

Universitat de Girona  
**Escola de Doctorat**

# **II Conference of Pre-doctoral Researchers Abstract Book**

**Miquel Solà**, PhD (Editor)

Volume II, 2018





II Conference

# of Pre-doctoral Researchers

Abstract Book

Miquel Solà, PhD *Editor*

Volume II, 2018

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**DOCTORAL PROGRAMME IN  
MOLECULAR BIOLOGY,  
BIOMEDICINE AND HEALTH**



# Identification of potential genes for suberin and phellem formation

Iker Armendariz, Sandra Fernández, Mercè Figueras, Olga Serra

*Universitat de Girona, Laboratori del Suro, Campus Montilivi, E-17003, Girona, Spain*

## Introduction

The development of a specific tissue is needed to protect terrestrial organisms from dehydration, pathogen attacks or UV irradiation. In plants, the phellem is the protective casing of mature organs such as stems, roots or tubers [1]. The phellem cell impregnates its wall with suberin isolating itself and therefore becoming dead at maturity. In our lab, we wanted to understand phellem formation and suberin cell wall modification at a molecular level. To this end, two models were used: (i) Cork oak (*Quercus suber*) phellem (cork) is particularly thick and pure, allowing the identification of molecular processes and genes that contribute to phellem formation and development. (ii) Potato (*Solanum tuberosum*) tuber phellem allows functional genetics experiments. The aim of the present work was to identify genes in cork and determine their suitability to be characterized by reverse genetics in potato.

## Material and methods

The previous genes identified in an RNA-seq analysis of cork transcriptome [2] were used to identify corresponding potato orthologs with Blastx. To each of them, we assigned the RNA-seq expression values available in the PGSC database [3]. A list of genes with a putative involvement in suberized tissues was considered taking into account their expression in root, phellem, and also after ABA, salt and temperature treatment. The expression pattern of selected genes was analysed among distinct plant tissues and along a time-course of wound-induced suberization in potato tuber by RT-qPCR. Subcellular localization analysis was also performed using the agroinfiltration technique on *Nicotiana benthamiana*. Concomitantly, each assay was contrasted using *in silico* predictions of expression and localization.

## Results and conclusions

A list of 50 genes with high expression levels among suberin-related conditions and tissues were generated. Two genes with no homologs expressed in phellem were then chosen from the list, preventing the complementation of their function when silenced. We chose a lipid transfer protein (StLTP1.3) and an  $\alpha/\beta$ -hydrolase superfamily protein, both with unknown functions. RT-qPCR results showed that both proteins suited a typical suberin-related expression pattern, among potato tissues. Subcellular localization showed that StLTP1.3 was located on endoplasmic reticulum, making it a possible candidate to transport the lipid monomers from ER to the plasma membrane. The localization of  $\alpha/\beta$ -hydrolase showed cytoplasmic accumulation, indicating that its function should be performed there. Overall, StLTP1.3 and  $\alpha/\beta$ -hydrolase protein seemed to be solid candidates to be studied for potato functional genetics.

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# **Antinociceptive effects of new vegetal polyphenolic extract in CD1 female mice subjected to spinal cord injury**

Anna Bagó-Mas<sup>1</sup>; Meritxell Deulofeu<sup>1</sup>; Beltrán Álvarez-Pérez<sup>1</sup>; Judit Homs<sup>1</sup>; Núria Fiol<sup>2</sup>, Enrique Verdú<sup>1</sup>; Pere Boadas-Vaello<sup>1</sup>

<sup>1</sup>*Group of Clinical Anatomy, Embryology and Neuroscience (NEOMA), Department of Medical Sciences, Faculty of Medicine. Universitat de Girona, Girona, Catalonia, Spain*

<sup>2</sup>*Group of Metals and Environment (MiMA), Department of Chemical Engineering, Agricultural and Food Technology. Universitat de Girona, Girona, Catalonia, Spain*

## **Hypothesis and objectives**

Spinal cord injury (SCI) may result in central neuropathic pain, which is largely refractory to current pharmacological treatments. Considering preclinical evidence showing that polyphenolic compounds may exert antinociceptive effects, the present work was aimed at analysing the antihyperalgesic and antiallodynic effects of a new vegetal polyphenolic extract (VPE) in a spinal cord injury-induced neuropathic pain model.

## **Methodology**

Female CD1 mice were subjected to mild SCI and daily treated with VPE (10, 15 and 20 mg/kg; i.p.) during the first week after surgery. Thermal hyperalgesia and mechanical allodynia were weekly evaluated up to 21 days post injury, by means of the Hargreaves test and Von Frey filaments, respectively. Moreover, locomotor functional recovery after SCI was assessed using the Basso mouse scale (BMS). To obtain the polyphenolic extract, the plant material was cut, sifted and boiled with saline solution. The extract polyphenols quantification was performed using the Folin-Ciocalteu method, with Gallic acid as the standard.

## **Results**

The concentration of total polyphenols in the VPE was 1104 mg/L. Mechanical allodynia and thermal hyperalgesia development were prevented in treated SCI-animals up to 21 days post injury. No major impairment in locomotor function was detected in any experimental group according to BMS test results.

## **Conclusion**

VPE treatment may be a suitable therapeutic strategy to prevent development of spinal cord injury-induced neuropathic pain.

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Hargreaves, K., Dubner, R., Brown, F., Flores, C., & Joris, J. (1988). A new and sensitive method for measuring thermal nociception in cutaneous hyperalgesia. *Pain*, 32(1), 77-88.



# **Living with stroke: physical exercise as a rehabilitation strategy to improve health-related quality of life across the disease continuum**

Míriam Barra <sup>1</sup>, Bernat Carles Serdà<sup>2</sup>, Arantza del Valle <sup>2</sup>, Montserrat Grau <sup>3</sup>

<sup>1</sup>*School of Health and Sport Science (EUSES-UdG), Spain*

<sup>2</sup>*University of Girona (UdG), Spain*

<sup>3</sup>*Autonomous University of Barcelona, Spain*

## **Introduction**

Patients with stroke suffer neurological deficits and physical deconditioning that compromise walking ability, activities of daily living (ADL) and health-related quality of life (HRQOL) (Chen et al., 2011). Physical exercise (PE) programs linked with daily living after conventional rehabilitation are particularly relevant in terms of promoting independence and reintegrating stroke patients into the community (Winstein et al., 2016). The practice of regular PE favours the improvement of the physical condition that allows ADL to be carried out with a lower energy cost, substantially improving stroke survivors' HRQOL (Billinger et al., 2014).

## **Hypothesis**

The establishment of a Physical Exercise Program Integrated into Community (PEPIC) promoting the autonomous PE habits of stroke survivors to reintegrate them into the community is necessary to improve their HRQOL across the disease continuum.

## **Objective**

To design a PEPIC linked to the realization and evaluation of a Physical Exercise Program in the After-Rehabilitation phase (PEPAR) in the context of the health system, to improve stroke survivors' HRQOL by increasing their adherence to community-based autonomous PE.

## **Methodology**

The methodology is based on between-methods triangulation; that is, the combination of qualitative and quantitative methodological approaches. The quantitative study is a prospective and quasi-experimental study with a single pre-post treatment group of stroke patients who have already completed conventional rehabilitation program. The quantitative method will be focused on the evaluation of the effect of PEPAR. PEPAR has a duration of twelve weeks, two sessions per week; a total of twenty-four one-hour sessions. PEPAR evaluates progress in physical condition, physical functions, balance, HRQOL, measurement of adherence, cardiovascular risk reduction and social support for PE. The qualitative method focuses on the definition of the strategies to improve, maintain or recover HRQOL across the disease continuum from the conventional rehabilitation phase to restoration to daily living and the establishment of chronic condition, from the perspective of stroke survivors and their carers.

## Conclusions

Physical exercise brings benefits for health even years after a stroke. Therefore, participation in regular physical activity and PE integrated into the community should be encouraged regardless of the time elapsed since the onset of stroke (Winstein et al., 2016). Considering that exercise is an important modifiable behaviour, adherence to exercise should be created to maintain or improve HRQOL among stroke survivors (Hou et al., 2018).

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# **Molecular mechanisms of Scn5a gene re-expression in denervated skeletal muscle**

Carreras, D.<sup>1</sup>, Martínez-Moreno, R.<sup>1</sup>, Lleal, M.<sup>1</sup>, Brugada, R.<sup>1,2</sup>, Santafe MM<sup>3</sup>, Scornik, F.<sup>1,2</sup>, Pagans, S.<sup>1,2</sup> & Pérez, G.<sup>1,2</sup>.

<sup>1</sup>*Cardiovascular Genetics Center, Institut de Investigació Biomèdica de Girona Dr. J. Trueta, Girona, Spain.*

<sup>2</sup>*Departament de Ciències Mèdiques. Facultat de Medicina, Universitat de Girona, Girona, Spain.*

<sup>3</sup>*Facultat de Medicina i Ciències de la Salut, Universitat Rovira i Virgili, Reus, Spain*

## **Introduction**

The voltage-gated sodium channel NaV1.5, encoded by the Scn5a gene, is almost exclusively expressed in cardiomyocytes, where it is essential for the upstroke and propagation of the cardiac action potential. However, in the embryo, NaV1.5 is also expressed in skeletal muscle, but it is replaced by the NaV1.4 isoform in adults, as the innervation of the muscle reaches the mature state. The re-expression of NaV1.5 upon muscle denervation has long been known, but the molecular mechanisms of this re-expression have remained unexplored.

## **Objectives**

Our objective was to identify the NaV1.5 isoform expressed after denervation. We also wished to investigate changes in the histone H3 lysine 27 acetylation (H3K27ac) epigenetic mark, and changes in the transcriptome caused by skeletal muscle denervation.

## **Methods**

We performed a differential analysis between rat gastrocnemius denervated and control muscles. Samples were collected four days after sciatic nerve section and the contralateral, intact muscle was used as a control. Using Sanger sequencing, we investigated whether the neonatal or the adult isoform of Scn5a was expressed after denervation. We then used chromatin immunoprecipitation (ChIP)-qPCR to investigate the alterations on the histone H3 lysine 27 acetylation (H3K27ac) and H3 lysine 4 methylation (H3K4me3) epigenetic marks near the Scn5a gene. Finally, we performed RNA-seq to study the transcriptomic changes caused by skeletal muscle denervation.

## **Results**

We found that the NaV1.5 isoform expressed after denervation was the adult one. Enrichment of H3K27ac and of H3K4me3 within the Scn5a transcription start site (TSS) region was found in the denervated samples compared to the control. These results are in agreement with the downregulation of Hdac9 (histone deacetylase) and upregulation of Setd7 (H3K4me3 methyltransferase), observed by RNA-seq. In

addition, upregulation of the Gata4 transcription factor in denervated muscle was observed compared to the control, which is in agreement with our previous results.

## **Conclusions**

These results suggest that the mechanism involved in Scn5a re-expression in denervated muscle includes a H3K27 acetylation of the Scn5a promoter region, trimethylation of H3K4 by Setd7, and the participation of Gata4.

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# Fatal scuba diving accidents in Girona 2003-2017

Josep Maria Casadesús<sup>1-2-3</sup>, Fernando Aguirre<sup>4</sup>, Anna Carrera<sup>2-3</sup>, Pere Boadas-Vaello<sup>2-3</sup>, Maite Serrando<sup>3</sup>, Francisco Reina<sup>2-3</sup>

<sup>1</sup>*Institute of Legal Medicine and Forensic Sciences of Catalonia (Division of Girona)*

<sup>2</sup>*Research Group on Clinical Anatomy, Embryology and Neuroscience (NEOMA). Department of Medical Sciences, University of Girona*

<sup>3</sup>*Department of Medical Sciences, Faculty of Medicine, University of Girona*

<sup>4</sup>*Special Group for Underwater Activities (GEAS) of the Spanish Civil Guard, L'Estartit (Girona)*

## Introduction

Diving is one of the most popular underwater activities on the Spanish coast. Despite all precautions taken, death cases related to this activity are reported every year. Drowning is the main cause of death, but other reasons are observed, such as decompression illness, natural pathology, and trauma. Epidemiological data on mortality in diving in Spain does not exist. The aim of the study was to analyse all scuba diving-related deaths in Girona (North-eastern Catalanian littoral) between 2003 and 2017, and to provide additional information about this kind of death.

## Methodology

A total of 43 cases with self-contained underwater breathing apparatus (scuba) were documented. The study was performed as a retrospective overview. All the judicial files of each analysed case were accessible in accordance with Regulation 1/2005 regarding accessory aspects of judicial proceedings, and/or the databases of Forensic Pathology Services of the Institute of Legal Medicine and Forensic Sciences. The empirical data consisted of police reports, forensic autopsy reports and examination of the diving equipment. We performed multivariable statistical analysis (a frequency table, IBM-SPSS statistical package).

## Results and Conclusions

Sex distribution was 37 men (86%) and 6 women (12%). The range of ages indicated that 80% of the fatalities were between the 5<sup>th</sup> and 6<sup>th</sup> decade of life, with the most prevalent age range between 50 and 59 (51%). Fatalities were season-dependent (60% of deaths were in summer). Regarding diving depth, 20 out of 31 divers (64%) died between 1-30 m. The cause of death was drowning in 25 out of 43 cases (58%). Ten divers died from arterial gas embolism following pulmonary barotrauma (23%). Other causes of death were natural pathology (16%) and trauma (3%). Blood-ethanol concentration was found in 7 divers, and cocaine in 2 others. Elevated body mass index indicated that 14 out of 20 divers had a BMI > 25.

In this study, a number of factors that probably influences fatal diving accidents were identified. Sex, age, season, depth, influence of toxics and BMI were important factors for the fatal outcome in these cases. As in other studies, drowning was the most common cause of death in scuba diving accidents. However, arterial gas embolism following pulmonary barotrauma was also described as a cause of death.

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# Trafficking and membrane dynamics of the sodium channel $\beta 2$ subunit

Eric Cortada<sup>1,2</sup> Robert Serradesanferm<sup>1,3</sup>, Ramon Brugada<sup>1,2,3</sup>, Marcel Verges<sup>1,2,3</sup>

<sup>1</sup>*Cardiovascular Genetics Group – Girona Biomedical Research Institute (IDIBGI) and Univ. of Girona*

<sup>2</sup>*Biomedical Research Networking Center on Cardiovascular Diseases (CIBERCV)*

<sup>3</sup>*Medical Sciences Dep. – Univ. of Girona*

## Introduction

The  $\beta 2$  subunit of the voltage-gated sodium channel promotes localization of the channel to the plasma membrane. Pathogenic mutations in  $\beta 2$  turn into fewer channels at the cell surface, leading to atrial fibrillation and Brugada syndrome, two potentially fatal cardiac conditions (Riuró et al., 2013; Watanabe et al., 2009).

## Hypothesis and objectives

The  $\beta 2$  subunit is a transmembrane protein displaying polarized trafficking and localization in polarized epithelial cells. Specific sequence motifs in  $\beta 2$  are responsible for its polarized delivery to the cell surface and its dynamics once in the membrane. Our aim was to identify these motifs and understand the underlying trafficking mechanisms.

## Methodology

We generated YFP-tagged  $\beta 2$  mutants with altered structural and functional features. We then expressed these in polarized Madin-Darby canine kidney (MDCK) cells. We used confocal fluorescence microscopy, biochemistry and functional assays to determine defects in  $\beta 2$  trafficking and membrane dynamics.

## Conclusions

Our data showed that  $\beta 2$  exit from the endoplasmic reticulum and export through the Golgi apparatus required the cytoplasmic tail. Mutants lacking the cytosolic domain or the extracellular immunoglobulin-like loop were not properly glycosylated. Failure to undergo complex N-linked glycosylation prevented  $\beta 2$  from reaching the surface, leading to its degradation. Association of  $\beta 2$  to cholesterol-rich regions determined apical localization. However, dimerization was not required for  $\beta 2$  to reach the cell surface. Moreover, truncation of the cytosolic domain dramatically increased  $\beta 2$  mobile fraction and diffusion kinetics. In summary, we propose that various structural motifs contribute to effective  $\beta 2$  trafficking and localization to the plasma membrane.

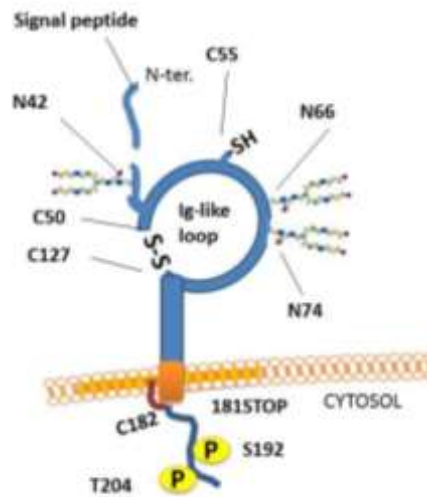


Figure 1:  $\beta 2$  topology. The protein has 215 residues, the first 30 being a cleavable signal peptide. The transmembrane domain expands throughout 20 residues and likely associates with lipid rafts. The diagram shows some of the altered structural features in the generated mutants, including the following: N42,66,74Q, to eliminate its three N-glycosylation sites; C127A, to prevent formation of the disulfide bond that holds the Ig-like loop, and 181STOP, lacking the cytoplasmic tail.

