 4) (Type)	Dominant Plant Species
LesPul 5 (N2)	Flonheim forest (N2)/E11	Carpinus betulus, Fraxinus ssp./E11a, Quercus robur
Ma 10 (S07)	Spruce forest (S07)/S1	Pinus abies
Malye Lohy (M1)	Wetland (M1)/M1	Carex acuta, Phragmites australis, Sphagnum magnum
Milne and Hill (M1)	Beech forest (M1)/M1	Pinus sylvestris
Radi (R1)	Spruce forest (R1)/R1	Pinus abies
Sty 10 (S1)	Mountain grassland (S1)/S1	Hordeum stricta, Festuca rubra, Helianthus annuus
Krasna v Berez (K1)	Agroecosystem (K1)/K1	30-year crop rotation
Domestek (D1)	Poplar plantation (D1)/D1	Populus alba - 300 (D1) (n = 4) (mammals)




Figure 3. Spruce forest - BR.




Figure 4. Wetland - M1.




Figure 5. Spruce forest - RA.




Figure 6. Poplar plantation - D08.




Figure 5. Grassland - M1.




Figure 6. Orchard - BR.




Figure 7. Spruce forest - RA.




Figure 8. Beach forest - BR.

Funding: This work was supported by the Ministry of Education, Youth and Sports of the Czech Republic within the CECCOS Program, grant number LM2025063.



ENVIRONMENTAL SCIENCES

Rare diseases: it's all about combining data

Knowledge Graph (KG) approaches are increasingly being used for data integration processes by combining clinical data with other data sources. However, using and directly navigating the combined data in the KG can be difficult for Health Data Researchers (HDRs). These researchers need meaningful access to the linked data in the KG, to understand better the rare diseases that they are researching. Ultimately a more appropriate combination of data will lead to better treatment for patients and will improve their quality of life. We developed a framework (methodology and tools) named SCEED (Semantic Combining for Exploration of Environmental and disease data), that carefully and safely combines environmental observations with clinical data using a KG approach; whilst hiding the complexities. We are evaluating this framework with HDRs who are investigating three rare diseases: ANCA vasculitis in Ireland, Kawasaki disease in Japan and vasculitis in Europe. We have shown HDRs are able to directly engage with the KG enabling them to access the clinical and environmental data in a meaningful way for ANCA vasculitis in Ireland, using SCEED. We published our results in a major Semantic Web venue (VOILA2020) demonstrating how our prototype satisfied their initial requirements of HDRs in accessing, exploring and exporting this linked data. Thus, our framework supports researchers that require a flexible methodology to integrate environmental data with longitudinal and geospatial diverse clinical data. Furthermore, we will evaluate the SCEED framework with Kawasaki disease in Japan, extending the data inputs with epidemiologic data; and vasculitis in Europe, limit testing with an increased data volume in a federated scenario.

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Rare diseases: it's all about combining data

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Supervisory Panel: Dipak Kalra (i-HD) and Xavier Rodó (ISGlobal)

Motivation and Relevance

Knowledge Graph (KG) approaches are increasingly being used for data integration processes by combining clinical data with other data sources [1]. However, using and directly navigating the combined data in the KG can be difficult for Health Data Researchers (HDRs). These researchers need meaningful access to the linked data in the KG, to understand better the rare diseases that they are researching. Ultimately more appropriate combination of data will lead to better treatment for patients and will improve their quality of life.

Solution

We developed a framework (methodology and tools) named "SCEED", that carefully and safely combines environmental observations with clinical data using a KG approach; whilst hiding the complexities. We are evaluating this framework with HDRs who are investigating three rare diseases: ANCA vasculitis in Ireland [2], Kawasaki disease in Japan [3] and vasculitis in Europe [4].

Key Benefit:

Our framework supports researchers that require a flexible methodology to integrate environmental data with longitudinal and geospatial diverse clinical data.

Results

We have shown HDRs are able to directly engage with the KG enabling them to access the clinical and environmental data in a meaningful way for ANCA vasculitis in Ireland, using SCEED.

We published our results in a major Semantic Web venue (VOILA2020) demonstrating how our prototype satisfied their initial requirements of HDRs in accessing, exploring and exporting this linked data [5].

Future work

We will evaluate the SCEED framework with Kawasaki disease in Japan, extending the data inputs with epidemiologic data; and vasculitis in Europe, limit testing with an increased data volume in a federated scenario.

Clinical data
Hospital, Health Records, Infectious diseases
Event Of Interest

Environmental data
Weather, Pollution, Aeronol
Spatio-Temporal Observations

Geometry data
Country, Location
Location Of Interest

SCEED Framework
Knowledge Graph, Methodology, Meaningful Access

*SCEED: Semantic Combining for Exploration of Environmental and disease data.

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Logos: Trinity College Dublin, HELICAL, engaging content, Marie Curie Alumni Association



ENVIRONMENTAL SCIENCES

How forensic science can lead the way in identifying culprit soil fingerprints in European mountains

Mountains in Europe are highly valued as they provide diverse living and recreational opportunities and unique landscapes, are key economic assets, and because they are treasures of unique flora and fauna. Their vulnerable environment is, however, threatened by the frequent occurrence of shallow landslides and water erosion which produce large amounts of sediment during floods. The urgency to mitigate natural hazards calls for an improved understanding of how physical and biological dimensions of soil restoration interact. We address this issue by investigating how environmental DNA (eDNA) or DNA of organisms isolated from environmental samples can be used to trace hotspots of soil erosion in the Bastan catchment in the Pyrenees (France). Based on the persistence eDNA from vascular plant litter in soils and sediments, and the possibilities offered by DNA metabarcoding to characterise whole plant communities to the species level, we argue that eDNA can be used as a high-resolution fingerprinting method for identifying and tracing sediment sources. As such, bridging the gaps between physical and biological connectivity features at the catchment scale will allow us to develop tangible soil restoration scenarios which incorporate hazard protection, landscape and biodiversity restoration.

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How forensic science can lead the way in identifying culprit soil fingerprints in European mountains

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Context
Mountains in Europe are very valuable:
© Amaury Frankl
WATER, ENERGY
AGRICULTURE SKI VILLAGE
FAUNA AND FLORA
HIKING, CLIMBING, GLIDING, CYCLING, ...
Pressure on mountains is high, accelerating land degradation:
© Jean Guyo

- Landslides
- Water erosion
- Avalanches
- Gullying
- Flash floods
- River bank erosion



These processes are exacerbated by extreme weather events and require actions to strengthen sustainable mountain development

Research objective
Investigate how environmental DNA (eDNA) or DNA of organisms isolated from environmental samples can be used to trace hotspots of soil erosion. We focus on a case study area in the Bastan catchment in the Pyrenees (France).

eDNA fingerprinting

- eDNA is assumed to be highly persistent in soils and sediments
- Allows to identify plant species and thus hotspots of soil erosion at an unprecedented resolution
- Allows to bridge the gaps between biological and physical catchment connectivity aspects

Development goal
Through our interaction with stakeholders and communities develop tangible soil restoration scenarios which incorporate hazard protection, landscape and biodiversity restoration.



ENVIRONMENTAL SCIENCES

Sewage chemical information mining – a novel concept for the assessment of human exposure to environmental contaminants

Humans are nowadays exposed to an increasingly large number of environmental contaminants. One of their major sources is personal care and household products, which contain numerous potentially harmful substances. Human exposure to these compounds can be assessed by human biomonitoring (HBM) studies, which involve the analysis of specific biomarkers (excreted parent compounds and/or metabolites) in biological matrices from individuals, mostly urine. Although useful, this approach is hampered by numerous difficulties.

Sewage chemical information mining (SCIM), often referred to as wastewater-based epidemiology, is a relatively novel concept for obtaining some relevant epidemiological information, including lifestyle and dietary habits, population health status, and exposure to contaminants. Similar to HBM, SCIM is also based on the analysis of specific human biomarkers. However, instead of biological matrices, SCIM involves the analysis of municipal wastewater (sewage), which contain biomarkers of almost everything we consume, or are exposed to, and, therefore, can be considered as a pooled urine sample of the entire population connected to a certain sewer network.

So far, SCIM has been mostly applied in the field of lifestyle biomarkers, to assess the consumption of illicit drugs and some legal substances, while its full potential in studying the human exposure to environmental contaminants has yet to be explored. The MCSA IF project “Sewage chemical information mining – development of a novel concept for the assessment of human exposure to pollutants through wastewater analysis” (SCHEME), aims to fill this gap by the development of a multi-class analytical method for the SCIM-based determination of biomarkers of human exposure to

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SEWAGE CHEMICAL INFORMATION MINING – A NOVEL CONCEPT FOR THE ASSESSMENT OF HUMAN EXPOSURE TO ENVIRONMENTAL CONTAMINANTS

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Introduction
Humans are nowadays exposed to an increasingly large number of environmental contaminants. One of their major sources are different consumer products used in day-to-day life, such as cosmetics, pharmaceuticals, food packages, plastic materials, clothing, furniture, electronics, paints, lubricants, adhesives, and many others. These products contain numerous potentially harmful substances, including parabens, UV filters, flame retardants, plasticizers, and bisphenols. Human exposure to these compounds can be assessed by human biomonitoring (HBM) studies, which involve the analysis of specific biomarkers (excreted parent compounds and/or metabolites) in biological matrices from individuals, mostly urine. Although useful, this approach is hampered by numerous difficulties, including high costs, selection bias, ethical approval requirements and lack of temporal dimension.

Procedure

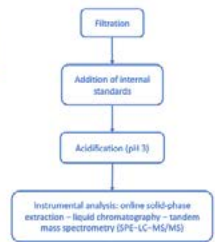



Fig. 1. General scheme of the SCIM approach



Objectives

- To select a suitable set of biomarkers of human exposure to chemical contaminants from personal care and household products (parabens, UV filters, phosphorous flame retardants, plasticizers, and bisphenols)
- To develop and validate a multi-class analytical method for their determination in wastewater
- To assess human exposure to selected contaminants in 4 European cities

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Acknowledgement
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parabens, UV filters, phosphorous flame retardants, plasticisers, and bisphenols. The developed methodology will be used to assess human exposure to these compounds in selected cities. Eventually, SCIM could be applied as an “early warning system”, helping to identify communities with the highest exposure to environmental contaminants.

ENVIRONMENTAL SCIENCES

P-TRAP: Diffuse phosphorus input to surface waters

Phosphate, an essential resource for food production is becoming scarce. Its uncontrolled loss from agricultural areas is in conflict with the principles of a circular economy. Enhanced loading of surface waters with phosphate is the main cause for eutrophication and presents a key challenge in meeting the objectives of the EU Water Framework Directive. Understanding and controlling environmental phosphate fluxes, therefore, is key to target both problems, to develop new methods and approaches to manage environmental phosphate fluxes, and to improve surface water quality.

In March 2019, P-TRAP has been launched. P-TRAP, an MSCA-ETN, establishes a framework of partners from multiple science and engineering disciplines, integrating partner organisations from various stakeholder groups to pave the way for the direct implementation of the acquired knowledge. The project is targeting the diffuse flux of phosphate into surface waters, i.e. the problems of understanding and controlling environmental phosphate fluxes. P-TRAP aims to develop new methods and approaches to trap phosphate in drained agricultural areas and the sediments of eutrophic lakes. Trapping of phosphate involves the application of iron-containing by-products from drinking water treatment. P-TRAP espouses the ideas of a circular economy and aims at recovering the retained phosphate in agricultural systems. Novel microbial technologies will be developed to convert phosphate-loaded iron-minerals into marketable fertilisers whose suitability will be evaluated. The P-TRAP technologies have in common that they rely on the naturally strong connection between phosphate and iron, and the innovative P-TRAP strategies will be underpinned by process-orientated investigations on the behaviour of phosphate during the transformation of

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iron minerals. The latter are key in trapping and recycling of phosphate in agricultural systems and lakes. Here we will present the structure and the planned research of the project, including an overview of achievements of the first two years.



ENVIRONMENTAL SCIENCES

MEMO2 - MEthane goes MOBile – MEasurements and Modelling

MEMO2 was a 4-years European Training Network with more than 20 collaborators from 7 countries. The project contributed significantly to the targets of the EU with a focus on methane (CH₄). CH₄ emissions are a major contributor to Europe's global warming impact, and the official inventories of emissions and estimates derived from direct atmospheric measurement show significant discrepancies. However, effective emission reduction can only be achieved if sources are properly quantified, and mitigation efforts are verified. MEMO2 contributed to advanced combinations of measurement and modelling which are needed to archive such quantification.

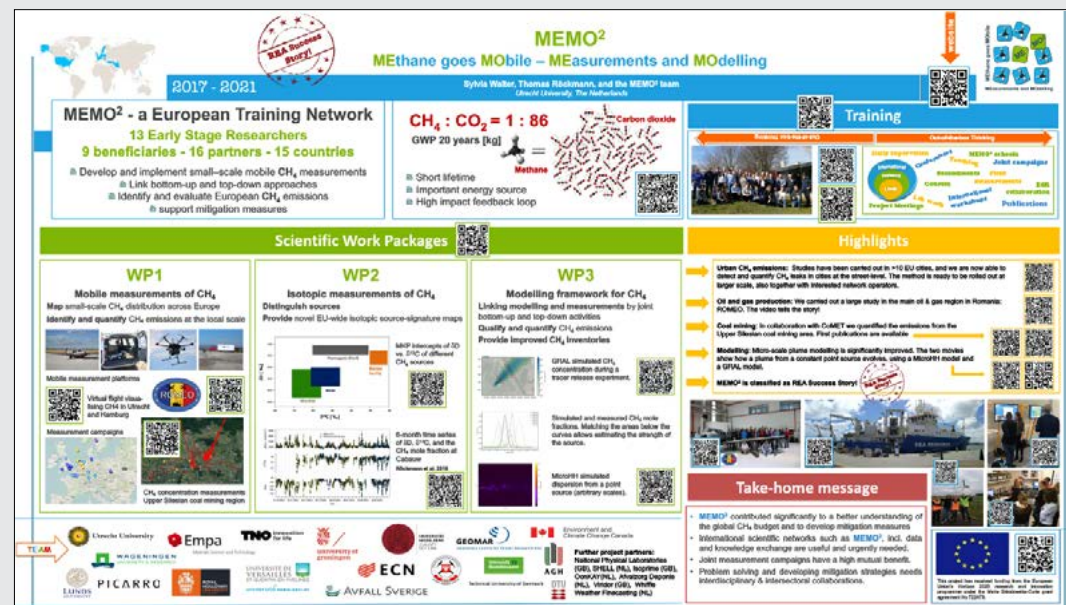
With respect to the recently released EU methane strategy and the implementation of independent verification of emissions by atmospheric measurements, we will present some examples of relevant results up to now:

Urban CH₄ emissions: We can now detect and quantify CH₄ leaks in cities at the street-level with mobile high precision analysers. Similar studies have been carried out in >10 EU cities and in collaboration with interested network operators those measurements are ready to be rolled out at a larger scale.

Oil and gas production: We carried out a large study in the oil and gas production region in Romania (ROME0), with aircraft, drones and vehicles. The final results are close to publication and help to improve the emission verification.

Coal mining: In collaboration with CoMet, another science project, we quantified the CH₄ emissions from the Upper Silesian coal mining area. The collaboration and its results contribute to the development of an independent and objective emission monitoring system

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Modelling: Micro-scale plume modelling is significantly improved. Those models, e.g., help to simulate a measurement day as we had during our field campaign in Romania and improve sampling and measurement strategies.



ENVIRONMENTAL SCIENCES

BioENERgy from biomass and bio-oil Fermentation using microbial Communities to produce Chemicals and Enzymes (BENEFICCE)

Although many efforts have been dedicated to the research and development of sustainable biorefineries, there are still some gaps to cover, especially to make chemical production energetically efficient and rentable. The proposed route combines biotechnological and thermochemical processes, departing from low-cost raw materials, like lignocellulosic biomass, to produce valuable chemicals via the activity of environmental microbial communities.

Bioplastics, enzymes, and lipids will be produced in a competitive biorefinery process. The project develops two approaches,

- Approach 1. Aims to study the fermentation of bio-oil, obtained from pyrolysis of waste biomass, to produce bioplastics, using microbial communities from contaminated environments. The scientific challenge is to find a microbial community able to metabolise the chemicals present in bio-oil (including the toxic compounds) with the concomitant production of bioplastics in one pot.
- Approach 2. Aims to study the fermentation of lignocellulosic biomass to produce fatty acids and enzymes that degrade the lignocellulose. The scientific challenge of this approach is to find a microbial community that can degrade the lignocellulosic material without any pre-treatment, and that can metabolise the toxic chemicals produced during biomass fermentation.

The BENEFICCE project is looking for developing a new technology for the sustainable production of bioplastics, lipids, and enzymes. Contributing to 2 of the 17 Sustainable Development Goals of the United Nations: Sustainable Production and Combat Climate Change. Moreover, the resulting biorefinery process aims to be competitive by using low-cost raw material and having fewer process steps than other existent technologies.

Author(s):

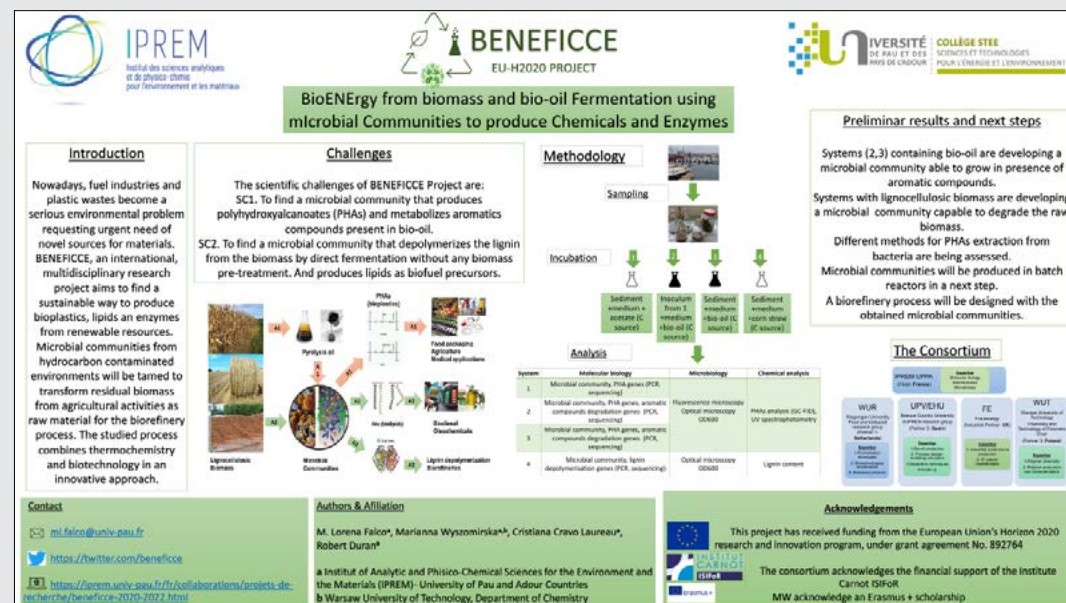
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This project has received funding from the European Union's Horizon 2020 research and innovation program, under grant agreement No. 892764.

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Marianna Wyszomirska acknowledges the Erasmus+ scholarship.

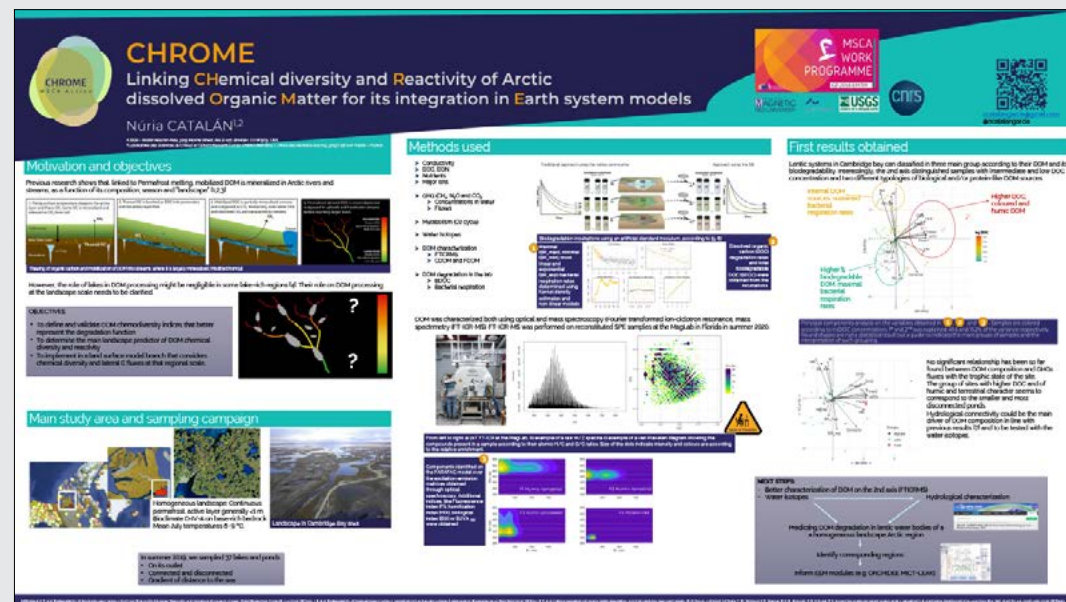
ENVIRONMENTAL SCIENCES

Linking chemical diversity and reactivity of arctic dissolved organic matter for its integration in earth system models (chrome)

Organic carbon (OC) is exported from terrestrial to freshwater ecosystems where, not only is it being degraded and eventually lost as CO₂, but such degradation occurs faster than in soils or marine systems. Across freshwaters, variations in OC degradation and reactivity have been related to compositional changes in OC. The flux from terrestrial to aquatic systems seems to be increasingly associated with anthropogenic perturbations. However, despite the relevance of these fluxes for the global C cycle, Earth System Models (ESMs) are just starting to consider them. In that sense, a particularly crucial region deserving urgent attention is the Arctic, as permafrost soils hold a massive C stock that is vulnerable to being mobilised towards freshwaters. Such transfer could turn that vulnerable C stock from a sink into a CO₂ source. Therefore, determining the reactivity of that OC flux and incorporating it in surface models is key now.

