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15 and 16 April 2019, Planica

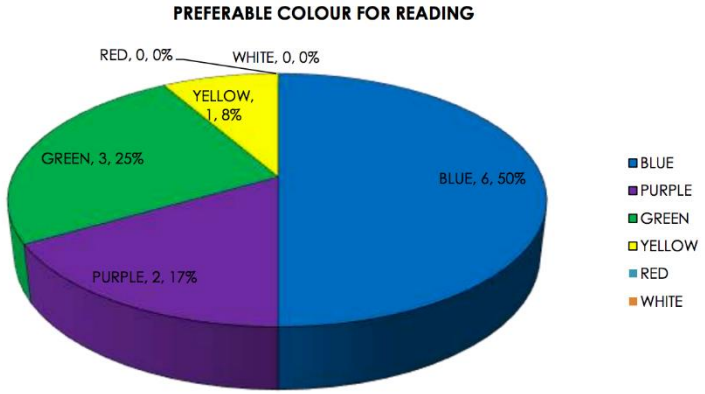
The sensor hub for detecting the influence of colors on reading in children with dyslexia (EEG, EDA, ECG, eye tracker)

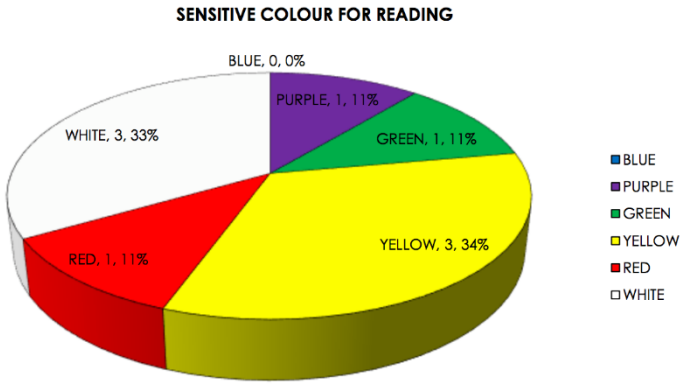
Tamara Jakovljevic,
Sensors technologies, Jozef Stefan International postgraduate school

Poster number: 8

WHY THE COLORS ARE SO IMPORTANT?

- Color affects behavior as well as cognitive abilities, performance, and intentions (Kumi, Conway, Limayem, & Goyal, 2013)
- Colors produce different physiological responses in blood pressure, heart rate, respiration, digestion, body temperature, and brain activity.
- Color has been used in reading tasks with dyslexic subjects in a number of different ways (Irlen, 2010; Jansky, 1958; Wilkins, 2003) and for different purposes.





EFFECT OF COLOR ON LEARNING-DISORDER CHILDREN IN LEARNING ENVIRONMENT BY MOHAMAD FAIZ BIN MARHALIM

EXPERIMENT SETUP

- In purpose of the the research study is created a sensor hub of 4 synchronized devices: Smarting (small, simple and mobile EEG device, which supports synchronization with other sensors and simultaneous multi-amplifier streaming via lab streaming layer), EDA (electro dermal activity sensor), Heart rate (ECG) and Eye tracking (SMI).

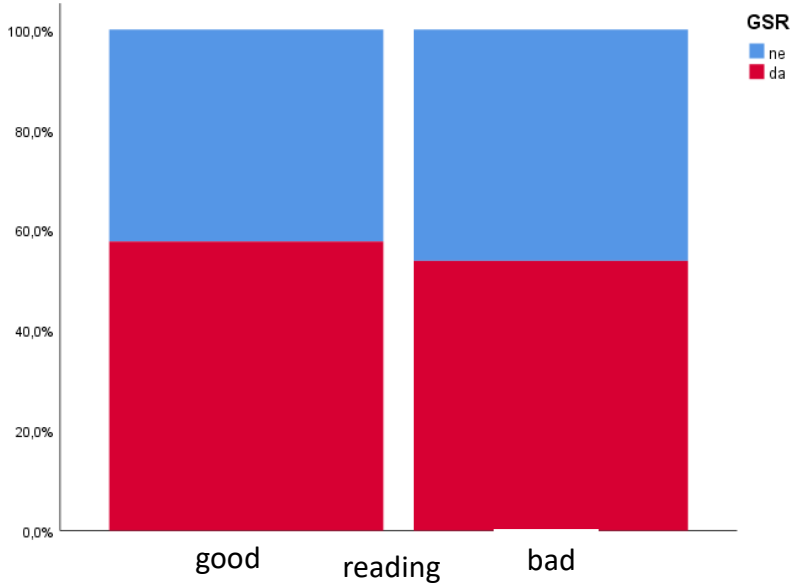
DYSLEXIA AND READING IN COLORS

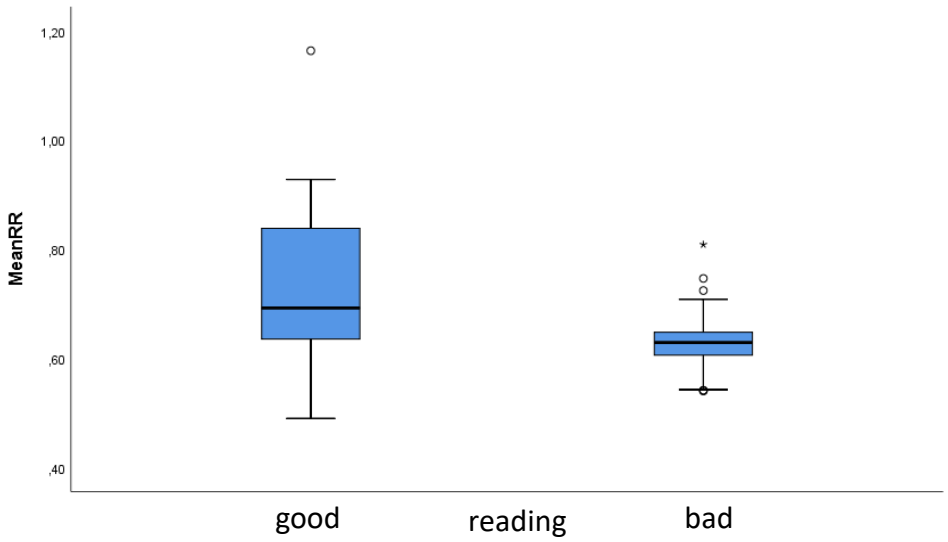
Dyslexic individuals exhibit a longer duration of fixations, shorter saccades and thus more fixations in reading than normally developing readers of the same chronological age.

Case Summaries

	Reading	N	Mean	Std. Deviation	Median	Minimum	Maximum
Fixation Count	good	52	37,7885	9,52877	37,0000	20,00	64,00
	bad	65	40,1538	15,69458	35,0000	18,00	86,00
	Total	117	39,1026	13,31216	36,0000	18,00	86,00
Fixation Frequency [count/s]	good	52	1,3038	1,05048	,8000	,50	3,90
	bad	65	,7651	,27050	,7100	,40	1,52
	Total	117	1,0045	,77319	,7600	,40	3,90
Fixation Duration Average [ms]	good	52	1126,0038	554,38397	1220,7500	234,20	2039,30
	bad	65	1388,5443	505,47548	1264,6800	611,56	2487,00
	Total	117	1271,8597	541,53366	1235,1000	234,20	2487,00
Saccade Count	good	52	30,2692	6,95395	29,0000	18,00	57,00
	bad	65	34,4615	12,70467	31,0000	15,00	74,00
	Total	117	32,5983	10,70937	29,0000	15,00	74,00
Saccade Frequency [count/s]	good	52	1,1096	1,00592	,6000	,40	3,80
	bad	65	,6774	,28154	,6200	,30	1,48
	Total	117	,8695	,73153	,6000	,30	3,80
Saccade Duration Average [ms]	good	52	22,7962	3,61874	21,7500	19,30	38,00
	bad	65	23,2595	4,50442	22,1000	17,36	38,00
	Total	117	23,0536	4,12374	22,1000	17,36	38,00
Saccade Amplitude Average [Â°]	good	52	1,4115	,85099	1,1000	,70	5,30
	bad	65	1,6575	1,08683	1,2100	,25	4,38
	Total	117	1,5482	,99255	1,1600	,25	5,30

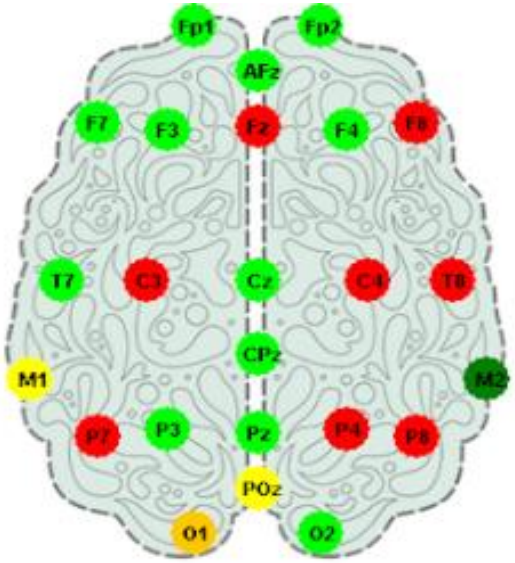
Comparing GSR and MeanRR in bad and good readers of 3rd grade scholars sample





1. In the 3rd grade scholars - good and bad readers there is no statistical significance on EEG measures.

2. When comparing 2nd and 3rd grade scholars, they are different in almost all EEG measures, and to individual eye-tracking measures.
When we include the colors in the analysis, we get the difference on two eye-tracking measures between the 2nd and 3rd grade scholars especially in the red, the purple (overlay) and orange (overlay).



In the next phase, parameters will be measured (with the same set of sensors) during the reading process of children with dyslexia.

THANK YOU FOR YOUR ATTENTION

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Routing in wireless network considering meteorological effects

Tadeja Saje,
Jožef Stefan International Postgraduate School

Poster number: 17

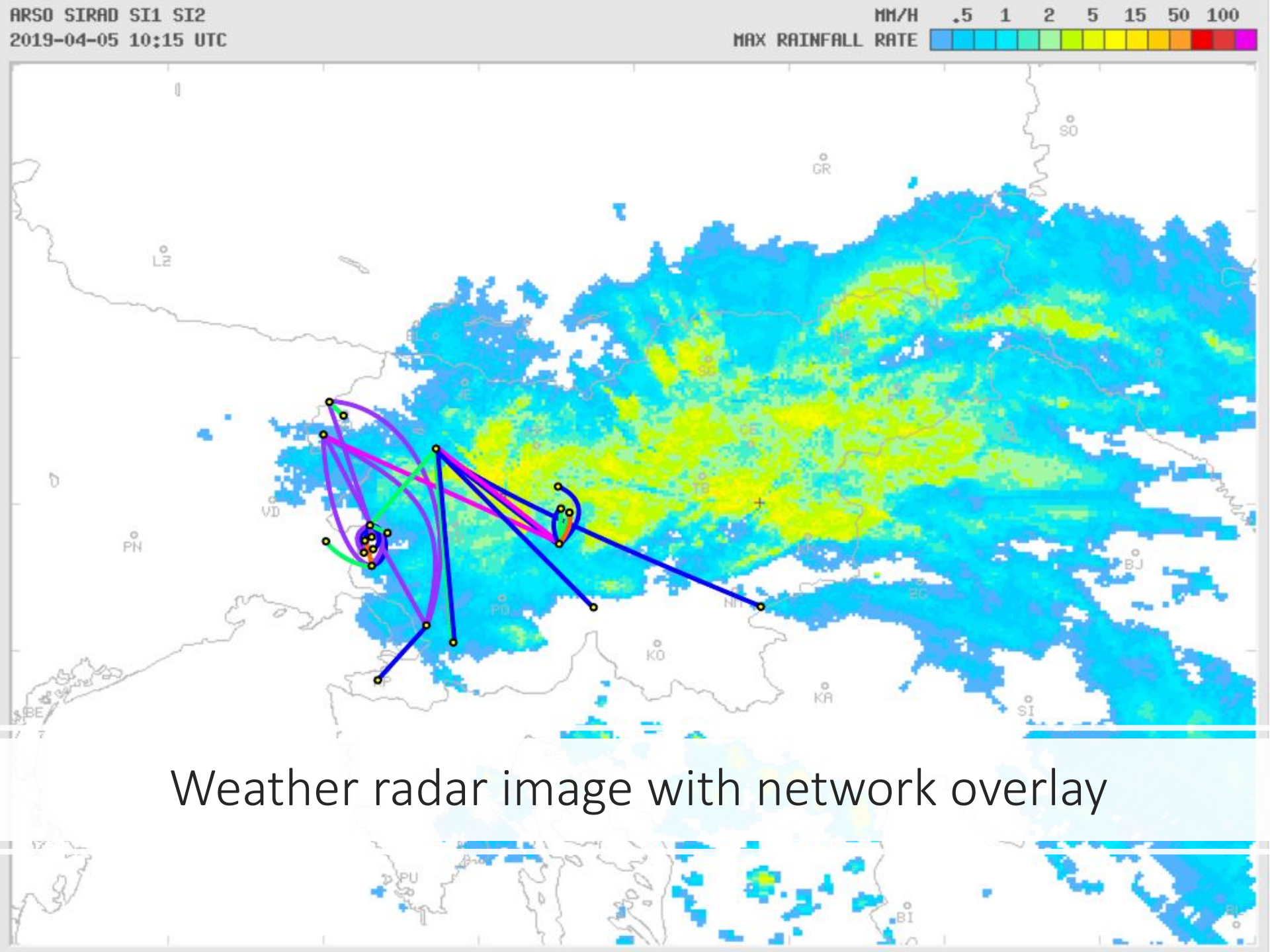
Problem overview

Wireless networks operate in different weather conditions

Communication might be distrubed due to rain attenuation, changing multipath and degraded antenna performances

Rain attenuation increases with frequency

The routing protocols used in wired networks are unsuitable for radio networks



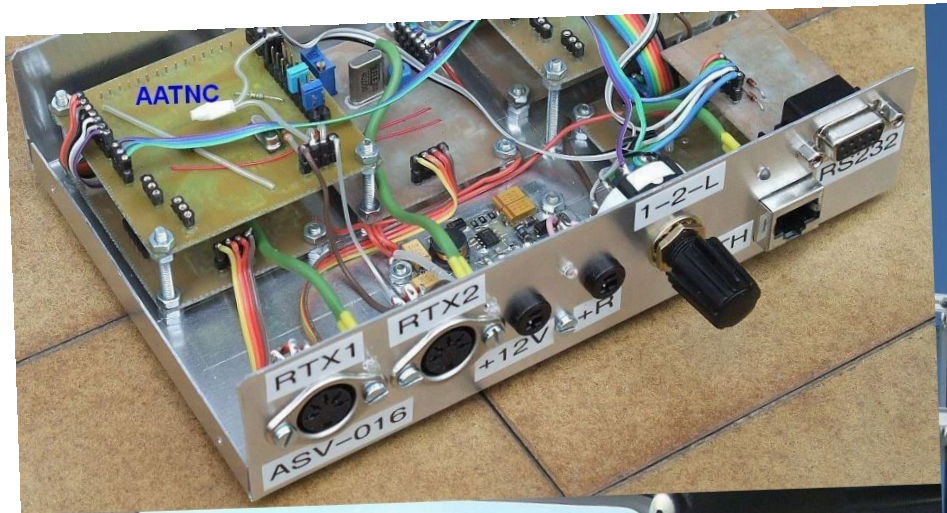
Weather radar image with network overlay

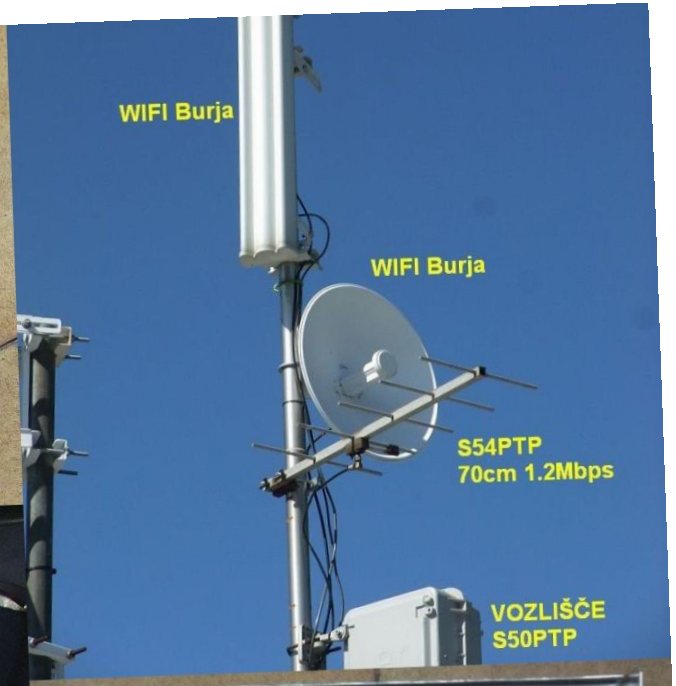
Proposed solution

different data sources:

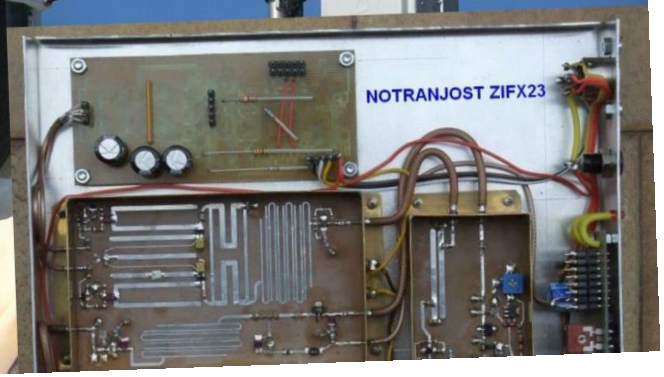
- measure the radio links using different methods: measure signal, antenna impedance
- using smart antenna technique
- using weather radar data

from available data sources of propagation try to learn which routing path is optimal


AATNC
RS232
1-2-L
RTX2
RTX1
+12V
+R
ASV-016


WIFI Burja
WIFI Burja
S54PTP
70cm 1.2Mbps
VOZLIŠČE
S50PTP

DOLENJSKA
IZ GORJANCEV
KRPA23
ZIFX23


NOTRANJOST ZIFX23

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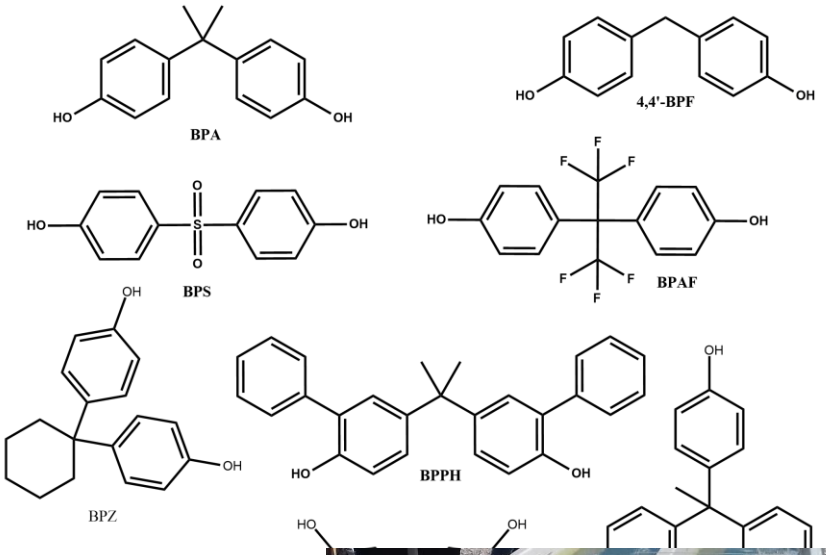
Wastewater reuse by algal tech

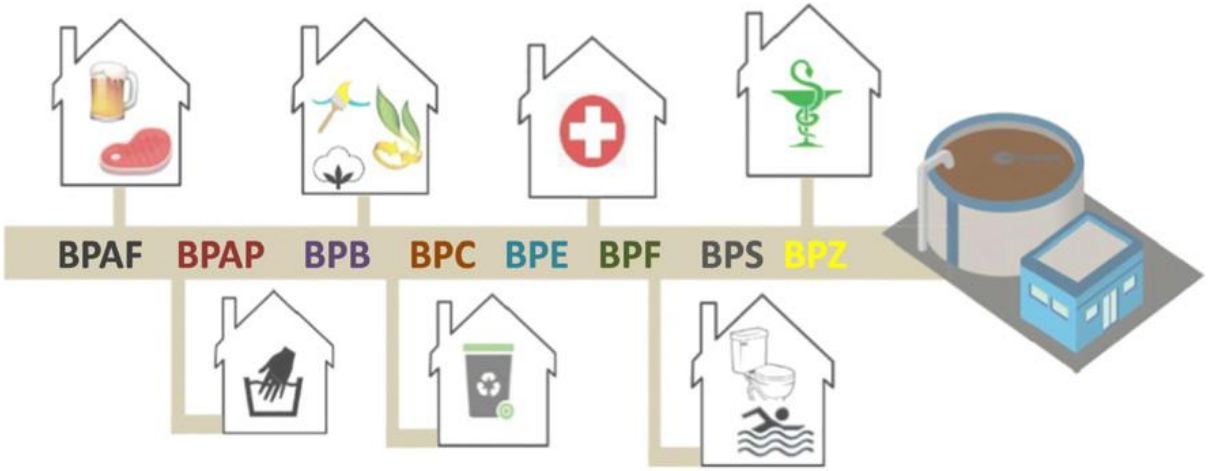
David Škufca,

Jožef Stefan Institute, IPS

Poster number: 52

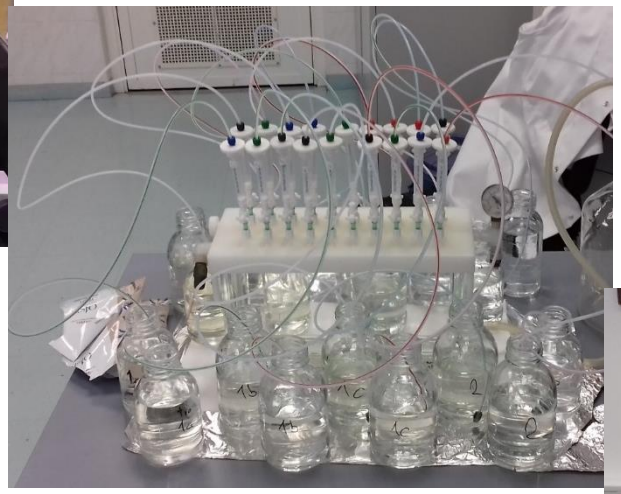
BPs and wastewater

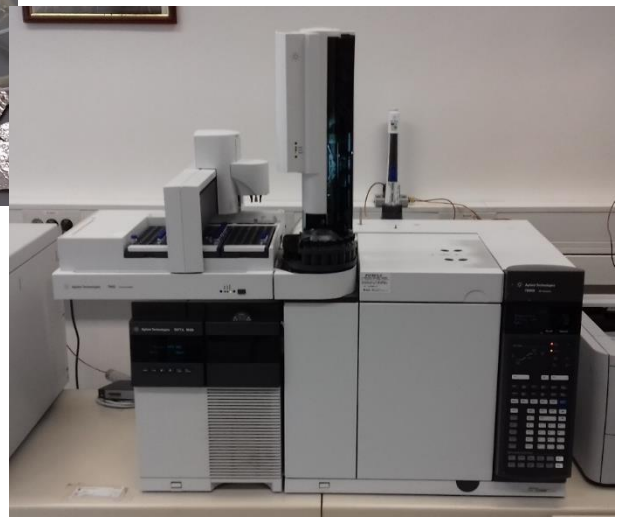


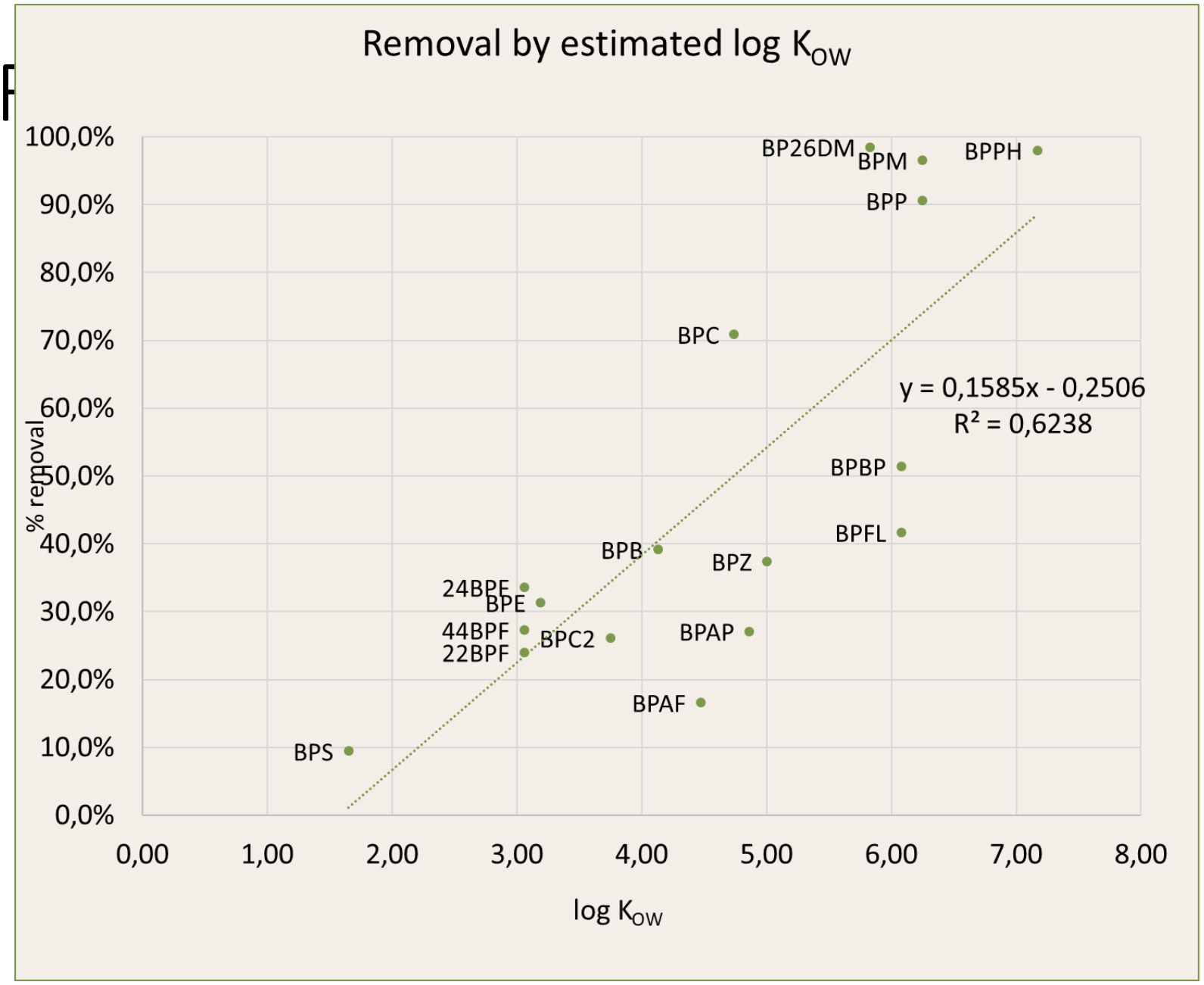


Česen et al., 2018

Methods

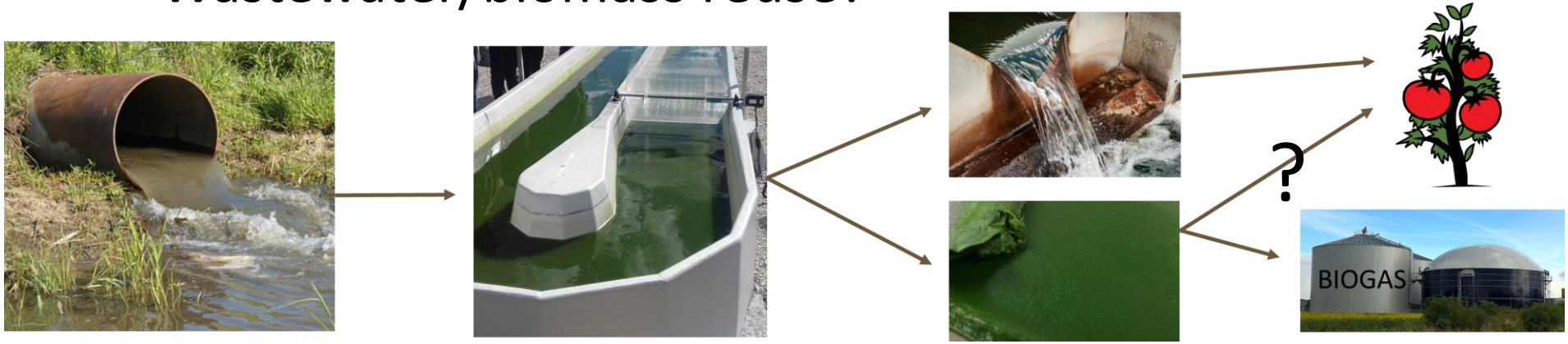





Removal by estimated log K_{OW}
100,0%
90,0%
80,0%
70,0%
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
% removal
0,00
1,00
2,00
3,00
4,00
5,00
6,00
7,00
8,00
log K_{OW}
BP26DM
BPM
BPPH
BPP
BPC
y = 0,1585x - 0,2506
R² = 0,6238
BPBP
BPFL
BPB
BPZ
24BPE
BPE
44BPF
22BPF
BPC2
BPAP
BPAF
BPS

And then?

- Mass balance?
- Co-culture → improved removal?
- Wastewater/biomass reuse?



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15 and 16 April 2019, Planica

Lipid droplets – antioxidant organelles

Ana Kump,

Jožef Stefan Institute, Department of Molecular and Biomedical Sciences (B2)

Poster number: 3

Fatty acids are necessary for cell growth

FATTY ACIDS

Saturated

Unsaturated

Omega-3

Reduce stress
Membrane fluidity

Omega-3 fatty acids are potential cancer therapeutics

SCIENTIFIC REPORTS

Correction: Author Correction

OPEN

Omega-3 docosahexaenoic acid induces pyroptosis cell death in triple-negative breast cancer cells

Received: 5 April 2017
Accepted: 18 January 2018
Published online: 31 January 2018

Nathalia Pizato[1], Beatriz Christina Luzete[1], Larissa Fernanda Melo Vasconcelos Kiffer[1], Luís Henrique Corrêa[2], Igor de C
Marina Kiyomi Ito[1] & Kelly Grac

Nutrition and Cancer

ISSN: 0163-5581 (Print) 1532-7914 (Online) Journal

Omega-3 polyunsaturated fatty acids as adjuvant therapy of colorectal cancer

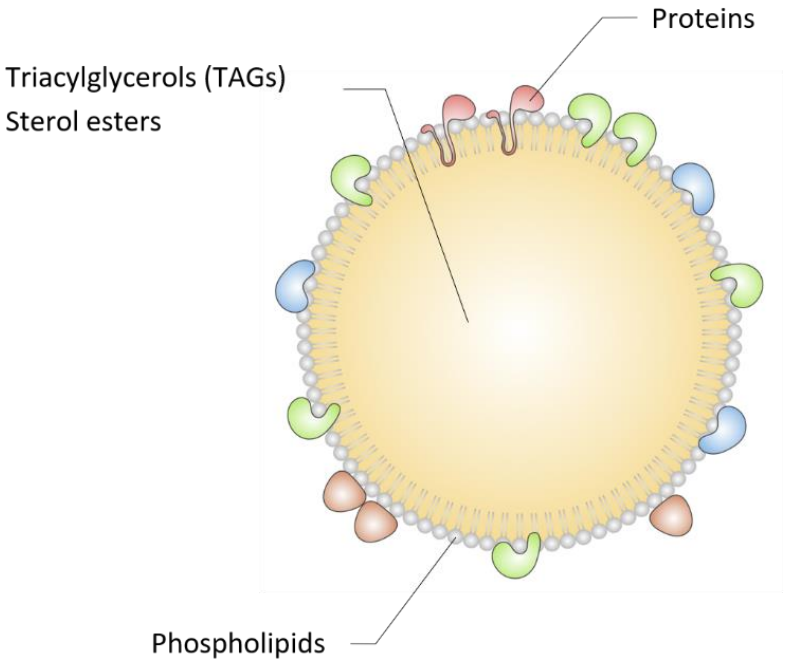
Milene Volpato [1] · Mark A. Hull [1]