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# Exploring mesothelin as a novel biomarker for pancreatic cancer diagnosis

Adrià Duran<sup>1</sup>, Pedro E. Guerrero<sup>1</sup>, María José Ferri<sup>1</sup>, Rafael de Llorens<sup>1</sup>, Esther Llop<sup>1</sup>, Rosa Peracaula<sup>1</sup>

<sup>1</sup>*Biochemistry and Molecular Biology Unit. Department of Biology, University of Girona, 17003 Girona, Spain.*

## Introduction

Despite its low incidence, pancreatic cancer (PaC) is the third cause of death from cancer, with a 5-year survival rate of just 8%. This poor prognosis is due to its high aggressiveness and lack of suitable biomarkers for early diagnosis [1]. Regarding biomarker discovery, protein expression deregulation and aberrant glycosylation have been described as important mechanisms underlying tumorigenic progression. Therefore, the combined analysis of protein expression levels and glycan epitopes on serum-located glycoproteins could yield novel biomarkers with increased accuracy [2]. A candidate for such studies is mesothelin, a glycoprotein neo-expressed in PaC and other cancers, which can be detected in patients' sera despite being a membrane-anchored glycoprotein.

## Hypothesis and objectives

Given the role of glycosylation in tumour promotion, the analysis of mesothelin expression and its glycan structures could provide a novel biomarker for PaC diagnosis. Hence, we proposed to analyse mesothelin expression in pancreatic cancer cell lines, their conditioned media, tumour pancreatic tissues and non-tumour ones. We also attempted to characterize mesothelin glycosylation through immunoprecipitation and western blotting using specific lectins.

## Methodology

Protein lysates were obtained from pancreas tissues and pancreatic cancer cell lines. In addition, the conditioned media from the cell lines were collected to assess mesothelin secretion. For mesothelin expression, samples were resolved on SDS-PAGE and revealed by western blotting using an anti-mesothelin antibody. For the glycan analysis, mesothelin was immunopurified from conditioned media with a specific antibody, resolved on SDS-PAGE and detected with lectins and antibodies against different glycan epitopes.

## Results and Conclusions

Mesothelin was detected in all pancreatic cancer cell lines and their conditioned medias (n=7). In tissues, mesothelin was not observed in control individuals (n=6), while it was present in 68.75% of PaC patients (n=16), suggesting its potential use as a PaC biomarker. On the other hand, mesothelin glycosylation was characterized in

pancreatic and ovarian cancer cell lines, giving rise to promising glycoforms the potential of which should be confirmed in forthcoming studies.

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# **Effect of Intracranial Self-Stimulation, a memory-improving treatment, results in changes in SIRT-1 expression.**

N. Faghihi<sup>1</sup>, L. Aldavert-Vera<sup>1,2</sup>, P. Segura-Torres<sup>2</sup>, G. Huguet<sup>1</sup> and E. Kádár<sup>1</sup>

<sup>1</sup> *Departament de Biologia, Universitat de Girona, Girona, Spain*

<sup>2</sup> *Universitat Autònoma de Barcelona, Unitat Psicobiologia, Institut de Neurociències, 08193 Bellaterra, Barcelona, Spain*

## **Hypothesis and objectives**

Intracranial Self-Stimulation (ICSS) is a form of deep brain stimulation in which subjects self-administer electrical stimulation in a rewarding system, such as the Lateral Hypothalamus (LH) [1]. Several studies have demonstrated that ICSS treatment is capable of learning and memory facilitation in implicit and explicit memory paradigms [1, 3, 4].

Moreover, this treatment increases the expression of genes related to synaptic plasticity in the specific memory-related brain regions [3]. Recent studies have shown that Sirt-1 plays a critical role in neuroprotection, synaptic plasticity and cognitive function [5], but the role of Sirt-1 in improving learning and memory has not been fully clarified. Our hypothesis is that ICSS could regulate Sirt-1 expression in the hippocampus, a memory-related area, and that Sirt-1 protein expression changes could be detected in short or medium term after ICSS.

The objective of this preliminary study was to analyse Sirt-1 protein levels in CA1 and dentate gyrus (DG) hippocampal subfields at different times after ICSS.

## **Methodology**

All animals were implanted with an electrode in the lateral hypothalamus by stereotaxic surgery and divided into rats receiving ICSS treatment (ICSS groups) and rats without electrical stimulation (sham group) during 45 minutes for 3 consecutive days. The rats were sacrificed after 30 minutes, 90 minutes or 180 minutes post-treatment and the hippocampal subfields were dissected. After protein extraction and quantification, the Sirt-1 protein was quantified by western blotting and all data were evaluated with ANOVA which were performed with statistical analysis in SPSS (Statistical software).

## **Results**

After preliminary analysis, results did not show significant differences between Sirt-1 protein levels in the sham and ICSS groups at 30min, 90min and 180 min post-treatment in the DG of the hippocampus, even though a slight increase seemed to occur after 90 and 180 min post-ICSS. Moreover, the Sirt-1 protein levels in CA1 were analysed.

## Conclusions

The Present study showed that ICSS treatment could have induced an increase in the expression level of Sirt-1 in the DG region, but new samples will be added to complete and confirm these results. Moreover, memory cognitive impairment in relation to changes in Sirt-1 levels in the serum we are expecting to analyse it in our samples.

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# **Assessing the effects of a home care rehabilitation program on the physical and functional capacity, autonomy and quality of life of people with fracture of the proximal femur: a salutogenic approach**

Jordi Joan Gómez Tomás <sup>1</sup>, Dolors Juvinya Canal <sup>2</sup>, Bernat-Carles Serdà Ferrer <sup>3</sup>

<sup>1</sup>*Home care rehabilitation unit, and Corporación fisiogestión of Barcelona, Spain; University School of Health and Sport, Department of Physiotherapy, Affiliated Centre, University of Girona, Spain*

<sup>2</sup>*Department of Nursing, Research Group Coordinator, Salut i Atenció Sanitària (Health and Healthcare), University of Girona, Girona, Spain*

<sup>3</sup>*Department of Nursing, Research Group Member, Salut i Atenció Sanitària (Health and Healthcare), and Biomedical Research Institute, University of Girona, Girona, Spain*

## **Hypothesis**

Following the 12-week home care rehabilitation program adapted to the fracture of the femur, we can expect:

- Decreased pain due to an improvement in physical and functional capacity and a greater ability to perform daily activities.
- A reduction in fear of falling and an improvement in mood and the quality of life of the individual.
- Enhanced autonomy and greater adherence to the program, increasing the sense of coherence in relation to health.

## **Objective**

To evaluate the effectiveness of a home care rehabilitation program adapted to the fracture of the femur (PREDA-FF) in people older than 65 years integrated in a salutogenic model in the following areas: physical and functional capacity, the fall and fear of falling, balance, depression, quality of life, adherence to treatment, the sense of coherence.

## **Methodology**

The number of older people with functional limitations caused by a fracture of the femur following a fall has greatly increased. In the period between 2003 and 2014, there was a 16.9% increase (Women 13.4% Men 28.4%)[1] in Catalonia (north-east Spain).

Consequently, we developed the PREDA-FF[2,3], which had a duration of 12 weeks. The first 8 weeks of the program were monitored by the professional (physiotherapist, and corresponded to two weekly sessions of 1h each. In the remaining 4 weeks the program could gradually be transferred to the patient and consisted of 6 1-hour sessions, 2 supervised by the professional, and 4 independent patient sessions.

This was a longitudinal, quasi-experimental, prospective study with a single treatment group. Evaluation was carried out at the start, after care and at the end of the 16-week and 6-month follow-up.

Measurements performed with:

- Mobility of goniometry articulated
- Medical Research Council Scale (MRC)[4].
- Barthel Index (IB).
- Visual analogue scale.
- Falls efficacy scale (FES)
- The Tinetti scale
- Functional Ambulation Categories (FAC)
- The speed of travel (10MWT m/s)
- Geriatric Depression Scale (GDS)
- Short Form Health Survey (SF-12)
- International Physical Activity Questionnaire (IPAQ)
- Orientation to Life Questionnaire (OLQ-13)

## Conclusions

The 12-week PREDA-FF with a salutogenic approach achieved functional recovery of the vast majority of elderly patients who had undergone surgery for a broken hip. Only the FES score was independently associated with recovery. Although recovery to pre-fracture values was not reached, differences in scores were not significantly related to any of the scales used.

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# **Inhibition of $\alpha 2,3$ -sialyltransferases reduces migration and invasion in pancreatic cancer cells through sialyl-Lewis x decrease.**

Pedro Enrique Guerrero Barrado<sup>1</sup>, Laura Miró<sup>1</sup>, Neus Martínez-Bosch<sup>2</sup>, Silvia Barrabés<sup>1</sup>, Rafael de Llorens<sup>1</sup>, Pilar Navarro<sup>2</sup>, Anna Massaguer<sup>1</sup>, Esther Llop<sup>1</sup>, Rosa Peracaula<sup>1</sup>

<sup>1</sup>*Biochemistry and Molecular Biology Unit. Department of Biology, University of Girona, Girona, ES, 2IMIM-Hospital del Mar Medical Research Institute, Barcelona, ES*

## **Introduction**

Of all solid tumours, pancreatic ductal adenocarcinoma (PDA) has the direst prognosis. In the absence of any significant advance in its treatment or early diagnosis, it is projected to become the second leading cause of cancer death in the United States by 2030[1]. In addition to late diagnosis, usually made after metastases have occurred, a major factor for this dismal prognosis is the high resistance of PDA to therapies. For this reason, finding potential new therapeutic targets is a challenge for the scientific community.

Aberrant glycosylation is a hallmark of cancer, and one of the altered glycans found in PDA is the carbohydrate antigen sialyl-Lewis x (SLe<sup>x</sup>). SLe<sup>x</sup> expression progressively increases with higher-grade pancreatic intraepithelial neoplasia lesions and pancreatic adenocarcinoma and is known to promote the invasive and metastatic potential of PDA. SLe<sup>x</sup> synthesis is catalysed in the later stages by specific  $\alpha 2,3$ -sialyltransferases, ST3Gal III and ST3Gal IV.

## **Hypothesis and objectives**

In this work, the specific  $\alpha 2,3$ -sialyltransferases involved in tumour progression were knocked down to reduce SLe<sup>x</sup> expression in order to evaluate whether this reduction could reverse the migration, invasive and metastatic capabilities of PDA cells.

## **Methods**

Two PDA cell lines that expressed moderate to high levels of SLe<sup>x</sup> (Capan-1 and BxPC3) were selected from a panel of seven PDA cell lines. They were silenced using lentiviral particles with ten specific shRNAs against the two target  $\alpha 2,3$ -sialyltransferase genes. The silenced shCapan-1 and shBxPC3 cells were analysed by real time PCR to determine ST3GAL3 and ST3GAL4 mRNA expression, and by western blotting and flow cytometry to evaluate SLe<sup>x</sup> levels. For each cell line, the two silenced clones (sh) for each gene that showed the highest reduction in SLe<sup>x</sup> expression were selected. Adhesion assays with recombinant E-selectin, cell migration and invasion through matrigel with transwell chambers were performed with the selected silenced clones.

## **Results and conclusions**

All shCapan-1 and shBxPC3 reduced the  $\alpha$ 2,3-sialyltransferases gene expression and the ones with greatest reduction in SLe<sup>x</sup> levels (between 40-80% reduction) were selected for functional assays. E-selectin adhesion was greatly reduced in ST3GAL3 and ST3GAL4 in both Capan-1 and BxPC3 silenced clones. Migration and matrigel invasion were also decreased in the silenced clones of both cell lines. These results show that the reduction in  $\alpha$ 2,3-sialyltransferase expression reverses the invasive phenotype of PDA, which makes these genes potential tumour therapeutic targets.

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# **Sodium channel current loss of function in induced pluripotent stem cell derived cardiomyocytes from a Brugada syndrome patient**

Rebecca Martinez-Moreno<sup>1,2,3</sup>, Elisabet Selga<sup>1,2,3</sup>, Franziska Sendfeld<sup>4,5</sup>, Claire N. Medine<sup>4,5</sup>, Olga Tura Ceide<sup>6,7</sup>, Sir Ian Wilmot<sup>4</sup>, Guillermo J. Pérez<sup>1,2,3</sup>, Fabiana S. Scornik<sup>1,2,3</sup>, Ramon Brugada<sup>1,2,3,8</sup>, Nicholas L. Mills<sup>5</sup>

<sup>1</sup>*Cardiovascular Genetics Centre, Department of Medical Sciences, University of Girona, Girona, Spain.*

<sup>2</sup>*Institut d'Investigació Biomèdica de Girona (IDIBGI), Girona, Spain,*

<sup>3</sup>*Centro de Investigación Biomédica en Red de Enfermedades Cardiovasculares (CIBERCV), Spain,*

<sup>4</sup>*Scottish Centre for Regenerative Medicine, University of Edinburgh, United Kingdom,*

<sup>5</sup>*BHF/University Centre for Cardiovascular Sciences, University of Edinburgh, United Kingdom,*

<sup>6</sup>*Department of Pulmonary Medicine, Hospital Clinic-Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), University of Barcelona, Barcelona, Spain,*

<sup>7</sup>*Centro de Investigación Biomédica en Red de Enfermedades Respiratorias, University of Barcelona, Spain,*

<sup>8</sup>*Hospital Josep Trueta, Girona, Spain*

## **Introduction**

Brugada syndrome predisposes to sudden death due to disruption of normal cardiac ion channel function[1,2], yet our understanding of the underlying cellular mechanisms is incomplete. Commonly used heterologous expression models lack many characteristics of native cardiomyocytes and, in particular, the individual genetic background of a patient. Patient-specific induced pluripotent stem (iPS) cell-derived cardiomyocytes (iPS-CM) may uncover cellular phenotypical characteristics not observed in heterologous models.

## **Objective**

Our objective was to determine the properties of the sodium current in iPS-CM with a mutation in *SCN5A* associated with Brugada syndrome.

## **Methodology**

Dermal fibroblasts from a Brugada syndrome patient with a mutation in *SCN5A* (c.1100G > A, leading to Nav1.5\_p.R367H) were reprogrammed to iPS cells. Clones were characterized and differentiated to form beating clusters and sheets. Patient and control iPS-CM were structurally indistinguishable. Sodium current properties of patient and control iPS-CM were compared. These results were contrasted with those

obtained in HEK-293T cells heterologously expressing sodium channels with the same mutation.

## Conclusions

Patient-derived iPS-CM showed a 33.1–45.5% reduction in  $I_{Na}$  density, a shift in both activation and inactivation voltage-dependence curves, and faster recovery from inactivation. Co-expression of wild-type and mutant channels in HEK-293T cells did not compromise channel trafficking to the membrane, but resulted in a reduction of 49.8% in sodium current density without affecting any other parameters.

Cardiomyocytes derived from iPS cells from a Brugada syndrome patient with a mutation in *SCN5A* recapitulate the loss of function of sodium channel current associated with this syndrome, including pro-arrhythmic changes in channel function not detected using conventional heterologous expression systems.

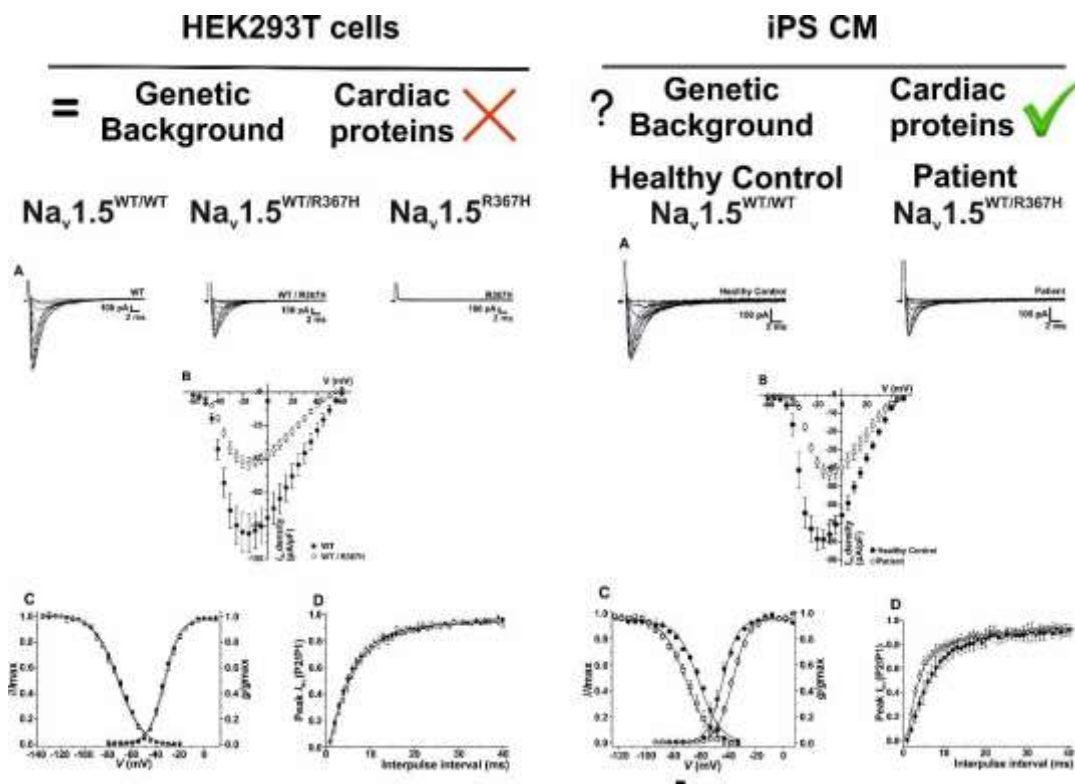


Figure 1 Electrophysiological characterization of HEK293T co-transfected with *SCN5A* either wild type or carrying R367H (left panel). Electrophysiological characterization of control and patient-specific iPS-CM (right panel).