The foundation of CHROME project is the idea that the chemical diversity of OC explains its reactivity and, as such, should be considered in biogeochemical models. CHROME represents the first attempt to incorporate OC chemical diversity to ESMs and will do so by: i) developing and selecting functional chemical diversity indices as indicators of Arctic OC reactivity and ii) implementing that knowledge in a regional branch of an ESM.

In this session, we will present an overview of the project as well as the first results of our first objective, determining the chemical diversity in Arctic lakes and ponds using high-resolution mass spectrometry data. This includes both the development



and assessment of the indices describing diversity as well as the spatial distribution of such diversity across these water bodies, in order to identify gradients to be applied in the second stage of the project.

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LIFE SCIENCES

Next-generation biodiversity monitoring: Bats as ecosystem samplers

Biodiversity underpins fundamental ecosystem processes and provides invaluable services. Current approaches of biodiversity monitoring may be limited to individual taxonomic groups and typically measure the end-state, but not the underlying processes. Drastic biodiversity loss and climate change have made the development of rapid, high-throughput multi-trophic ecosystem monitoring protocols a pressing need.

Plants are the primary producers responsible for oxygen production and carbohydrate synthesis and form the base of almost all global ecosystems. They are known to accumulate viral loads in response to climate-related stress. Plants, and their viruses, are eaten by phytophagous insects (with their own viral load), which are in turn eaten by a top consumer such as a bat. We will take advantage of this natural aggregation through trophic levels by collecting bat guano to retrieve the viromes of plants, fungi, insects and bats. The identity of eukaryotic taxa will be revealed by metabarcoding.

Temporal sampling across climates and habitats will ensure that complex and seasonal ecosystem processes are captured. We will explore taxon diversity and associations, and how these change over time and in response to environmental conditions.

This will increase our knowledge on biodiverse understudied groups, shed light on ecosystem processes and how they respond to climate change, and provide proof of concept results for 'aggregation' as a means to rapidly survey ecosystem health on a global scale.

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**Next-generation biodiversity monitoring:
Bats as ecosystem samplers**

CBGP **INRAE**

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Background

- Biodiversity plays a critical role underpinning ecosystem processes and providing an invaluable source of food, clean water, medicines, as well as climate regulation.
- Intensive anthropogenic pressure through overconsumption and misuse of natural resources has resulted in the current, human-driven, mass extinction event.
- Traditional methods of biodiversity monitoring include the use of indicator taxa and biodiversity metrics. The coverage of these methods may be constrained by limited accuracy and generality and high costs. Such approaches do not capture ecosystem relationships nor very rapid changes to biodiversity.
- To face the challenge of biomonitoring in today's context, a new generation of biomonitoring is urgently needed to detect perturbations in ecosystems accurately, cheaply, and generality at local to global scales.
- Exposure to environmental stress increases viral load in plants and animals. Plants and their viruses, are eaten by phytophagous insects with their own viral load. These in turn are eaten by top consumers such as bats.
- In the current study, we take advantage of bats as aggregator taxa, which effectively conduct a multi-trophic sampling of the landscape and deposit the sample in a fixed location (due to roost fidelity).
- Species with different foraging specialisations were selected to represent closed and open habitats.

Approach

Biogeographic context
Sampling takes place in France, representing five of the five European climate regions.

Temporal and spatial sampling
Droppings from two species of bat are collected from 18 sites each month throughout the summer, during 2 years.

Plant DNA, fungi and viruses (blue box) are consumed by herbivorous insects (yellow box) which are in turn eaten by bats (green box).

The bat insect-plant food-webs along with its associated mycobiome and virome is retrieved from the digested material in the bat droppings.

Sequencing
Following RNA/DNA extraction from pools of guano, taxonomic identities and viruses are recovered using cDNA metabarcoding (Illumina MiSeq) and shotgun metagenomics (Illumina NovaSeq), respectively.

Analyses
Using these sequences, taxon diversity and associations can be explored over time with respect to climate.

Current results & outlook

- The first year of sampling is completed.
- The lab protocols have been optimized for both the metabarcoding approach to amplify bat, insect, plant and fungi and the metagenomic approach to sequence the corresponding viromes. In both cases, the aim is to capture global diversity patterns with as little bias as possible.
- Insects & fungi are resolved to genus or species, plants & viruses are resolved to family or genus.
- Even closely related colonies have distinct dietary signatures, which often included pest species & vectors of disease (e.g. mosquitoes, box tree moth).
- A huge wealth of viral and fungal taxa were recovered with unknown ecological roles. Some of these could be key groups in ecosystem functioning and insect faunal study.
- Our preliminary results demonstrate the power of bat-based cDNA for illuminating multi-trophic relationships and processes in ecosystems. This high throughput multi-trophic ecosystem approach can contribute to a Next-Generation Global Biodiversity Monitoring capable of emerging ecosystem processes in close to medicine.

<https://eco-scan.fr>

Acknowledgements: This project was funded by a Marie Skłodowska Curie grant no. 101019231. We thank everyone who gave us access to sites and the very dedicated volunteers collecting the bat guano each month.

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LIFE SCIENCES

A tapered optical fiber tip used for superficial photothermal laser ablation of ex-vivo sheep esophagus

Gastrointestinal tract diseases can be caused by precancerous superficial mucosal lesions and may then spread to deep tissue structures. Barrett's esophagus (BE) is a precancerous condition of the esophagus and is associated with esophageal adenocarcinoma. Although endoscopic therapy interventions attempt to effectively reverse BE and reduce relative mortality from esophageal cancer, the main challenge associated with the current deployments of both RF ablation and photothermal laser ablation is that the depth of treatment typically has a deeper thermal injury than the mucosa layer. This therapeutic failure can thermally damage deeper layers that are not primarily intended. The aim is to further investigate a tapered fiber probe that delivers a focused Gaussian laser beam with relatively low laser power for superficial photo-thermal laser ablation of the mucosa layer. In an ex-vivo sheep esophagus model, a single-session photo-thermal ablation at 1505-nm using the proposed probe was successfully observed in epithelium and submucosa layers. The successful SPLA of the sheep mucosa layer was demonstrated for various speed-power combinations, including 300 mW laser power at a surface scanning rate of 0.5 mm/s and 450 mW laser power at a surface scanning rate of 2.0 mm/s.

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A tapered optical fiber tip used for superficial photothermal laser ablation of ex-vivo sheep esophagus

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Introduction

> Gastrointestinal tract diseases, such as esophageal cancer, colon cancer, or rectal cancer, can be caused by precancerous superficial mucosal lesions and may then spread to deep tissue structures. Barrett's esophagus (BE) is a precancerous condition of esophagus^{1,2} and is associated with esophageal adenocarcinoma³.

> Although endoscopic therapy interventions attempt to effectively reverse BE and reduce relative mortality from esophageal cancer, the main challenge associated with the current deployments of both RF ablation and photothermal laser ablation is that the depth of treatment typically has a deeper thermal injury than the mucosa layer^{4,5}.

> This therapeutic failure can thermally damage deeper layers that are not primarily intended.

Objective

The aim is to further investigate a tapered (cone-shaped) fiber probe that delivers a focused Gaussian laser beam with relatively low laser power for superficial photothermal laser ablation (SPLA) of the mucosa layer. In an ex-vivo sheep esophagus model, a single-session photothermal ablation using the proposed probe was successfully observed in epithelium and submucosa layers.

Methods

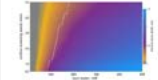
> Experimental setup used for chemical etching studios with an 8.2- μ m-core optical fiber⁶. The core of the distal fiber tip was etched with buffered hydrofluoric (BHF) acid for 90 minutes at room temperature and then cleaned thoroughly in distilled water. During the etching process, the fiber was surrounded by 40% HF acid diluted with water in the ratio 1:4 (acid:water). A small amount of toluene was added to prevent evaporation of the HF acid.

> The cone was measured ~260 μ m height for an etching time of 90 min. (scale bar = 50 μ m).

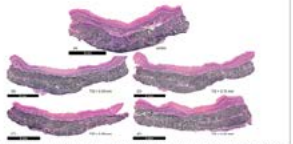
Objective

Experimental setup using chemically etched fiber optics for superficial photothermal laser ablation at 1505-nm: Schematic (A), photograph of the setup including the XYZ linear translation optomechanical stage for precise control of the fiber probe along the ex-vivo tissue surface (B), close-view of the optical fiber probe (C).

Results



A map of the estimated laser-induced thermal injury depth in the esophagus model. White solid line marks the tissue vaporization threshold (tissue temperature of 100 °C).



Microscopy images of ex-vivo sheep esophagus that were stained with nitroblue tetrazolium chloride. (A) Control. (B) 300 mW. (C) 350 mW. (D) 400 mW. (E) 450 mW. The measured thermal injury depths were approximately 0.54 mm, 0.59 mm, 0.70 mm, and 0.93 mm, respectively. The surface scanning speed was set to 1 mm/s and the total scanning time was 6 s. TID = thermal injury depth.

Experimental measurements of cubic spline interpolation fittings. Red circles: mean values of thermal injury depth measurements. Black lines: standard deviation. A minimum of five laser ablation (~50 mW increments).

Conclusion

The results have demonstrated that the tapered fiber probe using 1505-nm infrared laser radiation was capable of providing both superficial and highly effective photothermal mucosa ablation of the sheep esophagus, ex vivo. This probe with further development may hold promise for endoscopic therapy of targeted-lesion sites during a single-session procedure. More interestingly, it may be possible to extend the same concept to other endoscopy therapy applications such as colon polyps.

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Acknowledgement

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Biophotonics and Optical Imaging Laboratory




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BOOK OF ABSTRACTS: POSTER SESSIONS

MCAA

Systematic Review of Polygenic Risk Scores for Type 1 and Type 2 Diabetes

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Recent studies have led to considerable advances in the identification of genetic variants associated with type 1 and type 2 diabetes. An approach for converting genetic data into a predictive measure of disease susceptibility is to add the risk effects of loci into a polygenic risk score. In order to summarise the recent findings, we conducted a systematic review of studies comparing the accuracy of polygenic risk scores developed during the last two decades.

We selected 15 risk scores from three databases (Scopus, Web of Science and PubMed) enrolled in a systematic review. We identified three polygenic risk scores that discriminate between type 1 diabetes patients and healthy people, one that discriminates between type 1 and type 2 diabetes, two that discriminate between type 2 diabetes patients and healthy people.

Prediction accuracy of polygenic risk scores was assessed by comparing the area under the curve. The actual benefits, potential obstacles and possible solutions for the implementation of polygenic risk scores in clinical practice were also taking into account. Develop strategies to establish the clinical validity of polygenic risk scores by creating a framework for the interpretation of findings and their translation into actual evidence, are the way to demonstrate their utility in medical practice.

Systematic Review of Polygenic Risk Scores for Type 1 and Type 2 Diabetes
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INTRODUCTION
 Diabetes mellitus is a complex and heterogeneous group of chronic metabolic diseases characterized by hyperglycemia, now recognized as one of the most important public health challenges of the 21st century. Diabetes is commonly divided into three subtypes. Type 1 diabetes (T1D), Type 2 diabetes (T2D) and Maturity-onset diabetes of the young (MODY).

The key mission of genomic medicine aims to predict the genetic disease risk on the basis of an individual's genotype. Identifying those in the population who are at greater risk of disease can result in an improvement in the healthcare.

Recent studies have led to considerable advances in the identification of genetic variants associated with type 1 and type 2 diabetes. An approach for converting genetic data into a predictive measure of disease susceptibility is to add the risk effects of loci into a polygenic risk-score (PRS). In order to summarize the recent findings, we conducted a systematic review of studies comparing the accuracy of polygenic risk scores developed during the last two decades.

METHODS
 The databases chosen for the literature search were Scopus, Web of Science and PubMed. The inclusion criteria were based on 12 items from the criteria SYRCA.

The AUC of the PRS was taken into account to assess the accuracy. Classified based on the diabetes subtypes to discriminate:

- T1D-FRS comparison.
- T1D-FRS comparison.
- T1D-FRS comparison, T1D vs T2D and T2D vs monogenic.

RESULTS

Table 1. Comparison of accuracy of T1D-FRS in discriminate diabetes subtypes assessed by the AUC.

Year	Author	PRS	Study	AUC PRS	Subtype
2009	Wheeler G.	T2D	41	0.87	Caucasian
2010	Chen R.	T2D	39	0.88	Caucasian
2010	Chen R.	T2D+T1D	39	0.89	Caucasian
2010	Panis C.	T2D	22	0.88	Caucasian
2010	Pava D.	T2D	22	0.88	Caucasian
2010	Pava D.	T2D	22	0.75	African American
2010	Pava D.	T2D	22	0.91	Asian American
2010	Stapp L.	T2D	67	0.88	Caucasian

Table 2. Comparison of accuracy of T2D-FRS in discriminate diabetes subtypes assessed by the AUC.

Year	Author	PRS	Study	AUC PRS	Subtype
2009	Chen R.	T2D+T1D	39	0.89	Caucasian
2010	Chen R.	T2D+T1D	39	0.87	Caucasian
2010	Panis C.	T2D+MODY	22	0.87	Caucasian
2010	Inghineta M.	T2D+monogenic	4	0.88	Italian

CONCLUSION
 We identified 15 studies that developed PRS, 12 to discriminate between patients and controls, and 3 to discriminate between T1D and diabetes subtypes. The accuracy of PRSs was assessed using the AUC, regardless of the source of data, panel of genes used and genotyping strategies. The actual benefits, potential obstacles and possible solutions for the implementation of polygenic risk scores in clinical practice were also taking into account.

PERSPECTIVES
 In order to have a better prediction of diabetes, the use of PRSs that combine clinical, environmental and genetic interactions must be used. It is necessary to develop strategies to establish the clinical validity of PRSs by creating a pipeline for the interpretation of findings and their translation into actual evidence. Taking into account all the factors for implementation is the way to demonstrate the utility of PRSs in medical practice.

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LIFE SCIENCES

Pipeline optimisation for RNA-seq lung cancer data using an update version of the human reference genome

The use of sequencing technologies requires streamlined workflows that make the most efficient use of instrument yield and exclude effects of variability. Several approaches have been created to deal with RNA-seq data analysis, and bringing them together into a functional pipeline is an important task that facilitates bioinformatics settings. Optimisation of existing pipelines to fit new environments and requirements, adding tools in order to enhance understanding of the results and the update to the last version of the reference genome must be done to keep the workflow solid and accurate. Besides the creation of a stable pipeline, the design of frameworks that apply a logic and user-friendly structure is the keystone to achieve the proposed goal.

To keep an existing pipeline for RNA-seq lung cancer data analysis updated, the recreation of the pipeline with its specific flags on bioinformatic tools was performed, then its optimisation was done by using the last version of the human genome (GRCh38) as a reference and an improvement of the organisational structure of inputs and outputs files, as a result of using loops in the script. The resulting framework is user-friendly, having potential use in next-generation sequencing data analysis projects. The results observed on correlation plots after the analysis, using the two pipelines on the same RNA-seq dataset, provide evidence that the use of a different version of the human reference genome can influence the estimation of gene expression levels, which subsequently impacts identification of differentially expressed genes.

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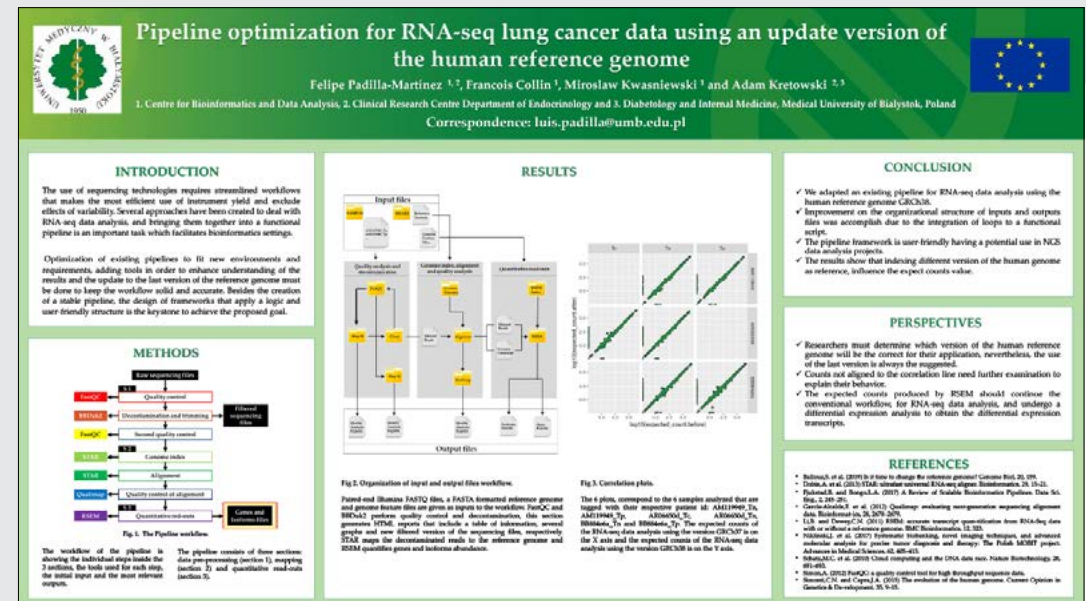
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LIFE SCIENCES

Systems biology-based drug repurposing to improve recovery from traumatic brain injury: in vitro and in vivo validation

Almost 50 million people suffer from traumatic brain injury (TBI) each year and over 40% TBI survivors develop long-term post-TBI complications such as epileptogenesis. To date, no treatment can alleviate progression of TBI sequelae, and identification of novel treatments to improve post-TBI outcome is major unmet medical need. Systems biology approach offers an unbiased approach to identify and select drugs for repurposing to enhance recovery from TBI by promoting neuroprotection and alleviating inflammation. This study aims at mitigating severity of pathological and functional post-TBI outcomes by using systems biology -identified drugs. Selected drugs were tested in cortical neuron-BV2 microglia co-cultures to assess in vitro efficacy of drugs on: (a) Neuronal survival using microtubule associated protein 2-based neuronal survival assay (b) Neuroprotective potential from nitric oxide mediated neurotoxicity using Griess reagent-nitrite assay (c) Anti-inflammatory effect using tumour necrosis factor alpha (TNF-alpha) ELISA. Our in vitro results revealed that neuronal survival was improved by 50 nM Trichostatin-A (73%, $p < 0.001$); 50 M Chlorpromazine (57%, $p < 0.001$) and 50 M Calpain inhibitor (47%, $p < 0.001$). Tranylcypromine and Geldanamycin did not improve neuronal survival. Levels of nitrite were reduced by 50 nM Trichostatin-A down to (28%, $p < 0.001$); 50 M Chlorpromazine to (81%, $p < 0.001$) and 50 M Calpain inhibitor to (-21%, $p < 0.001$). Tranylcypromine and Geldanamycin had no effect. Levels of TNF-alpha were reduced by 50 nM Trichostatin-A down to (-139%, $p < 0.001$); 50 M Chlorpromazine to (-41%, $p < 0.001$) and 50 M Calpain inhibitor to (-226%, $p < 0.001$). Our in vitro findings suggest that the systems biology approach helps identification of drugs that have a potential to treat post-TBI complications. In vivo experiments in a clinically relevant

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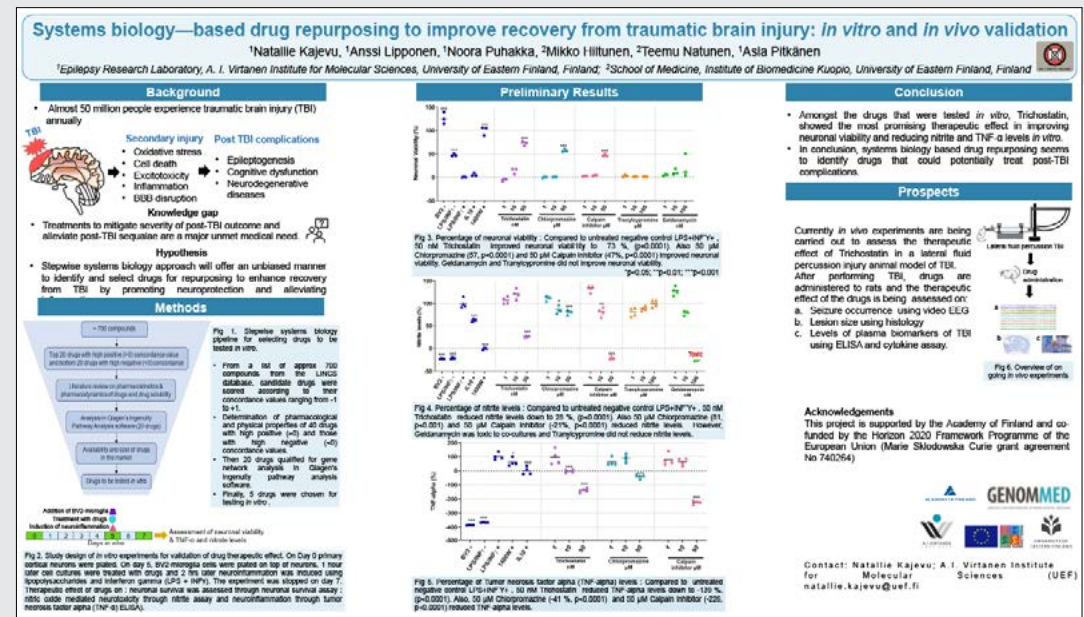
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Profiling of Mitochondrial Antioxidants in Oral Potentially Malignant Disorders and Oral Squamous Cell Carcinoma

Endogenous mitochondria-associated antioxidants such as Glutaredoxin 2 (GLRX2), Catalase, reduced Glutathione (GSH), Superoxide Dismutase 2 (SOD2), Glutathione Peroxidase (GPx), and Thioredoxin 2 (TXN2) protect mitochondria from Reactive Oxygen Species (ROS) and oxidative stresses. Excess ROS results in mitochondrial DNA damage as well as progressive respiratory chain dysfunction ultimately leading to carcinogenesis. We have profiled the expression of various mitochondrial antioxidants in Oral Potentially Malignant Disorders (OPMDs) and Oral Squamous Cell Carcinoma (OSCC). We reported expression of some mitochondrial antioxidants such as GPX1, GPX4, and catalase increases during the progression of OSCC. But some mitochondrial antioxidants such as PRX3, TXN2, GLRX2 and reduced Glutathione show increased expression. Although expression of SOD2 was found to be reduced in Stages II and Stages III of OSCC, but its expression increased in Stage IV. Similarly, these mitochondrial antioxidants showed differential expression in various Oral Potentially Malignant Disorders such as Oral Lichen Planus (OLP), Oral Leukoplakia (OL), and Oral Submucous Fibrosis (OSMF). There could be a complex interplay of these various mitochondrial antioxidants during progression of OPMDs and OSCC and delving insights into these molecular factors can help us in understanding the pathogenesis of the diseases.