Published online: 3 July 2018
© The Author(s) 2018

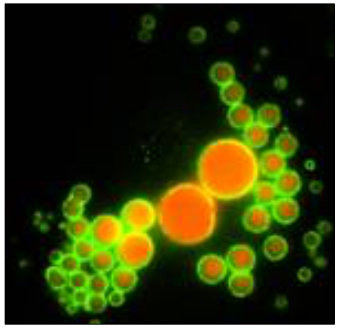
Fish oil supplementation during chemotherapy increases posterior time to tumor progression in colorectal cancer

Carolina de Quadros Camargo, Michel Carlos Mocellin, Juliana de Aguiar Pastore Silva, Maria Emilia de Souza Fabre, Everson Araújo Nunes & Erasmo Benicio Santos de Moraes Trindade

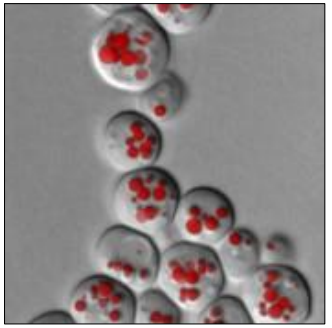
Lipid droplets are newly recognised organelles present in all eukaryotes



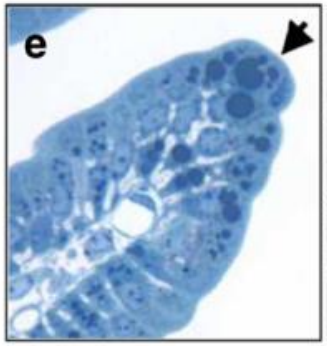
Adipocytes



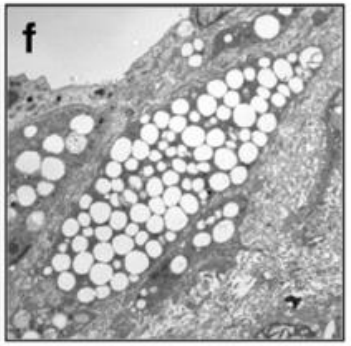
Yeast



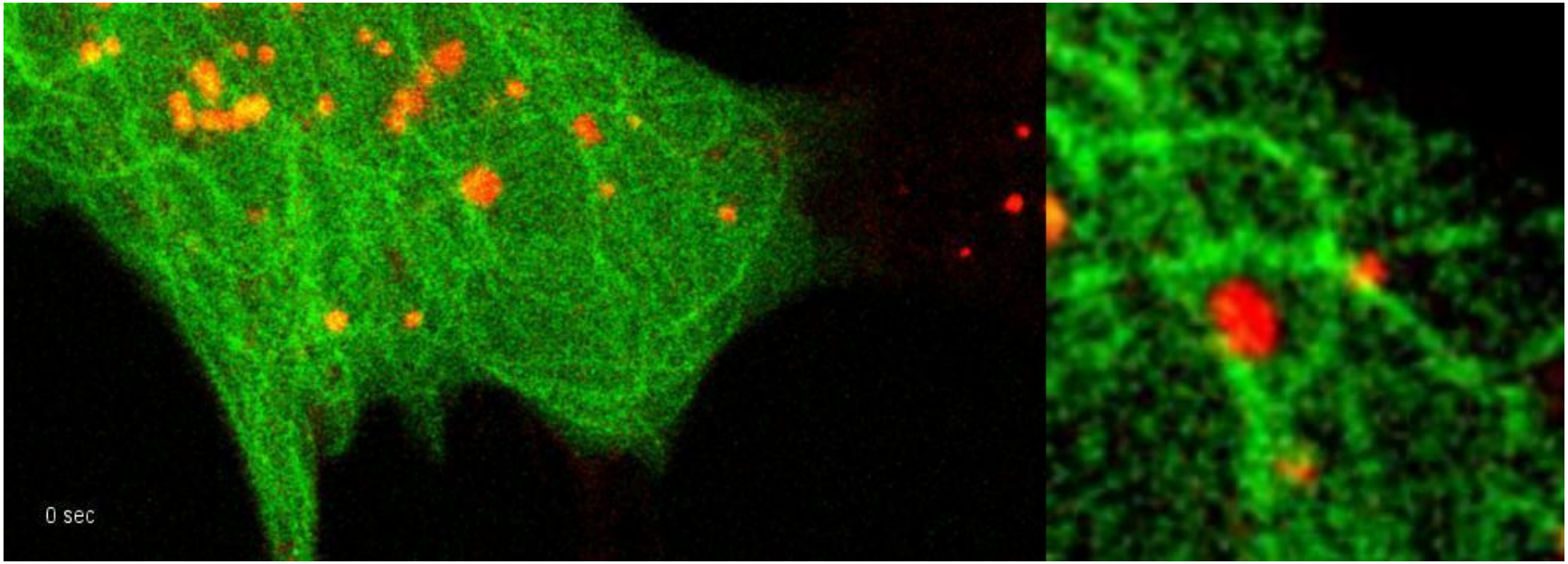
Enterocytes



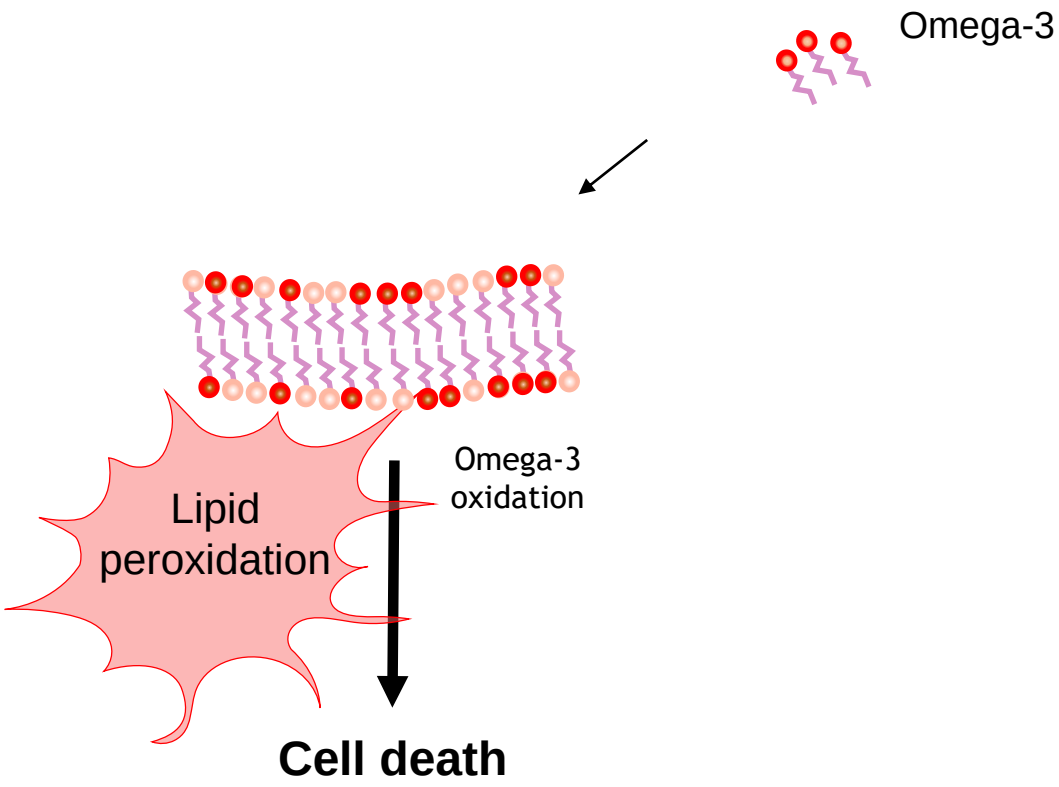
Macrophages

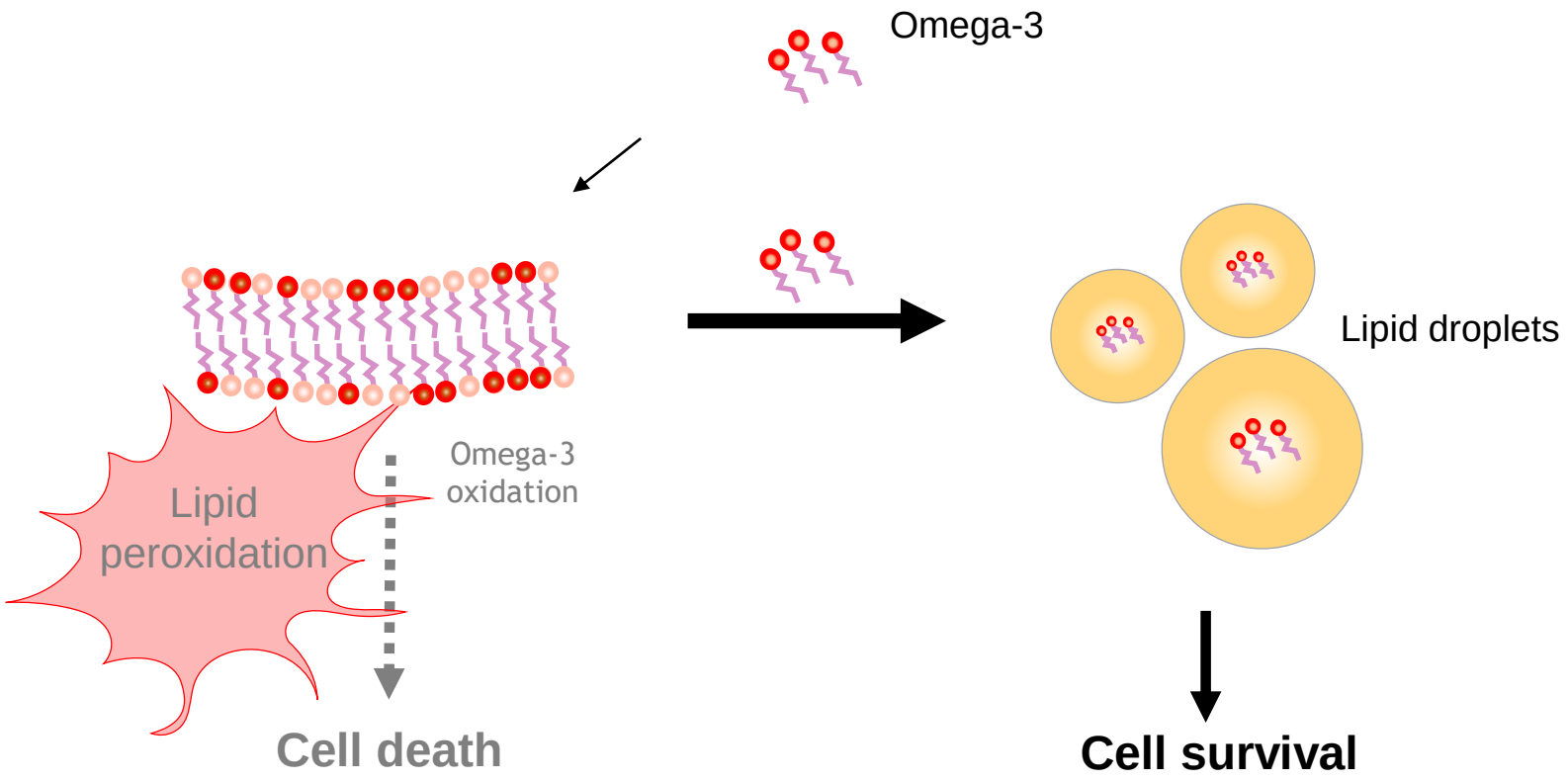


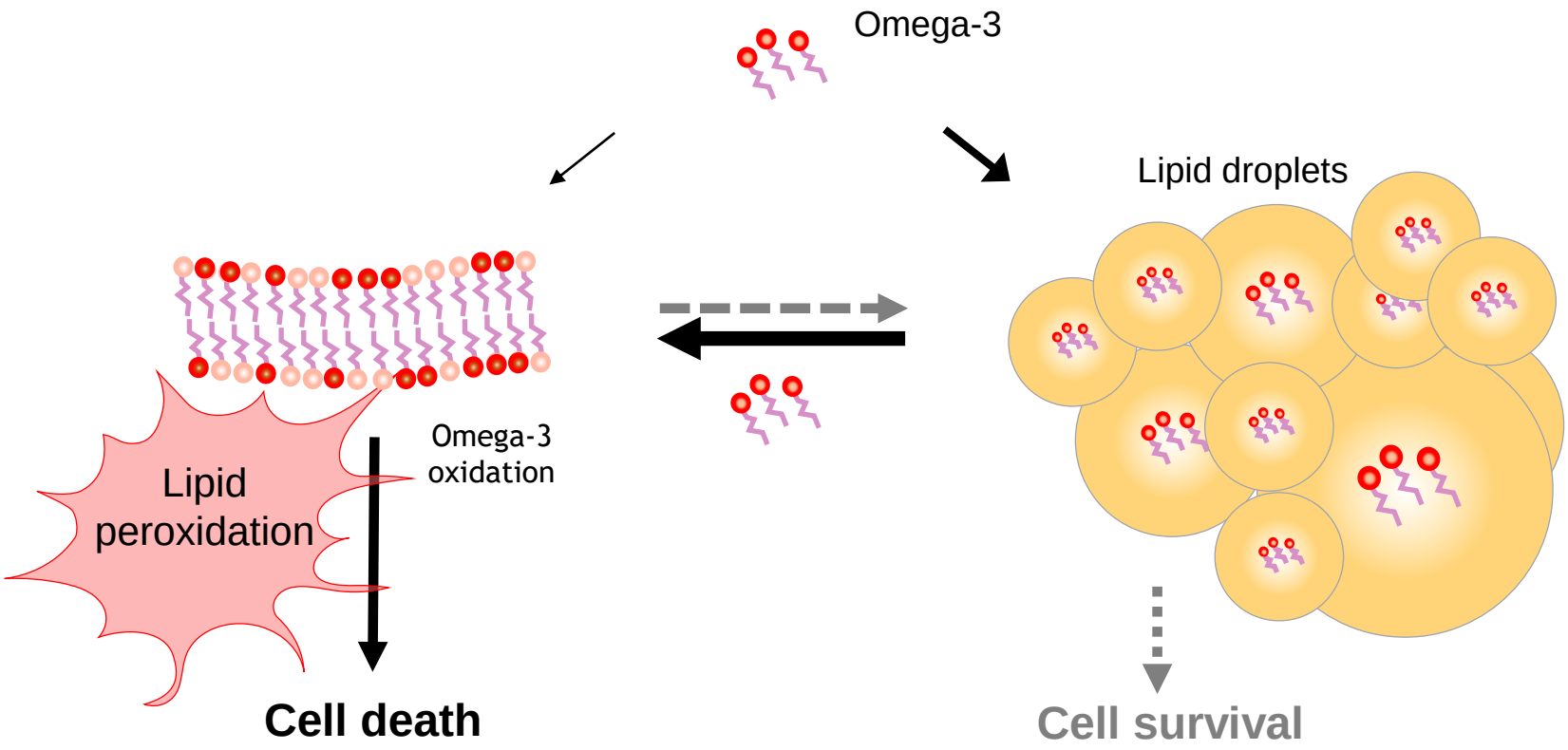
Lipid droplets are dynamic organelles



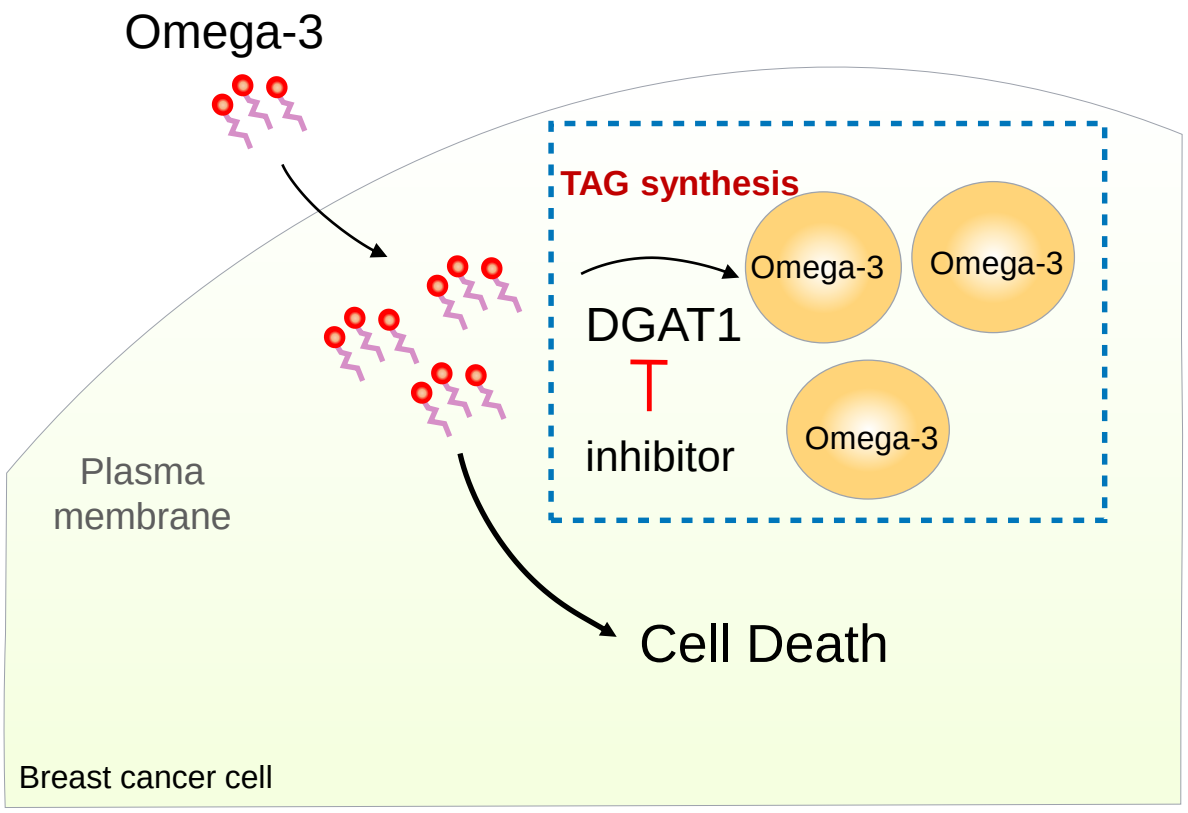
Herms, *Nature Commun.* 2015


Omega-3
Omega-3
oxidation
Lipid
peroxidation
Cell death


Omega-3
Lipid droplets
Omega-3
oxidation
Lipid
peroxidation
Cell death
Cell survival


Omega-3
Lipid droplets
Lipid peroxidation
Omega-3 oxidation
Cell death
Cell survival

Lipid droplets are antioxidant organelles



Thank you for your attention!

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Parameter Control in Evolutionary Bilevel Optimisation

Margarita Antoniou

Computer Systems Department, Jožef Stefan Institute, Ljubljana, Slovenia

Jožef Stefan International Postgraduate School, Ljubljana, Slovenia

Poster number: 49

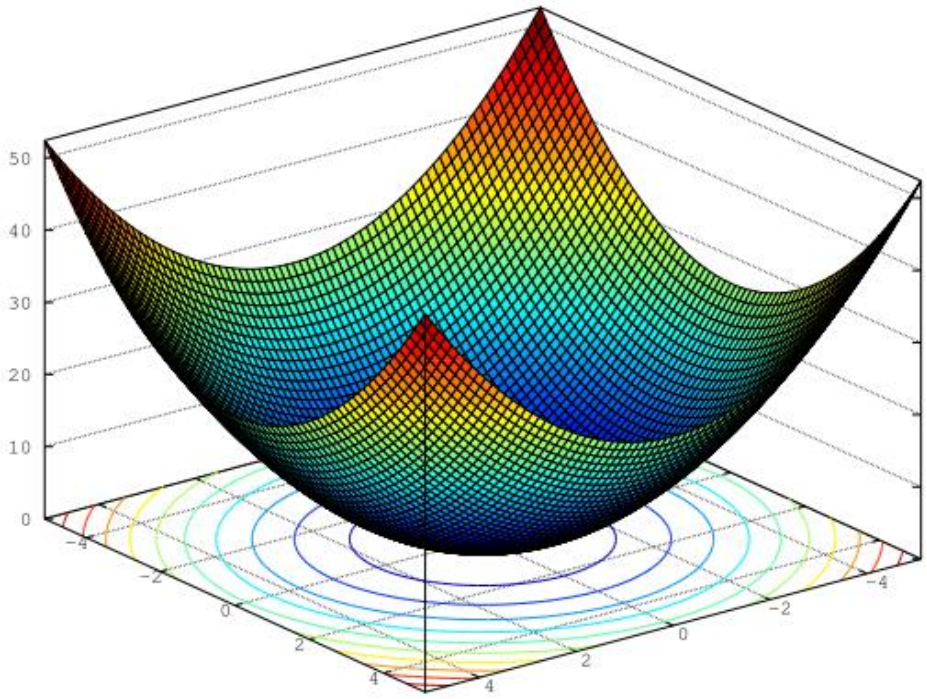
Optimisation

- Mathematical definition of optimisation problem:

$$\min_{x \in R^n} f(x)$$

Subject to : $h_j(x) = 0, j = 1, \dots, J$

$g_k(x) < 0, k = 1, \dots, K$



Bilevel Optimisation

Mathematical definition

The upper level problem is :

$$\min_{x_u \in X_U, x_l \in X_L} F(x_u, x_l)$$

Subject to :

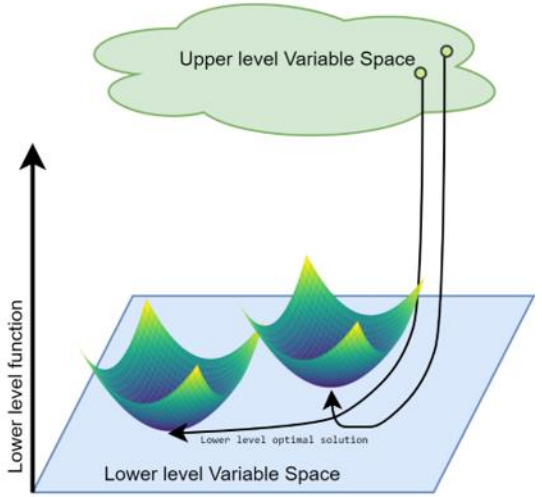
$$g_k(x_u, x_l) \leq 0, k = 1, \ldots, K$$