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## Utility of RET-HE test as a screening for thalasseмии

Anna Marull<sup>1</sup>, Orlando Jiménez<sup>1</sup>, Mariona Hernandez<sup>1</sup>, Maite Quintana<sup>1</sup>, Diana Pedrola<sup>1</sup>, Maite Serrando<sup>1</sup>.

<sup>1</sup>Hematology Laboratory; Territorial Laboratory ICS-IAS, Girona

### Introduction

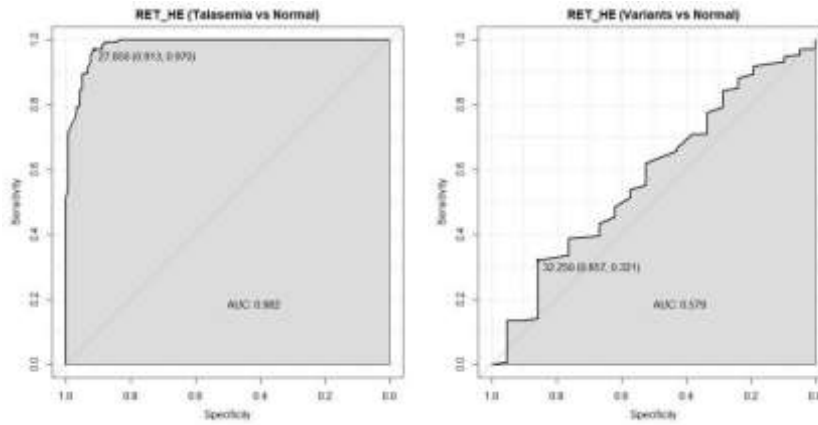
Hemoglobinopathies are a group of hereditary disorders characterized by alterations in hemoglobin globin chain synthesis due to mutations, deletions or insertions in its genes. It is estimated that 5.2% of the world's population carry one of these disorders. They can be classified as thalassemia, an absence or reduction of at least one globin chain (quantitative), or structural hemoglobin variants, a change in one or more amino acids that affects the globin structure (qualitative). Several algorithms using investigation parameters are suggested to distinguish iron deficiency from beta-thalassemia. One of these investigation tests is the ret-He which measures the quantity of hemoglobin in the reticulocytes and is used for the diagnosis and follow-up of iron deficiencies. It is reported that ret-He is not valuable when a patient presents thalassemia due to its permanently low value. Our goal was to determine if the ret-He parameter was useful in the diagnosis of thalassemia in adult patients, once iron deficiency was ruled out.

### Patients and methods

A total of 268 samples were processed for 5 months (July-September) in Girona Territorial Laboratory: 115 were thalasseмии, 20 structural hemoglobinopathies and 133 presented no hemoglobinopathy. The complete blood count and ret-He determination were analysed using a Sysmex XN, the iron-related tests were analysed by Cobas 5000 (iron) and Cobas 6000 (ferritin, transferrin). For the hemoglobin studies, High Performance Liquid Chromatography (HPLC;BIORAD D10) was used. When a molecular study (alpha thalassemia, delta thalassemia, structural hemoglobinopathies, etc.) was required, the samples were sent to our reference laboratory.

### Results

Patients < 12 years and iron-deficient patients were excluded for the evaluation of the ret-He parameter. When the ret-He results of thalassemia samples were compared to normal ones, a sensitivity of 0.97 and specificity of 0.91 were observed in the ROC curve. The best cut-off was 27.8 pg. When the ret-He results of structural hemoglobinopathy were compared to normal samples, they had a sensitivity of 0.32 and specificity of 0.85.



## Discussion

In the presence of our current demographics, we consider it essential to have good tools for proper hemoglobinopathy screening. A ret-He < 27.8 pg is a good marker for thalassemia screening, once iron deficiency has been ruled out. However, ret-He is not a good marker for structural hemoglobinopathy screening. Prospective studies are required for further investigation.

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# Characterization of an animal model of arrhythmogenic cardiomyopathy

Marta Prats-Vallverdú<sup>1</sup>, Mireia Alcalde<sup>1</sup>, Oscar Campuzano<sup>1,2</sup>, Ramon Brugada<sup>1,2</sup>

<sup>1</sup>*Cardiovascular Genetics Center, Institut de Investigació Biomèdica de Girona Dr. J. Trueta, Girona, Spain.*

<sup>2</sup>*Departament de Ciències Mèdiques. Facultat de Medicina, Universitat de Girona, Girona, Spain.*

## Introduction

Arrhythmogenic Cardiomyopathy (AC) is a cardiac disease characterized by fibrofatty replacement of right ventricular myocardium, which may cause ventricular arrhythmias and sudden cardiac death[1,2,3,4,5]. AC is a rare genetic disease with an autosomal dominant inheritance pattern and incomplete penetrance[5]. Pathogenic mutations in several genes encoding mainly desmosomal proteins have been reported. The most common causative gene for AC is *pkp2 gene*, encoding plakophilin 2 protein[1, 2, 3, 5]. PKP2 is a desmosomal protein that not only maintains the mechanical stability between cells but is also an intracellular signaling modulator[2, 3, 4].

## Hypothesis

Truncated PKP2 alters the molecular pathways of normal cardiomyocytes, increasing the risk of fibrofatty replacement and causing alterations in the electrical phenotype.

## Objectives

To understand molecular pathways triggered by truncated PKP2 and to study the structural and electrical progression of AC.

## Methodology

We studied an AC mouse model expressing truncated PKP2 with 412 amino acids (PKP2-413X). We performed molecular studies on 7 month-old wild-type (WT) and transgenic (TG) mice to compare the expression levels of some intercalated disk proteins and other proteins possibly involved in the AC molecular pathway. We also checked the mRNA levels of adipogenic and fibrotic factors in the heart of WT and TG. Moreover, to determine if there were any structural phenotypes, Sirius Red staining was performed on mouse heart samples to identify fibrotic tissue. Electrocardiograms (ECGs) were also performed on 6 month-old mice to study the electrical phenotype.

## Conclusions

PKP2-413X may be responsible for a decrease in plakoglobin (PG) and cardiac voltage-gated sodium channel (Nav1.5) protein levels in AC adult mice. Structural or electrical AC phenotypes were not identified in adult mice. We are currently focused on studying

this mouse model at different stages to understand the progression of the AC phenotype and to determine the onset age.

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# Alteration of miRNA profile as a result of intracranial self-stimulation

I. Puig-Parnau<sup>1</sup>, L. Aldavert-Vera<sup>2</sup>, P. Segura-Torres<sup>2</sup>, G. Huguet<sup>1</sup> and E. Kádár<sup>1</sup>

<sup>1</sup> *Universitat de Girona, Departament de Biologia, 17003 Girona, Spain*

<sup>2</sup> *Universitat Autònoma de Barcelona, Unitat Psicobiologia, Institut de Neurociències, 08193 Bellaterra, Barcelona, Spain*

## Hypothesis and objectives

MicroRNAs (miRNAs) have emerged as key regulators of gene expression. In the brain, some miRNAs have been related to cognition and plasticity and, so, their expression is altered in some neurodegenerative disorders[1]. Intracranial self-stimulation (ICSS) is a type of brain stimulation that has shown facilitating effects on learning and memory[2]. With the aim of exploring the molecular basis of this treatment, we tested the hypothesis that the expression of cognitive-related miRNA in the hippocampus is altered as a result of ICSS.

## Methodology

Rats implanted with an ICSS electrode in the medial forebrain bundle were treated with three 45-minute ICSS sessions, on 3 consecutive days. The levels of miR-132-3p, miR-134-5p, miR-181c-5p and miR-146a-5p in CA1 and DG hippocampal subfields were quantified by qRT-PCR, at 30 min, 90 min and 180 min after the last session, in ICSS-treated and control rats (N=5-6 rats/group). In a second experiment, miR-132-3p and miR-134-5p were further analysed at 90 min after the ICSS session (N=12 rats/group). We also assessed the suitability of miR-16-5p, let-7a-5p, miR-103a-3p and miR-124-3p as endogenous control candidates, by using both NormFinder and GeNorm algorithm analysis following qRT-PCR results. Normalized results were statistically analysed in SPSS by one-way ANOVA or T-test.

## Results

We found that miR-16-5p is a suitable reference gene for normalizing PCR results from hippocampal samples following ICSS treatment, according to both GeNorm and NormFinder algorithms. Using miR-16-5p as an endogenous control, we found a tendency towards alteration in miRNA expression in the DG region, which peaked at 90 min after stimulation. Even though no statistically significant differences were found, at this point, treated rats showed an increased expression tendency in miR-132 (p-value =0.052), a positive regulator of synaptic plasticity[3,4]. We also found a decrease tendency in miR-146a (p-value=0.080), which has shown to be selectively upregulated in brain regions affected by Alzheimer's Disease (AD)[5].

## Conclusions

These preliminary results indicate that miRNA profile could be altered as a result of ICSS treatment, concerning miRNAs related to synaptic plasticity and cognitive function, such as miR-132 and miR-146a, which are also altered in neurodegenerative



disorders, such as AD [4,5]. This promising outcome will be further investigated by miRNA array and should be further studied in the context of ICSS applied after a learning task. If confirmed, the tendencies in the direction of miRNA alteration would support the hypothesis that ICSS treatment could be effective to fight the cognitive deficits found in AD.

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# Segmental labelling of proteins using four orthogonal inteins and protein trans-splicing

Alex Romero Casañas<sup>1</sup>, Marc Ribó Panosa<sup>1</sup>

<sup>1</sup>*Protein Engineering Laboratory, Biochemistry and Molecular Biology Unit, Department of Biology, University of Girona, Girona, Spain.*

## Introduction

Inteins are intervening polypeptide sequences that can excise themselves from flanking protein regions, the exteins, and ligate them by a regular peptide bond in an autocatalytic manner in a process termed protein splicing. Even though their biological function remains to be elucidated, this type of proteins has found a widespread use in the field of protein chemistry. Inteins are object of study to be engineered to improve their properties and develop promising intein-based technologies. Split inteins in particular, which are expressed in two different genes and can ligate polypeptides in *trans*, have been of particular interest to ligate complex proteins, allowing for the segmental labelling[1] of their domains for different kinds of studies, such as Nuclear Magnetic Resonance. In this regard, the naturally split inteins gp41-1, gp41-8, IMPDH-1 and NrdJ-1[2] seem to be promising tools for such applications.

## Hypothesis and objectives

The aim of this study is to build a system of orthogonal inteins that allows for the ligation of four different domains to construct a complex polypeptide through protein trans-splicing. Assessing the orthogonality of the inteins of choice is key, and being able to produce and purify them in a recombinant manner will allow for *in vitro* ligation of the four protein domains, that could be labelled (i.e. isotopically) differentially if needed.

## Methodology

Firstly, the lack of cross-reactivity amongst all of the  $I_N - I_C$  combinations was confirmed, both by co-expressing the different intein subunits *in vivo* in *E. coli* and *in vitro* after purifying the different precursors. Then, four constructions using GB1, Ub, Trx and SUMO domains as exteins and the inteins gp41-1, gp41-8 and IMPDH-1 were obtained thanks to recombinant DNA techniques. After studying their splicing activity *in vivo*, they were produced and purified in *E. coli* and tested *in vitro*, in order to obtain the full splicing product GB1-Ub-Trx-SUMO.

## Conclusions

This orthogonal intein system offers an opportunity to ligate multiple protein domains expressed independently. Further studies aim to use this system to study protein structure through NMR.

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**DOCTORAL PROGRAMME IN  
WATER SCIENCE AND  
TECHNOLOGY**



# Genetic variability in blue and red shrimp, *Aristeus antennatus* (risso 1816) in spanish mediterranean populations, employing microsatellite markers

Agulló M.<sup>1</sup>, Planella L.<sup>1</sup>, Vera M.<sup>2</sup>, Heras S.<sup>1</sup>, García-Marín J.L.<sup>1</sup>, Roldán M.I.<sup>1</sup>

<sup>1</sup>Laboratori d'Ictiologia Genètica, Universitat de Girona, C/Maria Aurelia Capmany 40, 17003, Girona, Spain

<sup>2</sup>Current address: Departamento de Zoología, Genética y Antropología Física, Campus Lugo, Universidade de Santiago de Compostela, Avda Carvalho Calero S/N, 27002, Lugo, Spain

The blue and red shrimp, *Aristeus antennatus* (Risso 1816) is a marine decapoda crustacean characterized by a red colour, sexual dimorphism and a needle-like rostrum with three dorsal teeth. It is a eurybathic species inhabiting depths of between 80 and 2800 m, being highly abundant in the muddy bottoms of the upper and middle slope in the Western basin of the Mediterranean Sea. Its meat is much appreciated in Spanish coastal regions, reaching very high market values. As a consequence, *A. antennatus* has become the target of artisanal deep-water bottom trawl fisheries, mostly at depths of between 500 and 800 m, depending on the fishing ground (Fernandez *et al.*, 2011). The application of highly variable genetic markers, such as microsatellites, allows us to study i) genetic diversity within populations, and ii) genetic divergence among populations of a species. In the present work, we addressed the genetic diversity and genetic divergence of the blue and red shrimp in Spanish Mediterranean locations from the Gulf of Lions to Cabo de Palos (Murcia). Adult specimens (males and females) were collected at seven locations (Port de la Selva, Roses, Palamós, Blanes, Vilanova i la Geltrú, Dénia and Santa Pola) and a total of 701 individuals were genotyped for 12 previously reported microsatellite loci (Heras *et al.*, 2016). The number of alleles per locus ranged from 2 to 29. The observed heterozygosity ( $H_o$ ) and expected heterozygosity ( $H_e$ ) values for each location ranged from 0.440 to 0.486 and from 0.630 to 0.639, respectively. Of a total of 84 comparisons between the observed and the expected genotypic proportions under the Hardy-Weinberg equilibrium, 67 were significant, which caused significant deviations from the Hardy-Weinberg equilibrium in the seven locations analysed. Analysis of molecular variance (AMOVA) showed that 99.82% of genetic diversity was due to differences between individuals within populations, while 0.18% was due to differences among populations ( $F_{ST} = 0.00182$ ,  $P = 0.245$ ). Dispersal-related life history traits may account for the observed lack of large-scale genetic differentiation. These results are consistent with a scenario of high connectivity in the studied geographical region, supported by the oceanographic characteristics of the North-Western Mediterranean coast and bio-ecological factors of the species.

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# **Bacterial isolation from anoxic sludge enrichments with octamethylcyclotetrasiloxane (D4) as a carbon source: Isolates kinetic growth assays and characterization of the microbial community.**

Ellana Boada<sup>1\*</sup>, Eric Santos<sup>2</sup>, Alba Cabrera<sup>2</sup>, María Martín<sup>2</sup>, Lluís Bañeras<sup>1</sup>, Frederic Gich<sup>1</sup>

<sup>1</sup>*Group of Molecular Microbial Ecology, Institute of Aquatic Ecology (IEA), University of Girona, Girona, Catalonia, Spain \*email: ellana.boada@udg.edu*

<sup>2</sup>*LEQUIA, Institute of the Environment, University of Girona, Girona, Catalonia, Spain*

Cyclic volatile methylsiloxanes are present in most personal care products and are thought to be accumulative and persistent in the environment, and to exhibit toxicity. Moreover, the accumulation of cyclic volatile methylsiloxanes in anaerobic digesters causes significant economic losses due to corrosion [1]. Conventional biogas upgrading technologies have been developed for siloxane removal from biogas, but their application in practice is cost-limited [3]. Therefore, biodegradation offers a low-cost and environmentally friendly alternative to conventional technologies [2,4].

The aim of this research was to isolate and identify bacterial species able to grow with octamethylcyclotetrasiloxane (D4) as the sole carbon source, and to characterize the isolates by means of biodegradation assays from enrichments obtained of anoxic sludge.

Anoxic sludge from a wastewater treatment plant reported to have silicone accumulation residues was used to set up liquid anoxic enrichments containing D4 as unique carbon source adsorbed in support matrix of activated carbon or aluminosilicate. Community structure and diversity in the enrichments was determined using V4 region amplification of 16S rRNA gene by means of Illumina MiSeq sequencing. A total of 261 operational taxonomic units (OTUs) were identified. *Proteobacteria* (47%), *Actinobacteria* (11.1%), *Planctomycetes* (9.9%), *Chloroflexi* (6.13%) and *Firmicutes* (6.13%) accounted for 80.26% of the OTUs shared among all enrichments. Shifts in community structure according to the matrix used for biofilm development were related to changes in the relative abundance, rather than presence/absence of OTUs, suggesting a core or common bacterial community involved in D4 consumption.