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Profiling of Mitochondrial Antioxidants in Oral Potentially Malignant Disorders and Oral Squamous Cell Carcinoma

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Abstract
 Endogenous mitochondria associated antioxidants such as Glutaredoxin 2 (GLRX2), Catalase, reduced Glutathione (GSH), Superoxide Dismutase 2 (SOD2), Glutathione Peroxidase (GPx), and Thioredoxin 2 (TXN2) protect mitochondria from Reactive Oxygen Species (ROS) and oxidative stresses. Excess ROS results in mitochondrial DNA damage as well as progressive respiratory chain dysfunction ultimately leading to carcinogenesis. We have profiled expression of various mitochondrial antioxidants in Oral Potentially Malignant Disorders (OPMDs) and Oral Squamous Cell Carcinoma (OSCC). We reported expression of some mitochondrial antioxidants such as GPX1, GPX4, and catalase increases during progression of OSCC. But some mitochondrial antioxidants such as PRX3, TXN2, GLRX2 and reduced Glutathione show increased expression. Although expression of SOD2 was found to be reduced in Stages II and Stages III of OSCC, but its expression increased in Stage IV. Similarly, these mitochondrial antioxidants showed differential expression in various Oral Potentially Malignant Disorders such as Oral Lichen Planus (OLP), Oral Leukoplakia (OL), and Oral Submucous Fibrosis (OSMF). There could be a complex interplay of these various mitochondrial antioxidants during progression of OPMDs and OSCC and delving insights into these molecular factors can help us in understanding the pathogenesis of the diseases.

Altered Expression of Mitochondrial Antioxidants in Oral Squamous Cell Carcinoma

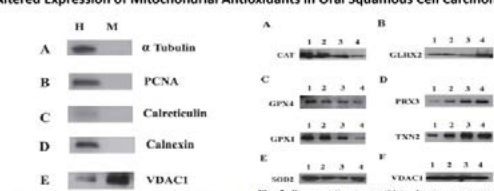


Fig. 1 Representative immunoblots using different protein markers to check the purity of the mitochondria isolated from oral tissue. "H" indicates total tissue homogenate and "M" indicates mitochondrial fraction isolated by differential centrifugation. (A) α -tubulin, cytosolic marker; (B) PCNA, nuclear marker; (C) calreticulin, endoplasmic reticulum marker; (D) calnexin, endoplasmic reticulum marker; (E) VDAC1, mitochondrial marker.

Comparative Evaluation of Mitochondrial Antioxidants in Oral Potentially Malignant Disorders

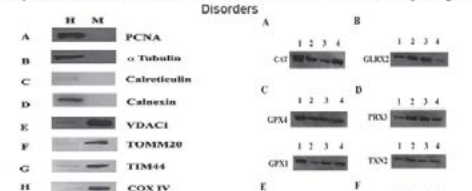


Fig. 2 Representative immunoblots showing expression levels of various mitochondrial antioxidants in various stages of Oral Lichen Planus, Oral Submucous Fibrosis, and Oral Leukoplakia. (A) Catalase, (B) GPX1, (C) GPX4, (D) Calnexin, (E) VDAC1, (F) Thioredoxin 2, (G) Superoxide Dismutase 2, (H) Cytochrome oxidase (COX IV) as a housekeeping protein in mitochondrial immunoblot analysis. Lane 1: control group; Lane 2: OSCC; Lane 3: OSCC Stage II; Lane 4: OSCC Stage IV.

Conclusion: We have done a comprehensive profiling of expression of various mitochondrial antioxidants in Oral Potentially Malignant Disorders (OPMDs) and Oral Squamous Cell Carcinoma (OSCC). Our results show: 1) There is an altered expression of mitochondrial antioxidants (Catalase, Glutathione Peroxidase, Superoxide Dismutase, Thioredoxin 2, and reduced Glutathione) during progression of Oral Squamous Cell Carcinoma as observed in various stages of OSCC. 2) These mitochondrial antioxidants also show differential expression in various Oral Potentially Malignant Disorders such as Oral Leukoplakia (OL), Oral Lichen Planus (OLP), and Oral Submucous Fibrosis (OSMF).

References: 1) Banerjee S, et al. Altered Expression of Mitochondrial Antioxidants in Oral Squamous Cell Carcinoma. Journal of Oral Science. 2017;59(3):439-446. 2) Banerjee S, et al. Comparative Evaluation of Mitochondrial Antioxidants in Oral Potentially Malignant Disorders. The Kurume Medical Journal. 2020;66(1):15-27.

LIFE SCIENCES

Academic Bullying, Trendy against Women during their Ph.D., Abused by their Supervisors. Abuses took place in 17 Countries

54 persons anonymously completed the survey about academic bullying, 75.9% identified themselves as victims of harassment. 64.8% of the respondents were women. Most of the episodes of abuse occurred during Ph.D. studies. The respondents mentioned the USA, Spain, Germany, France, UK, Italy, Denmark, Portugal, Austria, the Republic of Ireland, China, Netherlands, Latvia, Canada, Sweden, Chile, or Poland as the countries where either they witnessed or suffered abuses. 3% of the respondents noted two different countries as the place where abuses took place, the supervisor is considered the main abuser. The reasons behind the abuser were mainly the general environmental trend at the workplace, others associated the abuses with the responsibility, ethics, and hard work of the target. The reasons behind underreporting academic harassment were mainly fear damaging and jeopardizing their scientific careers, receiving bad reference letters, being badmouthed and blacklisted.

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Place of residence:

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COMING OUT THE CLOSET OF BULLYING
(An updated version)
Celia, Arroyo-López, Ph.D
MCAA General Assembly and Annual Conference, 5-7 March, 2021

1 BULLYING IN HIGHER EDUCATION
"A NON-VIOLENT, SOPHISTICATED, DANGEROUS UP-BEHAVIOR ADOPTED BY ACADEMICIANS TO 'WEAR AND TEAR' A COLLEAGUE DOWN EMOTIONALLY THROUGH UNJUSTIFIED ACCUSATION, HUMILIATION, GENERAL HARASSMENT AND EMOTIONAL ABUSE."
IT IS...
NORMALIZED AND SOCIALLY ACCEPTED
ASSOCIATED WITH HIGHER PRODUCTIVITY AND SUCCESS.
UNDERREPORTED; FEAR OF END OF YOUR CAREER, RETALIATIONS, REFERENCE LETTERS² & SABOTAGES
TARGETS CAN BE...
WOMEN, MINORITIES, IMMIGRANTS, ETHIC WORKERS...
YOU CAN BE THE NEXT

2 CASE OF STUDY
A FEMALE IMMIGRANT BULLIED DURING HER PH.D & POSTDOCTORAL STUDIES
2 DIFFERENT PROFILES OF AGGRESSORS
IRREGULAR CONTRACTS & INCOMES
PART-TIME APPOINTMENTS FORCED TO WORK FULL-TIME
FAKE CONTRACTS
WAGE DISCRIMINATION
PAID WITH UNEMPLOYMENT BENEFITS
RETALIATIONS
UNCOMPRESSIBLE CONTINUOUS DELAYS AND INACTIVITY
NAME-CALLING, GASLIGHTING, BLAMES
TASK ARBITRARILY CHANGED
ABILITIES UNDERMINED
PHYSICALLY AND SOCIALLY ISOLATED
LETTER OF EXPECTATION BASED ON LIES
SABOTAGED TO ACCOMPLISH TASKS
WITHHOLDING DATA & MATERIALS
BAD-MOUTHED AMONG REFEREES
AUTHORSHIP USURPED, ARTICLES BLOCKED AT THE JOURNAL

3 CONTACTS MADE IN SEARCH FOR HELP AND SUPPORT
Directors of School and Research Students', Workers' and Postdoctoral Unions
Human Resources, University Ombudsmen, Dean, Chancellor, Committees of Ethics
EthicsPoint site
Scientific Journals and generalist newspapers
National and International Labour and Social Security Inspectorates
European Parliament, European Ombudsmen...
RESULTS
7 ... TO SUBMIT THE PHD
2 PUBLICATIONS BLOCKED AT THE JOURNAL
2 AUTHORSHIP USURPED
3 PUBLICATIONS IN A DRAWER
HEALTH ISSUES
CAREER BLOCKED
WASTE OF PUBLIC FUNDS AND LIVES
BECOMING AN ACTIVIST
1 132/2020 PETITION ON THE CREATION OF A SPECIFIC EU ORGAN TO PREVENT HARASSMENT IN ACADEMIA⁴
Accepted


4 CONCLUSIONS
✓ A common agreement about bullying in academia is needed.
✓ Specialized organs seemed to be biased, oriented to protect institutions from litigation rather than protect victims.
✓ Bullies are self and socially perceived as untouchable.
✓ Letters of recommendation and scientific publication are used to blackmail or sabotage victims' careers.
✓ Victims suffer mental health issues, miss job opportunities, suffer career terminations and economic losses.
INITIATIVES
Support the Petition No 1132/2020 on the creation of a specific EU organ to prevent harassment in academia⁴
ACKNOWLEDGMENTS
MCAA, MCAA German/Swiss/Austria Chapter, Ruben Riosa & MCAA CorinnWö.
REFERENCES & CREDITS
Woman screaming image by Shutterstock artist
1. Arroyo-López, C. (2020). *Wife, 41-47*.
2-3. Arroyo-López, C. (2020). *Marie Curie Harassment 20*.
4. Petition No 1132/2020 by Celia Arroyo-López (sponsored) on the creation of a specific EU organ to prevent harassment in academia

LIFE SCIENCES

Malus genome editing via CRISPR/Cas9 to develop sustainable and pest-free apples

Most commercial apples are sensitive to pathogens causing fire blight (*Erwinia amylovora*) and powdery mildew (*Podosphaera leucotricha*). Pest control requires pesticides and eradication with a negative impact on the environment and huge economic losses. Resistant varieties were produced by classical breeding via the transfer of resistance genes (R-genes), but the resulting plants have low quality, and the resistance can be easily overcome by pathogens. The suppression of susceptibility genes (S-genes) could be used to confer durable resistance but past attempts to knock-down S-genes were mostly transgenic-based thus limiting the commercialisation of resulting plants. This project aims to use CRISPR/Cas9 to develop pest-free apples by simultaneously mutating S-genes responsible for the susceptibility to *E. amylovora* (*Dipm1*, *Dipm4*, *Hpm1*) and *P. leucotricha* (*Mlo19*). Gene mutation is obtained through the delivery of a vector containing the genome-editing machinery combined with a heat-inducible recombination system to permit the elimination of vector DNA from the genome of plants after editing. Here we present the results obtained from plants where vector delivery was achieved using *Agrobacterium*. More than 50 Gala and Golden Delicious lines with no evident growth deficiencies were regenerated and confirmed for T-DNA integration by PCR. Single-pass sequencing analysis indicated that about 80 % of such lines were edited in at least one of the four target genes and 30 % had all the four genes edited. The analysis of the Illumina sequencing data revealed that editing events were mostly constituted by small deletions (<6 bp). Edited plants will be scored for fire blight and powdery mildew resistance and then will be submitted to heat-treatments for the


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FONDAZIONE EDMUND MACH

Malus genome editing via CRISPR/Cas9 to develop sustainable and pest-free apples

GJAROLA Valentino, PIAZZA Stefano and MALINOJ Mickael
Research and Innovation Centre, Fondazione Edmund Mach, Italy



2021 MCAA ANNUAL CONFERENCE
5-7 March 2021

Project objectives

Develop multi-resistant apples via CRISPR/Cas9 mediated knock-out of S-genes. Mutations on apple DNA left in the genome of edited plants by combining CRISPR/Cas9 to different DNA delivery and post-editing recombination systems.

Develop an apple protoplast-to-plant regeneration procedure to use DNA-free methods for genome editing.

Background

Pathogen-resistance genes (R-genes) in wild apple (Malus sylvestris) and fire blight (Erwinia amylovora) represent natural barriers to apple cultivation. Past control requires pesticides and eradication with a negative impact on the environment and huge economic losses.

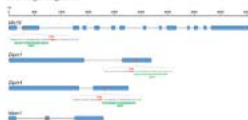
The transfer of resistance genes (R-genes) from wild apple to classical breeding promoted to improve disease resistance but resulting plants have low quality and the adjustment is not desirable.

The suppression of susceptibility genes (S-genes) in sensitive varieties could confer durable and sustainable resistance to apple by gene targeting to knock-down S-genes were mostly transgenic-based thus limiting the commercialisation and subsequent of resulting plants.

CRISPR/Cas9 mediated genome editing can be used to knock-out multiple genes with high efficiency and transiently. This approach has the application of this technology to apple is still limited.

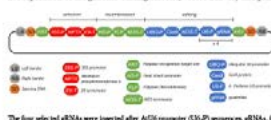
Experimental Procedures and Results

1. Design of gRNAs



Single guide RNAs (gRNAs) were designed to target the second exon of *Dipm1*, *Dipm4*, *Hpm1* and *Mlo19* genes. *Dipm1* and *Dipm4* are known to confer resistance to *E. amylovora*. *Hpm1* is a known S-gene for *P. leucotricha*.

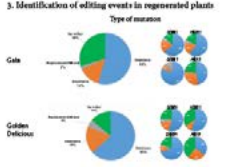
2. Preparation of the genome-editing cassette, vector delivery and plant regeneration



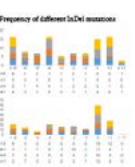
The four guide gRNAs were inserted after *AtR1* promoter (35S::gRNA) sequence. gRNAs, Cas9, PspCas9(FRT), loxP-flanked recombination system were assembled between the recombination target (RT) sites. The resulting vector cassettes are inducible recombination system to the CRISPR/Cas9 editing machinery to permit the best screened gene editing sites within the vector DNA from the plant genome. *Agrobacterium tumefaciens* was used to deliver the editing vector to apple 'Gala' and 'Golden Delicious' leaf materials. After transformation leaves were transferred to 300 plants supplemented with kanamycin and hormones for regeneration.

3. Identification of editing events in regenerated plants


Type of mutation



Frequency of different InDel mutations



Distribution of transcribed mutations in selected lines



More than 50 Gala and Golden Delicious lines with no evident growth deficiencies were regenerated and confirmed for T-DNA integration by PCR. About 300 bp genomic sequence surrounding the gRNA target sites was amplified by PCR and sequenced. Single-pass sequencing was used to identify edited plants which were then analyzed by Illumina pair-end sequencing to precisely characterize editing events. Single reads indicated that about 80% of obtained lines were edited in at least one of the four target genes and 30% had all the four genes edited (data not shown). Illumina sequencing data (2x150, see above) revealed that editing events were mostly constituted by small deletions (<6 bp) followed by single nucleotide insertions. None of the lines analyzed showed indels. Sequence variations in all the four S-genes. However, other lines showed indels/nucleotide mutations in the *P. leucotricha* Mlo19 gene and in at least one of the *E. amylovora* S-genes (*Dipm1*, *Dipm4* or *Hpm1*). Characteristic, i.e. the presence of more than two adjacent editing events per plant was also observed in about one-third of the lines analyzed (7 out of 32).

Future Perspectives

Edited plants will be scored for disease resistance and genetic stability. The copy number of the editing vector in plants with suppressed resistance to powdery mildew and fire blight will be determined after heat treatments by T-DNA PCR to confirm the elimination of vector DNA from the plant genome.

Available and new methods for plant regeneration from protoplast will be tested to establish a procedure for DNA-free genome editing in apple.

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MCAA

LIFE SCIENCES

Quantitative and rapid molecular MRI of tumor apoptotic response to virus-based therapy

The highly invasive nature of many cancer types and the toxicity of most systemic chemotherapies represent significant challenges for cancer therapies. An especially promising approach for overcoming these challenges is the use of oncolytic viruses that selectively kill only cancer cells while sparing the surrounding normal cells. Non-invasive imaging of the underlying molecular processes is an essential tool for achieving the full potential of this biological therapeutic, enabling the assessment of viral spread, innate immunity, and therapeutic response. However, previous methods for imaging oncolytic virotherapy had poor sensitivity and specificity or required the administration of radioactive or metal-based contrast-materials. Here, we present a new non-invasive method for quantitative and rapid molecular imaging of oncolytic virotherapy treatment response. The method combines proton exchange-based MRI with deep learning, yielding quantitative biomarker maps of protein and lipid/macromolecule concentrations as well as intracellular pH. The benefit of using this method was demonstrated in a glioblastoma mouse brain tumour model, where it allowed the early detection of apoptotic response to oncolytic virotherapy, in excellent agreement with histology and immunohistochemistry findings. The method was translated to clinical scanners and produced reproducible and quantitative 3D molecular maps of the human brain across 3 different imaging sites. The acquisition of 4 biomarker volumetric maps was achieved in less than 12 min; thus, it could potentially be incorporated within routine imaging sessions. The method is directly applicable to a wide range of additional pathologies where the intracellular pH or the lipid/metabolite concentration is altered, including stroke and neurological disorders.

Author(s):

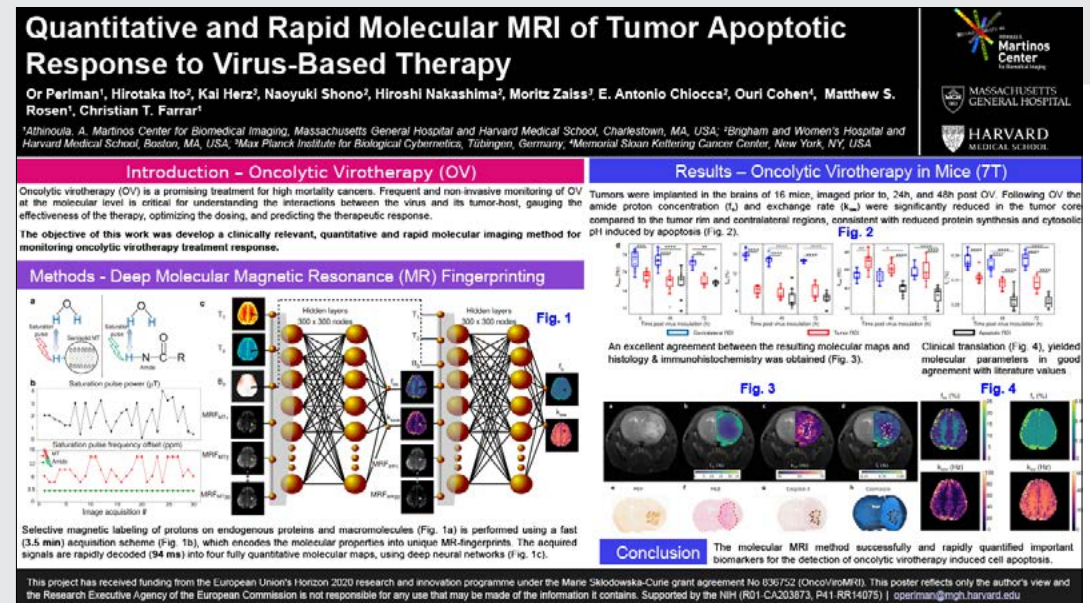
Or Perلمان

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Towards targeted protein degradation in bacteria in bacteria

Targeted protein degradation is a new paradigm in drug discovery; it uses chimeric molecules termed “degraders” to cause proteolysis of target proteins. This way, degraders can target even “undruggable” proteins in a more efficient way than classical drugs that rely on inhibition of protein activity. Degrader drugs show improved resistance against mutations, and have the potential to be powerful antibiotics, but have not yet been established to work in bacteria. We describe our approach to designing degrader molecules that exploit the bacterial ClpXP protease. Bacterial degraders could be used to study and control protein function or to develop new antimicrobial strategies.