Where x_l for each value of x_u, is the solution of the lower level problem:

$$\min_{x_l \in X_L} f(x_u, x_l)$$

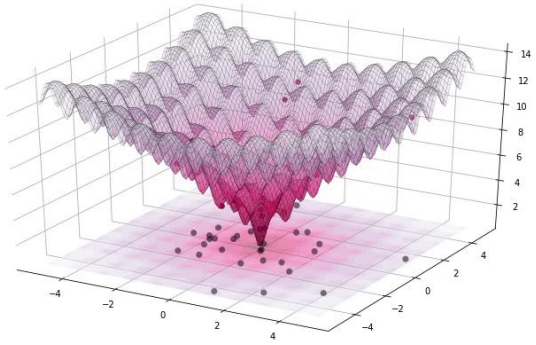
Subject to :

$$g_j(x_u, x_l) \leq 0, k = 1, \ldots, J$$

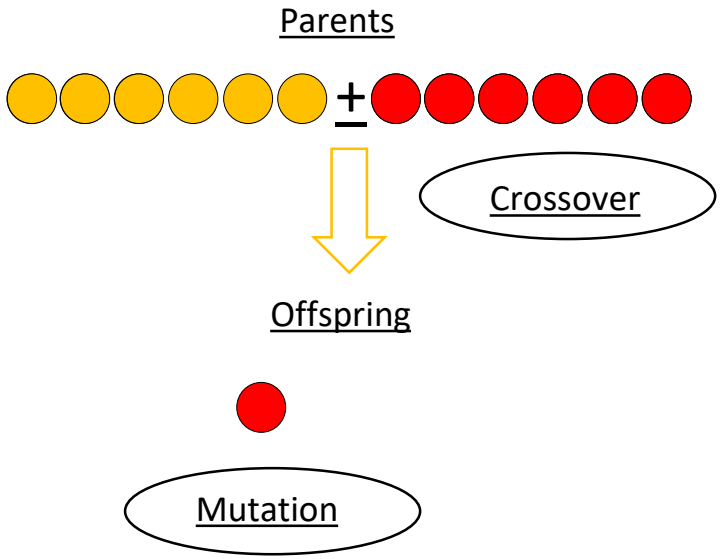


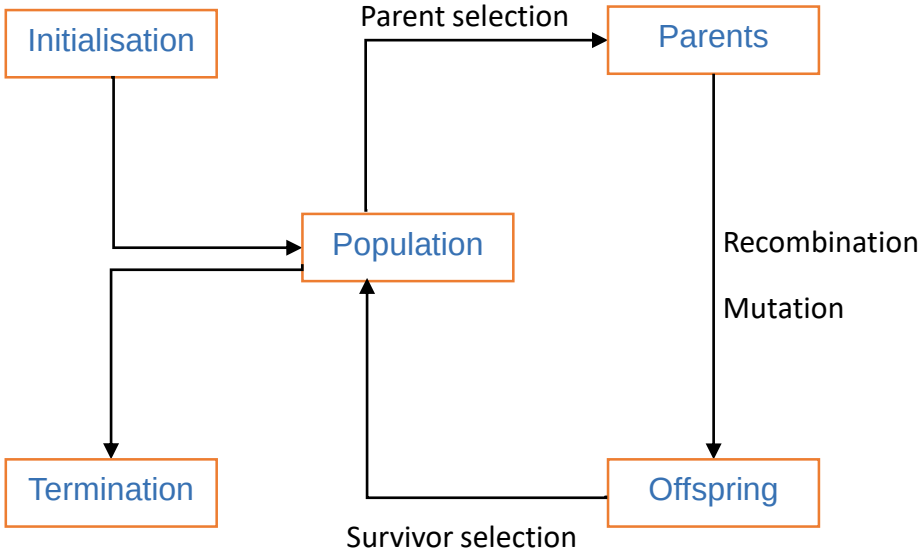
A general sketch of a bilevel problem.

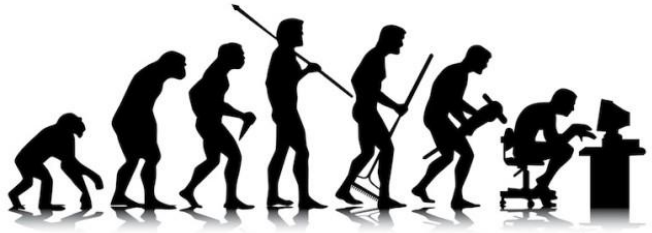
Evolutionary Algorithms



By Pablormier - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=62208829







Goal

The effect of *parameter control* when using *evolutionary algorithms* for tackling difficult *bilevel optimisation problems*, in terms of efficiency.

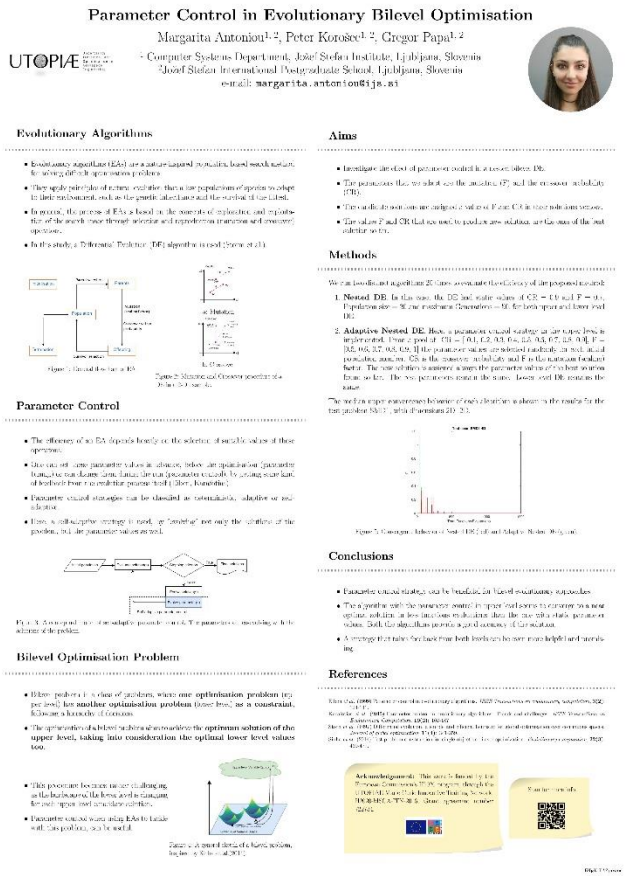
Acknowledgement

The research project received funding by the European Commission's H2020 programme, through the UTOPIAE Marie Curie Innovative Training Network, H2020-MSCA-ITN-2016, Grant Agreement number 722734.

http://utopiae.eu/

https://twitter.com/utopiae_network

Poster: 49



Parameter Control in Evolutionary Bilevel Optimisation

Margarita Antoniou[1,2], Peter Korošec[1,2], Gregor Papa[1,2]

[1] Computer Systems Department, Jožef Stefan Institute, Ljubljana, Slovenia
[2] Jožef Stefan International Postgraduate School, Ljubljana, Slovenia
e-mail: margarita.antoniou@ijs.si

Evolutionary Algorithms

Parameter Control

Bilevel Optimisation Problem

Aims

Methods

Conclusions

References

Acknowledgements: This work is funded by the European Commission via the H2020 programme through the UTOPIAE Marie Curie ITN project, grant agreement number 722734.

UTOPIÆ

Uncertainty Treatment and Optimisation in Aerospace Engineering

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Construction by the Destruction: Welcome to the Magic of Plasma

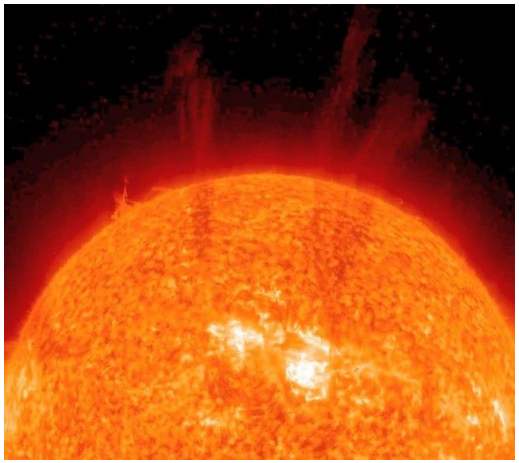
Neelakandan M Santhosh
Jožef Stefan International Postgraduate School (IPS),
Ljubljana, Slovenia

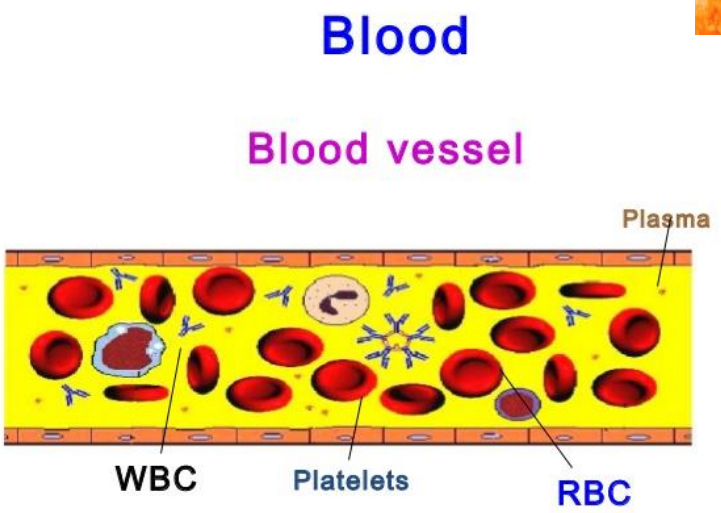
Poster number: 65

Plasma!!!