Furthermore, 34 bacterial isolates were recovered in solid medium containing D4 as a carbon source. Identification of strains based on the full 16S rRNA gene sequence revealed that all of them were identified as *Ciceribacter lividus*, *Alicyclophilusdenitrificans*, *Pseudomonasaeruginosa* and *Pseudomonascitronellolis*, species commonly found in bioremediation applications. The comparison of the 16S rRNA gene sequences of the isolates with that of the amplicon Illumina MiSeq analysis recovered from the enrichments revealed that the isolated strains represented up to 46% of the OTUs within the class *Alpha*-(28%), *Beta*-(11%) and *Gamma*-*proteobacteria* (7%) of the enrichments demonstrating the effectiveness of the enrichment process.

Kinetic assays with 8 representative strains confirmed higher cell growth in the presence of D4 as unique carbon source compared to controls (no C amendment). Overall, our results suggest that bacterial activity can be explored as an attractive biological alternative for siloxane removal from biogas.

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## Changes in nitrite reducer activity and microbial community diversity after a dredge event in a constructed wetland

Elena Hernández-del Amo<sup>1</sup>, Sara Ramió-Pujol<sup>2</sup>, Frederic Gich<sup>1</sup>, Rosalia Trias<sup>3</sup>, Lluís Bañeras<sup>1</sup>

<sup>1</sup>*Universitat de Girona; Institute of Aquatic Ecology, Spain*

<sup>2</sup>*GoodGut, Spain*

<sup>3</sup>*Danone Research, France*

Denitrification in constructed wetland sediments usually accounts for more than 60% of nitrogen removal in constructed wetlands (CW), while dissimilatory nitrate reduction to ammonium (DNRA) accounts for less than 10%. Sediment dredging (and plant removal) is a common practice in wetland management, which, regularly performed, may cause a tremendous impact on sediment properties and microbiota.

In order to determine the potential effect of sediment dredging and plant removal on the dissimilatory nitrite reduction capacity of a model CW (Empuriabrava FWS-CW, Catalonia, NE Iberian Peninsula), we studied the structure and activity of the microbial community 6 months before and 6 months after a dredge event.

Potential ammonification and denitrification were severely impacted by time, probably reflecting a change in the physicochemical conditions of the wetland. After 6 months of sediment dredging, no significant differences in any of the activities were detected between impacted and non-impacted areas. Ammonification ranged between 6 and 23%, whereas denitrification varied from 57 to 71% of total nitrate+nitrite reduction. qPCR showed a significant increase in the *nirK*/16S rRNA and *nirS*/16S rRNA ratios in the impacted area. This effect was not observed for *nrfA* and Anammox. The analysis of the microbial community before and after sediment dredging revealed that samples grouped in two separate clusters, most probably due to the removal of vegetation and sediment dredging. In fact, most samples collected before dredging grouped with vegetated sediments after the impact.

Overall, we confirmed that sediment dredge exerted a significant effect on the microbial community, but not on potential activities. Our results highlight a shorter recovery time in the functionality of an ecosystem service after a severe intervention, such as sediment dredging. We are confident these results will help in improving management strategies in constructed wetlands.

## **Elucidating the contribution of nitrifying and heterotrophic biomass in the removal of five endocrine disrupting compounds of concern**

Elissavet Kassotaki<sup>1</sup>, Maite Pijuan<sup>1</sup>, Ignasi Rodriguez-Roda<sup>1,2</sup>, Gianluigi Buttiglieri<sup>1</sup>

<sup>1</sup>ICRA, Catalan Institute for Water Research, Scientific and Technological Park of the University of Girona, 17003 Girona, Spain

<sup>2</sup>LEQUiA, Laboratory of Chemical and Environmental Engineering, University of Girona, Campus Montilivi, 17071 Girona, Spain

Many studies implicate endocrine disrupting compounds (EDCs) as a significant public health concern (Diamanti-Kandarakis et al., 2009) since they can interfere with the endocrine system. EDCs that are consumed and/or produced by humans and animals end up in sewage and wastewater treatment plants (WWTPs), but many of them are able to pass through the treatment processes, constituting WWTPs as a main point of discharge into the environment (Buttiglieri and Knepper, 2008). To date, many studies have investigated their removal using different types of biomass and reactor configurations, but results are somewhat contradictory.

The present study thus seeks to assess the degradation capabilities of autotrophic and heterotrophic types of biomass present in different engineered treatment systems, and to evaluate their efficiency in the removal of Estrone (E1), Estradiol (E2), Estriol (E3), Ethynilestradiol (EE2) and Bisphenol A (BPA). Several batch experiments were performed with enriched nitrifying activated sludge (NAS) and enriched ammonia oxidizing bacteria (AOB) sludge cultivated at lab-scale, as well as with conventional activated sludge (CAS) withdrawn from a WWTP. The experiments aimed to: i) explore the effect of increasing nitrification rates in the elimination of EDCs by the enriched NAS and AOB biomass; ii) investigate the contribution of the heterotrophic bacteria and the small autotrophic fraction present in CAS, and iii) evaluate the role of AMO enzyme. In all cases, a mix of the selected EDCs at an initial design concentration of 15 µg/L was spiked in the system, whereas the substrates of autotrophic and heterotrophic bacteria (ammonium and acetate, respectively) were also present at different concentrations or combinations depending on the aim of each test.

Both enriched NAS and AOB, demonstrated a negligible degrading capacity. The studied estrogens exhibited low removals (< 14%) and showed no correlation with the increasing nitrification rates. Contrariwise, the biodegradation capabilities of the heterotrophic fraction of CAS were highlighted. E2 and E3 were removed by up to 100% and 78%, respectively. As regards E1, although removals ranged from 10% to 46%, high elimination could also be considered given the fact that it was found to be the main transformation product of E2 (almost quantitative oxidation). EE2 and BPA were more persistent biologically with removals ranging from 10% to 39%. Experiments with heat-inactivated biomass revealed similar removals to those obtained biologically, only for EE2 and BPA, suggesting that sorption could be a relevant route of elimination for recalcitrant compounds.

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# **Wastewater treatment plant (WWTP) effluents and desiccation events interact to alter freshwater microbial communities.**

Ferran Romero<sup>1</sup>, Vicenç Acuña<sup>1</sup>, Sergi Sabater<sup>1,2</sup>

<sup>1</sup>*Catalan Institute for Water Research (ICRA), Science and Technology Park, University of Girona.*

<sup>2</sup>*Institute of Aquatic Ecology (IEA), University of Girona.*

## **Background**

Freshwater ecosystems are subjected to different anthropogenic pressures. Among them, wastewater treatment plant (WWTP) effluents can represent a significant proportion of total discharge, mostly in regions suffering from water scarcity. WWTP effluents contain a mixture of assimilable and toxic compounds, whose concentration determines the effect of the mixture on freshwater biota. Moreover, overexploitation of water resources together with climate change-derived pressures is causing drought events leading desiccation events to increase in number and intensity. To date, little is known about how desiccation events shape the response of river microbial communities to WWTP effluents.

## **Hypotheses and objectives**

Our aim was to evaluate how an acute desiccation event shapes the response of a complex microbial community (i.e. a river biofilm) exposed to a dilution of a WWTP effluent. We hypothesized that both wastewater effluents and desiccation would affect microbial community composition and functioning. We expected the microbial community to follow a subsidy-stress response when exposed to a dilution of wastewater effluent. Moreover, we hypothesized that the desiccation event would induce changes in community composition, which would ultimately shape the response to the subsequent wastewater effluent exposure.

## **Methodology**

The present study used 24 experimental channels in a replicated (n=3) regression design. The experimental channels were filled with sediment and allowed to acclimate for 2 weeks. Some sediment samples were then air-dried during 7 days and, afterwards, a wastewater dilution gradient was applied. The response of the microbial community was assessed in terms of community composition and functioning after one month of exposure.

## **Conclusions**

We found that desiccation and wastewater effluent significantly affected the bacterial community and key biofilm processes, such as photosynthesis, denitrification and methanogenesis. After the desiccation event, the biofilm associated to coarse sediment showed a stimulatory effect, even at low dilution factors, which was not observed under control (i.e. no desiccation) conditions.

**DOCTORAL PROGRAMME IN  
HUMANITIES, HERITAGE AND  
CULTURAL STUDIES**





# **Social change in England during the first globalization from Thomas Hardy's literary perspective: from the country to the city**

Herminia Cortés Quirós<sup>1</sup>

<sup>1</sup>PhD student, Universitat de Girona (UdG)

During the second half of the 19<sup>th</sup> century, a series of changes occurred in England and Catalonia which had a great impact on society. The aim of this research work in progress is to study how literature reflects the relationships between the country and the city during the transition from Industrialization to the First Globalization (1850-1914) through a comparative analysis between the two countries. To do this, I have chosen the poet-novelist Thomas Hardy (1840-1928) and his so-called *Wessex novels* as representative of the English case, and Marian Vayreda's *Sang nova* (1900), Narcís Oller's *Vilaniu* (1886) and Carles Bosch de la Trinxeria's *L'hereu Noradell* (1889) as relevant examples of the Catalan case.

From this country-city contrast perspective, different themes are studied using the comparative method with a historical and social approach. Such themes are the writers' perceptions of contemporary life both in the country and the city and to what extent they produced idealized images of the rural world. These include the psychological aspects of nature, the concept of social class and education related to social mobility and the use of language to depict the different characters who belong to different worlds. The writers' reactions to technological advances in those changing times (e.g. the construction of the railway) and their attitude towards social conditions and the consequent migration to the city are also important questions in my work. I also study the reception of the authors' literary productions by the intellectual community at the time and by the target readers as well.

So far, my task has been focused on the reading of the works by the Catalan writers taking the main themes mentioned above as a starting point. It can be concluded that all three describe the inevitable clash between the rural and the urban worlds and its effects on the population, reflected in their main fictional characters. In addition, the three authors convey a Catalan nationalist feeling as a result of the critical relationships with a Spanish government in crisis at the time; a socio-political background that I do not expect to find in Hardy's works. However, they differ in terms of attitude and purpose. Vayreda and Bosch de la Trinxeria show a tendency to idealize the country world and people – although the former does not always succeed – and their attitude is that of the intrusive narrator, sometimes irritably demagogic. Oller, from a more urban perspective, creates a deeper and more complex psychology for his characters and his attitude is closer to that of an observer, leaving more to the reader's imagination.

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# **Canonizing a Saint: The Importance of the Artworks in the Case of Saint Maria of Cervelló (1689-1692)**

Laura Farías Muñoz

*University of Girona, History and Art History Section*

Saint Maria of Cervelló (Barcelona, 1230-1290) was the first female member of the Order of the Blessed Virgin Mary of Mercy, founded by Pere Nolasc in 1218. During the early modern period, she was proclaimed the patron saint of Barcelona, alongside other saints like Ramon de Penyafort or Madrona. Today, several works exist on the presence of the patron saints in Hispanic and Catalan art and literature (Fontcuberta Famadas, 2015; Dilla Martí, 2017, Farías Muñoz, 2017), but none about Saint Maria in particular.

In the 1970s, Augustí Duran i Sanpere published an interesting fact: Barcelona government authorities had begun the process of beatification and canonization of Saint Maria de Cervelló in 1689 (1972, p. 20-21). This task ended in 1692, when Innocence XII confirmed her entry into the canon. In the Catalan reports submitted to Rome to prove Maria's saintly condition, several artworks appeared. All documentation – written in Catalan, Spanish and Latin – was preserved in the ArxiuHistòric of Barcelona and divided into three handwritten volumes. As Francesc Miralpeix explained, there is an entire section in the third volume dedicated to testing the quality and antiquity of seven visual representations of Saint Maria (2008, p. 26-27). For that purpose, the City hired three painters (Joan Grau major, Josep Vives and Joan Arnau), three sculptors (Pere Serra, Joan Roig and Francesc Santacruz) and three master carpenters (Francesc Puig, Pere Llopart and Josep Osset) as expert witnesses to examine these pieces.

This communication aims to provide an in-depth study of the aforementioned book in order to increase knowledge of the different artworks that feature Saint Maria as the subject, created during the 16<sup>th</sup> and 17<sup>th</sup> centuries in Barcelona.

## **Acknowledgements**

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# Thinking in images in the Renaissance Era

Roger Ferrer Ventosa

*University of Girona*

## Hypothesis and objectives

Images are a graphic system of communication that differ completely from an analytical and discursive approach. In this research I have focused especially on those images that refer to the sacred, taken as a space that is open to the transcendent, while trying to find their epistemology and discover why they are so important.

In many religious traditions, sacred or mythical images are so close to the real thing that they are the same (Gombrich, 1978). Let us think about the etymological meaning of the word “icon”, which comes from the Greek word *eikon*. Not only does it mean image, but also similarity; that is, the likeness between the portrayed figure and the mythical character. To the mythical-magical conscience, an image is not only a representation of the thing, it is the thing itself, part of its reality, and it works as its alter ego or hypostasis. Contrary to the semiotic theory, from this conscience signs and images can be considered the same thing

## Methodology

This research will be conducted using the most common art history research method. First, the pieces of art will be studied and then commented on. At a second stage, the most accurate or relevant primary and secondary sources on the subject will be read. Finally, based on this material, the own discourse of the researcher will be constructed.

## Conclusions

Given the central role of images and their strength, especially those focused on the sacred, it would be advisable to study them as an essential tool for encapsulating and spreading knowledge, especially if we are referring to religion. Thanks to them, we can become experts in a specific way of thinking through images. As Wittgenstein stated in *Tractatus*: “What *can* be shown *cannot* be said”.

In this conference for this *2<sup>nd</sup> Conference of Pre-doctoral Researchers of the UdG*, we will pay particular attention to the theories found in the Hermetic (*Corpus hermeticum* and *Asclepius*) and Neoplatonic texts, since they stand out as being crucial for some Renaissance artists and thinkers, such as Michelangelo, Botticelli, Ficino or Bruno. With this background, the epistemological foundations of a theory of this visual material will be established. Besides, the mnemonic systems in that period, based on visual representations, which helped information to be stored in the memory, will be commented on.

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# The nation in a border area of the Cerdanya: between french and spanish nationalisms and catalan regionalism (1879-1895)

Arnau Mayans Montés | [arnau.mayans@udg.edu](mailto:arnau.mayans@udg.edu)

Universitat de Girona

According to Benedict Anderson (1991), nations are political communities imagined as inherently limited and sovereign. This definition of nations as “imagined communities”, which does not mean that they are simple inventions or falsehoods, has been the most successful and influential of the last decades. In that same theoretical line, Craig Calhoun (1997) has argued that nationalism shapes a particular way to imagine a collective identity and the social solidarity that this infers.

Several authors have pointed to different mechanisms for the creation, expansion and reproduction of national identities; from Eric Hobsbawm’s “invention of tradition” to Michael Billig’s “banal nationalism”, through Anne-Marie Thiesse’s “IKEA’s system” and the importance that Anderson gives to the novel and the newspaper as a means capable of creating a national narrative.

Some of these mechanisms seem to presuppose an indisputable successful action of the nation state and the previous processes of nationalization. Where, then, is the “history from the bottom up” dialectic? Understanding that members of a national community only act as mere empty containers where national identity overflows from above obviates a large part of the constantly moving process of national construction. For this reason, we want to place ourselves in the field of “experience of nation”, proposed by Ferran Archilés (2013) to tackle the study of national identities. In this way, we seek to incorporate a theoretical framework from social history into the study of national construction processes: the notion of “experience” developed by Edward Palmer Thompson in his reference work *The Making of the English Working Class* (1963).

We present a chronologically and geographically delimited case study with a specific methodology: the border region of the Cerdanya at the end of the 19th century with a systematic work on the weekly *La Voz del Pirineo* (1879-1895). The political division of the valley at a definite time, as a result of the Treaty of the Pyrenees in 1659, and the fact that the division has remained without relevant changes until the present, offers the possibility to study and compare a political boundary in an exemplary way. As Peter Sahlins (1989) argues, these circumstances allow the dual process of the formation of the French and Spanish nation states and the Catalan regionalism’s role be examined. With the consolidation and expansion of the *Troisième République* and the *España restauracionista*, this work focuses on a key moment to study the creation and reproduction of nationalist experiences on both sides of the boundary.

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# **Interdependent world: an in-depth look at the integrationist system of the philosopher José Ferrater Mora**

Esther Molina-Olivencia

*Universitat de Girona / Càtedra Ferrater Mora de Pensament Contemporani*

## **Hypothesis and objectives**

This study's first basic hypothesis is that philosophers Josep Ferrater Mora and Priscilla Cohn played a key role in the introduction of Animal Ethics in Catalonia and Spain. They published the first book on Applied Ethics in Spain in 1981, when bullfighting and other forms of animal abuse were still unquestioned. Thus, our first objective was to see if both were pioneers in Animal Ethics studies and co-responsible (among other authors and public figures, such as J. Mosterín, and F. Rodríguez de la Fuente) for the development of the animalist movement in these territories.