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Towards targeted protein degradation in bacteria

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¹Structural Biology Group, Biological and Chemical Research Centre, ²Laboratory of Peptides, Department of Chemistry, University of Warsaw, Poland; *https://gorna.uw.edu.pl

Abstract

Targeted protein degradation is a new paradigm in drug discovery - it uses chimeric molecules termed “degraders” to cause proteolysis of target proteins. This way, degraders can target even “undruggable” proteins in a more efficient way than classical drugs that rely on inhibition of protein activity. Degrader drugs show improved resistance against mutations, and have the potential to be powerful antibiotics, but have not yet been established to work in bacteria. We describe our approach to designing degrader molecules that exploit the bacterial ClpXP protease. Bacterial degraders could be used to study and control protein function or to develop new antimicrobial strategies.

What are degraders?

Degraders or Proteolysis-Targeting Chimeras (PROTACs) are drugs acting through targeted protein degradation [1]. They are bifunctional molecules recruiting the bound protein to a proteolytic system, which results in removal of the targeted protein by hijacking proteostasis mechanisms.

Why are degraders interesting?

The increase in antimicrobial resistance is not sufficiently met by the development of new antibiotics. This global healthcare crisis could result in 10M annual deaths [2].

How to degrade proteins in bacteria?

A robust, conserved proteostasis system in bacteria employs ssrA, which rescues stalled ribosomes and appends ssrA degrons to the faulty proteins. This system is the most promising for exploitation in universal degraders.

The ssrA tag is an efficient degron recognized by an adaptor protein (e.g. SspB) that directs proteins to an AAA protease (e.g. ClpXP) [3].

Our strategies for recruiting a protease through direct binding of adaptor (SspB) protease (ClpP)

Testing ssrA variants for use in SspB-binding degraders

Increase thermotolerance of degen-tagged eGFP confers ANNDEN-dependent binding to SspB. The 100% increase of ssrA G:am. slightly lowers it.

In vivo degradation of degen-tagged eGFP is boosted by SspB for ANNDEN-containing tags and depends on sufficient degen length. ssrA tags respond to SspB in a weakly.

Testing ClpX-binding degraders in E. coli

Our degrader prototype (ssrA-ABE fusion) [4].

Expression of a degrader (ABE) containing a ssrA head protein (B) targeting an essential process lowers E. coli culture density in correlation with target length.

Inactivated expression of a degrader (Unactivated ABE fusion) lowers E. coli colony density.

Next, target validation by quantitative mass spectrometry and pull-downs on degraders followed by mass spectrometry.

Summary

- ✓ The critical requirement is met: colocalization seems sufficient for degradation in bacteria (shown in cis for eGFP appended with degrons).
- ✓ Colocalization may be achieved by recruiting SspB, and there is a role for degen length. SspB-binding degraders might be co-degraded with the target and are thus sub-optimal.
- ✓ Purified reconstituted protease system (ClpXP + SspB) is active and available for compound screening and various functional and structural studies with ligands.
- ✓ Peptide modules and degraders binding to ClpXP system are being tested and optimised.
- ✓ First degraders against essential proteins show bacteriostatic or bactericidal properties.

Plans and challenges

- The dimeric stereochemistry (linker length, stiffness and geometry) must be optimized for optimal degrader efficiency. Structural models should help understand the stereochemistry.
- De novo search for protease ligands might be needed to find a compound with a sufficiently high affinity e.g. to ClpX or ClpP. It might be necessary to screen a large compound library.
- Degraders must be optimized for solubility and penetration into the bacterial cell.
- Candidate degraders should be tested in other bacteria to establish species specificity and on human cell/animal models to test for toxicity.

European Union European Union European Union European Union

The “Proteolysis-targeting strategies in bacterial systems for functional studies of proteins and improvement of antibiotics” project is carried out within the FIRST TEAM programme of the Foundation for Polish Science (2014-2018) by the European Union under the European Regional Development Fund under the grant agreement number IPN-CM-04-04-00-00-0001/18-01



LIFE SCIENCES

Carotenoid composition in buah merah (Pandanus conoideus Lam.), an indigenous red fruit of the Papua Islands, Indonesia

At this conference, I would like to present research findings of my research group that have been published recently in Journal of Food Composition and Analysis (2021), 96, 103722. We studied the composition of carotenoid pigments from the fruit of the Pandanus plant, Pandanus conoideus Lam. monocot, or locally named as red fruit, indigenous to the Papua Islands, was investigated. By chromatographic and spectrometric analyses using RP-HPLC with C18 and C30 columns and gradient elution, NMR, MS/MS and FT-IR, eight κ -end group carotenoids, 5,6-diepicapsokarboxanthin, capsorubin, capsanthin, cryptocapsin, 13-cis capsorubin, and three capsanthin epoxides were identified. Additionally, β -cryptoxanthin 5,6-epoxide, α - and β -cryptoxanthin, α - and β -carotene, and other carotenoid-type compounds were found. The κ -end group carotenoids in red fruit comprised 92 % in relative contents and was much higher than that in red chili pepper, Capsicum annum L., at 64 %. These findings indicate that red fruit has similar carotenoids to those of red chili pepper, not only in composition but also in the content. Xanthophyll cycle carotenoids antheraxanthin and violaxanthin are the precursors of capsanthin and capsorubin, respectively. However, these precursors, as well as the precursors of zeaxanthin, were not detected in the chromatographic separation and identification in the extracts of red fruit, although they were detected in red chili pepper under the same analytical conditions used. Therefore, in red fruit, those precursors are likely not responsible for the biosynthesis of κ -end group carotenoids.

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Why is it interesting to us?

- ✓ Giant fruit (length: 86-110 cm, girth: 30- cm)
- ✓ Monocotyledon
- ✓ Distributed indigenously in Maluku, Papua-Indonesia, and Papua-New Guinea
- ✓ Deep red color: for food colors and medicine by locals

HIGHLIGHT

- ✦ Composition of carotenoid from red fruit (*Pandanus conoideus* Lam.) was studied.
- ✦ Seven κ -end group carotenoids were separated and identified from red fruit.
- ✦ κ -end group carotenoids in red fruit comprised 92% in the relative contents.
- ✦ A similar carotenoid composition was found between red fruit and red chili pepper.

Carotenoid composition in buah merah (*Pandanus conoideus* Lam.), an indigenous red fruit of the Papua Islands, Indonesia

Brotosudarmo, T.H.P.^{1*}, Heriyanto^{2,3}, Gunawan⁴, I.A., Fuji, R., Maoka, T., Shioi, Y., Kamebun, K.M.B.⁵, Limantara, L.⁶
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LIFE SCIENCES

Long-term exposure to industrial air pollution is associated Inflammatory Rheumatic Disease Risk in UK Biobank

Studies have shown that long-term exposure to outdoor air pollution is associated with cardio-respiratory morbidities and mortality. Little is known about its link with autoimmune diseases. We undertook a population case-control analysis of the UK Biobank cohort (n=502,492), selecting participants who were diagnosed with the inflammatory rheumatic disease between the years 2001 and 2018. We assigned each individual an annual mean pollution exposure (in ug/m³) that corresponded to their place of residence and follow-up time (maximum of 17 years). Data on air pollution exposure was sourced from the UK Department for Environment, food, and rural affairs. Our findings show long-term exposure to Sulphur dioxide (SO₂) is associated with an increased risk for systemic vasculitis (OR: 1.064, 95%CI:1.004-1.128), rheumatoid arthritis (OR: 1.037, 95%CI:1.011-1.064), and systemic lupus erythematosus (OR: 1.097, 95%CI:0.994-1.211), this is after adjusting for lifestyle risk factors and deprivation status. This association was again seen with markers of inflammation and disease activity. A 1ug/m³ increase in annual SO₂ was linked with 2% (95% CI: 1.9 - 2.4), 0.6% (95% CI: 0.5-0.7) and 0.7% (95% CI:0.6- 0.8) increase in C-reactive, neutrophil and monocyte levels in UK Biobank population, irrespective of disease status. Given that Sulphur dioxide is the leading source of industrial emissions, curbing down its release could contribute to lowering incidence of autoimmune diseases, both in the UK and Europe.

Author(s):

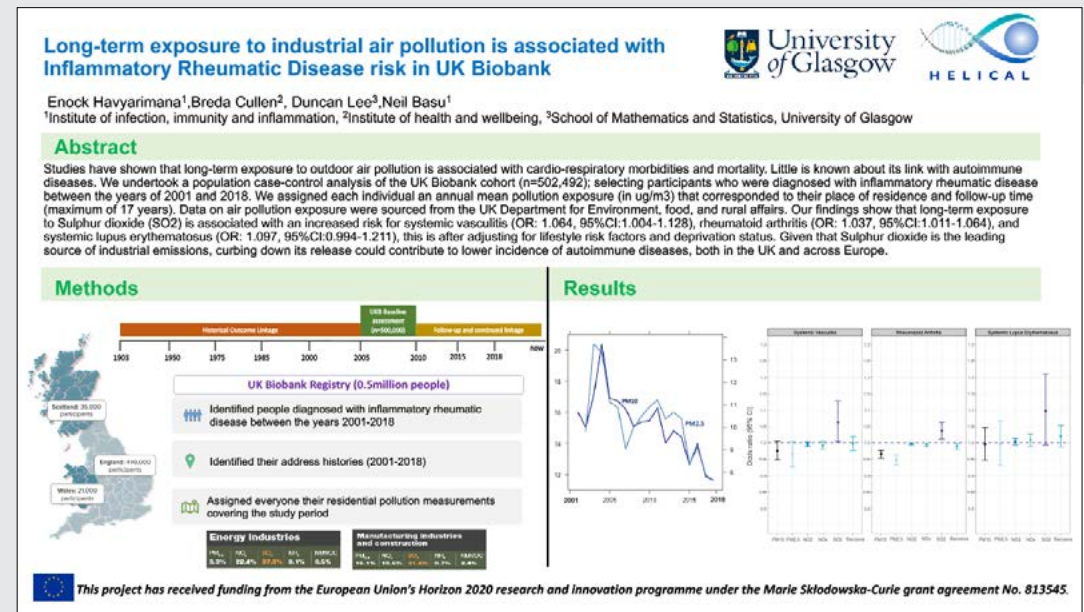
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LIFE SCIENCES

Point-of-care microfluidic PCR platform for fast detection of SARS-COV-2 and discrimination from other respiratory diseases

Covid-19 pandemic is a threat all over the world. PCR (polymer chain reaction) is the gold standard for SARS-COV-2 diagnostics. Today, almost all analyses require sending patient samples to core lab facilities. The related sample logistics cause diagnostic delays of at least several hours. Point-of-care testing approaches have the potential to revolutionise medicine as they offer immediate access to diagnostic parameters facilitating and accelerating treatment and isolation. The basic prerequisite for this is the speed and complete automation of pathogen detection.

In Fraunhofer IMM, we have built-up a so-called Panplex system that ensures sample-to-answer in a time as short as 30 minutes. What is unique about this system compared to the point-of-care diagnostic platforms on the market is that it allows up to 27 different detection reactions running in parallel by pre-storing 9 trays of assay reagents in the processing cartridge. To analyse the infection status, only a nasopharyngeal swab is necessary to be transferred in the sample container. After the container is placed on the microfluidic cartridge, the sample processing can be started. This step as well as the subsequent measurements are carried out completely automatically in the system developed for this purpose. The processed data are made available to the attending physician for a diagnosis.

As the SARS-COV-2 mutation is popular more and more, the typical applications of our system can be applied to multiple mutations test and discrimination in parallel. Multiplex tests, e.g., SARS-CoV-2 + Influenza + RSV are easily achievable on our platform as well. The platform also enables instant testing of entire disease panels (e.g., respiratory viruses, sexually transmitted diseases, MRSA and related resistance markers).

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Microfluidic Real-time PCR Platform for Ultra-fast Detection of SARS Coronavirus

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BACKGROUND
Polymerase chain reaction (PCR) is a commonly used technique and gold standard for medical diagnosis of many infectious diseases, e.g. current corona pandemic. Real-time PCR systems available on the market so far have some limitations. In addition to high-cost of the instrument, the PCR test requires at least 30 minutes. In order to be able to directly track the route of transmission and effectively suppress the spread, simpler, faster, and more accurate tests are needed to speed up the necessary preventive quarantine and medical treatment decisions. At the same time, if the cost per test is significantly reduced, it will be economically possible that vulnerable and high-risk groups of people can be regularly examined to prevent infection.

RESULTS
Fraunhofer IMM has developed a smart and reliable real-time PCR system based on the moving liquid plug concept (Fig. 1). This system enables an ultra-fast PCR capable of running 30 cycles with real-time fluorescence detection in as fast as 6 minutes. The module consists of an injection molded disposable polycarbonate chip that has an inlet to load the PCR reaction reagents and the meandering fluidic channels with a closed air reservoir at the distant end. The chip is placed above three individually controlled heating zones (Fig. 2). During operation, these zones are constantly heated to the required processing temperatures of the PCR, and the PCR reagent plug is moved back and forth with a syringe pump pushing against a dead end. Excitation is enabled by high power LEDs combined with filters. A conventional USB camera allows detection of the plug position inside the chip. In addition, the camera is also capable of real-time measurement of fluorescent dyes or probes in the plug (Fig. 3). This new concept omits the cyclic heating and cooling process used in common PCR machines and, hence, leads to an exceptionally fast temperature change in the PCR reactions. The reliability of the demonstrator has been proven in several R&D projects. Recently we test SARS-Cov (including SARS-COV-2) on this system, the result shows that while maintaining ultra-fast speed, the sensitivity is not inferior to the commercial instrument (Fig. 4).

Acknowledgment
This project is funded by the Carl Zeiss Foundation and the Ministry of Science, Education and Culture of Rhineland-Palatinate.

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Brunklau, S.; Hansen-Hogge, T. E.; Erves, J.; Höth, J.; Jung, M.; Latta, D.; Strobach, X.; Winkler, C.; Reiz-Lehner, M.; Dresch, K. S.; Electrophoresis, 33(2012)3222, doi:10.1002/elps.201200259

Figure 1 Ultra-fast real-time PCR prototype
Figure 2 Functional schematic of qPCR chip
Figure 3 Fluorescence evolution in a moving plug
Figure 4 Comparison between the MicroPlug qPCR system and a commercial qPCR instrument (Bio-Rad CFX96) by detecting SARS-CoV

LIFE SCIENCES

Evidence accumulation rate:
a neurophysiological signature indexing
response speed deficits in the ageing brain

Older adults differ vastly in their capacity to maintain healthy cognition in the face of advancing age and age-related neuropathological conditions. The concept of neurocognitive reserve refers to the phenomenon where older adults who have been exposed to enriched environments (EE) can maintain high levels of cognitive performance despite compromised markers of brain health. Individual differences in the preservation of cognitive function are indexed by the efficiency at which an individual can respond to visual information (response speed). The response speed is the outcome of several neurophysiological computations including early target selection, perceptual decision formation, and motor preparation and we are yet to understand which accounts for the close association between this fundamental facet of visual attention and neurocognitive health. Here, we isolate neurophysiological eight metrics indexing these discrete processing stages using extracranial human electroencephalography (EEG) in a cohort of 72 older and younger comparison human participants. Critically, we show that the efficiency at which an individual can formulate a perceptual decision, indexed by the build-up rate of sensory evidence accumulation influence response speed both directly, and indirectly by alerting subsequent neurophysiological processes (decision thresholds and motor preparation). Consistent with the notion that the evidence accumulation process might index a critical aspect of brain health, we found that high EE individuals did not rely on the evidence accumulation process to facilitate fast responding. We show that reliable estimates of evidence accumulation rate can be obtained in under six minutes, and we suggest that neural metrics of evidence accumulation

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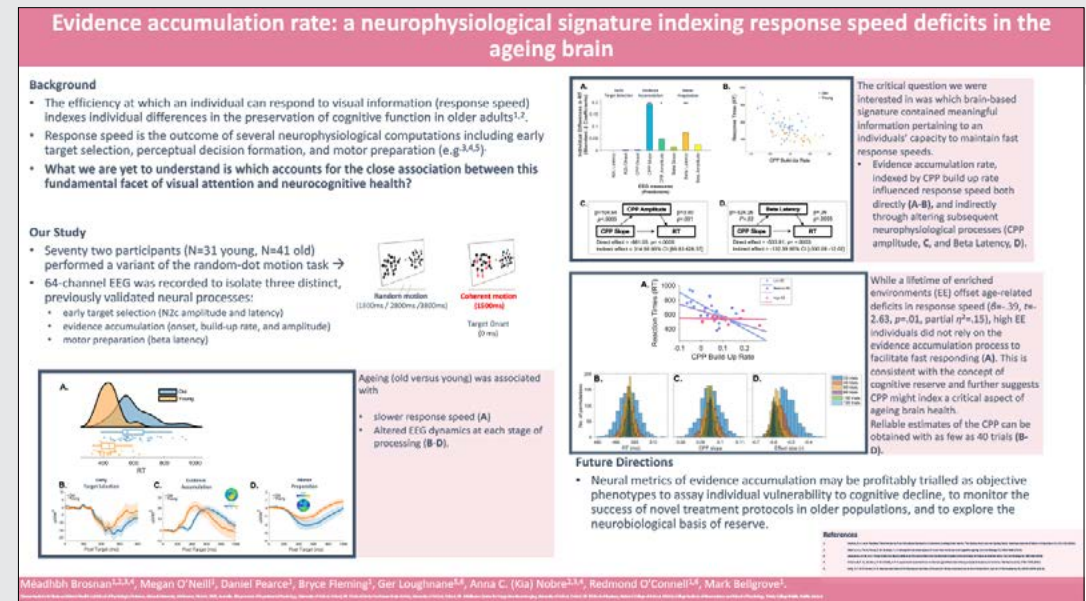
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may be profitably trialled as objective phenotypes to assay individual vulnerability to cognitive decline, to monitor the success of novel treatment protocols in older populations, and to explore the neurobiological basis of the reserve.

LIFE SCIENCES

Evaluation of epithelial to mesenchymal transition in peritoneal functional decline and cardiovascular disease

Prior preliminary results in peritoneal dialysis (PD) patients demonstrated that mesothelial cells are able to undergo mesothelial to mesenchymal transition (MMT) by differential genomic reprogramming, correlating with local damage of the peritoneum and a final ultrafiltration failure.

Therefore, our main goal is to find biomarkers with prediction and diagnosis value of all PD-induced MMT changes and CVD outcomes in PD effluents, biopsies or plasma from a longitudinal retrospective study of a European patient cohort of CKD, PD and HD; correlating them with cardiovascular disease (CVD), systemic inflammation, patient outcome and animal models along with IMPROVE-PD consortium.

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Evaluation of the epithelial to mesenchymal transition in peritoneal functional decline and cardiovascular disease

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GLORIA DEL PESO,^{1,3} RAFAEL SELGAS,^{1,3} MANUEL LÓPEZ CABRERA^{1,2,3}

FUNDED BY HORIZON2020 No 812694, PID2019-110132RB-00, AEI/10.13039/501100011033, Center for Molecular Biology "Severo Ochoa", Nicolás Cabrera 1, 28049, Madrid, Spain, IIdiPAZ, Pedro Rico 6, 28029, Madrid, Spain

BACKGROUND By 2030, **kidney failure** will be the leading cause of death of 20 mio. people. **Fatal systemic exitus** such as **cardiovascular diseases (CVD)** is suspected to arise from a long-term peritoneal dialysis (PD)-induced **local damage** and **genetic reprogramming** of mesothelial cells (MCs), a.k.a **mesothelial to mesenchymal transition (MMT)**. These unique cells, lining the abdomen, possess the power of **ultrafiltration (UF) of urine** from the bloodstream, which is **lost** by conversion to two phenotypes: an initial reversible, pro-angiogenic, pro-inflammatory **epithelioid (EPI)**, and a further non-reversible fibroblast-like **non-epithelioid (NOEPI)**. The latter correlates with UF, **technique failure** and possibly to transfer to hemodialysis (HD).

GOALS
Unravel the combination of **BIOMARKERS**,
with **PREDICTIVE & DIAGNOSTIC** value of the
PD-INDUCED MMT,
TECHNIQUE FAILURE
& **CVD**
in a European cohort of patients
and *in vitro* & *ex vivo* models

METHODS
a) RT-qPCR in MCs b) MAGPIX[®] in Effluents
c) IHC-P in Biopsies d) 3D-Transwell Assays e) Machine Learning

RESULTS
EPI and NOEPI have different correlation patterns and morphology; PD patients can be comparatively* classified into inherently short- (upregulators 1) or long- (downregulators 2) endures upon protein secretion within times. These groups are preliminary verified by Machine Learning.