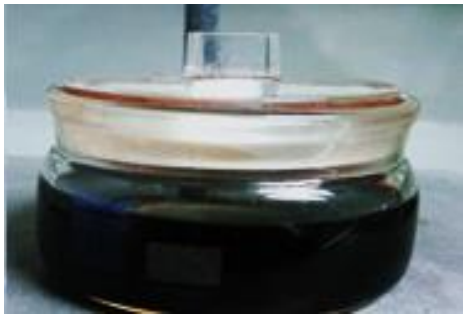
What it is ?

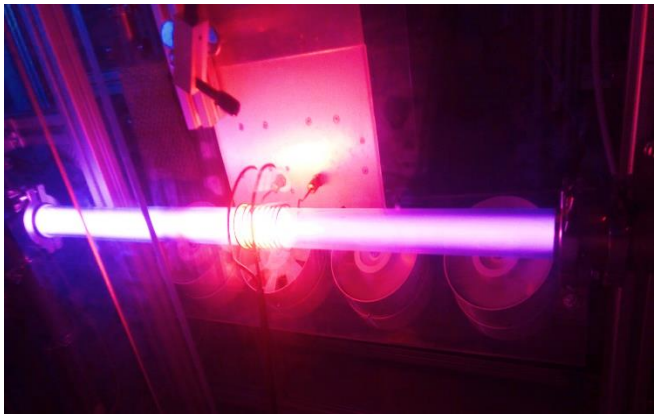
“Ionized gas”

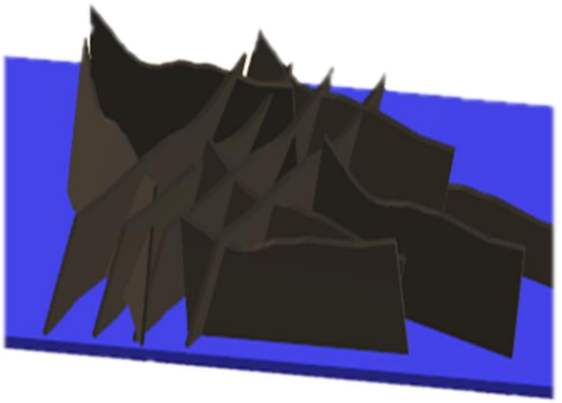


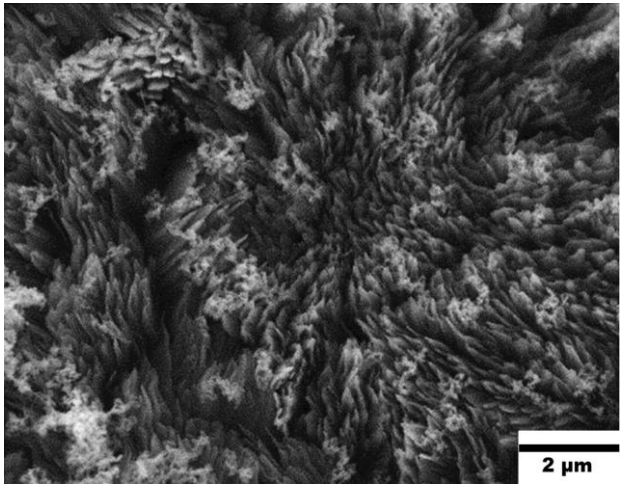


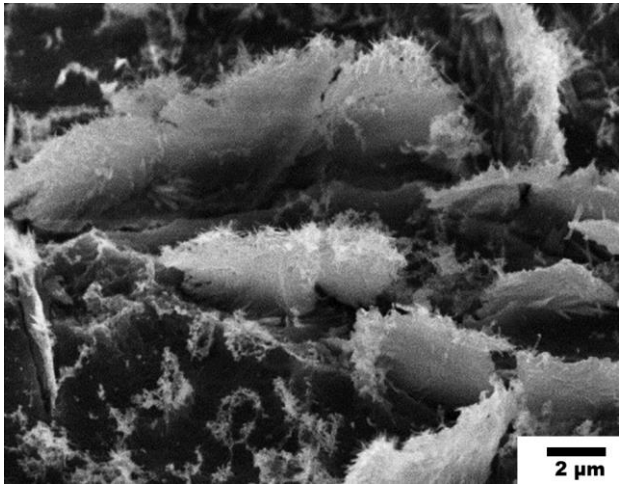
Construction by the Destruction

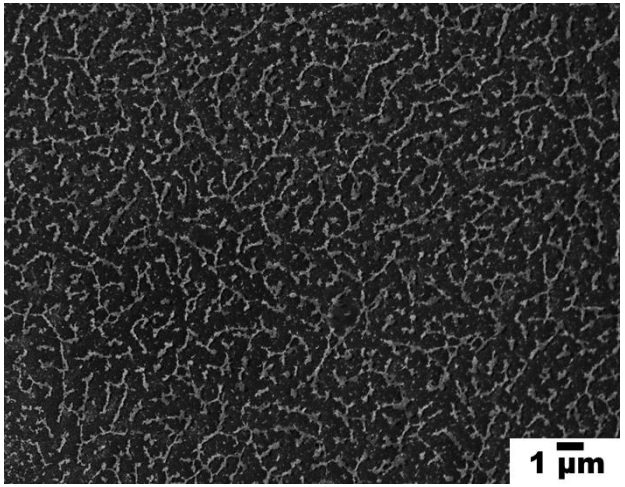












Why the "Magical" Plasma?

"Simple"

"Large scale synthesis"

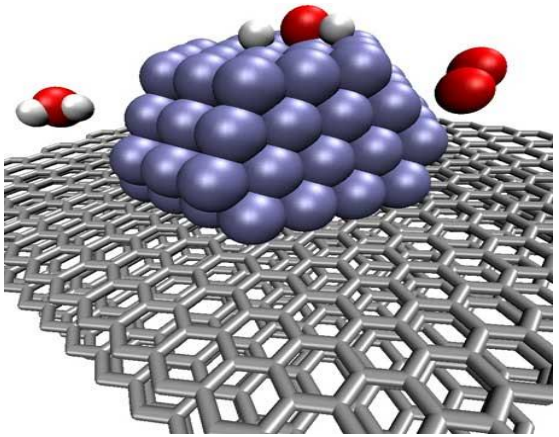
"Controllable"

"Fast and precise"

Demand of oriented structures

Super capacitors

Lithium Battery



Catalyst supporter for fuel cells

Thanks For Your Kind Attention

More on Poster No:65

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15 and 16 April 2019, Planica

Radon-based method to assess atmospheric stability

Dafina Kikaj

Jožef Stefan International Postgraduate School

Poster number: XX

Radon: a convenient atmospheric tracer

Why?

– know source, mainly terrestrial origin;

– exhales into the lower atmosphere: directly influenced by atmospheric processes;

– shows temporal variations: diurnal, synoptic, seasonal;

– inert / poorly soluble: its only atmospheric sink is radioactive decay;

– half-life ($t_{1/2}$=3.82 d) short enough → to not accumulate in the atmosphere;

– half-life appropriate (mixing in the lower atmosphere ≤24 hours) → to be used as a convenient indicator of the atmospheric stability.

Atmospheric stability

– term to describe the tendency of the lower atmosphere to suppress or enhance (30–2000 m);

– changes diurnally and seasonally – usually, the weakest mixing of air during night-time and winter season.

Atmospheric stability classes

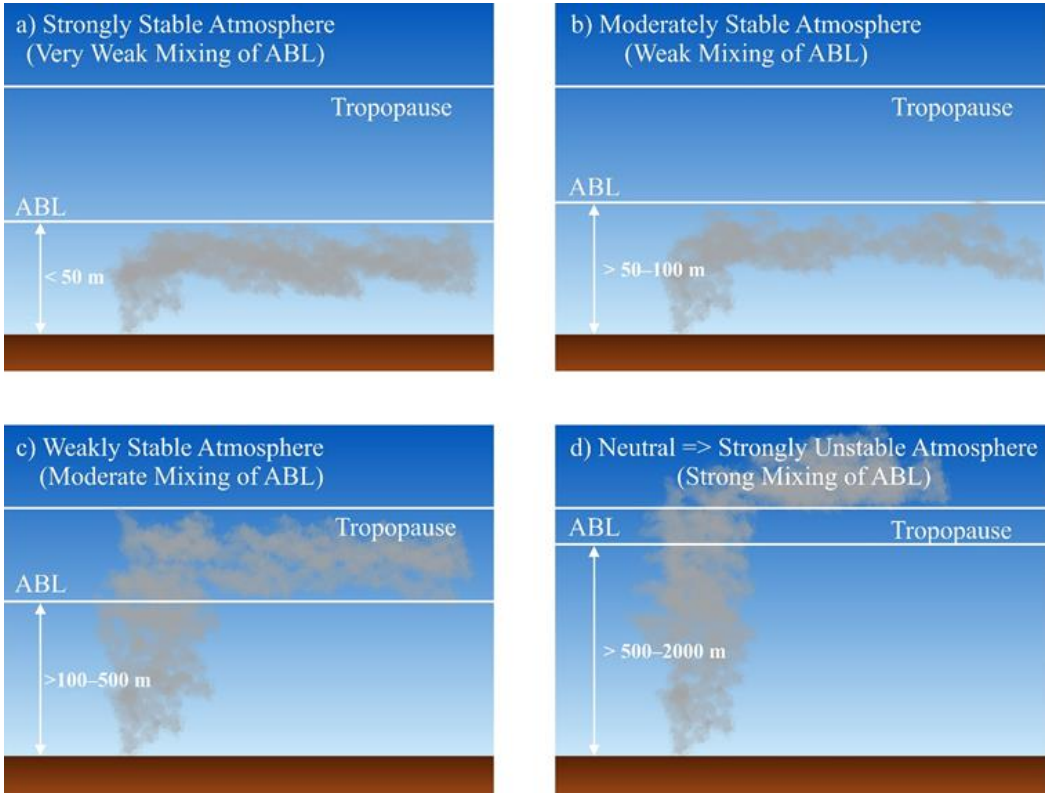
Night

Neutral
Weakly Stable
Moderately Stable
Strongly Stable

Persistent temperature inversion!

Day

Neutral
Weakly Unstable
Moderately Unstable
Strongly Unstable



Understating changes in atmospheric stability is prerequisite to characterize and evaluate air pollution.

Experimental: location and measurments

Location: Ljubljana Bežigrad Meteorological Station.

Data: – radon concentration, obtained by own measurements;
– meteorological parameters and air pollutants provided by the Environmental Agency of the Republic of Slovenia.

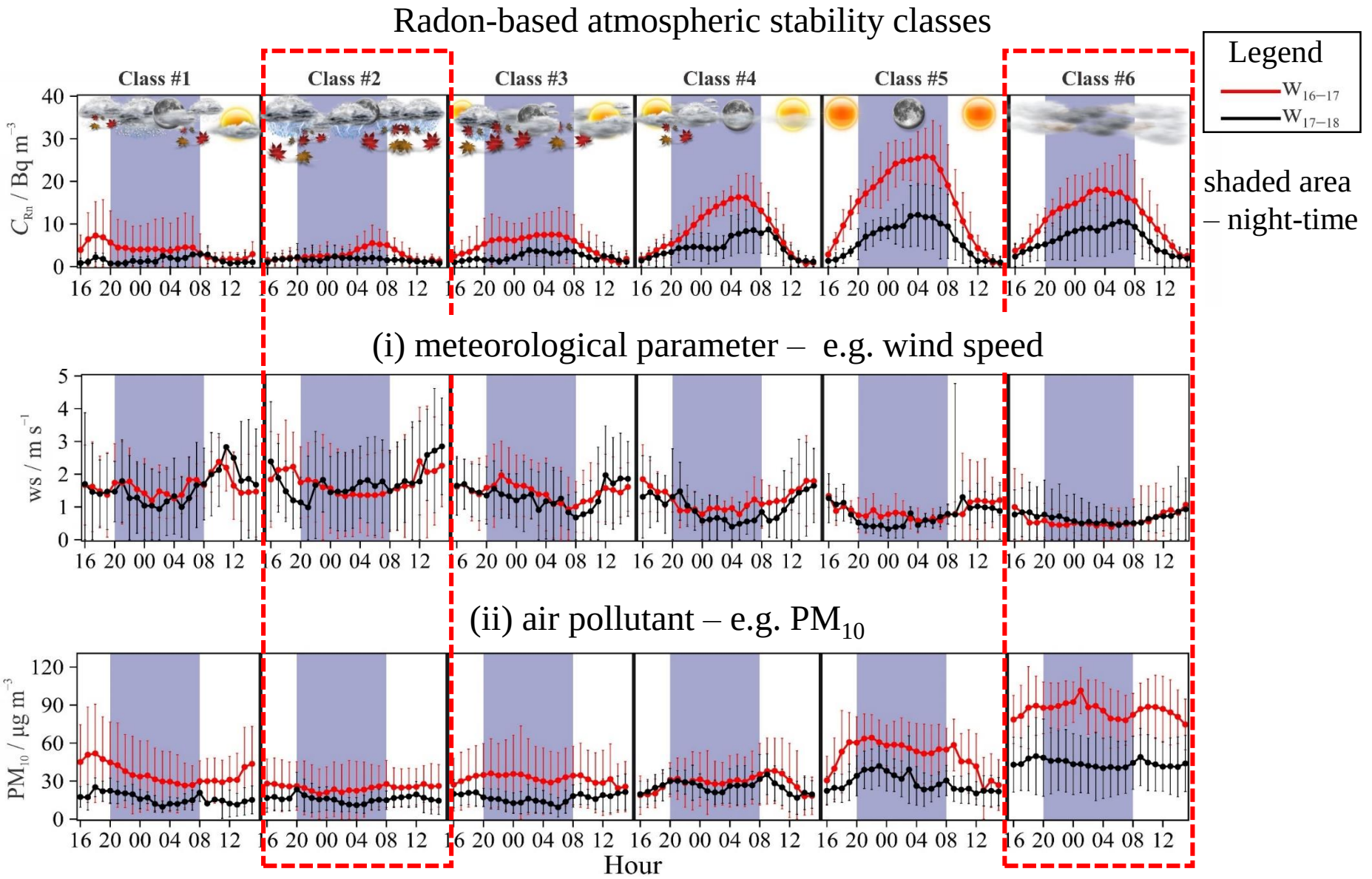
AlphaGUARD radon monitor
set up in a weather instrument shelter

Measurements:
– 1.5 m above ground level;
– 1-hour time resolution;
– since December 2016.