This work addresses the integrationist perspective and methodology of the philosopher Josep Ferrater Mora and his ideas on Animal Ethics --highly influenced by P. Cohn-- as a possible key to a broader view on this field. The second main objective was to analyse the connections with these ideas and the notion of interdependence, and then inquire if it could help to situate their work in a relevant place from which to study Animal Ethics nowadays, more than ever before, in an era of global and environmental challenges.

## **Methodology**

In order to develop these aims, this study was based on books and texts from the authors and on an analysis of those specifically related to the area of Animal Ethics, or those which denoted a systemic perspective. Some secondary bibliography was also contemplated.

The direct contact with Priscilla Cohn and other authors, who studied and knew the philosophers and their work, has also been important.

## **Conclusions**

Ferrater's ideas were very critical with the appropriation of Nature by humans. His ontological and systemic approach entails an extension of the moral consideration towards life. He used the "continuum of life" notion to describe the world we live in with a clear anti-anthropocentric and anti-speciesist view. This web of webs in which we are immersed turns out to be a basic premise on which to think of and develop ourselves. In times of eco-social crisis, such as the present day, where hurting animals is also an attack on ourselves, an ethics based on interdependence seems to be a promising approach that some people and collectives are already adopting.

This work claims that Ferrater and Cohn's contribution had consequences beyond the theoretical field. They are considered here to have planted the seeds to recent achievements like the ban on bullfighting and wild animals in circuses in Catalonia, the rethinking and restructuring of zoological parks, and the change in the legal status of animals from "objects" to "subjects of rights" under Spanish law.



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# The Failure of William James's Pragmatic Argument for Religious Belief

Alberto Oya<sup>1</sup>

<sup>1</sup> *Universitat de Girona*

In this talk, I will pursue the line of reasoning defended by me in "W. K. Clifford and William James on Doxastic Norms" (Oya, 2018). I will argue that William James's pragmatic argument for justifying religious belief, as stated in his "The Will to Believe" (James, 1896), fails because it assumes the possibility of doxastic voluntarism (i.e., the claim that we can, at least on some occasions, willingly decide what to believe). I take doxastic voluntarism to be an unacceptable position. As Bernard Williams showed (Williams, 1973), it is something essential to the act of believing that we cannot believe that P without believing that P is true; but if doxastic voluntarism were correct, in believing that P, we would not necessarily be believing that P is true, insofar that our believing that P would not be grounded in P, but in our conscious decision to believe that P. Furthermore, I will argue that James's argument is unacceptable even if we claim that religious belief is reducible to its non-cognitive content since James's argument is grounded in the claim that the practical adequacy of religious belief is due to the truth of God's Salvation, which is a factual claim.

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## **The metaphysical implications of focusing on the novel**

Ferran Rodríguez Palet

*Universitat de Girona*

In the present communication I will present the metaphysical implications that arise from focusing on the novel. The starting hypothesis is that every narrator of a novel starts from metaphysical assumptions, which are reflected in the point of view of the narrator, which affect the structure and constitution of the literary universe. That is, the point of view of whoever tells a story, directly determines the narrative universe he creates.

The methodology I will use will be interdisciplinary, although I will focus on comparative narratology. I have opted for this option since it seems to me the best one in order to show the similarities and divergences between different models. I will base the narratological study on the following works: *Du Côté de chez Swann* by Marcel Proust, James Joyce's *Ulysses*, and *La Nausée* by J-P Sartre.

Another important methodological element of the present study is the direct dialogue established between literature and philosophy. Contemporary philosophical materials will be used in the works studied to see the parallelisms between the two disciplines. In this way we will approach the ideas of philosophers, such as Henri Bergson, William James or Edmund Husserl, in order to see the influences they exert on the narrative of the first half of the 20th century.

One of the main conclusions that can be drawn from this study is a proposal of the evolution that occurs in the narrative voice during the first half of the 20th century. We will see how the psychologist narrator starts with patterns from nineteenth-century realism, based on omniscient extradiegetic narrators, and increasingly tend towards a radical psychology, built on intra-homodiegetic narrators. These formal characteristics affect the metaphysics of the novel in a decisive way, and they give new content to the 20th century novel. This is clearly shown in the selected works, which are the most representative of these narratological novelties.

## The locative prefix *inter-*: two morphological patterns

Begoña Ramos Jiménez

*Universitat de Girona*

Essentially, the prefix *inter-* was used in classical Latin with movement verbs (*interduco*, *intervolo*, *intereo*) (Alvar and Pottier 1987: 298). It is a locative prefix that, nevertheless, experiences an extension of the semantic content throughout its history, as witnessed by the formations in the Spanish language (Penny 1999).

The aim of this study is to document the historical process of the creation of prefixed forms with *inter-*. In this historical trajectory, it becomes evident how an inherited morphological Latin pattern develops into a newly created one: the romance pattern.

This phenomenon flourished significantly in the 19th century. This work also aims to account for the semantic evolution of these formations; from the locative value (*intervenio*, *interpono*), typical of the origins, the prefix develops other meanings, such as reciprocity (*intercomunicar*, *interconectar*) or relationship (*acuerdo interministerial*, *presupuesto interbancario*, *viaje intergaláctico*) in which the correspondence between the semantic component and the morphological one is undeniable (Felú 2003). The prefix *inter-* applies a modification on the verbal basis to which it is attached, specifically, it acts on the participants linked to the lexical-semantic structure of the verb with which it is combined, insofar as it is a prefix with argumentative incidence (Felú 2003).

For the development of this analysis, different textual corpora (*CREA*, *CORDE*, *CE*) have been used.

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## **The painter Antoni Peitaví and his time (1561- 1592).The painted altarpieces in the provinces of Rosselló and Cerdanya.**

Adrià Vázquez Vives

*Universitat de Girona*

The main aim of the present communication is to present the results of the first stage of this pre-doctoral thesis research on the late 19<sup>th</sup>-century painter Antoni Peitaví and his art works in the provinces of Rosselló and Cerdanya. Peitaví has been considered one of the most productive and efficient painters in this region at this time. A recent discovery of a contract in the Archive at Perpinyà concerning the altarpiece of Palau del Vidre has allowed us to reflect on Peitavi's pictorial style, and the connections between its generation and the one before. Simultaneously, leading artisans in his environment, working in the same studio or in others nearby, help to explain the altarpiece painting process in this territory.

Principally, research started with studies conducted during the late 19<sup>th</sup> century and the first half of the 20<sup>th</sup> century,, establishing Peitaví as a leading figure in the region's pictorial production. Research was carried out by archivists and priests of the period, such as B. Alart (1872), P. Vidal (1897), F. Montsalvatge (1911-1915), J. Masdeu (1916 and 1917), Pujoli Tubau (1925), J. M<sup>a</sup> Madurell (1946) and Ch. R. Post (1950), as well as the most accurate study of the figure of the painter to date, by Marcel Durliat (1954). Besides, recent studies, such as the ones by T. Avellí and F. Miralpeix (2012), J. Garriga (2016) or J. Bosch (2016), which emphasise the painter's significance for Renaissance altarpiece productions in his time, should also be mentioned.

This research is also connected to current research on altarpiece production in the Catalan Pyrenees, and studies focused on the artist/artisan graphic culture of that period, found in Italian-German engravings and the Italian Masters' models, which were the main source on which the sacred scenes for *Cinquecentisti* liturgical furniture were based.

The systematic emptying of the archives in the region, where we know these painters worked, such as the archives at Perpinyà, Puigcerdà, La Seu d'Urgell, Ripollès, Olot, or the Monastery of Sant Joan de les Abadesses, allow us to prove the productive career of Antoni Peitaví, as a leading figure in altar piece art in Northeast Catalonia.

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**DOCTORAL PROGRAMME IN  
EDUCATION**



## **Early Algebraic Literacy: A learning trajectory to teach the patterns to studies as young as 3**

Acosta, Y.<sup>1</sup>, Alsina, Á.<sup>1</sup>

<sup>1</sup>*University of Girona*

In recent years, the mathematics curriculums of various countries (the United States, for example) have begun to teach algebra to children as young as 3 years, in the belief that understanding patterns, relations and functions, as well as analysing increasingly difficult repeated patterns are abilities that should be worked on in these early ages (National Council of Teachers of Mathematics [NCTM], 2003). However, research on the initial development of algebraic thinking has traditionally been aimed at students older than 6, with very little or no effect on the basic algebraic thinking that students should acquire in earlier years.

Early algebraic thinking is developed through an awareness of the structural relations of the patterns and later in the structure of arithmetic (Carraher, Schliemann, Brizuela and Earnest, 2006; Mason, Stephens and Watson, 2009). Exploring patterns can therefore be considered a useful trampoline on which to build a solid base of learning that favours the acquisition and treatment of a more sophisticated knowledge of algebra at subsequent levels of the teaching-learning process.

This point of view has led to the development of design-based research (DBR), an emerging, basically qualitative method used to understand and improve educational realities. Núñez del Río, de Castro, del Pozo, Mendoza and Pastor (2010) add that the method can be used to promote the design of theory-based curricular innovations that enrich the teaching and learning process through a reflective cycle of analysis, implementation and redesign.

A pilot study with 24 three-and four-year-old students will be held to analyse their knowledge of the patterns, based on a learning trajectory previously validated by experts, which considers different teaching-learning contexts: situations from daily life, manipulative materials, games, literary resources (stories), technological resources and graphic resources.

The results indicate that the participants in the study are able to identify, recognize and represent patterns that follow a simple structure in these teaching contexts, thereby reinforcing future algebraic literacy. It can be concluded that the designed learning trajectory helps early childhood education teachers to coordinate specialized educational interventions that promote this initiation to algebraic thinking.

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# **Digital media and youth participation in secondary education. Towards a sustainable future**

Meriam Boulahrouz Lahmidi, Rosa M. Medir Huerta, Salvador Calabuig i Serra

*University of Girona*

## **Introduction**

Sustainable development is one of the great challenges of our time. At the global level, many communities are immersed in poverty, climate change threatens our future, and conflicts are proliferating in different regions. If we want to achieve sustainable development at different scales, it is essential to train the citizens of the future (Calero, Vilches, and Gil Pérez, 2013). This research consists of a didactic proposal carried out in secondary education to engage students in learning for a sustainable future in their local environment through the use of audio-visual materials. This research aims to contribute to the development of education for sustainable development (ESD) in a society increasingly knowledgeable about appropriate ESD practices by promoting the participation and involvement of young people in sustainable development (Tilbury & Ross, 2006).

## **Objectives**

The research aims to:

- Involve young people in their immediate environment through the local media.
- Analyse the critical-reflexive capacity of young people in relation to the events that take place daily.

## **Methodology**

This research consists of the didactic proposal *Let's improve our communities*, a learning sequence that involves young people in citizen participation through the use of audio-visual materials.

This didactic proposal has been tested with 58 students in the second year of compulsory secondary education (*ESO*). In the course of the field work, data was collected using different instruments (focus groups, participant observation, and texts written by the students).

## **Results**

Audio-visual scripts were created by young people to justify their alternatives for improvement in a critical and understandable way based on sustainability criteria. The participating students showed an interest in different occurrences in the local environment, whose reality they would like to change.

The proposals for improvement were formulated with the intention of transmitting to the rest of the citizens the importance of living in a sustainable way.

## **Conclusions**

The final conclusions demonstrate that, in a society where formal and informal education are playing increasingly important roles, communication skills are necessary

for young people to participate successfully in society and can contribute actively to transforming the world. (Hart, 2001).

Young people are very active and motivated in putting forward their points of view and would like adults to consider their opinions. The proposals originating from the didactic experience have been very useful, allowing them to debate, and contrast their opinions.

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# **Making friends: qualitative research focused on the opinions of young people with intellectual disabilities**

Gemma Diaz-Garolera<sup>1</sup>, Maria Pallisera Díaz<sup>1</sup>, Judit Fullana Noell<sup>1</sup>

<sup>1</sup> *University of Girona*

## **Introduction**

Friendships constitute supportive social networks that, in addition to contributing to social belonging and personal well-being, act as natural sources of support. Although people with intellectual disabilities (ID) positively value having friendships (Cooney, 2002; Tarleton & Ward, 2005), research suggests that they usually have reduced social networks, and these are often composed of family members and/or professionals (Emerson & McVilly, 2004). In addition, young people with disabilities have fewer leisure and free time opportunities than their non-disabled counterparts (Small, Raghavan & Pawson, 2013; Verdonshot, de Witte, Reichrath, Buntinx & Crufts, 2009). The aim of this research is to identify the main difficulties experienced by people with ID when establishing and maintaining friendships, as well as those factors that favour the establishment and maintenance of friendships. The opinions and experiences of people with ID have therefore been essential.

## **Method**

This qualitative study consists of 10 individual interviews conducted with teenagers (aged 16-19) with ID who are users of a socio-educational service, and 4 focus groups carried out with groups of self-advocates (32 adult people). The transcripts of the individual interviews and the focus groups were analysed through thematic content analysis, searching across the data corpus to find repeated patterns of meaning and developing a thematic content codification process.

## **Results**

Participants valued the benefits of friendship. According to them, what may negatively affect their friendships are segregating organizational strategies used in some schools, a lack of participation in leisure activities, and having poorly developed social skills, among others. In contrast, it was a support for them when families contributed to maximizing their participation in leisure activities, as well as when they had ample opportunity to meet different people in diverse community areas.

## **Conclusions**

Having meaningful relationships contributes to personal well-being. Social and psycho-pedagogical support strategies can be established in order to guide professionals, families and also young people with ID to increase the opportunities for the latter to establish interrelationships, as well as to enhance the skills they need to establish and maintain friendships.

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# **Educational attention for left-behind children (LBC) in rural China from the perspective of inclusive education**

Chengcheng Huang, Montserrat Vila Suñe, Maria Pallisera Diaz

*University of Girona/ Faculty of Education and Psychology*

## **Objective**

Based on the previous literature review, the main objective of this study is to provide a generalization of the educational situation of left-behind children (LBC) in China from the perspective of inclusive education.

## **Methodology**

In this study, the variables are specified based on the research problem, the proposed objectives and the revision of the theoretical framework. The proposed variables are in line with the three factors of the index for inclusion (Booth and Ainscow, 2000): culture, politics and practice.

Our specification, taking into account left-behind children and rural areas, considers three fundamental variables to analyze the educational inclusion of left-behind children in rural areas:

- Teachers
- Members of family
- Representatives of the municipality (Rural areas)

The collection of information was made from a methodological approach that is qualitative techniques (individual in-depth interviews).

In this study, I have collected the data during June and July of the year 2017, the participants come from 3 schools, 2 are elementary schools that are in the same area of Chongqing, and the third is a secondary school that is in the Hebei province. Totally, there are 21 teachers, 10 members of family and 2 representatives of the municipality.

## **Results and Conclusion**

From the interview, we found a wide range of problems for left-behind children. Although their situation has improved, however, for left-behind children, it is noted that none of the resources has been well done. With the remoteness and local poverty of the location of these schools, there is always a scarcity of material resources and due to the invisibility of these problems, only professional specialists pay enough attention to the professional training of the teachers. And obviously, after the so-called social and financial support, the economic situation of the families of left-behind children has remained the same and still lacks a personified attention to a certain population. In summary, these aspects that the government should take still have a lot of room to make and improve.

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# **Discovering challenges and formulating strategies for the participation of people with intellectual disability in the university context**

Paulina Elizabeth Mejía Cajamarca<sup>1</sup>, Maria Palliser<sup>1</sup>

*University of Girona / Doctoral Programme in Education*

The goal of ensuring participation for people with intellectual disabilities (ID) generates great challenges for their inclusion in the university context (Cerrillo, Izuzquiza, & Egido, 2013; Plotner & Marshall, 2015; Verdugo & Schalock, 2011). The aim of this thesis derives from a concern for and commitment to this goal by academia, and consists of determining the challenges in, and strategies for, ensuring said participation from the perspectives of managers and people with ID at the Faculty of Education and Psychology of the University of Girona.

This research was carried out from a qualitative perspective, using interviews and focus groups as information-gathering techniques. The study had 15 participants (8 managers and 7 people with ID, who comprise the Advisory Committee of the Diversity Research Group at the University of Girona). The interviews and focus groups were recorded in their entirety and, following their transcription, a thematic content analysis was carried out (Braun & Clarke, 2006).

The results showed the following to be main barriers to the inclusion of people with ID in the university: a lack of knowledge of educational strategies for people with ID; difficulties accessing higher education; low awareness, and a lack of educational accreditation for people with ID. As for support strategies, the following were detected: individualized tutoring projects for students with ID; accessibility and adaptability for their entry into university; more flexible pathways and alternative training courses; the provision of spaces for interaction, and the creation of mixed groups (Hart, Grigal, Sax, Martinez, & Will, 2006).

The participation of people with ID in the university context demands joint responsibility from the different agents. Similarly, the coordinated, evaluated, mediated and applied design of strategies that affect the academic and social sphere of the university context are called for.