CONCLUSIONS
We found:
1) a set of 12 PREDICTOR/DIAGN. biomarkers of the MMT-PD-CVD.
2) Types of PD patients:
40% LONG-TERM (> 5 YEARS)
60 % SHORT-TERM (< 4 YEARS)+CVD
We will:
3) Replicate results in mice models and biopsies.
4) Predict types of CVD outcomes.

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LIFE SCIENCES

Prediction error signalling and neuronal mismatch in the medial prefrontal cortex

The mismatch negativity (MMN) is a key biomarker of automatic deviance detection believed to emerge from two cortical sources. Primarily, the auditory cortex (AC) encodes spectral regularities and detects frequency-specific deviances. Subsequently, the prefrontal cortex (PFC) encodes more abstract representation, which allows detecting contextual changes of potential behavioural relevance. Nevertheless, the precise location and time asynchronies between neuronal correlates underlying the frontotemporal network remain unclear. Our study recorded neuronal spiking- and local field potential activity across the rat medial PFC (mPFC) while passively presenting the oddball paradigm to find mismatch signals to sequence violations under a regular stimulation context. To separate prediction errors from repetition suppression effects of mismatch responses, we played two no-repetition control sequences: the many-standards and cascade paradigms. Whereas mismatch responses in the auditory system are mainly induced by stimulus-dependent effects, we found that auditory responsiveness in the mPFC was driven by unpredictability, yielding context-dependent, comparatively delayed, more robust, and longer-lasting mismatch responses mostly comprised of prediction error signals. This clearly different composition discarded that mismatch responses in the mPFC could be simply inherited or amplified from the auditory system. Conversely, it is more likely that the mPFC exerts top-down influences on the AC since the mPFC showed flexible and potent predictive processing, capable of suppressing redundant input more efficiently than the AC. The time course of the mismatch responses in the spiking- and local field potential activity of the combined AC and mPFC coincided with the time course of the large-scale MMN-like signals reported in the rat brain. This finding, thereby, links automatic deviance detection at the microscopic, mesoscopic, and macroscopic levels.

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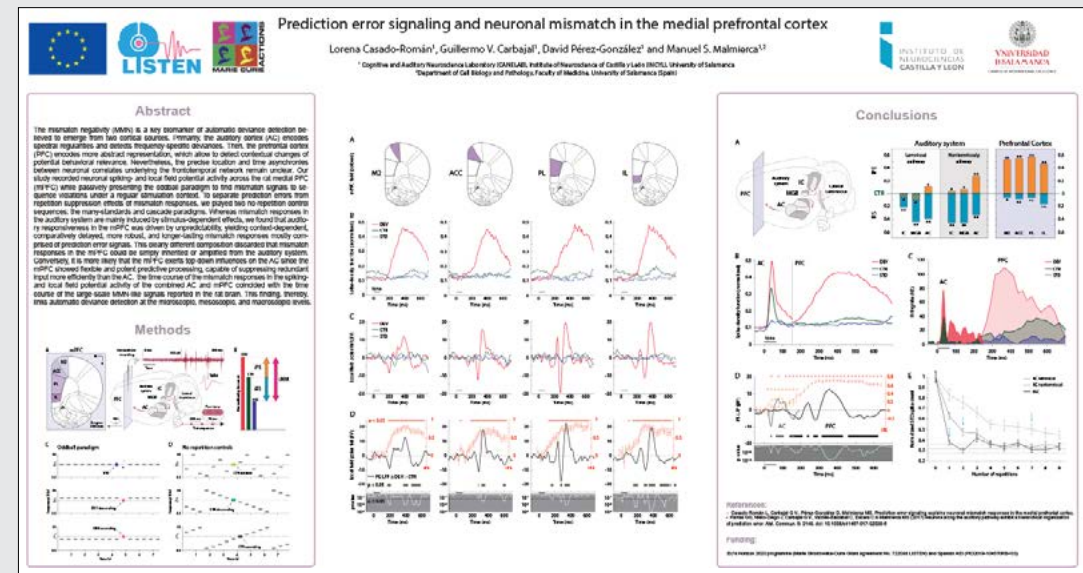
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Reference: Casado-Román L, Carbajal G V., Pérez-González D, Malmierca MS. Prediction error signaling explains neuronal mismatch responses in the medial prefrontal cortex. Deouell L, editor. PLoS Biol. 2020;18: e3001019. doi:10.1371/journal.pbio.3001019



MATHEMATICS

Model Reduction and Numerical Simulation using Moment Models


Classical fluid equations are inaccurate for a wide range of scientific and engineering applications, e.g., fusion energy reactors as well as atmospheric re-entry of spacecraft and shallow flows. The technological progress of these applications requires advances in modelling and simulation. The equations pose severe simulation challenges, due to their high dimensionality and a wide range of time scales.

The high dimensionality can be addressed by an extended set of fluid quantities via moment models. To deal with the stiffness of the equations, asymptotic-preserving time discretisation methods need to be used. Since both the stiffness and the accuracy of a kinetic model depend on space and time, the design of numerical methods incorporating fully integrated space-time adaptivity is crucial to allow these methods to be efficiently used in real-world applications.


In this action, we address the following objectives:

- (1) Develop fully space-time adaptive numerical schemes
- (2) Implement software for space-time adaptive simulations
- (3) Compute numerical solutions for real-world applications

The results of the project will constitute a major step forward in the development of technologies for next-generation reactors and space exploration efforts.



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FOR FLUID DYNAMICS

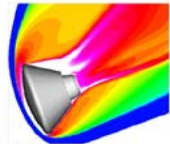
Model Reduction and Numerical Simulation using Moment Models

Julian Koellermeier
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Abstract

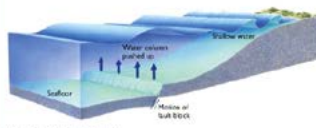
Classical fluid equations are inaccurate for a wide range of scientific and engineering applications, e.g., fusion energy reactors as well as atmospheric reentry of spacecraft and shallow flows. The equations pose severe simulation challenges, due to their high dimensionality and a wide range of time scales. The high dimensionality can be addressed by an extended set of fluid quantities via moment models. To deal with the stiffness of the equations, asymptotic-preserving time discretisation methods need to be used. Since both the stiffness and the accuracy of a kinetic model depend on space and time, the design of numerical methods incorporating fully integrated space-time adaptivity is crucial to allow these methods to be efficiently used in real-world applications. In this action, we address the following objectives:
 (1) Develop fully space-time adaptive numerical schemes; (2) Implement software for space-time adaptive simulations; (3) Compute numerical solutions for real-world applications. The results of the project will constitute a major step forward in the development of technologies for next generation reactors and space exploration efforts.

Application 1: Atmospheric Reentry



Relevant scale is the Knudsen number
 $Kn = \frac{\text{mean free path length}}{\text{reference length}} = \frac{\lambda}{L}$
 Model equation is the Boltzmann Transport Equation
 $\frac{\partial f}{\partial t} + v_i \frac{\partial f}{\partial x_i} + \sigma_{ij} \frac{\partial^2 f}{\partial x_i \partial x_j} = S(f)$

Application 2: Shallow Flows



Relevant scale is the shallowness
 $S = \frac{\text{water height}}{\text{wave length}} = \frac{h}{\lambda}$
 Model equation is the incompressible Navier-Stokes Equation
 $\nabla \cdot \mathbf{u} = 0, \quad \Delta \mathbf{u} + \mathbf{u} \cdot \nabla \mathbf{u} = -\frac{1}{\rho} \nabla \cdot \sigma + \mathbf{g}$


Ansatz: Hermite Expansion [1, 2]

Expand unknown distribution function in Hermite series around equilibrium Maxwellian
 $f(t, \mathbf{x}, \mathbf{v}) = \sum_{\alpha} f_{\alpha}(t, \mathbf{x}) \phi_{\alpha} \left(\frac{\mathbf{v} - \mathbf{v}_0}{\sqrt{\theta}} \right)$
 Leads to hyperbolic moment model
 $\partial_t \mathbf{u} + A \partial_x \mathbf{u} = S, \quad \mathbf{u} = (\rho, v, \theta, f_1, f_2, \dots, J_M)^T$

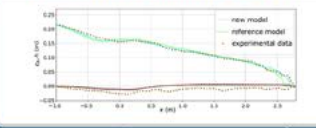
Ansatz: Legendre Expansion [3]

Expand unknown horizontal velocity profile in Legendre series around mean velocity
 $u(t, x, z) = u_m(t, z) + \sum_{\alpha} \alpha_{\alpha}(t, z) \phi_{\alpha} \left(\frac{z - h_0}{h} \right)$
 Leads to hyperbolic Shallow Water Moment Model [4]
 $\partial_t \mathbf{u} + A \partial_x \mathbf{u} = S, \quad \mathbf{u} = (h, u_m, \alpha_1, \alpha_2, \dots, \alpha_M)^T \in \mathbb{R}^{M+2}$

Results: Hypersonic channel flow [2, 5]



Results: Shallow sediment transport [6]



Next challenges:

- (1) derivation of hybrid moment models
- (2) development of adaptive numerical schemes
- (3) simulation of application tests

This research has been supported by the European Union's Horizon 2020 program under the Marie Skłodowska-Curie grant agreement no. 888596 and the Research Foundation – Flanders (FWO) under the FWO grant no. 0880.212.840.

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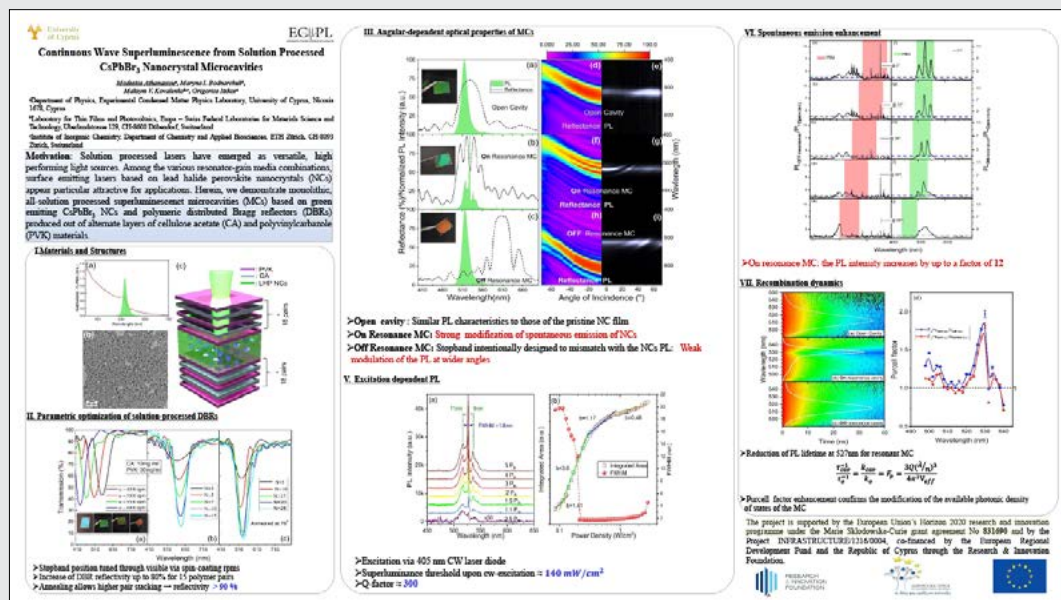


PHYSICS

Continuous Wave Superluminescence from Solution Processed CsPbBr₃ Nanocrystal Microcavities

Solution-processed lasers have emerged as versatile, high-performing light sources. Among the various resonator-gain media combinations, surface-emitting lasers based on lead halide perovskite nanocrystals (NCs) appear particularly attractive for applications. Herein, we demonstrate monolithic, all-solution processed superluminescent microcavities (MCs) based on green-emitting CsPbBr₃ NCs and polymeric distributed Bragg reflectors (DBRs) produced out of alternate layers of cellulose acetate (CA) and polyvinylcarbazole (PVK) materials.

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PHYSICS

Higgs Hidden-Dark Sector Physics

The Standard Model (SM), while extremely powerful as a description of the strong, electromagnetic and weak interactions, does not provide a natural candidate to explain Dark Matter (DM). Theoretical, as well as experimental, motivation exists for the existence of a hidden or dark sector of phenomena that couples either weakly or in a special way to SM fields. Hidden sector or dark sector states appear in many extensions to SM to provide a particular candidate for dark matter in the universe or to explain astrophysical observations. If there is such a family of Beyond the Standard Model (BSM) particles and interactions, they may be accessible experimentally at the present and future high-energy Colliders.

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Hidden-Dark Sector Physics

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Summary

The Standard Model (SM), while extremely powerful as a description of the strong, electromagnetic and weak interactions, does not provide a natural candidate to explain Dark Matter (DM). Theoretical as well as experimental motivation exists for the existence of a hidden or dark sector of phenomena that couples either weakly or in a special way to SM fields. Hidden sector or dark sector states appear in many extensions to SM to provide a particular candidate for DM in the universe or to explain astrophysical observations. If there is such a family of Beyond the Standard Model (BSM) particles and interactions, they may be accessible experimentally at the present and future High-Energy Colliders.

- Nature seems well described by **Standard Model** theory.
- We already know we are missing most of it...**Dark Matter!**
- We study it through the **Hidden-Dark Sector!**

Dark Matter Experiments

indirect detection

production at colliders

Standard Model h ψ, χ **Hidden sector**

$SU(3)_C \times SU(2)_L \times U(1)_Y$ $U(1)_{DM}$

$\Delta C = \frac{1}{2} P^3 \text{ or } F^3$

LHC **ATLAS** **CMS**

https://www.mdpi.com/journal/symmetry/special_issues/Hidden_Dark_Sector_in_High_Energy_Physics

PHYSICS

Roles of electron-phonon interactions in the phase transitions of rare-earth nickelates

Rare-earth nickelates (RNiO₃) are unusual among transition metal oxides due to their negative charge-transfer electronic configuration of Ni 3d⁸L (L = oxygen ligand hole) in their paramagnetic metallic state. Most RNiO₃ undergo metal-insulating (MIT) and antiferromagnetic (AFM) transitions at low temperatures accompanied by breathing distortion in their crystal structure. This leads to bond disproportionation where expanded NiO₆ octahedra (Ni 3d⁸, no holes on oxygen, and high spin) alternate with collapsed NiO₆ octahedra (Ni 3d⁸L₂, an average of two holes on oxygen, and low spin), resulting in an AFM ordering vector of (¼,¼,¼) pseudocubic. This close relationship between breathing distortion and electronic configurations suggests that electron-phonon couplings (EPC) lie at the heart of the MIT in RNiO₃. Recent progress in both theory and instrumentation have allowed the use of high-resolution resonant inelastic x-ray scattering (RIXS) to probe this EPC. Here, we use high-resolution RIXS to track the momentum- and temperature-dependent evolution of the EPC across the phase transitions of RNiO₃ films for R = La, Nd, and Sm. We find that the EPC of the phonon mode related to the breathing distortion of NdNiO₃ reduces significantly by ~20% at the onset of its MIT just below 180 K. This drastic change of EPC is consistent with the polaronic condensation model, which proposes that the MIT of RNiO₃ is caused by the condensation (melting) of polaronic carriers at low (high) temperatures. Furthermore, we also find that the momentum-dependent EPC of insulating NdNiO₃ becomes maximum at half of the AFM ordering vector, signifying a strong magneto-elastic coupling in this material. These results reveal the intimate connection between electronic, lattice, and spin

Author(s):

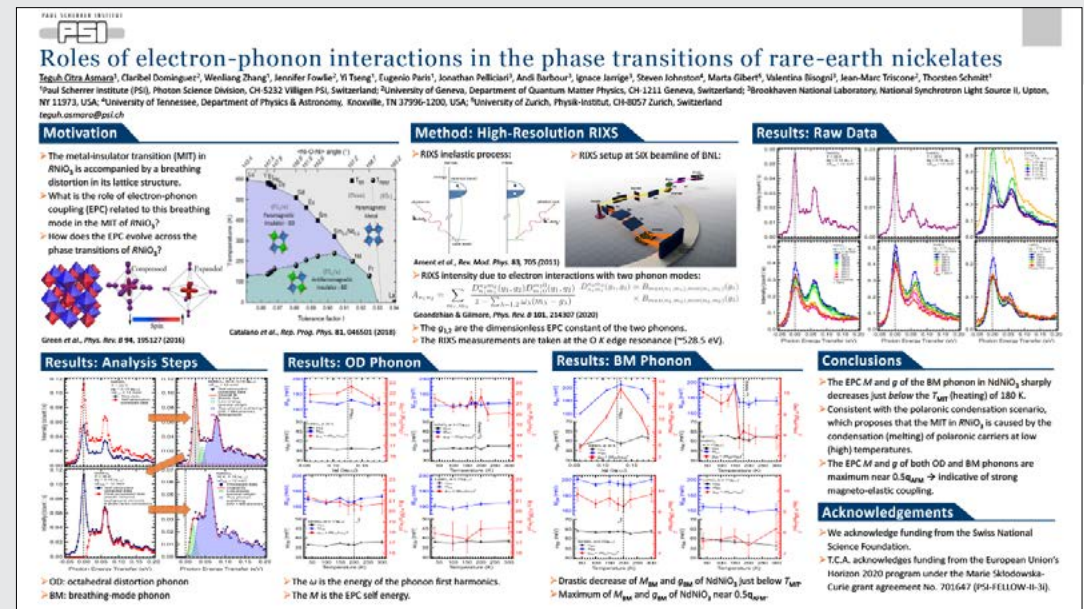
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degrees of freedom in RNiO₃ that can be exploited for future advanced functional devices, and demonstrate the capability of high-resolution RIXS in probing and quantifying the electron-phonon interactions in advanced materials.



PHYSICS

Numerical modelling of the large stretch of adhesive fibrils seen in PSA tapes

In a pressure-sensitive adhesive (PSA) tape, adhesion rupture is accompanied by fibrillation and cavitation of the adhesive layer. In this study, we propose a multiscale picture of adhesion rupture, involving a better understanding of fibrillation. Numerically, a single fibril is modelled using the Finite element method using axis-symmetric boundary conditions. An Arruda Boyce, hyper-elastic constitutive law is employed to tackle the large strains associated with the computer modelling of the layer of adhesive. Our final aim is to connect the macroscopic work of fracture and the dissipative properties of the PSA material through a proper description of the large strain deformation of the interface.




PSL
SORBONNE
UNIVERSITÉ

Numerical Modeling of Large Stretch of Adhesive Fibrils

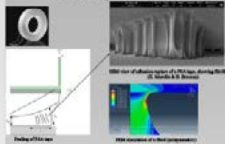
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ESPCI
PARIS

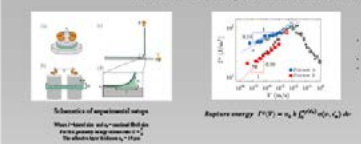
PSA Tapes And Fibrils



PSA Tapes and Fibrils

Microscopic images of PSA tapes and fibrils.

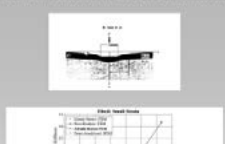
Factor of 5 in Experimental Measurement



Schematic of experimental setup

Rupture energy $\Gamma(P) = \gamma_0 + k \int_0^P \sigma(P) dP$

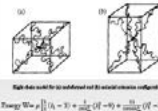
Thin films and small strain calculations



Thin film schematic

Stress-strain graph


Arruda Boyce Constitutive Relation



Arruda Boyce Constitutive Relation

When $\mu = \text{Shear Modulus}$
 $I_1 = \text{Invariant of 1st Cauchy Green Tensor}$
 Locking stretch λ_m

FEM Implementation of modeling single fibril



Schematic of fibril in PSA

Boundary condition in shear

Min stress distribution in fibril

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PHYSICS

Atmospheric pressure synthesis of metallic particles, via radiofrequency plasma, starting from various bulk metals

To understand the importance of nano and micro metallic particle research topic, one has to be aware of the increase in the global market for nanoparticles from USD 12.35 Billion in 2017 up to USD 25.26 Billion by 2022 [1]. A similar trend is foreseen for micro metallic particles [2].

Hence, our study presents a radiofrequency (RF) plasma jet that operates in argon at atmospheric pressure, suitable for the generation of both nano- and micro-metallic particles from bulk metals (i.e. iron, copper, titanium, zinc or nickel). The main advantage of our synthesis method is its attractiveness which derives from the fact that the metal source is the RF-powered electrode itself, hence, making this physical method a more environmentally friendly and non-toxic technique. For further details see the already published results regarding the synthesis of copper particles using this method [3, 4].

Diverse analysis techniques (Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDS), etc) reveal that nano and micro-oxide metallic particles can be obtained, regardless of the used metal. During the synthesis, and depending on the metal, nanoparticles with diameters between 20 and 50 nm or microparticles with sizes of 1 to 3 μm were obtained. Electrical and optical emission spectroscopy measurements show the complexity of the synthesis process and point out to the key parameter to control the synthesis process, namely the RF power.

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Atmospheric pressure synthesis of metallic particles, via radiofrequency plasma, starting from various bulk metals
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Introduction
Metallic particles have specific applications dictated by their particular properties: composition, size, shape, surface area, structure, etc.
There are many synthesis methods, which are organized into synthesis-type categories, and the methods that are using phase "bulk-up" are nowadays preferred. This is due to the better control of the particles critical properties. The phase "bulk-up" synthesis methods make use of the condensation in gas or liquid phase in order to obtain the desired metallic particles.
Our contribution presents a RF atmospheric plasma jet able to produce metallic particles by means of a gas phase plasma method. As metallic source zinc, copper, titanium, stainless steel and nickel bulk materials were used. We obtained particles with different properties regarding their composition, size and shape, depending on the used precursor and plasma parameters.