Ljubljana Bežigrad
Meteorological Station

Presented are results for two winters:
$w_{16–17}$: Dec 2016–Feb 2017 and $w_{17–18}$: Dec 2017–Feb 2018

Testing of radon-based atmospheric stability classification



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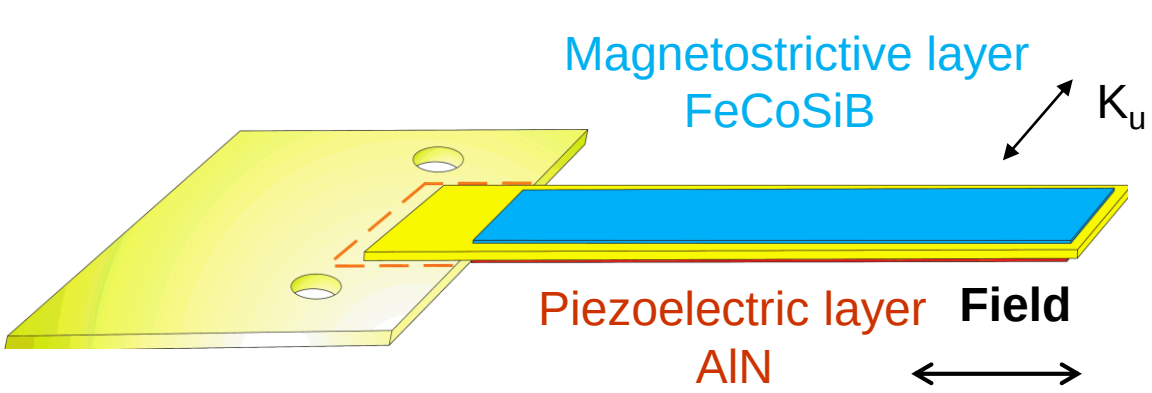
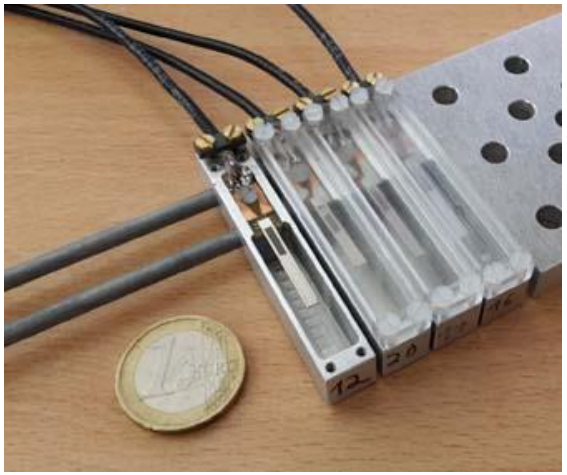
15 and 16 April 2019, Planica

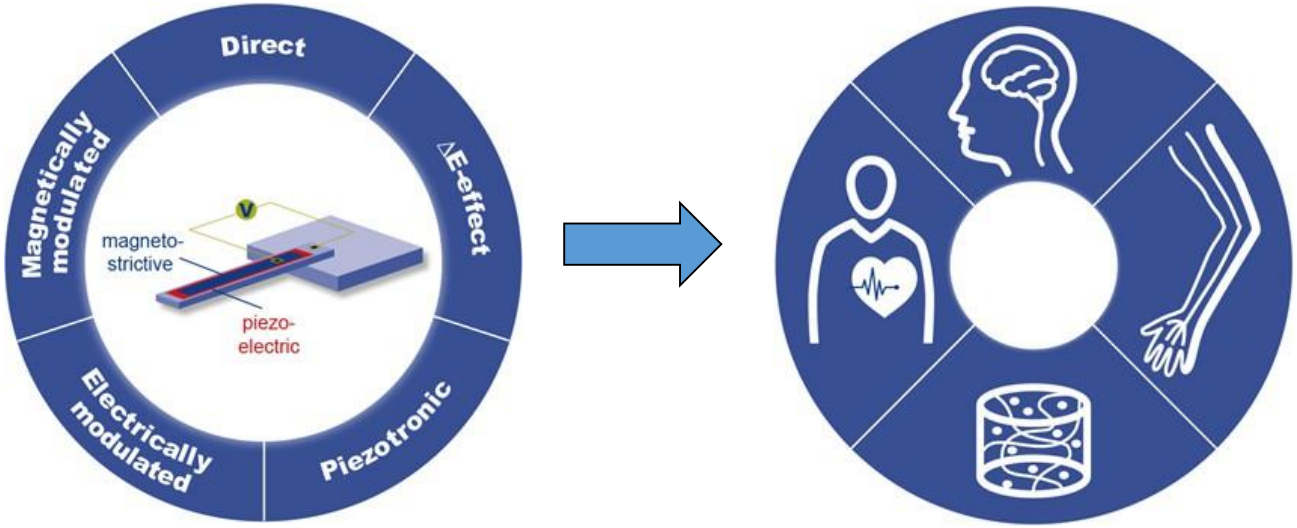
Magnetic Noise? No Problem. We have Antiparallel Exchange Bias!

Matic Jovičević Klug
Institute for Materials Science
Kiel University, Germany

Poster number: **30**

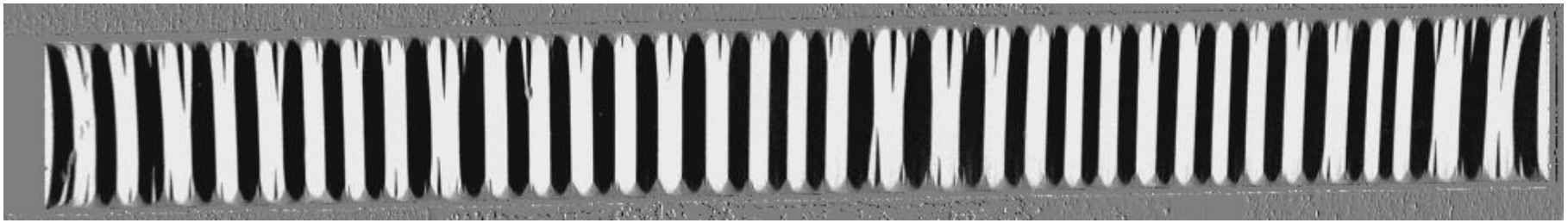


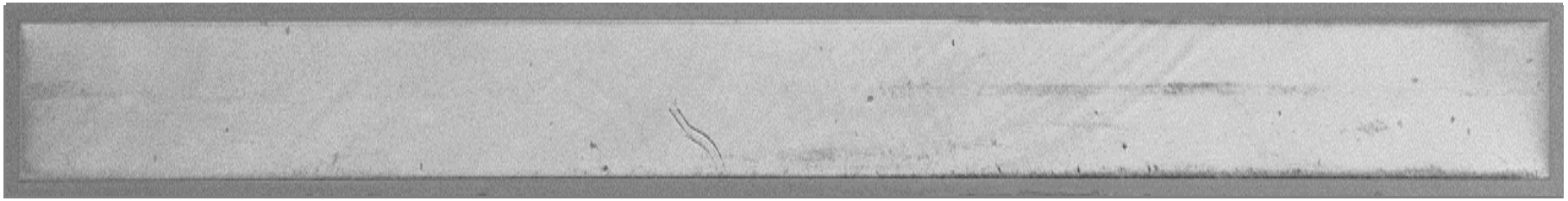


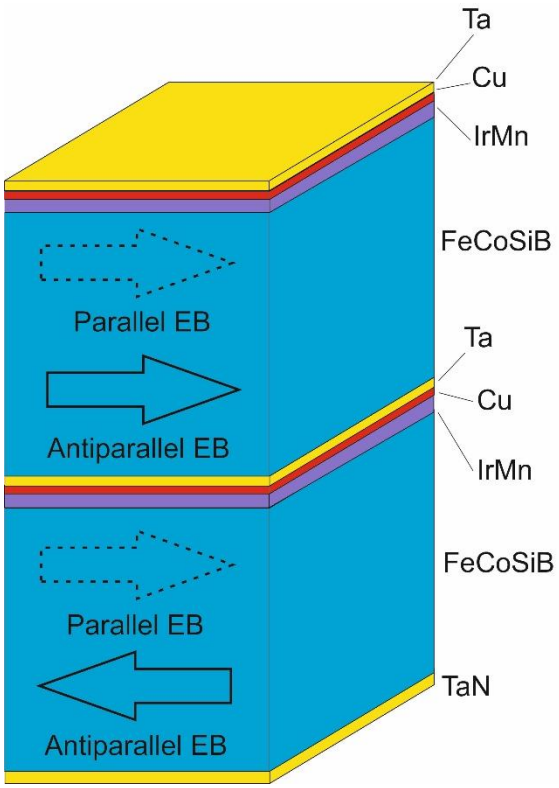


- Development of sensor concepts for biomagnetic field sensing applications

- Collaboration of 14 projects conjoining 6 disciplines and 4 Institutions
  With total of around 60 personnel


2 mm




Ta
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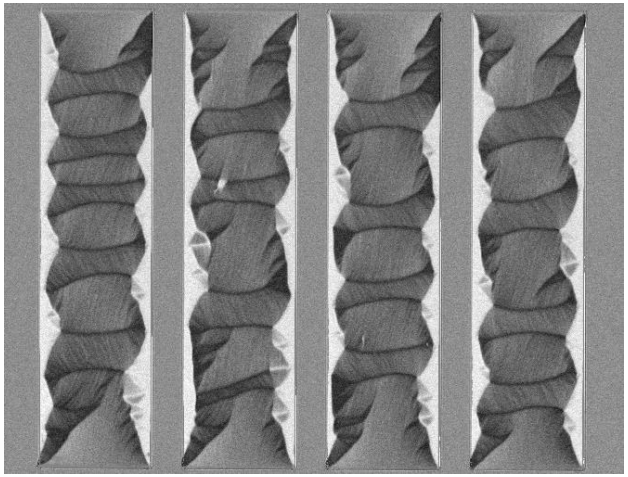
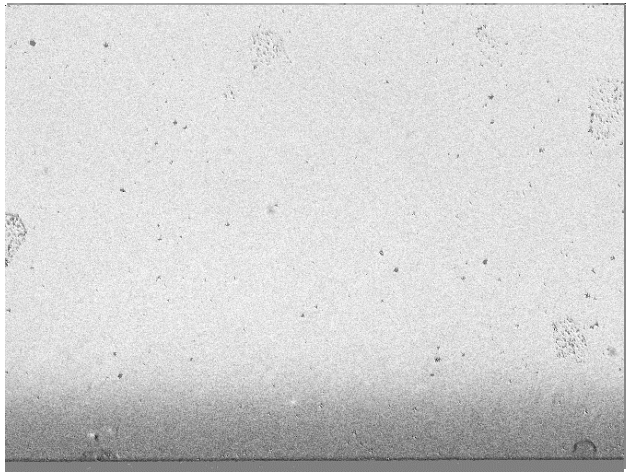
IrMn
FeCoSiB
Parallel EB
Antiparallel EB
Ta
Cu
IrMn
FeCoSiB
Parallel EB
Antiparallel EB
TaN


100 µm



Magnetic Noise Extinction through Single Domain Stabilization with Antiparallel Exchange Bias in Magnetoelectric Composite Sensors

M. Jovičević Klug[1], L. Thormählen[1], S. D. Toxværd[2], V. Röbisch[1], D. Meyners[1], R. Knöchel[2], M. Höft[2], E. Quandt[1], J. McCord[1]

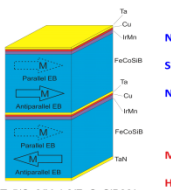
[1]Institute for Materials Science, Kiel University, Kiel, Germany
[2]Institute of Electrical Engineering and Information Engineering, Kiel University, Kiel, Germany

C | A | U
Christian-Albrechts-Universität zu Kiel
Faculty of Engineering
Institute for Materials Science
Institute of Electrical Engineering and Information Engineering

Introduction

Magnetoelectric (ME) composite sensors have shown potential in magnetic field sensing applications. Through advancing research, the limiting factors of the sensors have been shown to originate from magnetic noise contributions when magnetic frequency conversion (MFC) is used [1]. Sudden movement of domain walls (Barkhausen noise) and effects of demagnetization field are crucial contributions for the generated noise [2], [3]. Such noise has been reduced in the past by using a multilayer exchange bias (EB) [4], however the increase of performance of these ME sensors is still not sufficient for most biomagnetic sensing applications. Within this project, new techniques and magnetic structures are investigated to establish new ME sensors with lower magnetically induced noise and reduced limit of detection (LOD). In the latest, the so-called antiparallel EB configuration in a multilayer stack is introduced.

Model & Theory



{Ta5/Cu3/MnIr8/FeCoSiB90/Ta5/Cu3/MnIr8/FeCoSiB110}/Ta5

Parallel EB (PEB)

Noise limitation
Domain nucleation at larger fields and ripple formation

Signal limitation
Magnetically harder sensors – reduction of sensor signal

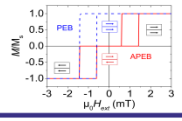
Noise and signal limitation
Increased demagnetization field – thickness limitation

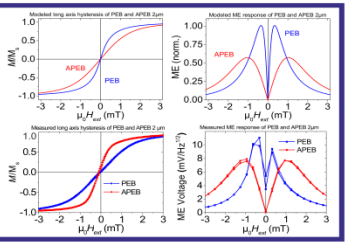
Antiparallel EB (APEB)

Minimization of demagnetization field effects
Decreased demagnetization field due to stray field coupling

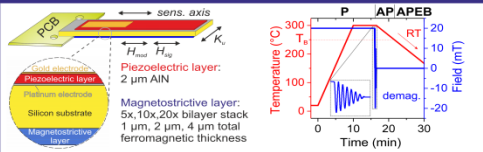
Higher stability of domains and decreased noise
Fixation of magnetization configuration leading to reduced magnetic wall and magnetic domain motion/switching

Modeling of magnetization and ME response (right, up) was conducted with a macrospin model based on Stoner–Wohlfarth model. Experimental data (right, down) shows good correlation with the modeling. Below is the modeled example of magnetization response of PEB and APEB along the short axis.





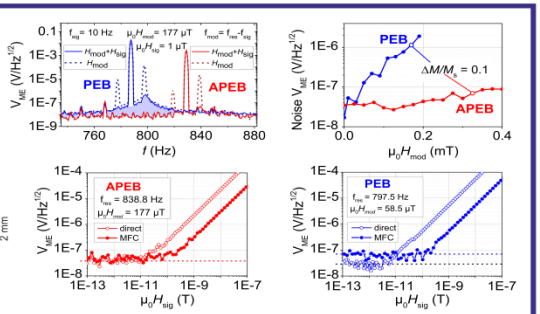
Experiments & Results

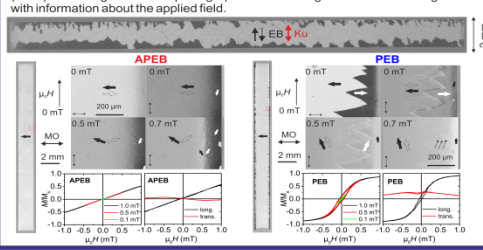


Piezoelectric layer:
2 μm AlN

Magnetostrictive layer:
5x,10x,20x bilayer stack
1 μm, 2 μm, 4 μm total ferromagnetic thickness

The sensor construction is represented in the schematic on the left. The H_{sig} and H_{mod} indicate the orientation of the excitation field during magnetic frequency conversion (MFC). On the right is the temporal graph for the heating scheme for attaining APEB with information about the applied field.





On the left, the magneto-optical Kerr effect (MOKE) domain images are presented. An enlarged example of a multidomain APEB is displayed. The comparison of domain evolution under field for PEB and single domain APEB with accompanying component selective magnetometry loops are also presented. The electrical characterization of the same PEB and APEB sensors is given above. All this data indicates the superiority of the APEB in terms of noise performance due to the stabilized magnetic domain structure. The noise behavior of APEB compared to PEB is reduced10 fold at the same change of magnetization. The measurements done with MFC indicate that the noise level is limited due to thermomechanical noise and the LOD is improved down to 50 pT/Hz$^{1/2}$ at 10 Hz [5].

Conclusions

In summary, we showed a method with antiparallel EB
noise of sensors. The new sensors exhibit for the first ti
noise with magnetic frequency conversion technique. Th
the limit of detection of the sensors down to 50 pT/Hz$^{1/2}$ at 1
for further improvement of ME composite sensors as well a

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Acknowledgements

Funding by the German Research Foundation through Collaborative Research Center CRC 1261
Magnetoelectric sensors: From Composite Materials to Biomagnetic Diagnostics
biomagnetic sensing
SFB 1261
Deutsche Forschungsgemeinschaft
DFG

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E-mail: matk@tf.uni-kiel.de

COME SEE POSTER # 30

CRC 1261 – Magnetoelectric Sensors: From Composite Materials to Biomagnetic Diagnostics

Funded by the German Research Foundation (DFG).

www.sfb1261.de

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Fraunhofer ISIT

IPN Leibniz-Institut für die Pädagogik der Naturwissenschaften und Mathematik

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15 and 16 April 2019, Planica

INSENSION: Giving a voice to those who don't have one

Matej Cigale,

Department of Intelligent Systems and Jožef Stefan International Postgraduate School, Jamova cesta 39, 1000 Ljubljana

Poster number: 7

People with PIMD

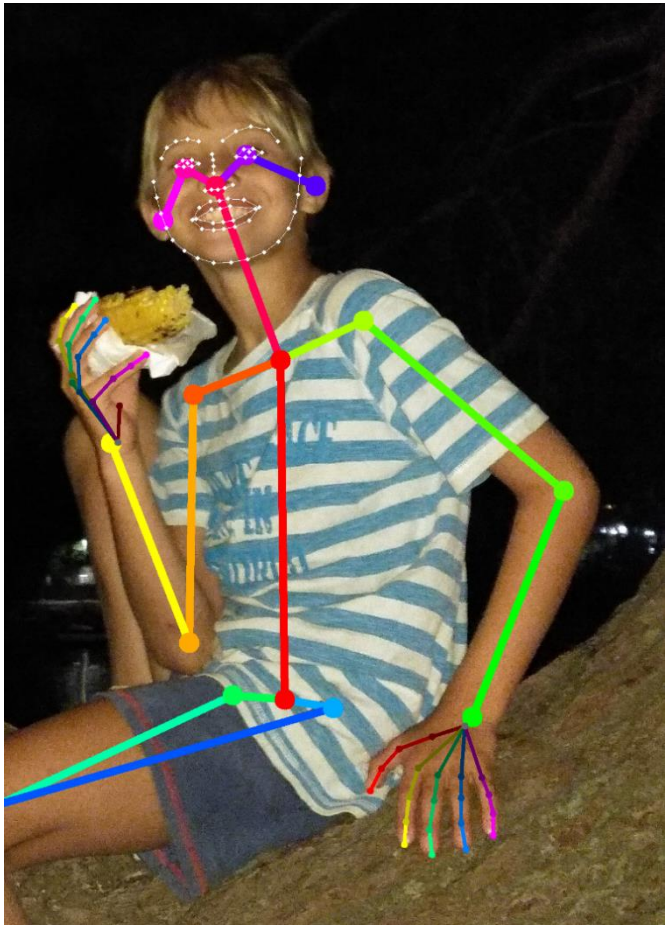
- Profound Intellectual and Multiple Disabilities
- Severe intellectual disability
  - Lack of conventional and symbolic communication abilities
  - Other possible disabilities such as motor or sensorial impairments
- Heavily reliant on caregivers
  - Leads to severe insecurity
  - Hard to extend the circle of communication partners.