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# **The graphical representation of empowering life experiences in a study of young people from the southern cone of Latin America living in Catalonia<sup>1</sup>**

Sonia Paez de la Torre, Pere Soler Masó, Carles Feixa Pàmpols

*<sup>1</sup>Institute of Educational Research, Department of Education, University of Girona*

This study explores the empowering process of young people between 20 and 34 from the Southern Cone of Latin America (Argentina, Chile and Uruguay) who, after a migratory experience, are living in Catalonia. Specifically, it inquires into the relationship between the social, cultural, economic and symbolic capital of these young people and their possibilities of empowerment (Bourdieu & Ruiz de Elvira Hidalgo, 1998; Úcar Martínez et al., 2016; Soler et al., 2017).

The hypothesis holds that migration, during the period of youth, can be thought of as a process of empowerment; it is an opportunity to increase the individual's capabilities, to develop self-confidence and a wide range of social skills. From a total of 50 "Biograms A", 24 participants were selected to apply a "Biogram B" (Abel, 1947). An intentional sample of 12 young people was formed with the collected data, and in-depth interviews were conducted with them. Each interview concluded with a graphical representation of their life itinerary (Páez de la Torre, 2017).

The aim of this paper is to present the results of the graphical representation that participants recorded in relation to their own empowering experiences in the course of their lives. A battery of youth empowerment indicators, developed by the Hebe Research Group (2014-2017)<sup>2</sup> (Úcar et al., 2017; Llena et al., 2017), was methodologically useful for this task. Autonomy, efficiency, self-esteem and critical ability were the dimensions where these young people located their empowerment experiences. This evidence must be triangulated with the results of the in-depth-interviews. While waiting for this work to be completed, this presentation offers a first interpretation of what each of these dimensions means for these young people.

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**DOCTORAL PROGRAMME IN THE  
ENVIRONMENT**





# Degradation of azo dye reactive black 5 using Mn-Ni and Mn-Al nanostructured particles

Wael Ben Mbarek<sup>1</sup>, J.J. Suñol<sup>1</sup>, Mohamed Khitouni<sup>2</sup>

<sup>1</sup> *University of Girona, C/Universitat de Girona 4, 17003 Girona*

<sup>2</sup> *Université de Sfax, Tunisia*

## Hypothesis and objectives

Main research activity is related to the study of the degradation of organic pollutants (Azo dye) of formula general  $RN = NR'$  radicals, R and R' are generally organic molecules and are one of the most common families of dyes used in textile and leather treatments. An important step during the treatment of water polluted by these compounds, is the degradation of the compounds by decomposition of the  $-N = N-$  bonds, producing the de-colorization of the water. The main hypothesis is that nanostructured particles of Mn-Al and Mn-Ni alloys are good candidates to de-colorize waters with azo dyes.

## Methodology

De-colorization process in a commercial dyes as Black five. We tested the produced powders in the degradation of organic pollutants of formula  $RN = NR$  existing in textile waste (dyes used in fabrics and leathers treatments).

Characterization of water after de-colorization: One of the problems of the applied method is the generation of new shorter molecules after decomposition of azo compounds. Characterization of metallic particles of metastable phases (amorphous or nanocrystalline) elaborated by rapid solidification and mechanical milling with scanning electron microscopy coupled with EDX microanalysis and also by X-ray diffraction. We also check the reutilization of the powdered alloys with good repeatability of the de-colorization process.

## Conclusions

The particles produced directly by mechanical alloying were heterogeneously composed of Mn-rich and Al or Ni--rich crystalline phases. Despite the difference in crystalline structure, both compounds showed an outstanding performance as decolorizing materials of azo dyes aqueous solutions. The powdered alloys showed higher degradation efficiency and the Black5 solution was completely decolorized after 30 min. The degradation kinetic and the formation by-products is found to be influenced by the pH and temperature of the solution. The analyses of the extract product allowed detecting the cleavage of the  $-N = N-$  bonds. The inherent ability of Mn as decolorizing agent is potentiated by the presence of Al or Ni, obtaining a degradation efficiency among the highest found in literature. Contrary to Fe-based materials, the high decolorizing efficiency is not decreased in alkaline conditions. This being of importance for the application of this material in real wastewater treatments. The easy production method and the high performance shown by Mn-Al and Mn-Ni nanostructured particles makes them worth to be considered as promising materials for environmental remediation.

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# **Digitizing Community Engagement for Social Sustainability; Observations and Potentials from a Web-based Approach**

Islam Bouzguenda<sup>1</sup>

<sup>1</sup> *Universitat de Girona*

## **Introduction**

The field of sustainable development needs to broaden its horizons beyond the built form of cities and incorporate what Information Communication Technologies (ICTs) could offer by means of innovative solutions that contribute to the development of smart and sustainable cities [1]. Whereas governments are playing a major role in supporting community engagement in participatory planning projects to meet the social goals of sustainable development, these governmental efforts are not always successful and are facing several challenges [1][2][3], which are the concern of this research.

## **Objective**

This research aims to analyse the interplay between several dimensions to enhance participatory planning projects and accordingly community engagement and social sustainability via the utilization of ICTs. To this end, the research question is as follows: How effective are ICTs in overcoming the main obstacles facing the traditional ways of involving citizens in participatory planning projects? Specific consideration is given to the use of three-dimensional interactive online participatory planning tools (3DIOPPTs). Not only are 3DIOPPTs expected to help increase the number of participants, but also the spectrum of participants, and the quality and type of participation.

## **Methodology**

In order to test this hypothesis, a multi-level case study design approach was employed through a collaboration with Schiedam Municipality, in the Netherlands as well as a mixed-methods analysis approach. First, a literature review was conducted, followed by practical parts of the research in which qualitative and quantitative research methods were utilized. Qualitative research methods included a retrospective study, collecting analysed data elaborated during previous participation sessions by Schiedam Municipality. Data was also collected via semi-structured interviews with experts and questionnaires addressed to Schiedam citizens. The results of the first practical part will be used as a base to conduct the second practical part of the research; a comparative research study in which two participation cases will be compared to examine the effect of introducing 3DIOPPTs to the participation process. This will be conducted in the form of participatory action research in which local residents from Schiedam will experiment 3DIOPPT on a new development project in one of the city's neighbourhoods.

## **Research Advances**

A literature review article has been produced. The data collected through semi-structured interviews and questionnaires were analysed using NVIVO and SPSS software. However, a scientific methodology to assess the effective aspects of introducing 3DIOPPT to the participation processes, such as increasing the number of participants, the spectrum of participants and quality of participation, has not yet been determined.

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# **Landscape visuals of historical towns as unexplored territorial heritage**

Bernat Llauradó

*University of Girona/Department of Geography*

Historical small towns represent an important landscape heritage because of their aesthetic, historical, social, productive and symbolic values. During the last decades the urban growth model in these towns has signified a gradual loss of landscape quality, where small interventions may cause serious alterations to their fragile landscape. This phenomenon has affected the visual landscape perception of the historical village and its surroundings.

Landscape visuals from motorized approach routes are the points with a highest density of visuals of the town and can also be considered as heritage, since they define its character. In fact, the scene of the old town skyline against the backdrop of its surrounding landscape is a well-known tourist attraction and an important factor for economic development.

This research is based on the contradiction between the relevance of visuals and the absence of their protection and management in local urban planning, where the criteria for new urban developments are regulated. Landscape visuals are conceived as heritage and all the visuals in a given geographical area as territorial heritage, since they make up the image of the territory and its identity.

The study was structured in two phases; the first one provided the basic urban and landscape characteristics of the 285 small towns of Girona province in order to obtain a greater knowledge of the urban and landscape reality. This was done from a database and the analysis was carried out using descriptive techniques.

The second phase was an in-depth study of 15 small towns carried out with a methodological proposal for urban and landscape diagnosis. It was focused on visuals and based on the theoretical foundations of the landscape integration discipline. The optimum observation points were detected and discordant elements of the landscape scene and visuals were analysed.

Partial results show that the population is growing, but not homogeneously in the territory; with significant urban growth potential that can affect landscape heritage, as 71% of the towns had a high or medium degree of visual exposure and 78% had urban growth strategies, which allow for new urban extensions. On the other hand, unity is emerging as the most important determining factor for obtaining an adequate degree of landscape integration for new urban interventions. Finally, we are witnessing a lack of landscape criteria for minimizing the impact of new urban development regarding landscape visuals in local urban planning regulations.

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## **Water-saving measures and climate change in the mediterranean. The case of the Muga Basin (Girona, Spain)**

Maria Torres-Bagur <sup>1</sup>, Josep Vila Subirós <sup>1</sup>, Anna Ribas Palom<sup>1</sup>

*<sup>1</sup>Department of Geography. University of Girona.*

The Mediterranean is one of the most important tourist destinations in the world. However, it has important challenges, because tourist activity is highly related to climatic conditions and the availability of natural resources, such as water. A decrease in water availability due to the consequences of climate change, and an increase in demand might generate new problems and challenges for the future availability of water for economic activities. So, the adaptation of the tourist sector to these new limitations is fundamental.

The main aim of this research is to determine what problems the lodging industry – hotels, camp sites and rural accommodations- has related to water resources. In addition, it is important to analyse what water-saving measures are being developed by the establishments and what kind of incentives or barriers are perceived by managers when they want to apply them. The study area is the Muga River basin, an important tourist destination located in north Catalonia, bordering with France. It is important to point out that this area could suffer important water stress in the future.

The methodology was divided into two phases. First, an exhaustive literature review was done. Secondly, the most important part was data collection and analysis, based on field work. Interviews with managers and workers were conducted and user surveys were carried out. In this way, the problems this sector has with water resources and the kind of water-saving measures being developed could be known. At the same time, it was also important to find out incentives and barriers for developing them. On the other hand we are also intending to analyse tourist water consumption habits and use. A transcript was made of all this information and it was analysed in depth using specific software to extract results and conclusions.

Preliminary conclusions indicate that the lodging industry is not greatly aware or concerned about future water availability problems and challenges. Neither is it concerned about the consequences that this decrease in water availability could have on its economic activity, or how it can adapt to this situation. Furthermore, perceptions of future problems and the implementation of different water-saving measures are different depending on the type of establishment, its location and the services it offers. Thus, in-depth knowledge of all these elements is the key to designing and planning future strategies to strengthen sector resilience.





**DOCTORAL PROGRAMME IN  
PSYCHOLOGY, HEALTH AND  
QUALITY OF LIFE**



## **Diagnostic validation of universals online survey**

Ballester L <sup>1,2,3</sup>, Alayo I <sup>1,2</sup>, Vilagut G <sup>1,2,4</sup>, Almenara J <sup>5</sup>, Blasco MJ <sup>1,2,4</sup>, Castellví P <sup>1</sup>, Echeburúa E <sup>6</sup>, Piqueras JA <sup>7</sup>, Roca M <sup>8</sup>, Alonso J <sup>1,2,4</sup>, equipo de investigación UNIVERSAL (Cebriá A, Gabilondo A, Iruin A, Lagares C, Leiva D, Miranda-Mendizábal A, Pérez-Vázquez MT, Sesé A, Soto-Sanz V, Vives M)

<sup>1</sup> *Instituto Hospital del Mar de Investigaciones Médicas (IMIM)*

<sup>2</sup> *CIBER de Epidemiología y Salud Pública (CIBERESP)*

<sup>3</sup> *Universidad de Girona (UdG)*

<sup>4</sup> *Universidad Pompeu Fabra (UPF)*

<sup>5</sup> *Universidad de Cádiz (UCA)*

<sup>6</sup> *Universidad del País Vasco (UPV-EHU)*

<sup>7</sup> *Universidad Miguel Hernández (UMH)*

<sup>8</sup> *Universidad Illes Balears. Rediaapp IUNICS/IDISPA*

### **Introduction and objectives**

The UNIVERSAL “University and Mental Health” project aims to develop and validate predictive models of suicidal behaviour among university students. The UNIVERSAL diagnostic tools are adapted versions of consensus clinical diagnostic instruments, and, therefore, it is necessary to know their diagnostic accuracy.

In this study we assess the diagnostic capacity of the versions of the Composite International Diagnostic Interview Screening Scales [CIDI-SC] modules for four common mental disorders and the Self-Injurious Thoughts and Behaviours Interview [SITBI].

### **Methodology**

This study is part of the UNIVERSAL project, a prospective longitudinal study of freshmen students in Spanish universities (18 to 24 years old). The mental disorders evaluated included: Major Depression Episode, Bipolar Disorder (BD), Panic Disorder (PD), and Generalized Anxiety Disorder. A Clinical Reappraisal study was carried out on a subsample of participants from the UNIVERSAL project, as a two-phase observational study. This sub-sample was invited to participate in telephone clinical interviews with a reference clinical standard MINI International Neuropsychiatric Interview (MINI). The validity of each index test was assessed comparing its diagnosis with diagnosis on the MINI. Diagnostic ability was estimated using classification accuracy statistics (sensitivity SN and specificity SP) and Receiver Operating Characteristics and the area under the curve (AUC).

## **Results**

A total of 287 university students completed the clinical reappraisal. Most were women (75.3%), with ages 18 and 19 (80.5%), Spanish (89.9%), and studying Social (37.6%) or Health Sciences (29.6%). The online survey instruments, detected a higher prevalence of the disorders assessed than the clinical assessment with the MINI (mood=17.7% 12-month and 36.1% lifetime; anxiety=18.5% 12-month and 34.1% lifetime). Suicidality showed highest prevalence in the SITBI (15.6% 12-month and 41.7% lifetime).

SN of the on-line survey for 12-month and lifetime mood disorders was 75% and 70.3%, respectively, and SP, 87.7% and 73.4%; SN for anxiety disorders was 78.9% and 65%, respectively, and SP, 85.3% and 70.1%. For suicidality, SN was 88% and 98.6%, respectively; and SP, 89.4% and 72.5%, while it was below 20% for panic disorder. Individual-level concordance was adequate (AUCs>0.7) for most disorders except for 12-month BD (0.6) and for 12-month and lifetime PD (0.6).

## **Conclusions**

Among the Spanish university population, the online measuring instruments used in UNIVERSAL showed a good diagnostic accuracy for common mental disorders as well as for suicidal ideation and behaviours, in particular when assessing 12-month prevalence.

# **Health training for improving chronic venous disease management in primary health care in Catalonia (Spain)**

Bonany-Pagès, Maria Antònia, González-Carrasco, Mònica

*University of Girona*

## **Hypothesis and objective**

Chronic venous disease is a highly prevalent pathology that seriously impacts the quality of life of people affected by it. A well-known formal training method, PSAP (support program for primary health care), was carried out in Catalonia (north-east Spain) by the National Health Service. It involved 285 primary health care professionals—including physicians and nurses working at this level- in 18 primary care centres (Figure 1). It was based on the assumption that training would contribute to improving interest in having more knowledge about the disease and to decreasing the loss of quality of life associated to the evolution of the disease, thanks to its better management.

## **Methodology**

A formal training method using interactive methodology was used. We analysed the differences before and after the training under a pre-post evaluation design. Results show that training produced a change in primary care professionals, which was translated not only into knowledge acquisition, but also into greater interest in the disease. The PSAP teaching programme aims to generate a change of attitude in the overall management of the disease with the final objective of improving patients' health and quality of life. After the experience, it was considered that PSAP training should be expanded to the entire primary care level.

## **Conclusions**

Pre-test results showed that the participating professionals did not have enough knowledge and were not very interested in acquiring it. In contrast, post-results showed that both knowledge and interest increased after the training.

This experience is the first step in a wider project aimed at improving the quality of life of people suffering from chronic venous disease by developing a protocol, based on intensive training, to better manage the disease. This protocol will incorporate the opinion of health professionals and take the patient's own perspective into consideration.