Materials and methods
RF Gas (Argon)
2x2cm Si (100)-oriented substrates
13.56MHz RF plasma jet 10-40 [1, 2, 3]
MAGNETIC ROTARY POWERING electrode
Continuous mode
- p = 1 atm
- P_{RF} = 5-200 W
- Q = 1000 sccm Argon (purity 5%)
- t = 1h
- Substrate-to-nozzle distance: 6 mm
- Nozzle diameter: 2 mm

Deposits photos - OES spectra

SEM & EDS investigations

Conclusions
The synthesis of metallic particles from different metals, using a RF plasma jet at atmospheric pressure, was proven.
Depending on the metal type, the particles start forming at various RF powers. For some metals (Cu or Ti) only spherical particles were obtained, however for other metals (Zn, stainless steel or Ni) we obtained also other shapes (i.e. nanorods, etc). On top of the metals, the particles contain traces of O, C or N.

Acknowledgements
We acknowledge the financial support of the project Nucleu 2015-2022 at INFILPR, LAPLAS VI, 16N/08.02.2019.

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[1] A. Lazea-Stoyanova, A. Vlad, A. M. Văduș, V. S. Teodorescu and G. Dinulescu, "Synthesis of Copper Particles by Non-thermal Atmospheric Pressure Plasma Jet", Plasma Processes and Polymers, Vol. 12, Issue 8, 536, 2015.
[2] V. Marascu, A. Lazea-Stoyanova, C. Silanici, G. Dinulescu
[3] "The influence of plasma operation parameters on synthesis process of copper particles at atmospheric pressure", Plasma Processes and Polymers, Volume: 15, Issue: 1, Article Number: e1700091, 2018.
[4] Scientific report no 1 for project "A NEW METHOD FOR METALLIC PARTICLES SYNTHESIS AT ATMOSPHERIC PRESSURE - COLD PLASMA APPROACH", 2015-2017, Project Director Dr. A. LAZEA-STOYANOVA <http://doi.org/10.1002/plpp.201500001>

PHYSICS

Environmentally smart materials

During the last years, concepts like sustainability, circular economy, human health, and environmental changes have been extensively discussed and consequently included as strategies in the European Green Deal. Moreover, the COVID-19 pandemic has shown us that every aspect regarding sectors like economy, health, environment, should be reviewed, rethought, and reformed for the reliable development of our future society. In this context, one of the key solutions which enables us to adapt to the continuous environmental changes is to develop materials with smart and increasing levels of functionalities, well-known as multifunctional smart materials. In the era of everything is getting smarter (smart cars, smart cities, smart buildings) emphasises should be on smart materials. The work to be presented refers to the latest published studies performed together with my colleagues on environmentally friendly smart materials.

Author(s):

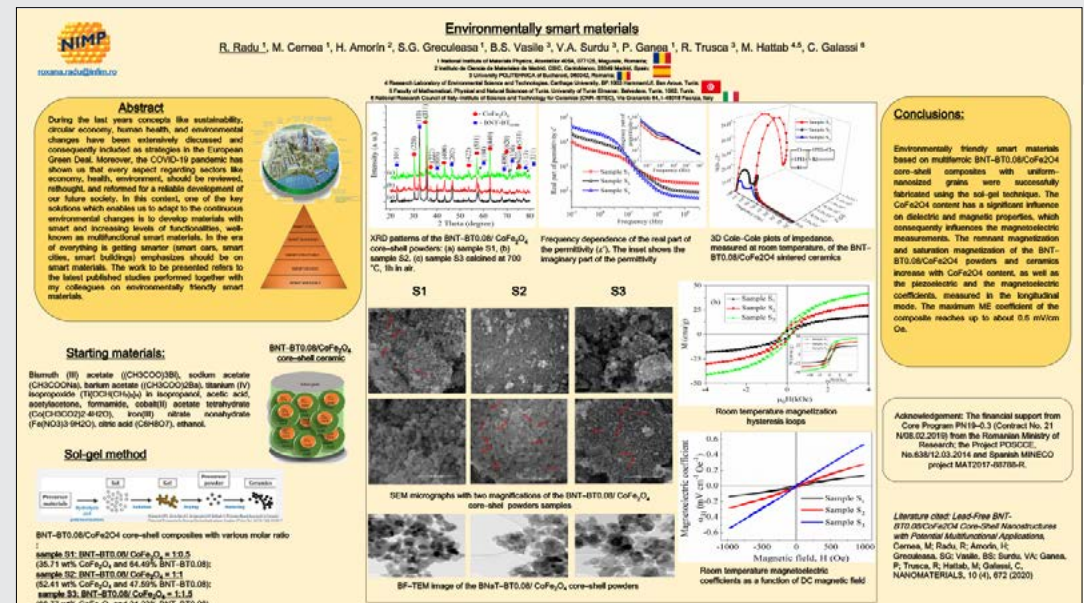
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PHYSICS

A landslide granular phase transition

Landslides appear in many different forms and sizes, from devastating debris flows to overly optimistic sandcastles. A familiar and well-documented feature of all landslides is the positive correlation between volume and mobility. Larger landslides have a greater potential to reach farther. Here we explore the low volume limit and find a surprising negative correlation between volume and mobility. A decrease in volume leads to an increase in mobility. In a series of experiments, we systematically vary the landslide volume to reveal a transition between these two regimes.

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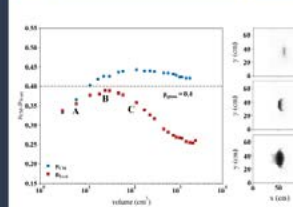

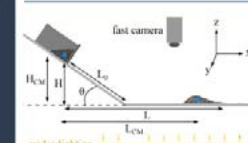
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A landslide granular phase transition

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<p>Abstract</p> <p>Landslides appear in many different forms and sizes: from devastating debris flows to overly optimistic sandcastles. A familiar and well-documented feature of all landslides is the positive correlation between volume and mobility. Larger landslides have a greater potential to reach farther. Here we explore the low volume limit and find a surprising negative correlation between volume and friction. A decrease in volume leads to an increase in mobility. In a series of experiments, we systematically vary the landslide volume to reveal a transition between these two regimes.</p>	<p>Methods</p> <p>The main experimental observable is the normalized landslide runout, the effective friction μ. This is the height from which the landslide falls divided by the horizontal distance it runs out. Here we use two definitions (see Fig. 2 for parameter definitions)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>front runout</p> $\mu_{front} = \frac{H}{L}$ </div> <div style="text-align: center;"> <p>center of mass (CM) runout</p> $\mu_{CM} = \frac{H_{CM}}{L_{CM}}$ </div> </div> <p>μ_{front} is more common in the landslide literature and easier to measure, but the μ_{CM} is more amenable to theory³</p>	<p>Results</p>  <p>Fig. 3. Left: Effective friction vs. initial volume for ~500 um diameter grains. Right: Intensity (normalized) images during landslide motion t = 0.5s after the junction is first reached, with A, B and C corresponding to the data with the same notation on the left. As the volume increases, the landslides become more dense and less gaseous in appearance. The change in appearance corresponds with the non-monotonic behavior of the effective friction.</p>
<p>Introduction</p>  <p>Fig. 1. (a) Herjangnes landslide. (b) Schematic of experiments.</p> <p>Landslides are a complex natural phenomenon with a host of factors that can influence their behavior. The most essential elements, however, are much fewer in number. A granular material, such as rocks and/or sand, slides and flows down an inclined slope onto a less inclined or flat region where it finally stops. We seek universal features of landslides by focusing on these elements and perform analog laboratory experiments with grains released on an incline to run out onto a flat section.</p>	 <p>Fig. 2. Schematic of experimental setup. The grains are released from a rectangular box by a sliding plate gate at the front. The released grains slide down a flat glass plate ($L_x = 42.5$ cm) inclined at an angle θ to the horizontal and eventually come to rest on a level flat glass plate. The motion and final position of the grains are observed with a fast camera. By illuminating the grains from below and calibrating the illumination intensity, the height distribution and thus center of mass (blue circle) can be accurately determined. Typical runout distances are $L = 30-100$ cm.</p>	<p>Conclusion</p> <p>Using a simple experimental setup we have observed a novel non-monotonic relationship between two measures of effective friction, μ_{front} and μ_{CM}, with respect to initial landslide volume. We have provided preliminary evidence for an explanation that this non-monotonicity is a manifestation of a granular gas-liquid phase transition. Further experiments, including DEM simulations, are required to substantiate these claims.</p>
<p>Acknowledgements and References</p> <p>R.T.C. gratefully acknowledges the support of a MarieSkłodowska-Curie Action Individual Fellowship (MSCA-IF).</p> <p>¹H. Murinaki et al. <i>Landslides</i> 1(4), 277-288 (2004)</p> <p>²S. Paree, E. Aharonov, <i>Frontiers in Physics</i> 3, 00 (2015)</p> <p>³H. Andreotti, Y. Forterre, D. Pouliquen, <i>Granular media: between fluid and solid</i> (Cambridge University Press, 2011)</p>		



SOCIAL SCIENCES, HUMANITIES AND ARTS

Traumatic mortality in late human evolution from an integrated non-invasive bioarchaeological and taphonomic perspective

Traumatic death affects our daily life, but how did traumatic mortality affect human behaviour from an evolutionary perspective? TRAUMOBITA aims to understand how traumatic mortality among prehistoric humans shaped our behaviour during the Late Pleistocene to the Middle Holocene. Confirming that how we died had an enormous influence on our ancestors and represents an enormous change in how we understand human societies. Traumatic mortality has an enormous influence among non-human primate social life and environmental adaptations, but not much effort has been dedicated to the study of how such deaths affected the behavioural development of modern humans. Identifying and understanding how humans died is essential for determining the role of violence in shaping our behaviour and, it seems, an equally important factor among our primate relatives. The goal here is to study these behavioural adaptations on the basis of two analytical sections. The first will comprise analysis of human fossils from different key sites from Lake Turkana (Africa): the region is known as the cradle of humankind and the archaeopaleontological record is an essential one for reconstructing our own evolutionary path. The second will be dedicated to the integration of forensic science into taphonomic study of human fossils, in addition to the development of new non-invasive methods based on virtual analysis and experimentation. The data obtained from this approach will facilitate the identification and the characterisation of traumatic mortality in the archaeological record, in order to integrate our results into the study of past societies to determine which behavioural changes are related to traumatic mortality. The research is an integrated analysis that guarantees the interdisciplinary and innovative nature of the project. Little is known on the role of traumatic mortality in human behavioural adaptations, and therefore the project will represent a major advance.

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#MCAACON2021

The role of traumatic mortality in late human evolution from an integrated non-invasive bioarchaeological and taphonomic perspective

Edgard Camarós
Robert Foley
Marta Mirazón-Lahr

Call: H2020-MSCA-IF-2019
Type of action: MSCA-IF-EF-ST
Proposal number: 895712
Proposed acronym: TRAUMOBITA
Activity: EF-ST-SOC
Supervisor: M. Mirazón-Lahr/ Tutor: R. Foley
More information:
<https://cordis.europa.eu/project/id/895712>

The research: Scope, objectives and hypothesis

Mortality is a major fact in evolution and ecology, and the timing and causes of death can drive many aspects of adaptation. In prehistoric hunter-gatherer societies the relation between resource availability and disease, particularly in childhood, has been seen as a major mortality parameter. However, there is increasing evidence in the archaeological record and among non-human primates that traumatic causes of death (i.e. predation, accidents and inter- and intra-specific violence) play a significant role in demography and adaptive response during our late evolution. The aim of TRAUMOBITA is to understand how such traumatic deaths among prehistoric humans shaped our behaviour, and to answer the following research questions: i) How can traumatic mortality be characterized? ii) Why did traumatic mortality occur? iii) Does traumatic mortality change according to social and environmental change? and iv) Did traumatic mortality affect human behavioural adaptations?

A challenging hypothesis would be that traumatic mortality caused by inter- and intra-specific predation and violence is a major evolutionary factor in human evolution shaping modern and complex behaviours. Focusing on a range of sites across Lake Turkana (Kenya) (Figure 1), TRAUMOBITA aims to investigate traumatic mortality among prehistoric hunter-gatherers from East Africa and answer these questions. An exceptional sample of human fossils dating from the Late Pleistocene to the Holocene will be analysed from a bioarchaeological and taphonomic non-invasive perspective, linking archaeology and forensic science, to understand the role and factors of traumatic mortality in prehistoric human behavioural adaptations.

Little is known about this among past societies and the proposed research will represent a major advance in our understanding of the role of violent death in late human evolution.

Why Lake Turkana?

West Turkana, Kenya, is one of the key regions for answering questions regarding the late evolution of human universal characters and major behavioural adaptation events of *Homo sapiens*, our species (1). For instance, clear evidence of inter-personal/group conflict and violence has been inferred among hunter-gatherers at Nataruk (Kenya) during the early Holocene (2) (Figure 2). In this sense, other sites in West Turkana dating from 50,000 to 10,000 years ago (late Pleistocene to early Holocene) have enormous potential for providing insights about the behavioural context of the emergence of modernity.

Evidence of bone injury

Figure 1. Location of some of the sites involved in the present research

Figure 2. Individual KNW-WT 71251 (male), facing down with evidence of two projectile cranial trauma and blunt force trauma on the knees (modified after Mirazón-Lahr et al. 2016)

(1) Foley et al. (2016) Major transitions in human evolution. *Phil Trans R Soc B* 371: 20150229.
(2) Mirazón-Lahr et al. (2016) Inter-group violence among early Holocene hunter-gatherers of West Turkana. *Nature* 529: 394-398.

UNIVERSITY OF CAMBRIDGE

SOCIAL SCIENCES, HUMANITIES AND ARTS

Group enmity syndrome and/or
Homonationalism? The articulation of racism
and homophobia in the values of the Europeans


Social science identified racism and homophobia as two of the important challenges for contemporary societies. Group-focused enmity (GFE) and homonationalism represent two key concepts that are opposed concerning their understanding of the relationship between racism and homophobia. In this presentation, we seek to analyse this relationship of racism and homophobia in the population of Austria, France, Spain and the Netherlands, based on data from the European Values Study (EVS) 2017. Methodologically we constructed a structural and articulated typology, combining correspondence and classification analysis. Our results lead us to partially confirm the adequacy of both GEF and homonationalism to explain the relationship between racism and homophobia. On the one hand, racism was higher than homophobia in all groups. On the other hand, we obtained a moderately racist and little homophobic group, another racist and homophobic, and only in a very minority group were their trends towards a genuinely inclusive society.

Homonationalism or Group Focused Enmity (GFE)

On the relation of racism and homophobia
in the values of the Europeans

Authors: Leon Freude & Núria Vergés Bosch

GFE	Homophobia and racism correlate positively. Homophobia and racism correlate negatively.
Homonationalism	There is homonationalist groups combining racism and homophobia.
Where	Europe: Austria, France, Spain, Netherlands
When	EVS2017, Fieldwork: 2017-2018
How	6 racism and 3 homophobia related variables Structural and articulated typology through - Multiple Correspondences Analysis - Cluster Analysis
Results	Homophobia and racism correlate as in GFE Racism is stronger than homophobia as in homonationalism Racism structures (divides) the samples as in homonationalism No clearly homonationalist group can be found, but groups neither fit into GFE



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SOCIAL SCIENCES, HUMANITIES AND ARTS

Mirror installations

At the exhibition 'Spazi Aperti at the Accademia di Romania a Roma', the author developed an installation, based on a photograph from Rome and a mirror. During the pandemic crisis, the exhibition has been redone in Bucharest using images from Maramures county, a place full of tradition in Romania.

The poster presents the installations and places them in the context of mirror installations, be them from the Italian 1960s kinetik art as present in the Novecento museum in Milan, the arte povera in the contemporary art museum next to the Accademia di Romania a Roma, or Olafur Eliasson's installations as in Baroque in Vienna, also at the time of the stay at Accademia di Romania a Roma. This way an exhibition rooted in Italian tradition has been converted to Romanian space. Both variations included seeing the author reflected in the context of the photograph. In the case of the Romanian variation this was done including the Getty challenge of redoing artworks and made use of the oval shape of the mirror and the painting in oval framing of Revolutionary Romania by C.D. Rosenthal which features folk art as the heritage of Maramures is.

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Mirror installations

Maria BOSTENARU DAN
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Bucharest, Romania

Spazi aperti exhibition at Accademia di Romania a Roma June 2016, exhibited as Vasile Pärvan fellow and volunteer

Context: Mirror installations in Italy (visited as part of the Vasile Pärvan programme) in the 1960s

- Kinetic art in Museo del Novecento in Milan Ambiente Stroboscopico n.4, 1967 (2005) by Davide Boriani, where the self reflection is dynamic <https://youtu.be/110am1805e>

-Arte povera in Galleria Nazionale d'Arte Moderna Rome, close to the Accademia di Romania: Michelangelo Pistoletto „I visitatori” (The visitors) 1968 <https://artsandculture.google.com/asset/visitors-michelangelo-pistoletto/> where visitors in the museum can self reflect with the collage on the mirror. The museum features also a pavement of broken mirror, in line with other creations of the artist (breaking a mirror)


Spazi aperti exhibition at Accademia di Romania a Roma June 2016, exhibited as Vasile Pärvan fellow and volunteer

Context: Mirror installations visited from Italy in Vienna, Austria

-Visit to mirror installations of Olafur Eliasson in Vienna (Baroque, Baroque 2015.1.6 in The Winter Palace of Prince Eugene of Savoy) see <https://olafureliasson.net/archive/exhibition/EXH102394/olafur-eliasson-baroque-baroque> The mirrors present large size catelidoscopes in which one can self reflect but also self reflection in wall size mirrors in the rooms of the palace. The artist puts focus on the artistic expression of physical phenomena. The self reflection can be put in context with other mirror installations in Vienna such as the mirrors in the Labyrinth in the Schönbrunn garden.

Spazi aperti exhibition at Accademia di Romania a Roma June 2016, exhibited as Vasile Pärvan fellow and volunteer

Concept
Self reflection in an ovale mirror opposite to an own photograph of a space in Rome (Blue room at MAXXI museum) in blue clothes in the basement of the Accademia. The ovale mirror was chosen as Baroque.



Installation in Bucharest, Romania

Context:
-Mirror installation at Theodor Aman museum in Bucharest (enter mirror along with dynamic painter hologram), the installation was experimented with folk cloth from the same region as in the drawing below.
-Pandemic context of the Getty challenge to redo art works: and the exhibition on C.D.Rosenthal of „Revolutionary Romania” in an ovale frame

Concept
Self reflection in an ovale mirror opposite to an own drawing of folk architecture like the clothes of „Revolutionary Romania”



SOCIAL SCIENCES, HUMANITIES AND ARTS

Imitations and inTeractions in the Eastern Mediterranean

During the Second Millennium BC, Cypriot ceramics were traded widely throughout the Eastern Mediterranean, leading to the development of imitations as well as innovative productions inspired by Cypriot shapes and motives. Questioning the concept of imitation and its traditionally held theories, the EU-funded ITEM project investigates where, when and why these productions developed and how foreign motifs and techniques were integrated into the local traditions of geographically diverse regions. ITEM aims further to produce a comprehensive study of the social and economic mechanisms involved in the transition from trading connections to cultural exchanges. Ultimately, the project explores the link between the circulation of goods and ideas and the complex processes by which both aspects are interconnected.

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Université Paris Nanterre | MSc | ARS&An | CHES

ITEM

Imitations and inTeractions in the Eastern Mediterranean

Sarah Vilain¹

Marie Skłodowska-Curie Fellow (December 2020–November 2022)
Université Paris Nanterre - UMR 7041 ArScAn - HAROC²

IMITATION, INSPIRATION, INFLUENCE

The project **ITEM** is a diachronic and multi-regional reassessment of mechanisms at work in the development of **imitations** and productions **inspired by Cypriot pottery** in the Eastern Mediterranean during the Second Millennium BCE (Fig. 1). The project questions **when** imitations developed, **why** they were elaborated, **who** made them, **what** their functions were and **how** foreign motifs and know-how were adopted in the local traditions. ITEM also evaluates **how the imitation process** is linked to the development of **trading connections** and assesses their progressive evolution into **cultural exchanges** during the Middle and Late Bronze Ages (c. 1750–1200 BCE).



Fig. 1. The distribution of imitations of Cypriot wares in the Eastern Mediterranean ©Sarah Vilain



Fig. 2. Cypriot juglet and its imitations in stone and glass (a. MMA 12.191.284, courtesy of the Metropolitan Museum of Art, New York; Rogers Fund, 1917; b. AO15721 ©Musée de Louvre / Franck Rauc; c. EA 1099, 1229, 53, courtesy of the British Museum ©Sarah Vilain; d. EA 22819 ©The Trustees of the British Museum)

A HOLISTIC APPROACH

ITEM develops five complementary key research axes:

- 1) From concepts to theories**
Notions of copy, imitation, inspiration and influence are explored through the varied scopes of archaeological, anthropological and sociological theories to offer new perspectives on the archaeological material.
- 2) From occasional contacts to trading connections**
This axis scrutinises the development of trading connections between Cyprus and the Eastern Mediterranean and evaluates their overall evolution.
- 3) From decorative motifs to techniques**
This part appraises how shapes, motifs and techniques were adapted in different raw materials, such as clay, stone or glass (Fig. 2), in order to clarify the complex processes at work in the transfer of know-how and to identify regional variations.
- 4) From the circulation of goods to the circulation of ideas**
Building from 3), this section aims to define if only elements of shape and decoration were adopted from Cyprus, or also the technology, the social functions and the meanings of the objects.
- 5) From the circulation of ideas to the circulation of people**
Relying on both archaeological and epigraphic data, this axis investigates the presence of Cypriot sailors, merchants and craftsmen in the Eastern Mediterranean and questions their role in the diffusion of various ceramic productions.