INSENSION project

- An ICT platform that enables persons (PIMD) to use digital applications and services
- Increase their ability to self-determination and enrich their life
- Sense the intentions of its users and translate them into meaningful communications
- Extract the context of the communication

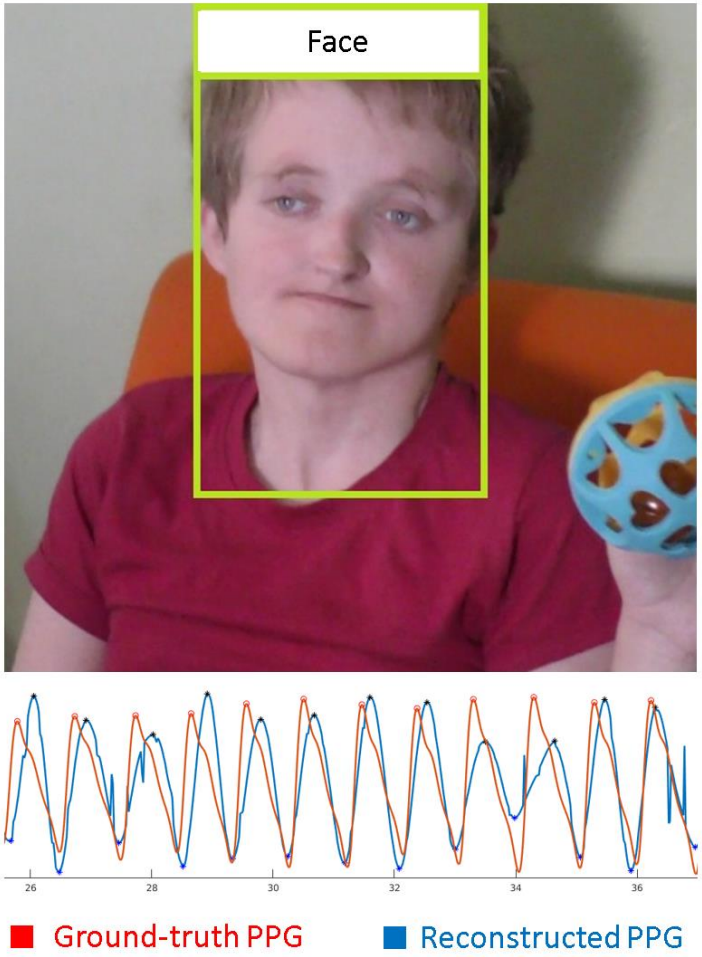
Bridging the gap

- Voice recognition
- Facial features extraction
- Mapping the body movement
- Object detection



Behavioral state from the PPG

- Signal extracted form wearable or form video
- Reflects changes of blood volume in the skin tissue and is periodic



INSENSION

www.insension.eu

Personalized intelligent platform enabling interaction with digital services to individuals with profound and multiple learning disabilities

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 780819.

PARTNERS:

PSNC

Pädagogische Hochschule HEIDELBERG University of Education

Jožef Stefan Institute

CTIC centro tecnológico

natak

HARPO

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15 and 16 April 2019, Planica

Wound healing using piezoelectric patch

Lea Udovč,

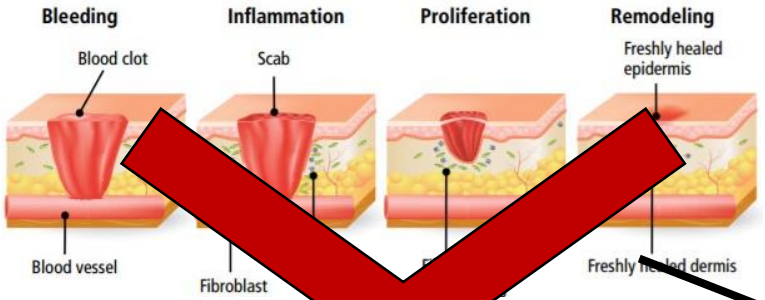
Advanced Materials Department K9, JSI,

Jožef Stefan International Postgraduate School

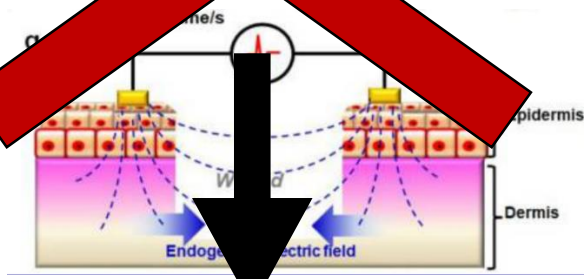
Poster number: 18

Electric stimulation in healing of wounds

Natural healing:

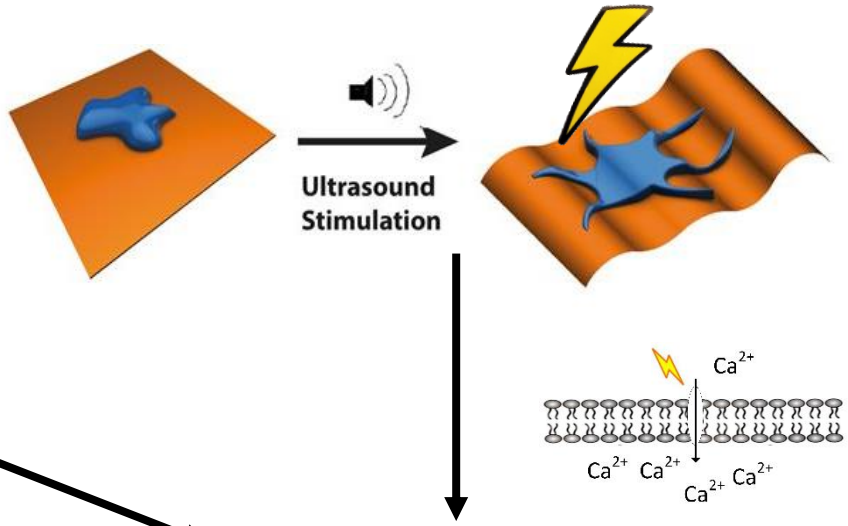


Electric field formed at the wound site



Chronical wounds

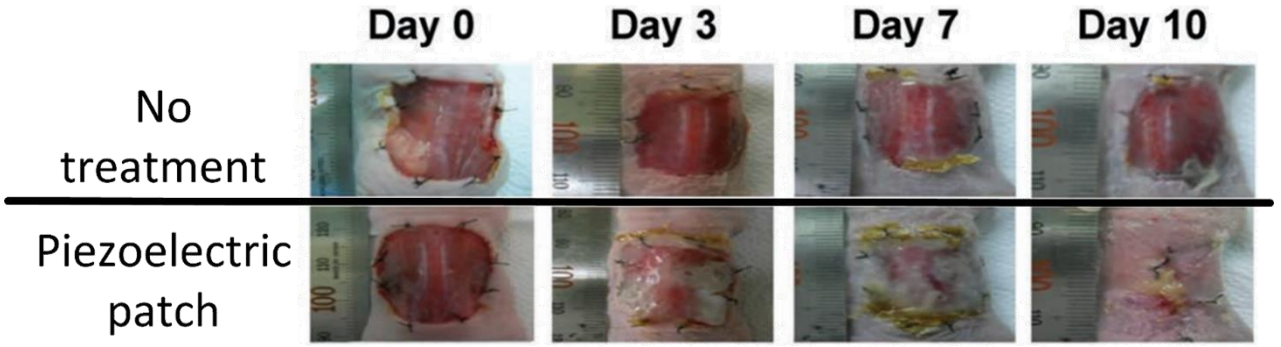
Healing of chronical wounds using piezoelectric patch:

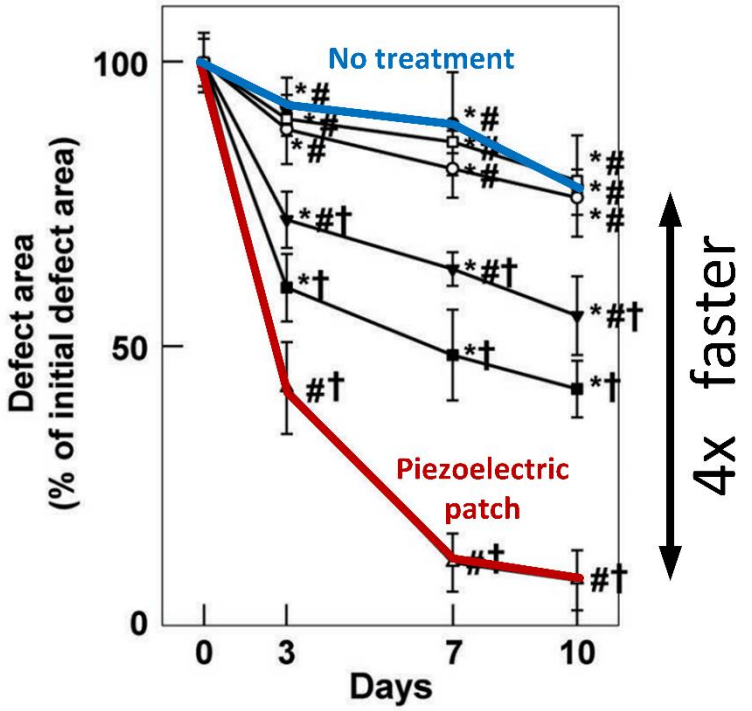


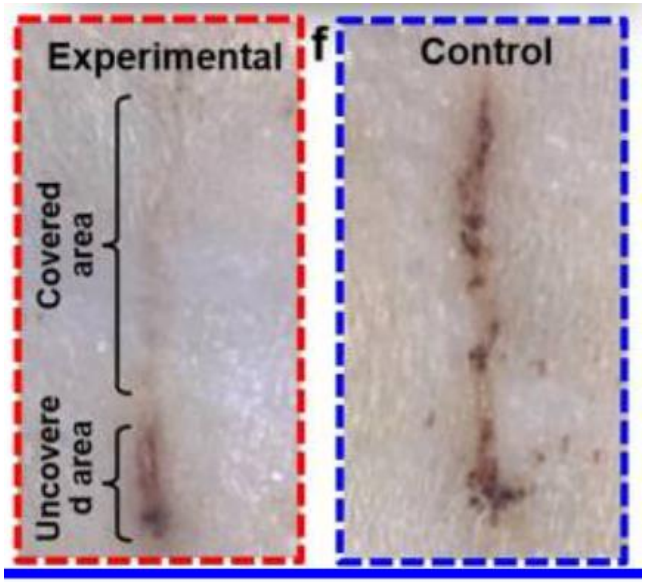
Cell growth and migration
→ **tissue repair**

Healing *in vivo*

Bhang, S: et al.:Zinc Oxide Nanorod-Based Piezoelectric Dermal Patch for Wound Healing. Adv. Funct. Mater. 2017, 27, 1603497







Piezoelectric film for medical applications

Film requirements:

- Biocompatibility ✓
- Biodegradability ✓
- Mechanical properties ✓
- Hydrophilic surface ✓

We prepare PLA/HAP piezoelectric film:

Polylactic acid (PLA)
as piezoelectric compound

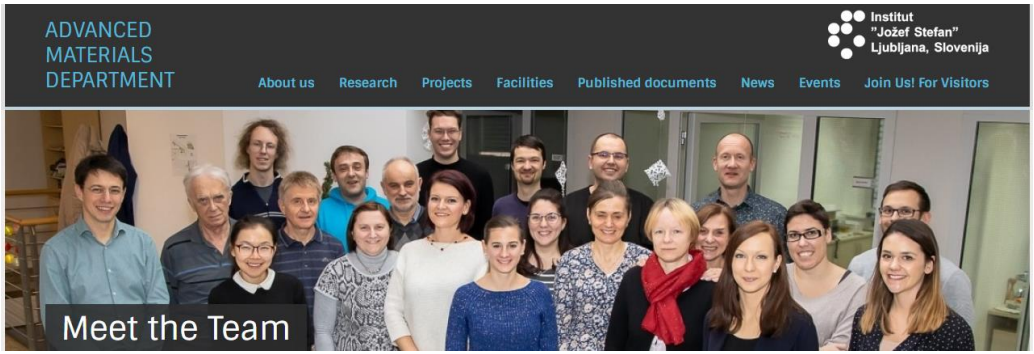
+

Hydroxyapatite particles (HAP)
as bioactive compound

Piezoelectric polymer film

JAVNA AGENCIJA ZA RAZISKOVALNO DEJAVNOST
REPUBLIKE SLOVENIJE

Thank you !



Poster number: **18**

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15 and 16 April 2019, Planica

Can we detect plant viruses using *USB key*-like device?