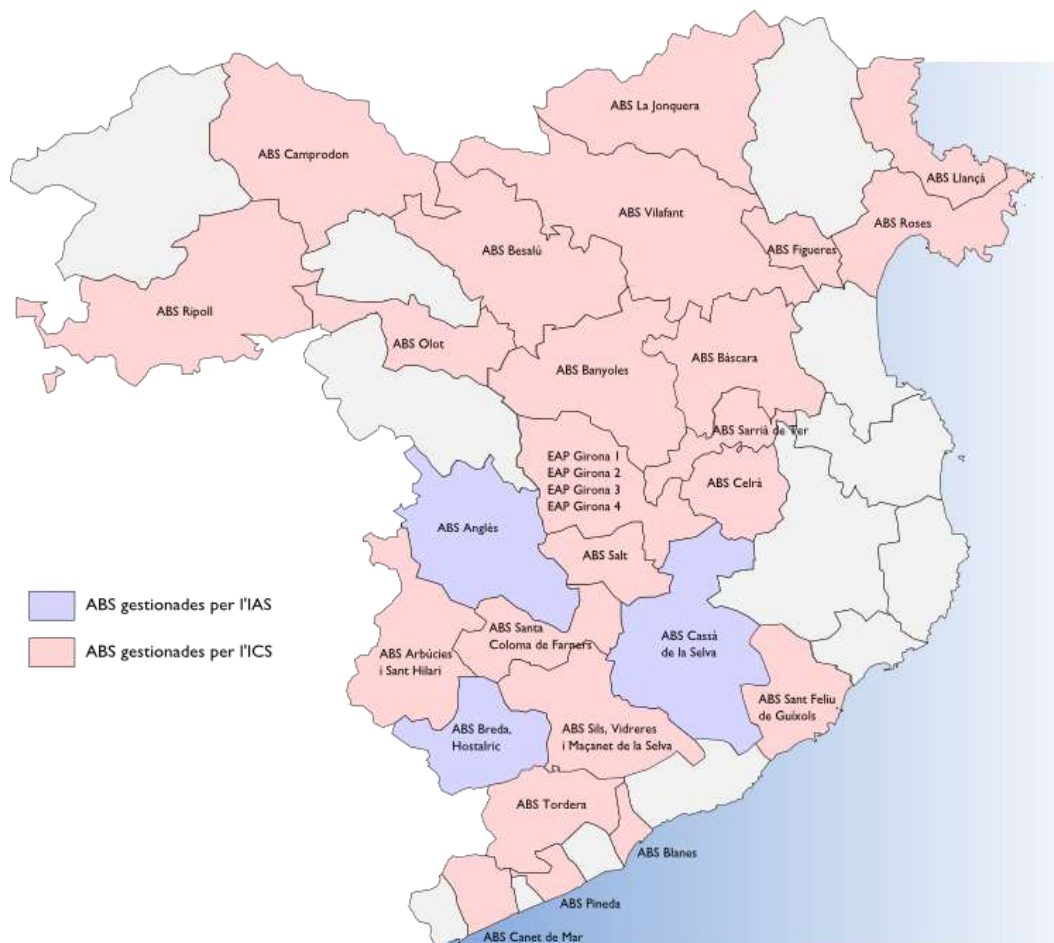


Figure 1 Geographical distribution of the primary health care centres where training was implemented.

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# **Efficacy of Alpha Neurofeedback Training for treating stress and anxiety/depression**

Alexandra Glink <sup>1</sup>

<sup>1</sup> *University of Girona*

## **Introduction**

It has been well documented that anxiety and depression are the most common mental disorders and that everyone experiences stress in some way, shape or form. Biofeedback is a technique in which people are trained to improve their health by learning to control certain internal bodily processes that normally occur involuntarily. Various studies in the past have shown the usefulness of Alpha electroencephalographic biofeedback or neurofeedback in the alleviation of anxiety symptoms.

## **Objectives**

The purpose of this randomized controlled study is to investigate if individuals with stress and anxiety/depression can learn how to increase their alpha brain waves and if alpha neurofeedback training can have positive psychological results by reducing their stress and anxiety/depression.

## **Methodology**

This study was carried out by enrolling 14 volunteers with stress and/or anxiety/depression symptoms. Their anxiety level was assessed clinically, and by using the Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983; Catalan version from Soto, Gras and Planes, 2008). Half of the randomly assigned participants were treated with alpha neurofeedback training (intervention group), while the other half remained on a waiting list (control group). The intervention group received 10 sessions of alpha neurofeedback training in five weeks. Then, the control group received the same training.

## **Results**

The mean alpha amplitude score before training in both groups (intervention and control group) was almost the same. While after the alpha neurofeedback training, the mean alpha amplitude score was significantly higher in the intervention group than in the control group. Similarly, the analysis of reduction in mean anxiety and depression scores after training, showed a significant reduction in the intervention group, while no significant changes were detected in the control group.

## **Conclusions**

The participants learned to increase their alpha brain waves with ten sessions of alpha neurofeedback training and it had positive psychological results by reducing anxiety and depression. The usefulness of alpha neurofeedback training was confirmed not

only for the treatment of anxiety, but also in the case of depression. We suggest the research is extended with samples that also include males.



# **Media multitasking, personality, executive functions and academic achievement relationships in a sample of spanish adolescents**

Martín-Perpiñá, Maria Mercedes<sup>1</sup>, Viñas Poch, Ferran<sup>1</sup>, Malo Cerrato, Sara<sup>1</sup>

<sup>1</sup> *Institut de Recerca Sobre la Qualitat de Vida. Universitat de Girona.*

## **Introduction**

Technological progress and the emergence of multi-function devices have created a perceived need for users to always be connected to multiple media devices (Courage, Bakhtiar, Fitzpatrick, Kenny, & Brandeau, 2015). Despite media multitasking becoming a common form of media use in the Information Society (Baumgartner, van der Schuur, Lemmens, & te Poel, 2017; Rideout et al., 2010), it is more prominent among adolescents aged 12 to 18, whose executive functions are still immature. Although there is no consensus on this to date, several authors have concluded that multitasking is detrimental to speed and accuracy in the performance of a wide range of tasks.

## **Hypothesis and objectives**

Given the small number of investigations that explore the role of personality as a mediating variable between Media Multitasking and its effect on executive functions, the present study has been carried out in order to analyse whether personality acts as a modulating variable in the relationship between these variables, especially when Media Multitasking occurs during academic tasks.

## **Methodology**

Data for this study were collected at six High Schools in Girona (Catalonia). Participants in this investigation came from 1st to 4th levels of Secondary Education, 1st and 2nd of baccalaureate and formative cycles. The final sample was composed of 977 adolescents aged 11 to 18.

Participants filled in a questionnaire which included different scales to evaluate the variables of this study. The Media Multitasking index was calculated using the Media Multitasking Inventory (Ophir, Nass, & Wagner, 2009). Personality was assessed by NEO-FFI (Costa & McCrae, 1992), and Executive Functions by DEX-Sp (Pedrero et al., 2009). To evaluate academic achievement, we asked about marks in Mathematics and Language.

## **Results**

High rates of Media Multitasking have been found among adolescents. The dimensions of Responsibility, Agreeableness and Neuroticism acted as mediating variables of the relationship between Media Multitasking and executive dysfunction. In addition, Media Multitasking while doing homework was associated with a worse academic performance in Mathematics and Language. The Responsibility dimension was the best predictor of academic performance.

## Conclusions

The high presence of Media Multitasking and the relationship of this with a worse academic performance emphasize the importance of developing actions focused on the intervention of this phenomenon, once the mediating effect of the personality has been found. Thus, knowing adolescents' personality profile can be useful to develop strategies for the prevention of Media Multitasking.

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**DOCTORAL PROGRAMME  
IN CHEMISTRY**



# Highly Enantioselective Oxidation of Non-activated Aliphatic C-H Bonds with Hydrogen Peroxide Catalyzed by Manganese Complexes

Michela Milan,<sup>1</sup> Massimo Bietti<sup>2,\*</sup> and Miquel Costas<sup>1,\*</sup>

<sup>1</sup> QBIS Research Group, Institut de Química Computacional i Catàlisi (IQCC) and Departament de Química, Universitat de Girona, Campus Montilivi, Girona E-17071, Catalonia, Spain.

<sup>2</sup> Dipartimento di Scienze e Tecnologie Chimiche, Università "Tor Vergata", Via della Ricerca Scientifica, 1 I-00133 Rome, Italy.

## Introduction

The oxidation of aliphatic C-H bonds is a powerful reaction because it can transform the inert C-H bond into a suitable site for further chemical elaboration[1,2]. Additional challenges are encountered in enantioselective C-H oxidations[3]. Not surprisingly, examples of enantioselective C-H oxidation with non-enzymatic systems are rare and limited to weak C-H bonds[4].

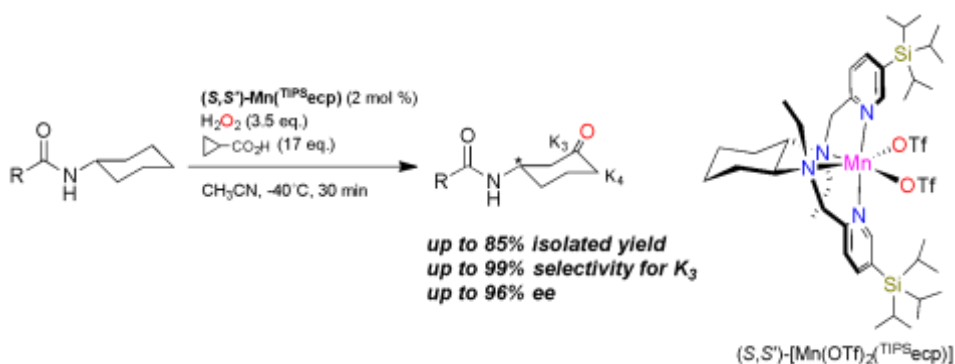


Figure 1. Representative example of the oxidation reaction and the catalyst employed.

## Objective

In this paper, we describe the development of chiral manganese complexes with sterically demanding tetradentate aminopyridine ligands that catalyze the regio- and enantioselective oxidation of methylenic groups in monosubstituted cyclohexanes using H<sub>2</sub>O<sub>2</sub> as an oxidant.

## Methodology

Different aminopyridine tetradentate ligands were prepared. The corresponding manganese triflate complexes were synthesized and fully characterized.

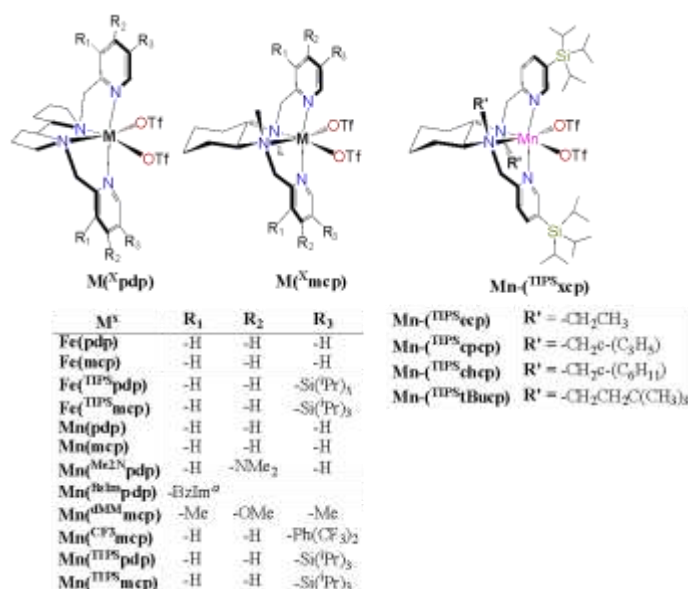


Figure 2. Manganese complexes used in this work.

## Conclusions

This work describes unique examples of regio- and enantioselective oxidation of nonactivated aliphatic C-H bonds. The change of the pyridine ring has a strong impact on the selectivity and the stereoselectivity of the reaction.

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# Segmental labelling of proteins using four orthogonal inteins and protein trans-splicing

Alex Romero Casañas<sup>1</sup>, Marc Ribó Panosa<sup>1</sup>

<sup>1</sup>*Protein Engineering Laboratory, Biochemistry and Molecular Biology Unit, Department of Biology, University of Girona, Girona, Spain.*

## Introduction

Inteins are intervening polypeptide sequences that can excise themselves from flanking protein regions, the exteins, and ligate them by a regular peptide bond in an autocatalytic manner in a process termed protein splicing. Even though their biological function remains to be elucidated, this type of proteins has found a widespread use in the field of protein chemistry. Inteins are object of study to be engineered to improve their properties and develop promising intein-based technologies. Split inteins in particular, which are expressed in two different genes and can ligate polypeptides in *trans*, have been of particular interest to ligate complex proteins, allowing for the segmental labelling [1] of their domains for different kinds of studies, such as Nuclear Magnetic Resonance. In this regard, the naturally split inteins gp41-1, gp41-8, IMPDH-1 and NrdJ-1 [2] seem to be promising tools for such applications.

## Hypothesis and objectives

The aim of this study is to build a system of orthogonal inteins that allows for the ligation of four different domains to construct a complex polypeptide through protein trans-splicing. Assessing the orthogonality of the inteins of choice is key, and being able to produce and purify them in a recombinant manner will allow for *in vitro* ligation of the four protein domains, that could be labelled (i.e. isotopically) differentially if needed.

## Methodology

Firstly, the lack of cross-reactivity amongst all of the  $I_N - I_C$  combinations was confirmed, both by co-expressing the different intein subunits *in vivo* in *E. coli* and *in vitro* after purifying the different precursors. Then, four constructions using GB1, Ub, Trx and SUMO domains as exteins and the inteins gp41-1, gp41-8 and IMPDH-1 were obtained thanks to recombinant DNA techniques. After studying their splicing activity *in vivo*, they were produced and purified in *E. coli* and tested *in vitro*, in order to obtain the full splicing product GB1-Ub-Trx-SUMO.

## Conclusions

This orthogonal intein system offers an opportunity to ligate multiple protein domains expressed independently. Further studies aim to use this system to study protein structure through NMR.

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# Computational exploration of epoxide hydrolase conformational dynamics and ring-opening of epoxides

Serrano-Hervás, E.<sup>1</sup>, Casadevall, G.<sup>1</sup>, Feixas, F.<sup>1</sup>, Garcia-Borràs, M.<sup>3</sup>, Osuna, S.<sup>1,2</sup>

<sup>1</sup> Institut de Química Computacional i Catàlisi (IQCC) and Departament de Química, Universitat de Girona (UdG), Campus de Montilivi, 17071 Girona, Catalonia, Spain, <sup>2</sup> ICREA, Pg. Lluís Companys 23, 08010 Barcelona, Spain, <sup>3</sup> Department of Chemistry and Biochemistry, University of California, Los Angeles, 607 Charles E. Young Drive East, Los Angeles, CA 90095

## Hypothesis and objectives

Among optically active chiral compounds, enantiopure epoxides are recognized as highly valuable synthons in organic synthesis for the manufacturing of pharmaceuticals, agrochemicals and fine chemicals. Producing such compounds in high stereo- and regioselectivities with reasonable yields is still a major challenge using conventional strategies.

Epoxide hydrolase (EH) enzymes have caught the pharmaceutical industry's attention as they have shown promising features for the preparation of enantiopure epoxides and diols during the selective hydrolysis of racemic mixtures of epoxides. Indeed, EHs exhibit different enantiopreferences for their substrates depending on the epoxide structure and its substituents. For instance, in EH from *Bacillus megaterium* (*BmEH*)[1], a switch in its (*R*)-selectivity towards aryl glycidyl ethers (PGE) is observed when a nitro group is included at the *ortho position* (*o*-NO<sub>2</sub>) of the PGE substrate[2]. The factors governing the stereo- and regioselectivities of the process remain unknown, despite all the mechanistic studies put forward to gain insights into those fine details of the catalytic reaction[3,4]. Our goal was to explore and elucidate the conformational dynamics of EH enzymes, as well as the effect of the substrate structure on their selectivities, to gather key information for the rational design of enhanced enzyme variants towards pharmacologically relevant substrates.

## Methodology

In this study, we evaluated enzyme conformational dynamics through conventional nanosecond time-scale Molecular Dynamics (MD) simulations and active site preorganization. Quantum Mechanics (QM) calculations were also applied to study the ring-opening of different relevant epoxide substrates, and elucidate the effect of the substrate substituents on the reaction mechanism[5].

## Conclusions

On the one hand, our extensive MD simulations combined with active site volume measurements revealed interesting features of *BmEH* conformational dynamics. A new conformational state that deviates from X-ray crystallographic structure was characterized. Our observations and analysis suggest that this conformation is key for binding the epoxide substrate. In addition<sup>2</sup>, the study of the conformational dynamics of *BmEH* variants allows the exploration of additional conformational states in

comparison to the observed for natural *BmEH* enzymes. Our analysis suggests that these might be relevant for binding bulky pharmaco-relevant substrates[6]. On the other hand, our QM calculations within the cluster model (CM) framework indicate that the substrate structure switches the usual *BmEH* (*R*)-selectivity towards (*S*) when racemic styrene oxide (*rac*-SO) and racemic *para*-nitro styrene oxide (*rac-p*-NSO) substrates are considered[5].

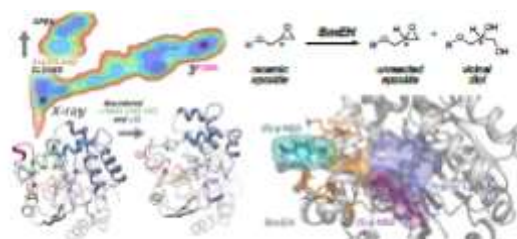


Figure 1 Study of the conformational dynamics of epoxide hydrolase (EH) enzyme (left) and, mechanistic studies of asymmetric ring-epoxide opening using EH (right).

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**DOCTORAL PROGRAMME IN  
TECHNOLOGY**



# Compositional data analysis of daily glucose profiles of type 1 diabetes patients

Lyvia Biagi <sup>1,2</sup>, Arthur Bertachi <sup>1,2</sup>, Josep Antoni Martín-Fernández <sup>1</sup>, Josep Vehí <sup>1</sup>

<sup>1</sup> *University of Girona*

<sup>2</sup> *Federal University of Technology – Paraná*

## Hypothesis and Objectives

Achieving optimal glycemic control in type 1 diabetes (T1D) patients is still a hurdle due to great intra-patient variability. Both high and low glucose levels lead to several complications. Recently, a tool for profiling the blood glucose (BG) dynamics of T1D patients based on different levels of BG was developed[1]. The analysis of time spent in distinct BG ranges defined by different levels during one day can be performed with Compositional Data Analysis (CoDa). CoDa deals with vectors in the form of proportions to some whole[2]. The time spent in different glucose ranges are relative contributions to the 24-h time budget, and therefore, are compositional data. The objective is to propose a novel methodology based on CoDa to analyse the BG profiles of T1D patients.