Fig. 3. Clay imitation of a Cypriot juglet (L1713486, courtesy of the British Museum ©Sarah Vilain); b. Inscribed mark (10 AO 8 ©Musée de Louvre / Sarah Vilain); c. and d. Samples of Cypriot fabrics ©Sarah Vilain

A TECHNOLOGICAL STUDY

The project relies on a corpus of artefacts from both **archaeological excavations** and **museum collections**. The cautious examination of the assemblages is completed by a technological study of the **pottery fabrics** and the **macro-traces** (Fig. 3) in order to pinpoint which features are part of the **Cypriot tradition** and which ones belong to the **local craftsmanship**.

References:

Vilain, S. (2019), "Is imitation the staircase form of Battery? New light on local productions inspired by Cypriot wares at Tell el-Dab'a", in M. Bietak & S. Freil, (eds.), *The Enigma of the Hyksos, Volume 1*, CAENL 9, Harrassowitz, Wiesbaden, p. 308–315.

Vilain, S. (2018), "Imitations et productions locales influencées par la céramique chypriote *White Painted Pendant Line Style* à Tell el-Dab'a", *Egypte & the Levant* XXVIII, p. 497–506.

LEARNING ABOUT ANCIENT SOCIETIES TO UNDERSTAND OUR MODERN WORLD

Ultimately, ITEM explores **how intercultural encounters** shaped human societies throughout the ages.

The main topics of this research - **globalisation, mobility, cultural exchanges and diversity** - are highly relevant to our modern and ultra-connected world.

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SOCIAL SCIENCES, HUMANITIES AND ARTS

Resisting isolation: Research with persons with dementia in times of Covid-19

The spread of Covid-19 highly impacted on my MSCA project 'Metaphorical Narratives in Dementia Discourse' (MeNDD). MeNDD research focuses on the potential that persons with dementia themselves bring to dementia discourse by challenging the common stereotypes about dementia and persons with dementia to help to change public views.

The project plan included face-to-face (ftf) activities, interviews and focus group, involving vulnerable groups of persons with dementia in three different countries highly affected by the coronavirus (United Kingdom, the Netherlands, and Italy).

A new plan was set up considering the risks for global health, spreading Covid-19 to centres with vulnerable older people and across different countries, and the new constraints imposed by the crisis. In the new situation, ftf contact with persons with dementia was forbidden, and ad hoc solutions like online interviews were non-fully compliant with ethical protocols. Moreover, there was limited or no access to travel and different regulations in different countries.

Solution

The research methodology shifted from ftf and online interviews to text analysis. In the UK, 'Dementia Diaries' gathers a group where early-onset persons with dementia record and share their own experiences on an online platform (dementiadiaries.org). The group was contacted, and research is now carried out on their diaries.

Lessons learned and new questions for research

Persons with dementia are facing new issues brought by the Covid-19 pandemics which deserve attention and set new goals for researchers and innovators in the

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2021 MCAA Annual Conference 'Research in times of crisis'- 5-7 March

Resisting isolation: Research with persons with dementia in times of Covid-19

MeNDD project

Metaphorical Narratives in Dementia Discourse
Focus: persons with dementia's potential to challenge the stereotypes about dementia and change public views

Plan

- Face to face activities - interviews and focus group
- Vulnerable groups of persons with dementia
- In United Kingdom, Netherlands, and Italy

Risks for global health
Spreading Covid-19 to centres with vulnerable people and across different countries

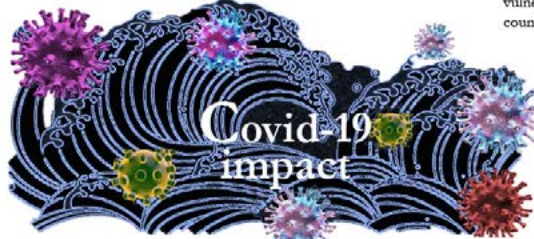
Issues for research

- No contact with persons with dementia
- No access to travel
- Online interviews not fully compliant with ethical protocols

Change of plan

- Text analysis
- Dementia diaries (UK) a group where early onset persons with dementia record and share their own experiences in an online platform - dementiadiaries.org

Lessons learned and new questions for research
New issues became urgent for persons with dementia in times of Covid-19 like social isolation and the use of technology



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EU MSCA-IF Project MeNDD - 101046119
UNIVERSITY OF AMSTERDAM

forthcoming future. Special consideration in MeNDD's analyses of the diaries is given to themes that became even more urgent for persons with dementia in times of crisis, like social isolation and the use of technology.

SOCIAL SCIENCES, HUMANITIES AND ARTS

The green and digital transition of EU cities: urban innovation ecosystem and urban governance

The ZES (opportunity Zones for innovation Ecosystems Governance) project aims to build a logical framework for prioritizing public choices at the city level towards Innovation Ecosystem (IE) rationale. The investigation of the complex knowledge and innovation dynamics occurring within the Innovation Ecosystem with respect to the urban context can provide useful suggestions for improving the Smart Specialisation Strategies (S3) approach and reinforcing the Cohesion Policy in a period of uncertainty for EU regions and cities.

Urban Innovation Ecosystems (UIEs) are central to create the pre-conditions for innovation to emerge and establish in cities. Exploring their dynamics and relationships with the (urban) context is deemed crucial to address the complexity of the current cities' challenges (i.e., climate change effects, rapid urbanisation, social exclusion, COVID response, etc.).

To create and develop UIEs, cities should detect and activate their relevant resources and target public policies, investments, and resources accordingly. Cities need to know their context, where their resources are, how to connect them and how to put all the pieces together to embrace a new development paradigm based on knowledge and innovation dynamics.

The ZES project investigates the Boston Area Innovation Ecosystem (BAIE) as an exploratory case study through a data-driven approach, with the aim to: identify the knowledge and innovation assets related to the urban context, the actors, networks and initiatives that feed knowledge and innovation dynamics at the urban level and the urban governance mechanisms supporting the UIE.

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The poster is divided into four quadrants:

- top-left: the ZES project**
Pasquale Pizzimenti
CLUCLAB, PAU Dept. Università Mediterranea di Reggio Calabria (Italy)
Visiting Research Scholar, Dept. of Economics, Northeastern University (USA)
The ZES (opportunity Zones for Innovation Ecosystems Governance) project aims to build a logical framework for prioritizing public choices at the city level towards Innovation Ecosystem (IE) rationale. The investigation of the complex knowledge and innovation dynamics occurring within the Innovation Ecosystem with respect to the urban context can provide useful suggestions for improving the Smart Specialisation Strategies (S3) approach and reinforcing the Cohesion Policy in a period of uncertainty for EU regions and cities.
- top-right: background & topics**
cities | urban complexity | urban innovation ecosystems | urban governance
Urban Innovation Ecosystems (UIEs) are central to create the pre-conditions for innovation to emerge and establish in cities. Exploring their dynamics and relationships with the (urban) context is deemed crucial to address the complexity of the current cities' challenges (i.e., climate changes effects, rapid urbanization, social exclusion, COVID response, etc.).
To create and develop UIEs, cities should detect and activate their relevant resources and target public policies, investments, and resources accordingly. Cities need to know their context, where their resources are, how to connect them and how to put all the pieces together to embrace a new development paradigm based on knowledge and innovation dynamics.
- bottom-left: the approach**
Big Data and Cities | Urban Informatics
The ZES project investigates the Boston Area Innovation Ecosystem (BAIE) as exploratory case study through a data-driven approach, with the aim to: identify the **knowledge and innovation assets** related to the urban context, the **actors, networks and initiatives** that feed knowledge and innovation dynamics at the urban level and the **urban governance mechanisms** supporting the UIE.
Boston Area Innovation Ecosystem
- bottom-right: expected results**
The Project is expected to:
- detect, identify and orchestrate the local innovation potential through a Smart Open Data Dashboard (SODD): it aims to "scan" territories and cities for the formulation of urban development strategies based on the UIEs;
- unveil urban complexity and support local policymakers for the development of UIEs rooted in the urban context's specific assets/values
Scan EU cities for the Urban Innovation Ecosystem activation
Smart Development Data Dashboard (SODD)

The Project is expected to:

- detect, identify and orchestrate the local innovation potential through a Smart Open Data Dashboard (SODD): it aims to "scan" territories and cities for the formulation of urban development strategies based on the UIEs;
- unveil urban complexity and support local policymakers for the development of UIEs rooted in the urban context's specific assets/values.

SOCIAL SCIENCES, HUMANITIES AND ARTS

Local roots and far-reaching networks: A case study of the Early Nordic Bronze Age burial of the Ølby Woman

The elite Nordic Bronze Age Period II (1500-1300 BC) oak coffin burial known as the Ølby Woman has been the subject of several scientific analyses over the past five years. These have, inter alia, examined the origins of the ores used in the production of her bronze neck collar, sword/dagger and belt plate, the glass of her blue bead and even her own origin through isotopic analyses of her dental enamel. While the results suggest that Ølby Woman may have lived locally within Denmark during her lifetime, she was nonetheless buried with objects originating from many different parts of the Bronze Age World (Northern Italy, Austria, the Carpathian Basin and Egypt). This poster examines this body of provenience data via Gilbert's concept of "rootedness" in order to suggest that Ølby Woman's local roots and high status allowed her to participate in the greater cross-cultural systems which connected the Bronze Age World and that the cultivation of a combination of long-distance and local networks may have been a specific strategy for coalescing social power.

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Local roots and far-reaching networks: A case study of the Early Nordic Bronze Age burial of the Ølby Woman
Samantha S. Reiter*, Heide Wrobel Nørgaard**, Flemming Kaul* and Karin Margarita Frei*
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Introduction

• Ølby Woman's burial mound (FF 020107-3) lies south of Copenhagen, Denmark.
• Dates from 1500-1300 BC.
• Rich female grave included inter alia a blue glass bead, a bronze belt plate, the broken off lower portion of a bronze sword/dagger in a wooden sheath, a bronze neck collar and 125 bronze tubes from a egyptian skirt.

All images incl. references [1]

State of Bronze Age research

- Relative human mobility in the Nordic Bronze Age [2]
- Association between elite social status and foreign materials in this period [3]
- The cobalt oxide from Ølby Woman's glass bead was recently identified as characteristic of imported Egyptian glass [4]

Research questions

Given the rich and elite manner of her burial, was Ølby Woman foreign herself? Where did the metals from her grave originate?

Provenancing methods by material

- Human dental enamel, strontium isotope analysis (⁸⁷Sr/⁸⁶Sr)
- Ores from bronze neck collar, belt plate and sword: common Pb isotope analysis (²⁰⁸Pb), ²⁰⁷Pb and ²⁰⁶Pb)

Results strontium isotope analysis			
Sample No.	Molar	⁸⁷ Sr/ ⁸⁶ Sr	[± 2SE]'
KF1872	M1	0.70998	0.00001
KF1873	M2	0.71002	0.00001
KF1874	M3	0.71085	0.00001

- Ølby Woman's molars ranged from ⁸⁷Sr/⁸⁶Sr = 0.70990-0.71005
- Local environmental samples ranged from ⁸⁷Sr/⁸⁶Sr = 0.70871 – 0.71031

Results lead isotope analysis on bronzes

- Each of the three bronze artefacts analyzed seems to have been manufactured with ores from a different region
- Neck collar: Slovakian ore mountains
- Belt plate: Trentino, Italian Alps
- Sword/dagger: Mitterberg region

Discussion provenance

- Compared with baseline data for present-day Denmark as well as with the accoutrements of social (or other) power, as has been proposed in other contexts [5].
- Ølby Woman's apparent local origins can be juxtaposed with the non-local glass from her glass bead as well as the varied origins of the ores used in the production of her bronze neck collar, belt plate and sword/dagger

Further implications

- The non-mobility of the Ølby Woman did not limit her from the accoutrements of social (or other) power, as has been proposed in other contexts [6]
- In a context in which foreigners and exotica were desirable, spatial containment (non-mobility) may also have been enabling
- Through social entanglement on the local level ("rootedness") [7], Ølby Woman created a wide-reaching network of influence as represented by the many sources of the items assembled from near and far to accompany her in the afterlife.
- Rather than bringing those items along with her, she may have had them brought to her by others.

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Acknowledgements

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SOCIAL SCIENCES, HUMANITIES AND ARTS

Navigating Schengen: Historical Challenges and Potentialities of the EU's Free Movement of Persons, 1985-2015 (NAVSCHEN)

NAVSCHEN will produce the first dedicated historical analysis of all worldwide available primary sources on the transnational roots, debates and conditions for the implementation of the European Union (EU)'s free movement of persons (henceforth, FMP). The project's overall objective is to highlight: a) the value of critical historical analysis and b) the normative legacies on human mobility rights in the European integration process (EU)'s free movement of persons (FMP).

This project aims to bridge this gap via the comparative analysis between the European Parliament (EP) and the European Commission (EC)'s role and impact on the changing modes of implementation of this Schengen Area 'fourth freedom'. These two cases will be explored as part of a larger study on belonging and displacement in a 'Europe in the making'. The project's timeline will examine human mobility rights under the light of the historical analysis of the European integration process from 1985 (the inception of the Schengen Area) to 2015 (a key turning point dominated by the public and private perception management articulation of responses to the so-called 'refugee crisis').

Core questions: What are the evolving modes of exclusion in transnational mobility in Europe and beyond? How can historical critiques be relevant to today's challenges to the free movement of persons? What are the neglected solidarity and diversity dimensions of European integration? In this light, can we articulate responses to humanitarian dilemmas beyond security-centered conceptions of transnational

NAVSCHEN
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Core questions

What are the evolving modes of **exclusion** in transnational mobility in Europe and beyond? How can **historical critiques** be relevant to today's challenges to free movement of persons? What are the neglected **solidarity and diversity** dimensions of European integration in this light, can we articulate responses to humanitarian dilemmas beyond security-centered conceptions of **transnational mobility**? And normatively, are narratives on **'shared values'** in the EU and beyond, sufficient to mediate countervailing factors of exclusion?

The main consulted archives will comprise the **Historical Archives of the EU (HAEU)** ¹, the **Historical Archives of the European Parliament (HAEP)** ² and the **Barbara Slater European Union Delegation Collection (BSEDIC)** ³, currently hosted at the University of Pittsburgh Archives.

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Logos: University of Pittsburgh, European Union, Marie Curie, Erasmus+.

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SOCIAL SCIENCES, HUMANITIES AND ARTS

Private sponsorship of refugees.

Insights and lessons from Canada's experience

In 2019, Canada resettled 30,100 refugees, overtaking the United States and Australia in the number of refugees admitted that year. About three in five refugees who have arrived in Canada over the past decade have been admitted under the private sponsorship program.

Private sponsorship was formalised by the 1976 Immigration Act, drawing on the will of private individuals to identify and support refugees financially and emotionally for one year by taking responsibility for their resettlement and integration. Ever since then, more than 350,000 refugees have been privately sponsored to resettle in Canada.

Objectives

This research aims to analyse Canada's experience in resettling refugees through the support of private sponsors. It elaborates on the outcomes and challenges of Canada's program and explores its transferability in Europe.

Results

The Canadian program of resettlement of refugees has been a considerable success. It is considered more suitable than the government-assisted sponsorship program as it ensures a smoother and long-term integration of refugees. However, government priorities and inadequacy of services offered could limit the intake of refugees through this program and could potentially threaten the successful integration of refugees.

Is private sponsorship transferable to Europe? Canada's program is a product of unique and favourable domestic circumstances, which could make it inappropriate for other countries lacking such conditions. However, the literature on policy transfer shows that policy-makers can learn from the observations of policies in foreign systems. Some aspects of Canadian program may be potentially desirable for European countries: it provides ordinary people with a direct channel for proactive

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PRIVATE SPONSORSHIP OF REFUGEES
INSIGHTS AND LESSONS FROM CANADA'S EXPERIENCE
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Background
In 2019, Canada resettled 30,100 refugees, overtaking the United States and Australia in the number of refugees admitted that year. About three in five refugees who have arrived in Canada over the past decade have been admitted under the private sponsorship program. Private sponsorship was formalised by the 1976 Immigration Act, drawing on the will of private individuals to identify and support refugees financially and emotionally for one year by taking responsibility for their resettlement and integration. Ever since then, more than 350,000 refugees have been privately sponsored to resettle in Canada.

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Is private sponsorship transferable to Europe?
Canada's program is a product of unique and favourable domestic circumstances, which could make it inappropriate for other countries lacking such conditions. However, the literature on the policy transfer shows that policy-makers can learn from the observations of policies in foreign systems. Some aspects of Canadian program may be potentially desirable for European countries: it provides ordinary people with a direct channel for proactive engagement in the resettlement process; it represents a safe and legal alternative to irregular migration; it promotes the faster and easier integration of refugees; it reduces the government costs and enhances the resettlement capacity; it promotes the regionalization of refugee resettlement.

Private Sponsorship factsheet

1976-2020	500,000 refugees welcomed through PSR
1976-1980	34,000 Indochinese refugees privately resettled
1980-1998	40,000 Polish refugees arrived through PSR
1982-2018	6,000 refugees from Iran privately sponsored
1988-2018	63,000 Iraqi, Afghan and Somali refugees
2004-2018	17,000 Syrian refugees privately sponsored
2015-2020	35,000 Syrian refugees resettled through PSR
2015-2019	2 million Canadians personally involved
2021-2023	67,500 refugees planned to be resettled
2020	123 organizations signed sponsorship agreement

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SOCIAL SCIENCES, HUMANITIES AND ARTS

Biomarkers of Emotion Regulation in Children and Adolescents

Emotion regulation (ER) is considered a transdiagnostic factor and, specifically, maladaptive strategies are associated more with psychopathology than adaptive strategies. In a similar vein, psychopathology is often characterised by emotion dysregulation. Despite the growth of research on the role of ER in healthy adaptation and psychopathology, evidence on the physiological underpinnings of ER abilities is in its' infancy, though patterns of activity are emerging and are often labelled as biomarkers of ER. Biomarkers are used as objective measures of risk factors for various disorders and illnesses and psychological research has started implementing candidate biomarkers in the diagnosis and treatment of psychiatric disorders. Research on ER includes usually adult samples whereas younger ages are sparsely investigated, which is inversely proportional to the role of ER in later psychopathology and mental health difficulties. Here, the literature on candidate biomarkers of ER abilities in childhood and adolescence was reviewed to identify areas of convergence that may serve as reference points for a more systematic search of ER biomarkers. The focus was on the link between generic ER skills and brain and psychophysiological reactions to emotion eliciting material. Findings are not uniform and suggest that a multimodal approach is more suitable in the search for biomarkers due to the complexity of the reaction to emotion eliciting stimuli and the individual differences in the implementation of ER strategies.

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Biomarkers of Emotion Regulation in Children and Adolescents
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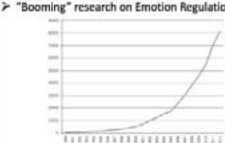


Introduction

Evidence on physiological correlates of Emotion Regulation (ER) and adjusted behavior comes from psychophysiological, electrophysiological and brain imaging studies that investigate associations between emotional states, psychopathologies and adjustment skills and physical reactivity. Patterns of activity are emerging, and findings are often interpreted as potential biomarkers of emotion regulation.

Rationale and Expectations

➤ "Booming" research on Emotion Regulation.



➤ Emotion Regulation is considered a transdiagnostic factor.

➤ Early onset psychopathology is related to detrimental outcomes.

➤ Lack of research addressing physiological underpinnings of ER, especially in youth.

➤ Thus:
This review addresses the extent to which objective measures can be used as biological markers of Emotion Regulation abilities in youth.

Search strategy

Databases:

- Psycarticles
- Pubmed
- Scopus
- Embase
- Reference lists of selected articles

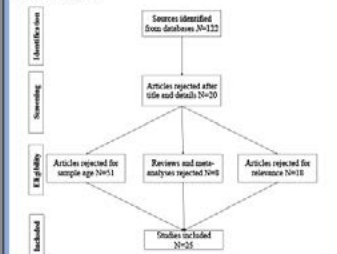
Keywords: "Biomarkers", "Emotion Regulation", "Self Regulation", "Childhood", "Adolescence".

Wildcards & synonyms were also used.