Anja Pecman

National Institute of Biology,
Department of Biotechnology and System Biology

Poster number: 42

Plant pathogenic viruses

↓ economy - ↓ crop quality and quantity

https://www.google.com/search?q=VEGETABLES+IMPORT&rlz=1C1GCEU_enSI828SI828&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjWr6uGysXhAhXE6aQKHe70CrQQ_AUIDigB&biw=1920&bih=1008#imgrc=LcaQn84-mBTqcM:

→ quick detection

→ appropriate action

In the case of viruses if we do not know which is causing the disease we can not detect it!

https://www.google.com/search?q=anonymous&rlz=1C1GCEU_enSI828SI828&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjqzLrto8XhAhXQ1qQKHU7ICl4Q_AUIDigB&biw=1920&bih=1008#imgrc=dfmPd2c5MCOsIM:

High-throughput sequencing – massively parallel reading of multiple DNA/RNA fragments

illumina®

https://www.google.com/search?q=ngs&rlz=1C1GCEU_enSI828SI828&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiDoKPXo8XhAhWLKewKHe7GD0oQ_AUIDigB&biw=1920&bih=1008#imgrc=B-NMFmSPBoUo_M:

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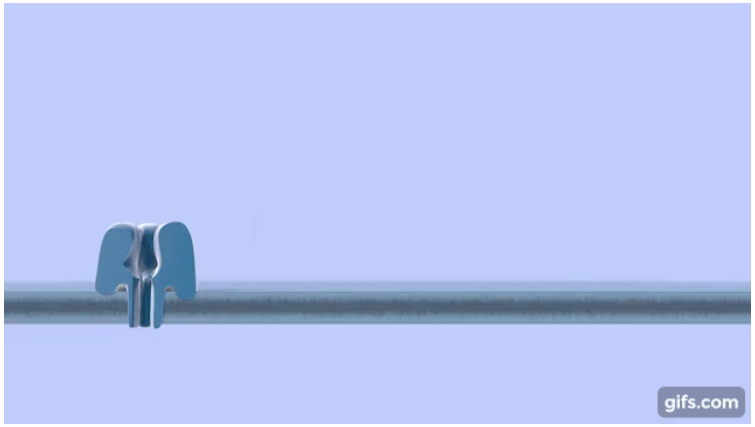
MinIon – Oxford Nanopore Technology

portable device



sequencing through Nanopore
(measuring electric current)

↓

!long reads with high error rate!

simple & rapid or automated library prep

Comparison on detection of different plant viruses/viroids using ***MinIon (Oxford Nanopore sequencing)*** versus establish approach ***MiSeq (Illumina)***

Sample number	Virus name (Abbreviations)	Baltimore classification
I	*Potato virus Y (PVY)*	*ssRNA+*
	Cauliflower mosaic virus (CaMV)	*dsDNA-RT+/-*
II	Novel cabbage cytorhabdovirus 1 (CCyV1)	*ssRNA-*
	Tomato Yellow Leaf Curl Virus (TYLCV)	*DNA+*
III	*Tomato chlorosis virus (ToCV)*	*ssRNA+*
	Pepino mosaic virus (PepMV)	*ssRNA+*
	Tomato mosaic virus (ToMV)	*ssRNA+*
	Southern tomato virus (STV)	*dsRNA +/-*
	Columnea latent viroid (CLVd)	*viroid*
IV	*Phaseolus vulgaris Endornavirus 1 (PvEV1)* *Phaseolus vulgaris Endornavirus 2 (PvEV2)*	*dsRNA +/-*
V	*Ulluco tymovirus 1*	*ssRNA+*
	Ulluco tymovirus 2	*ssRNA+*
	Ulluco polerovirus	*ssRNA+*
	Ulluco potyvirus	*ssRNA+*
	Ulluco tobamovirus	*ssRNA+*
	Ulluco comovirus	*ssRNA+*
	Potato aucuba mosaic virus (PAMV)	*ssRNA+*
	Broad bean wilt virus (BBWV)	*ssRNA+*
VI	*Tomato apical stunt viroid (TASVd)*	*viroid*
VII	*Tomato spotted wilt virus (TSWV)*	*ssRNA-*

Further work on comparison and sensitivity

Poster number: 42

https://www.google.com/search?q=lab+work&tbm=isch&source=lnt&tbs=itp:lineart&sa=X&ved=0ahUKEwisuZzKosXhAhXIQxUIHe_zDLUQpwUIRw&biw=1920&bih=1008&dpr=1#imgrc=oWx7wvAnDZgmEM:

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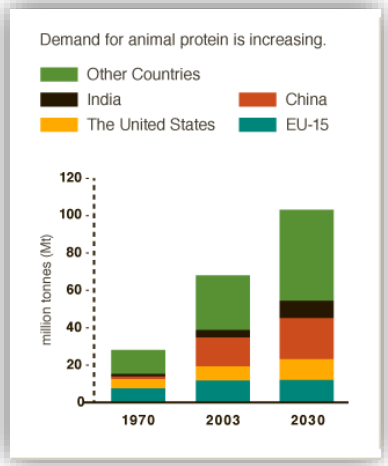
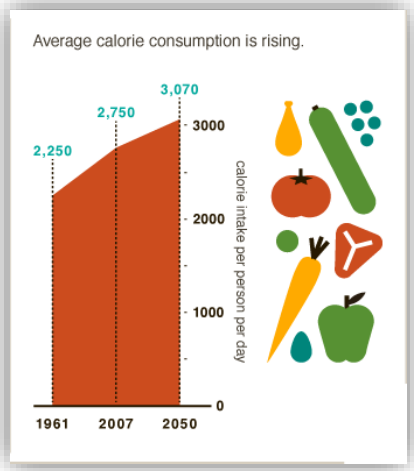
and Young Researchers' Day CMBO
15 and 16 April 2019, Planica

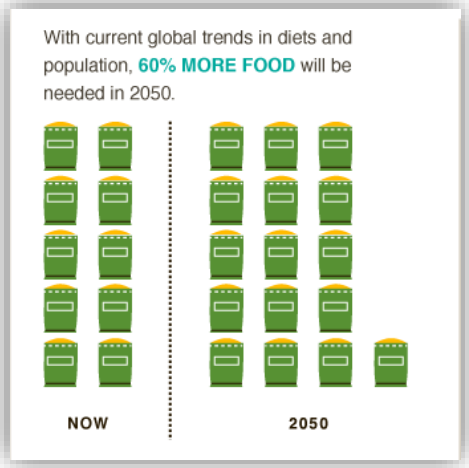
Love is in the air

Mojca Juteršek,
National Institute of Biology,
Jožef Stefan International Postgraduate School

Poster number: 21



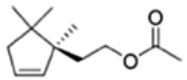




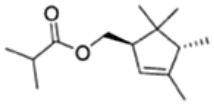
https://ccafs.cgiar.org/bigfacts/#theme=food-security

https://commons.wikimedia.org/wiki/File:Ermine_Moth_Larvae_-_Flickr_-_gailhampshire.jpg

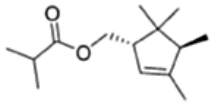
https://commons.wikimedia.org/wiki/File:Starr-130914-1508-Ipomoea_pes_caprae_subsp_brasiliensis-leaf_with_whitefly_or_mealybug-Near_lake-Laysan_(25224992515).jpg; Forest and Kim Starr



(*S*)-**300**



(1*R*,4*R*)-**301**



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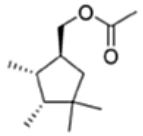
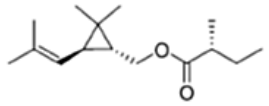
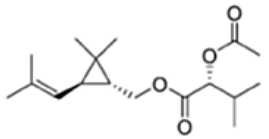


(1*S*,2*S*,3*R*)-**302**



(1*R*,3*R*,2'*R*)-**252**



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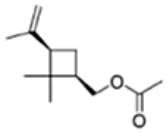

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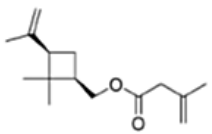
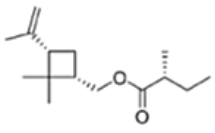


(1*R*,3*R*)-**255**



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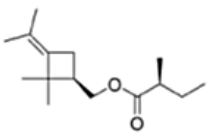
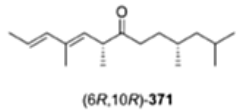
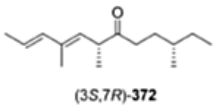


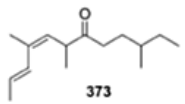
(1*R*,2'*S*)-**257**



(6*R*,10*R*)-**371**



(3*S*,7*R*)-**372**



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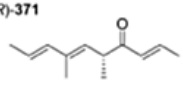
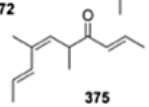


(3*S*,7*R*)-**374**



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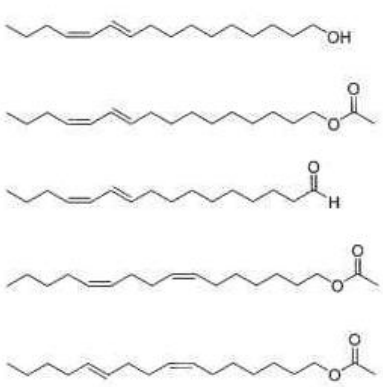
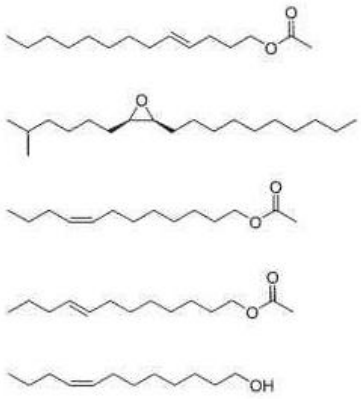
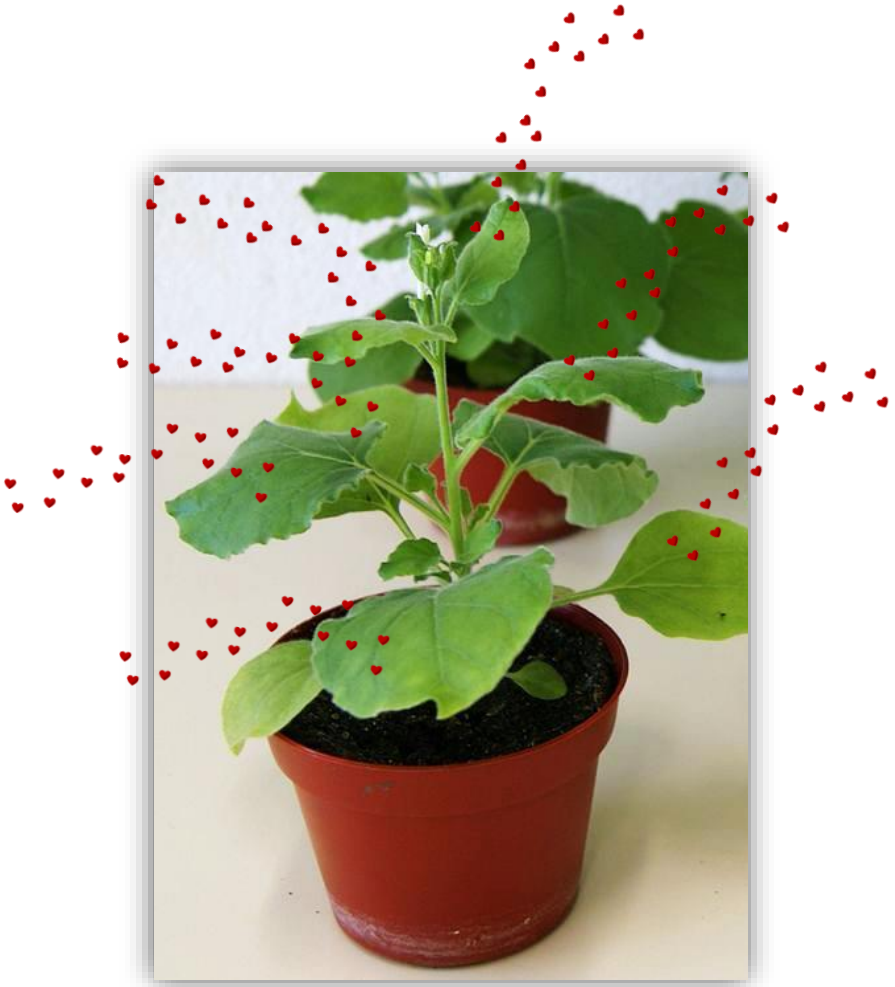






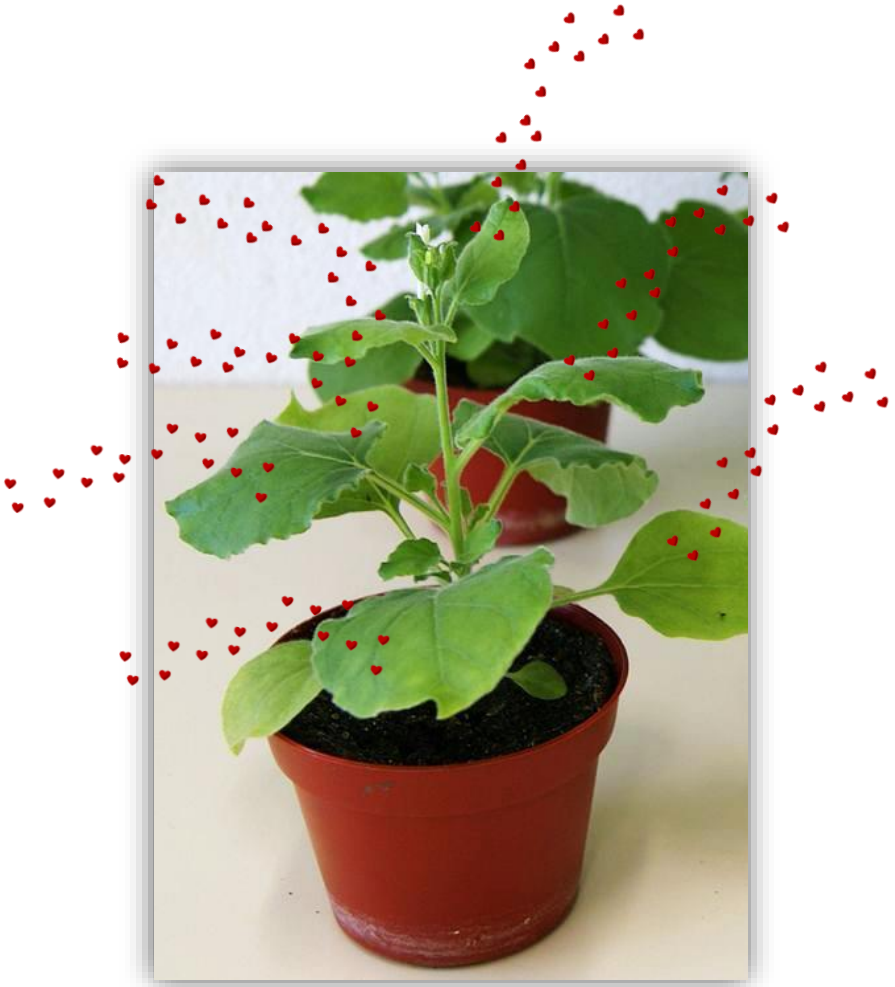
PoC: The Sexy Plant

Improvement

Produce more pheromones

Grow better

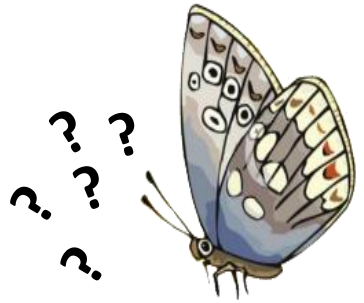
Emit the pheromones



Implementation

Pheromones of different insect species

PoC: The Sexy Plant



Sometimes a broken heart can mend something else's brokenness.

—

Munia Khan

www.LUVZE.com

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15 and 16 April 2019, Planica

TV screens of the past for thermal insulation of tomorrow

Uroš Hribar,

Advanced Materials Department K9, JSI,

Jožef Stefan International Postgraduate School

Poster number: 64

LCD and LED monitors

Cathode ray tube televisions less popular

Production of CRT monitors

DISCONTINUED

NO CLOSED LOOP RECYCLING

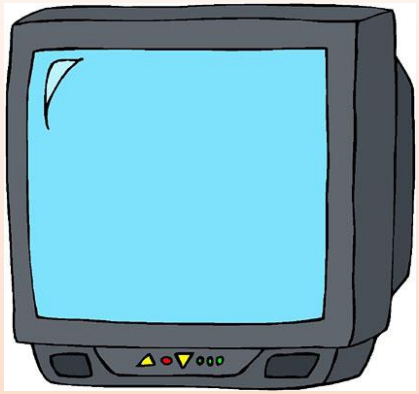
Waste generation - **LANDFILLS**

Solution?

FOAMED GLASS

- Porous material
- Chemically inert,
- Water resistant,
- Non-flammable,
- Low thermal conductivity,
- Closed porosity,
- High crushing strength and density ratio.

Properties ✓



Properties ✓

Crushed cathode ray tube glass (**CRT**) from television panels

Waste glass

Foaming agents

Inert atmosphere (N_2, CO_2)

Heat treatment

Crushed cathode ray tube glass (**CRT**) from television panels

Waste glass

Foaming agents

Air atmosphere

Heat treatment

Crushed cathode ray tube glass (**CRT**) from television panels

Waste glass

Foaming agents

Air atmosphere

Heat treatment

Crushed cathode ray tube glass (**CRT**) from television panels

Waste glass

Carbon

Mn_3O_4

Water glass

Foaming agents

Air atmosphere

Heat treatment

Amount of porosity

Type of porosity (closed/open)

Gas composition

Rate of expansion

Effect of water glass on foaming process

Useful product based on waste CRT glass?

THANK YOU FOR YOUR ATTENTION!

Institut
"Jožef Stefan"
Ljubljana, Slovenija

IPSSC + CMBO

Tuesday, 16.04.2019

COFFEE BREAK & POSTER SESSION 3

11:15 – 12:30

SUPPORTED BY

IPSSC + CMBO

Tuesday, 16.04.2019

INVITED LECTURE

prof. dr. Igor Mekjavić,

12:30 - 13:05

IPSSC + CMBO

Tuesday, 16.04.2019

INVITED LECTURE

Tour of the altitude hypoxic rooms and laboratories

13:05 – 13:50

WINENR ANNOUNCEMENT & CLOSING

13:50 - 14:15

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15 and 16 April 2019, Planica

ORGANIZED BY

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