Selection criteria:

- Empirical Studies
- English Language
- Sample under 18 year old
- Must include psychophysiological/ electrophysiological/ brain imaging/ Eye Tracking methodology

Current progress:



Preliminary Results

Brain Imaging: Structural and functional differentiations in frontoparietal areas linked to deficient ER strategies use in preterm born children

Eye Tracking & Skin Conductance: Increased first fixation duration correlated with SCR when fearful adolescents face distressing pictures

Cardiovascular activity: Greater RSA reactivity linked to maladaptive strategies

EEG: Variation in Late Positive Potential amplitude depending on ER strategy to negative stimuli

Conclusion:

- The small pool of studies and the multitude of methods do not allow at this point a conclusive outcome.
- Further research is necessary for substantial progress, the field is in its' infancy.
- Current findings demonstrate a clear shift towards using objective measurements that serve as biomarkers in psychopathology research


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SOCIAL SCIENCES, HUMANITIES AND ARTS

Changing Legacies: A Snapshot of European Law Enforcement's Pandemic Communications

Emergency communications can be classified into a variety of sub-genres, falling under the larger domain of business communication. For instance, risk communication involves minimizing emergencies before they start through the dissemination of information about possible risks (Kostelnick, 2007); crisis communications involve addressing businesses-borne emergencies (Moon & Rhee, 2012), and disaster communications respond to and communicate typically natural disasters (National Institute of Disaster Management, 2014). One interesting thing about these types of communications is that they are often limited to a department or a group of individuals to provide the communication, and they are often short-term periods of communication. The COVID-19 pandemic has forced many emergency workers to operate in a state similar to what Agamben (2004) called the "state of exception" though, and this has created institution-wide, exceptional communication changes that radically alter the way people work. But how has the pandemic affected law enforcement's technological communications? And what can this say about business communications during the pandemic in general? Based on an analysis of literature and interviews of law enforcement workers across Europe, I argue that some forms of law enforcement communication have obviously suffered during the pandemic such as disaster response training, but there have been some surprising benefits to law enforcement personnel in regards to increased virtual communications.

Ultimately, this poster will illustrate some of the pandemic's challenges and benefits to the law enforcement communication practices and argue that overall, the pandemic has encouraged some police organisations with large legacy practices to challenge the status quo and adopt virtual communications.

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Abstract and Argument

Emergency communications can be classified into a variety of sub-genres, falling under the larger domain of business communication like risk (Kostelnick, 2007), crisis (Moon & Rhee, 2012), and disaster (National Institute of Disaster Management, 2014). One interesting thing about these types of communications is that they are often limited to a department or a group of individuals to provide the communication, and they are often short-term periods of communication. The COVID-19 pandemic has forced many emergency workers to operate in a state similar to what Agamben (2004) called the "state of exception" though, and this has created institution-wide, exceptional communication changes that radically alter the way people work. But how has the pandemic affected law enforcement's technological communications? And what can this say about business communications during the pandemic in general? Based on an analysis of literature and interviews of law enforcement workers across Europe, I argue that some forms of law enforcement communication have obviously suffered during the pandemic such as disaster response training, but there have been some surprising benefits to law enforcement personnel in regards to increased virtual communications.

Study and Method

Study Thematic analysis of eight interviews with law enforcement representatives from Spain, the UK, and the Netherlands. Interviewees were asked to give an account on their overall work-related interaction with technology, and the highlighted effects of the pandemic, with approximately twenty also different topical passages.

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Negative Impact of Pandemic on Law Enforcement

Issue	Impact	Adaptation/Response	Consequence	Implication
Reduced face-to-face interaction	Decreased trust and rapport	Increased reliance on digital communication	Reduced effectiveness of traditional communication methods	Need for new communication strategies
Increased digital communication	Reduced privacy and security	Increased reliance on digital communication	Increased risk of data breaches and cyberattacks	Need for enhanced digital security measures
Increased digital communication	Reduced social support and community	Increased reliance on digital communication	Reduced sense of belonging and community	Need for virtual community-building initiatives
Increased digital communication	Reduced physical activity and health	Increased reliance on digital communication	Increased risk of physical health issues	Need for virtual fitness and health programs
Increased digital communication	Reduced mental health and well-being	Increased reliance on digital communication	Increased risk of mental health issues	Need for virtual mental health support services

Benefits of Pandemic to Law Enforcement

Issue	Benefit	Adaptation/Response	Consequence	Implication
Increased digital communication	Increased digital skills and literacy	Increased reliance on digital communication	Increased digital literacy and skills	Need for digital literacy training programs
Increased digital communication	Increased digital security and privacy	Increased reliance on digital communication	Increased digital security and privacy measures	Need for enhanced digital security training
Increased digital communication	Increased digital communication skills	Increased reliance on digital communication	Increased digital communication skills	Need for digital communication training programs
Increased digital communication	Increased digital communication effectiveness	Increased reliance on digital communication	Increased digital communication effectiveness	Need for digital communication training programs
Increased digital communication	Increased digital communication engagement	Increased reliance on digital communication	Increased digital communication engagement	Need for digital communication training programs

Important Pandemic Considerations for Law Enforcement by Law Enforcement

Virtual communication is essential for law enforcement during the pandemic. It allows for quick dissemination of information and coordination of resources. However, it also presents challenges such as reduced face-to-face interaction and increased digital security risks. Law enforcement agencies must prioritize digital communication training and security measures to ensure effective and safe operations during the pandemic.

Meaning Making: Pandemic Communications?

The results of this study provide an interesting window into how law enforcement has been affected by the pandemic. While it might be expected that there have been negative impacts, it was also surprising to see that there were also benefits to the slow changing "old tanker" that is law enforcement which often resists change. It was also interesting to see how the ability and acceptance of creative solutions for communication challenges were also discussed as benefits. This leads me to hypothesize that pandemic communications can be reflexive, bubbling, and require more work, but they can also be creative, and progressive, and make work easier, while it remains to be seen whether communication practices adopted during this time will continue in the long-term, it is useful to at least see some outcomes in the communication practices currently being carried out.

While this analysis is preliminary and exploratory in nature, it provides a way to envision an extended scholarly agenda focused on a deeper analysis of a budding emergence of pandemic communications.



SOCIAL SCIENCES, HUMANITIES AND ARTS

Women in Research Ireland: A Platform for Unheard Voices in Research and Academia

Women in Research Ireland (WIRI) is a registered charity founded in 2017. Based in Dublin, Ireland, WIRI's mission is to build a community that connects and unites women, minorities, non-binary and other underrepresented groups. WIRI provides a safe platform for unheard voices with solution-based conversations. The goal is to raise awareness and create cultural changes. This poster explores WIRI's origins and illustrates the diversity of topics explored at events. WIRI's grass-roots approach empowers the audience with tools and knowledge to respond against obstacles that minority groups commonly face in academia.

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SOCIAL SCIENCES, HUMANITIES AND ARTS

Knowledge Kiosk: towards an original and effective dialogue system between science and society

Public dialogue is an important scientific responsibility. It can increase the awareness among the general public of the importance of research, lead to a better understanding of the key benefits that research brings to society and integrate into the scientific process contributions from society. However, it is hard to find examples of effective dialogue systems, in which citizens play an active role and give their voice to science. Additionally, many researchers would like to contribute (more) to public engagement, but do not know how to bring it into practice.

The Knowledge Kiosk started as a series of co-creation workshops to design novel and original dialogue systems between citizens and researchers. For the implementation of the workshops, we developed our own Design Thinking methodologies. The workshops were implemented in Barcelona and Lisbon in 2019 and early 2020 and had the following composition and structure: i) first round with only citizens, who developed first ideas for new interaction formats of citizens and researchers; ii) second round with only researchers to select some ideas from the first workshop and further develop them; iii) third round with both groups to finalise a prototype that could be ideally implemented. The workshop results from both cities were compared and delivered insightful results.

The methodology used in the workshops was very successful and will therefore be shared as an open tool. It shall serve as a “manual” to facilitate the organisation of workshops in other cities and countries to allow the development of different prototypes according to the different local needs and desires of both target groups.

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Knowledge Kiosk: towards an original and effective dialogue system between science and society

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Introduction: Public dialogue is an important scientific responsibility. It can increase the awareness among the general public of the importance of research, leading to better understanding of the key benefits that research brings to society and integrate in the scientific process contributions from society. However, it is hard to find examples of effective dialogue systems, in which citizens play an active role and give their voice to science. Additionally, many researchers would like to contribute (more) to public engagement, but do not know how to bring it into practice.

Development of methodology: The Knowledge Kiosk evolved from the MSCA social lab within the H2020 project NewHoRRizon (<https://newhorizon.eu/>) and aims at contributing to bridge the communication gap between science and society, focusing particularly on public engagement as one of the six RRI key elements of Responsible Research and Innovation. For the implementation of the workshops, we developed our own Design Thinking methodologies:

Workshop Implementation: The workshops were implemented in Barcelona and Lisbon in 2019 and early 2020 using exactly the same methodology and with the following composition: i) first round only with citizens of any age (18+) and of any professional group; ii) second round only with researchers from various scientific disciplines and career stages and iii) third round with both groups, partly comprising people from the first two workshop rounds, but also new participants. The results from each workshop round from both cities were compared and pooled for the next workshop round.

Workshop 1: Non-scientists

Objectives:

- Collection and discussion of known interactions between citizens and scientists
- Development of first ideas on how a new interaction of citizens and scientists on a regular basis could look like

Results:

- Non-scientists are keen to provide their opinion and thoughts.
- Developed ideas covered a broad spectrum and different target groups, from children to elderly people.

Workshop 2: Scientists

Objectives:

- Selection of ideas from first workshop rounds (presented as cartoon models)
- Further development and iteration rounds and presentation of two final ideas per workshop

Results:

- Scientists appreciate the input provided by non-scientists.
- Scientists are open to novel formats of public engagement.

Workshop 3: Non-scientists and Scientists

Objectives:

- Selection of ideas from second workshop rounds (presented in a picture exhibition)
- Finalisation of prototypes
- Identification of opportunities and frameworks for implementation

Results:

- Two ideas that evolved in the workshops were:
 - to initiate non-scientific events with scientific content (instead of organising separate events dedicated to science)
 - to bring scientific activities to the streets (incl. parks)

Overall conclusions

- The applied design thinking methodology was very successful to bridge scientists and non-scientists and cocreate new interaction formats.
- Developed prototypes are partly very similar in both cities but also have regional specificities.
- The co-creation workshops themselves can already be seen as a novel interaction format between both groups (and not only the actual workshop outcomes).

Next steps

The methodology will be shared as an open tool and shall serve as a “guideline” to facilitate the organisation of workshops in other cities and countries to allow the development of different prototypes according to the different local needs and desires of both target groups.

Invitation to collaborate!

If you are a scientist and enthusiastic about public engagement, you have experience in the planning and implementation of co-creation events with the public or you would like to provide your feedback on the initiative please get in touch with us: jonas.krebs@crg.eu

Logos: CRG, Science for Change, CIUMCT, i3H, MSCA, Horizon Europe, NewHoRRizon.

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SOCIAL SCIENCES, HUMANITIES AND ARTS

Using Institutional Ethnography to improve policy: an example from STRESS-Mums project

STRESS-Mums project is a two-year Institutional Ethnography (Smith, 2005, 2006) in four European countries on the legal transition (separation/divorce) from double to single parenthood. The research study investigates how judicial institutions and legal professionals shape this phase of transition. The fieldwork involves lone mothers, legal professionals (attorneys), gender activists, and other professionals. Through discursive interviews and interviews to the double, the study investigates how mothers and professionals “read” and interpret the legal texts translating them in a language that fits the everyday experience of the lone mothers.

Institutional Ethnography (IE) is a feminist research approach. IE allows investigating how texts’ interpretations, the translations of these texts done by people to other people, and institutional discourses (Manicom and Campbell 1995) socially organise the knowledge. In other words, IE allows understanding how texts shape the everyday life of people.

The methodological approach focuses on three aspects: the text, the process, the discourse (Murray 2020). In STRESS-Mums, the texts are the law on children custody and other laws and codes that organise the civil trial; the process concerns the active translation of the law by professionals (“specialised readers”) and by the mothers (“non-specialised readers”); the discourse is the textually mediated discourse that circulates among institutions, professionals, and mothers. The disjunctures between texts, process, and discourse and the concrete needs of the mothers are highlighted.

This poster illustrates how IE collects data and identifies disjunctures, and how the research project works in explaining these disjunctures to participants, policymakers,

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and stakeholders to improve policies and practices. Using the STRESS-Mums project as an example, the poster shows how the IE approach can be applied to other areas of research that need to detect gaps between the people’s everyday experience and institutions’ ruling functions by texts (e.g., law, regulations, and guidelines).



SOCIAL SCIENCES, HUMANITIES AND ARTS

ASTROMOVES: Careers and Research during Crisis

ASTROMOVES is a MSCA funded project focused on documenting and analysing the career moves and decision-making of astrophysicists and related scientists. Keeping with the conference theme of “Research in times of crisis”, the global pandemic has led to the restructuring of the project to include interviews conducted via the internet and more interactions via email rather than in person. The astrophysicists are speaking about how the pandemic is changing both their lives and how they are navigating their careers. Salient issues are life-work balance, unemployment and mental health. Presented are the demographics of the astrophysicists, some information about their career trajectories, and statistics on the duration of their career post PhD along with the number of positions they have held. Snippets of interviews will be used to illustrate the points that have been made about life-work balance, unemployment and mental health under normal circumstances and now during the pandemic.

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ASTROMOVES: Careers and Research during Crisis

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ABSTRACT

ASTROMOVES is a MSCA funded project focused on documenting and analysing the career moves and decision-making of astrophysicists and related scientists. Keeping with the conference theme of “Research in times of crisis”, the global pandemic has led to the restructuring of the project to include interviews conducted via the internet and more interactions via email rather than in person. The astrophysicists are speaking about how the pandemic is changing both their lives and how they are navigating their careers. Salient issues are life-work balance, unemployment and mental health. Presented are the demographics of the astrophysicists, some information about their career trajectories, and statistics on the duration of their career post PhD along with the number of positions they have held. Snippets of interviews will be used to illustrate the points that have been made about life-work balance, unemployment and mental health under normal circumstances and now during the pandemic.



Moving

Astrophysicists, as with other PhD researchers, oftentimes have to complete two or more postdoctoral positions before obtaining a permanent position. Each position can be between 1 and 5 years, but typically are three years. It has been hypothesised that having to move so often is a factor in the lack of diversity of their scientific community. There are other factors that are under exploration including the reputation of institutions in terms of various forms of discrimination: the role of families.

Interviews

Scientists had to hold a PhD and had to have changed positions twice since obtaining their PhD. Changing positions included changing job titles while remaining in the same location, however, all those interviewed had relocated at least twice post-PhD.

Twenty scientists have been interviewed. Eleven are male, nine are female. There is self-identified gender diversity: two are bisexual, two are asexual, two are gay. Two have disabilities. Two married couples were interviewed.

COVID-19 & The Astrophysicists

The global pandemic, COVID-19, had positively and negatively impacted the lives of astrophysicists. Themes that emerged from the interviews are life-work balance, mental health, and unemployment. The Maka’ala quote includes these except unemployment.

Life-Work Balance: First, most of the scientists defined being productive as producing more articles, i.e. publishing. Moving online most scientists found to be positive for their work in terms of not having external distractions, such as going to conferences and departmental meetings, allowing them to get more research completed and more articles submitted for publication. However, when teaching or childcare was added, the scientists were not happy with their life-work balance and felt distinctly not balanced and unproductive.


Mental Health: Mentally being unwell such as depression and loneliness resulting from the pandemic, the scientists correlated to not being productive (i.e. not getting research done and articles submitted). Loneliness was acute with those people that were single and living alone.

Unemployment: Two scientist had become unemployed due to positions being put on hold due to the pandemic. One of these had to use public assistance to survive until job negotiations resume.

There was no mention of lack of access to data because most already had their datasets before the pandemic, and/or many telescopes take data automatically and make the data publicly available, and/or scientists could access the observatories remotely.

Acknowledgement

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Maka’ala Quote

Each scientist was assigned a Hawaiian pseudonym.

“I mean a lot like, of course it’s affected everybody’s life. Profoundly and so I’m certainly no exception to that. Yeah, I mean, before before COVID, I would I... I travel a lot... I have friends in many different places. I like to think of myself as being very research active. So, I get lots of invites to conferences and seminars. And there’s lots of interesting things I want to attend in that way. My family lives abroad, etc. So, a big part of my life was traveling around to do all these things. And, you know, that is all completely stopped now. So that’s disappointing. I’ve managed better than I might have guessed. If someone had told me a year ago that something like this was going to happen. In that regard, thanks to... video calls and things like that. But yeah, it’s not it’s not great. In terms of other aspects, so...I’m by myself. So, I have like no human interaction whatsoever and haven’t for nine months. And that’s not great. You know, aside from again through the computer. So again, I’m managing okay for now because there’s an expectation that this will end eventually. Um, but yeah, I mean, you know, it’s pretty profoundly unpleasant experience.”



SOCIAL SCIENCES, HUMANITIES AND ARTS

Modelling individual farmers behaviours in Coupled Human Natural Systems under changing climate and society (MODFaBe)

Climate change and water resources governance represent two necessarily interdisciplinary topics in which the natural and social sciences must be integrated. Assuming water flows as physical, social, political, and symbolic matters, it is necessary to entwining these domains in specific configurations in which water users, managers, and decision-makers could be directly involved. Social learning is considered an important issue in achieving this goal by promoting new understanding or shared meaning to (1) increase adaptive capacity, (2) build trust and collaborative problem solving, and (3) ensure better co-working. The perception of climate change is fundamental for two important reasons: first, because it constitutes a key component of the socio-political context within which policymakers exercise their decisions in socio-ecological systems. The second reason is more direct: climate change adaptation requires behaviour transformation and attitude change from those who make individual and collective choices that have a huge impact on the planet's climate balance.

The MODFABE project aims to increase the robustness of decision-making processes in Coupled Human-Nature Systems (CHNS) by modelling farmers' perception and adaptation capacity to climate change. The MODFABE's core is to integrate observational data (farmers' perception) into an existing behavioural model (DistriLake) applied to the management of water supply and demand in Lake Como (Italy) to increase the rationality of farmers' interventions in the decision-making processes considering multiple competing purposes and a multi-objective context. The Muzza system is the case study acting as a test for understanding which

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driving factors are affecting farmers' perception regarding climate change impacts and how their adaptation capacity affects the management of the CHNS. Results could be extrapolated to other socio-ecological systems and used to reformulate policy recommendations from social-learning to better respond to climate change by considering the preferences shift toward a new equilibrium in decision-making processes.

CHAPTERS

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Description of the activities of the MCAA Spain-Portugal Chapter in 2021.



CHAPTERS

Czech Chapter

Challenges in academia in Eastern European countries

The Czech Chapter has currently 50 members, thanks to an increase we had in recent months. One of our biggest challenges is how to reach out to potential members, and to make people interested in activities outside their research area. We are keen to hear from other Chapters about their experiences, what helped, what was appreciated by the members etc. Compared to Western European countries, academia in the Czech Republic is facing some additional challenges. The academic culture is often very old-fashioned and lacks enthusiasm for change. In general, the biggest problems of Czech academia are inbreeding, nepotism, unwillingness towards change, nationalism, and refusal of international exchange. Supposedly, other Eastern European countries face similar challenges. Hence, we hope that our MCAA Chapters can work together on mitigating them, prepare workshops on common topics, and support each other. Networking, soft skills training, or mentoring are not considered as important or natural parts of academic culture and training. Hence, often people do not understand their advantages and have sceptical attitudes. We believe MCAA gives us a great opportunity to face these challenges, provide networking activities, soft skills training, and other extra-curricular activities. Through our Chapter, we can offer such opportunities to our members. Step by step, we want to show academics in Czechia the benefits of these activities and hopefully, we can kindle their widening.



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Czech Chapter

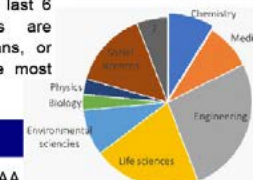
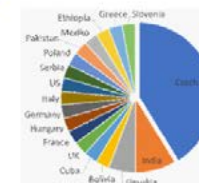
Challenges in academia in Eastern European countries.

Julie Kovářová



Czech Chapter Overview

The Czech chapter was established in 2015 with the support of the MCAA and started off with 9 members from different countries (Bolivia, Cuba, Czech Republic, Hungary and India) all of them located in the Czech Republic. The first year was successful in terms of networking and transfer of knowledge among the Chapter members, however, there was a huge potential to disseminate the MCAA mission in the region. In 2021, the Czech Chapter has 52 members registered via MCAA Portal. Out of that, 17 members joined in the last 6 months. Regarding nationalities, 18 nationalities are represented in the Chapter, most are Czech, Indians, or Slovak. Regarding distribution by scientific fields, the most represented are Engineering and Life sciences.



Challenges for the Chapter

1. Foster greater public awareness of MSCA and MCAA and promote the MSCA experience of international and inter-sector mobility
2. Increase the Chapter's networking and other activities. Increase the cooperation with local organizations in order to organize scientific events (workshops, seminars, lectures)

Challenges for scientists in Eastern European countries

Many aspects of academia in Eastern European countries are not as established as in Western Europe, for instance support from institutions and organisations for extra-curricular activities, or overall academic culture. Activities outside hard skills science are often not considered that important, their benefits are not appreciated. The biggest problems in Czech academia include: inbreeding, lack of transfer (of people and knowledge), closeness, unstability of funding, unwillingness towards change etc.. We feel other countries (and Chapters) are probably facing the same issues. Hence, hopefully we can collaborate on common activities facing these problems. We believe MCAA gives us a great opportunity to collaborate and mitigate these challenges.



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