## Methodology

A dataset of six T1D patients carrying continuous glucose monitoring (CGM) and under continuous subcutaneous insulin infusion (CSII) during eight weeks was considered for the analysis. Daily glucose profiles were discretized into time spent in different glucose ranges, according to levels[3] and formed the composition. An exploratory analysis of the composition of days was performed using the compositional biplot, which suggested the discovery of groups of similar compositions. Data was expressed in coordinates[4] and k-means algorithm was applied to the coordinates to analyse different patterns of data.

## Conclusions

This novel methodology was applied on a dataset composed of data from real patients under free-living conditions. Through the CoDa approach, individualized categorization of patients' glycemic profiles were obtained. Clinically relevant data were also analysed for each group obtained by the clustering method. These classifications could be incorporated to a decision support system, allowing physicians to adjust patients' treatments.

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# **Urban space and art: the contribution of public arts to the definition of urban space**

Mar Cabarrocas i Salvador

*University of Girona / Doctoral Programme in Technology*

Urban space is an active part of our daily lives. Architecture, in all its forms, affects us inside and outside our work and leisure places. Researchers and urban planners have been starting to tackle urban space on a much smaller scale than before, exploring the relationship between citizens and what lies within their direct perception.

Within this nearer city we find, fused with the architecture, what we call public art (any form of art integrated into the public space). This part of our constructed perception of the surroundings establishes a dialogue in its own language with the architectonic materials, volumes and surfaces, which all together make up the city we inhabit.

The aim of this study is to strip this language to its volumetric core, searching for its most architectonic code. This research comes with the expectations of being able to offer some useful insights for future planners and artists in how public art positively shapes our public spaces. It also aims to demonstrate the important role art plays in the definition of the spaces we inhabit, not only for its artistic and cultural significance, but also for its capacity to construct the space.

Based on these objectives, a framework will be decided. The study is centred on public squares that include art in different dispositions. These urban spaces are analysed through comparison, applying graphic and conceptual methods previously used in architecture and urbanism for understanding how constructed realities affect the way we experience them. The final set of analyses used in all the public spaces is the result of filtering and selecting the methods with the most potential for providing insights from the previously used methods.

A first result is obtained when a selection of the squares are analytically confronted. The comparison brings into the light the different aspects and project decisions taken in each intervention. As the initial hypothesis suggests, public art can exert a powerful influence on the collective and individual imaginary of the public square.

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# Efficiently encoding scheduling problems to satisfiability modulo theories

Jordi Coll Caballero

*University of Girona*

## Objectives

Scheduling problems consists of determining execution times for a set of activities while respecting some constraints, such as precedence relations between activities or correct resource distribution. Among all possible schedules, it is interesting to find the one with the smallest duration. These problems have a strong combinatorial component, which make them hard to solve in reasonable computation time. We have focused on the use of logic-based language and the solving technology Satisfiability Modulo Theories (SMT) to provide models which let us solve hard scheduling problems optimally in competitive computation times.

## Satisfiability Modulo Theories

In this thesis, we study the use of logic-based tools to solve scheduling problems. Our approach is to encode problem instances into logic formulas, and use specialized algorithms to find satisfying assignments for the formulas. In particular, we use Satisfiability Modulo Theories (SMT). This consists of finding satisfying assignments for propositional logic formulas combined with other Boolean predicates. Roughly, we use Boolean variables, i.e. variables that can take either value *true* or value *false*, integer variables, and the logic relations between them.

We have obtained very high solving performances by, on the one hand using Integer Difference Logic expressions to model precedence relations between activities, and on the other, expressing resource constraints as pseudo-Boolean (PB) constraints. We have provided new translations of PB constraints into Boolean formulas, which are much smaller than other state-of-the-art translations. The distinctive characteristic of our approach is the use of problem knowledge to relax PB constraints. In particular, we use the fact that there are sets of activities which cannot be running at a same time. This allows us to assume at-most-one constraint over the variables of PB constraints, and reflect this assumption to the obtained Boolean formulas. Moreover, the provided translations maintain Generalized Arc Consistency, which is a very powerful property of formulas when solved by modern SMT solvers, using Unit Propagation.

The small size of our formulas is a key factor to our solving performance. Moreover, we have stated that our contributions to the field of translating PB constraints to Boolean formulas also have applications to many other families of constraint satisfaction problems.

## Conclusions

The results of our research show that efficiently encoding resource constraints to Boolean formulas is determining to get high solving performances in scheduling problems. Our SMT formulations are currently the best state-of-the-art solving approach in some scheduling problems.



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# Effects of Cu and Ti addition on the magnetostructural and magnetic phase transformations of Ni-Mn-Sn shape memory alloys

Asma Wederni <sup>1</sup>, J.J. Suñol <sup>1</sup>, Mohamed Khitouni <sup>2</sup>

<sup>1</sup> *University of Girona, C/Universitat de Girona 4, 17003 Girona*

<sup>2</sup> *Université de Sfax, Tunisia*

## Hypothesis and objectives

In recent years, a new type of ferromagnetic shape memory alloys (FSMA) have been becoming an increased interest as sensor and actuator materials due to their large magnetic-field-induced strain and shape memory effects. The aim of this research work is the obtention and the thermal, structural and thermomagnetic analysis of ferromagnetic Heusler type alloys (based on Ni-Mn-Sn-X quaternary systems (X= Cu, Ti) and the study of several of their functional relevant properties : shape memory, magnetoelasticity, magnetoimpedance, magnetocaloric effect, exchange-bias and magnetoresistance.

## Methodology

Preparation of master alloys: fusion by electric arc in controlled Argon atmosphere (and addition of a fourth element to Ni-Mn-Sn system). Preparation of ribbons by “melt spinning” technique. The alloys will be structurally and magnetically characterized after their fabrication as well as after the thermal treatments that will be performed in order to change or optimize their microstructural, structural and magnetic properties. The crystalline structures of the as spun ribbons were determined by X-ray diffraction technique (XRD), the characteristic transformation temperatures and the thermodynamic parameters of the samples were determined by differential scanning calorimetry measurements (DSC). The magnetic measurements (hysteresis loop and magnetization) were performed by a vibrating-sample magnetometer (VSM) in the temperature range 10–400 K.

## Conclusions

Besides the first order martensitic structural transition (induced by change of temperature and/or magnetic field), the Heusler ferromagnetic alloys here analyzed exhibit magnetic transitions associated to austenite and martensite phases. The transition temperatures vary noticeably with small changes of concentration of valence electron per atom,  $e/a$ , what allows to adjust or “tune” certain functional properties in a wide temperature range, including the room temperature (for applications as magnetic refrigeration. Likewise, the minor addition of a fourth X element can modify drastically both microstructure and functional behavior. It is found that the addition of 2at.% of Ti inhibits structural transformation when no external magnetic field is applied. The applicability of these materials is based in the cyclic reponse under the application of an external magnetic field, pressure and/or heat exchange. It is important checking the stability of the microstructure as well as the magnetic and the thermal reponse after cycling. Therefore, cyclic experiments (100 cooling-heating experiments working with

liquid nitrogen) has been performed. It has been usually found that thermal behavior and microstructure was unchanged, with the exception of the alloy with 1 at.% of Ti (after cyclic treatment, a premartensitic phase appears).

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**DOCTORAL PROGRAMME IN LAW,  
ECONOMIC AND BUSINESS**



# **Review of the principle of legality in the constitutional state**

Francisco Xavier Alarcón Espinosa

<sup>1</sup> *Universitat de Girona/ Universidad Técnica del Norte*

## **Hypothesis**

The principle of legality that characterizes Administrative Law has lost its validity in the Constitutional State of Human Rights. The object of this discussion is focused on reviewing the validity of the principle of legality in the constitutional state of human rights, to determine the scope and validity of Administrative Law in the State model that protects human rights. Efforts are being made to determine the fundamental role of the Public Administration in the effective protection of citizens' rights.

## **Work Methodology**

A qualitative methodology, focusing on the analysis and evaluation of public entities and the legal system, was used. Administrative management results, based on scientific measurement and the use of technical management auditing tools, will be provided, using the application of the inductive approach to analyze the former. We seek to expose whether the exercise of power of the Constitutional State is limited by the legal system: the principle of legality. Efforts will be made to analyze the validity, effectiveness and scope of the legal rules to determine the principle of legality that guides the operation of government offices. The techniques used were sample-taking, document review and critical analysis

## **Conclusions or progress**

Administrative Law has lost its validity in the Constitutional State of Human Rights. The object of this discussion is focused on reviewing the validity of the principle of legality in the constitutional state of human rights, to determine the scope and validity of Administrative Law in the State model that protects human rights. We propose rethinking the legal, philosophical and political development of the principle of legality of the administrative law that governs the exercise of public administration, in order to better fulfil the ends of the State.

This research proposes the legal reasons that explain why the State has created its own administrative rules, outlining a legal scenario for cases of violation of the law. It also asks if the fulfilment of its purpose to guarantee rights is being prevented.

In Ecuador, political, legal and social aspects are involved, which, revealed by the public opinion, have allowed the identification of alleged acts of corruption by public servants, taking place even in government agencies. We propose an academic debate, and the need to investigate, not only by those who have started fiscal inquiries, preliminary investigations or research, but also the academy, who must investigate the effectiveness and validity of the principle of legality, which questions the validity of standards in Ecuador. We discuss whether Administrative Law allows us to create fair management environments and scenarios for the effective protection of people's rights.

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# **A Comparative analysis of forest protection laws**

Alois Aldridge Mugadza<sup>1</sup>

*Universitat de Girona*

## **Introduction**

The thesis will explain the benefits and need for an instrument on forest protection. The motivation for this is that there is currently no binding instrument which focuses specifically on forest protection. Natural forests have important socio-economic and ecological functions. However, human activities have been the cause of deforestation and forest degradation through urban development, agricultural activities, forest-fires and illegal logging.

Despite international multilateral initiatives, the forest law regime remains riddled with a serious issue namely the lack of a binding instrument. There are a few international environmental instruments which have been promulgated and are “relevant and relate” to the issue of forest protection. These instruments include the CITES; the UNCCD; the Kyoto Protocol; UNFCCC; the CBD and the ITTA.<sup>2</sup>

## **Methodology**

The thesis will be a desktop research (qualitative research).

## **Objectives**

The thesis will look at judicial cases that have given the much needed judiciary jurisprudence in forest law and managed to change national laws and environmental practices. The thesis will look at forest national legislations from South Africa, United Kingdom and Australia. It will analyse international environmental treaties, protocols and agreements and investigate if the laws already in place are sufficient for forest protection.

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<sup>1</sup> Bachelor of Laws (University of the Witwatersrand), Master of Environmental Laws (University of Kwazulu Natal), both in South Africa, Doctorate Student (Universitat de Girona, Spain).

<sup>2</sup> Convention on Biological Diversity (Rio de Janeiro, 5 June 1992) in force 29 December 1993, (CBD), Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington, DC, 3 March 1973) in force 1 July 1975, (CITES), United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (Paris, 1994) in force 26 December 1996, (UNCCD), The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UNREDD, 2005), the International Tropical Timber Agreement (ITTA) (Geneva, 27 January 2006); Kyoto Protocol to the UNFCCC, (Kyoto, 11 December 1997) in force 16 February 2005. Kyoto Protocol, to, the United Nations Framework Convention on Climate Change, (New York, 9 May 1992), (Kyoto, 11 December 1997). United Nations Framework Convention on Climate Change (May 1992, New York City, USA) in force March 1994.

## **Conclusions**

The debate for a forest instrument seems to have stalled and much effort has moved to regional instruments. The Southern African Development Community has since enacted an instrument of which South Africa has made its national forest instrument. In Europe the European Union has since guided the protection of forests by directives that aim at reducing deforestation and forest degradation. Thus, there has been much development of instruments regionally than internationally.

## **Recommendations**

Deforestation is caused by various sectors that do not observe the concept of sustainability, and this can be reduced by encouraging sustainable land-use management. Importantly, under the Kyoto Protocol there is already an agreed project, which is the Land Use and Land Use Change Forest. This is a project that aims at regulating the sustainable use of land and spatial planning under the climate change regime. It has been agreed upon as a project with various policies and programmes already underway. However, it would need to be set out as a treaty or protocol. The instrument would be beneficial for the defining of concepts and its binding targets or obligations.

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# **Product innovation in Spain: measuring the innovation performance of firms in collaboration with universities and research institutes**

Giovanna Lara <sup>1</sup>, Joseph Llach <sup>2</sup>, Anna Arbussà <sup>3</sup>

<sup>1</sup> *Universidad de Girona / Universidad de las Fuerzas Armadas*

<sup>2</sup> *Universidad de Girona*

<sup>3</sup> *Universidad de Girona*

## **Abstract**

The goal of this study is to compare the innovation performance of the firms that have succeeded in developing product innovations (goods or services) in cooperation with institutions of higher education (Universities) with those that have done so in cooperation with private and public research institutes. The two groups are further compared to the group of firms that cooperate with other agents in product innovation. This empirical research uses the Community Innovation Survey (CIS) data for Spain for the period 2010-2012. Results show that firms that collaborated with Universities outperformed those that collaborated with research institutions, and both groups outperformed the firms that cooperated with all other types of collaboration partners in product innovation. The nature of this paper provides deeper insight into the nature and efficacy of the cooperation activities that shape the innovation ecosystem in Spain.

## **Hypothesis**

The hypotheses raised are: a) Average innovation performance is greater for firms with product innovations that cooperated with universities compared to firms that cooperated with research institutes, and, b) Average innovation performance is greater both for firms with product innovations that collaborated with universities and/or research institutes than for firms that cooperated with other partners.

## **Methodology**

This study used the database of the Community Innovation Survey (CIS) applied in Spain during the period 2010-2012. We selected the firms that obtained product innovations in cooperation with partners: suppliers, clients, competitors, consultants, universities and research institutes. Differences between the means of the groups, specifically the mean of innovation performance, were analyzed. The dependent variable of innovation performance was operationally defined as the total of turnover from new or significantly improved products introduced, which were new to the market or new to the firm.

## **Conclusions**

According to the results, firms that performed product innovations in collaboration with universities attained on average better innovation performance than firms that collaborated with research institutes. At the same time, both groups obtained a higher

than average innovation performance compared to firms which collaborated with partners who were better suited to producing other kinds of innovations, such as management and organizational innovations.

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# Law, mental health and stereotypes

Maria Àngels Porxas Roig <sup>1</sup>

<sup>1</sup> *University of Girona*

## Introduction

The CRPD promulgates the transformation of all substitute decision-making models, both formal ones like guardianship, but also the substitution of decisions on health matters or other more informal processes. This study focuses particularly on the effects that this human rights document has on the rights of persons with mental illness.

## Aim

The aim of this study is to analyze legal restrictions on the capacity to take decisions imposed on people with mental illness. It identifies the values that dominate the conceptualization of the institutions of guardianship and medical institutionalization in the legal thought, and the relations of power that they represent. The current concept of the exercise of legal capacity is linked to that of mental capacity, a discriminative approach according to the CRPD. Mental capacity tests are also the starting point to permit substitute consent for medical decisions, which together with stigmatizing beliefs about people with mental illness, such as perceived dangerousness, serve as justifications for the restriction of their rights.

## Method

This study examines how the Spanish legal framework has regulated issues concerning the exercise of autonomy of persons with mental illness. Taking into account the leading role of the CRPD on disability issues in the international legal sphere, it compares its position with the one enhanced in the CRPD.

## Conclusions

The first conclusions of the study reveal that the Spanish legal framework regulating mental health issues is against the human rights standards established by the CRPD. Moreover, the legal treatment of persons with mental illness is based on the limitation of their rights with arguments such as the risk of dangerousness or their incapacity to decide; justifications not based on evidence, but which rather perpetuate stereotypes.

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# **Implementation of internal control in financial processes: a comparison between the public and private sector**

Maria de los Angeles Torres Paredes<sup>1</sup>

<sup>1</sup> *University of Girona/North Technical University*

## **Hypothesis and objectives**

To determine the validity of the evaluation of risk management and internal controls in financial processes in public and private organizations from three perspectives: The management committee, senior management and operating staff, and the integrity of the audit.

## **Methodology**

A historical, logical, analytical, synthetic, inductive and deductive investigation of a sample of 2,400 special tests carried out in the ecuadorian public administration for 2015, 2016 and 2017, demonstrating breaches in the legal framework inherent in administrative and financial processes, due to the absence of internal control systems.

## **Conclusions**

The results were transferred to four publications of scientific papers and a book chapter as evidence of the major shortcomings in the internal control system in the Ecuadorian public administration. In addition to this, the paper: "The evaluation of internal control and risk management as a basis for effective and efficient functioning of the administration to mitigate corruption" has been accepted and will be presented at the University of Granada (Spain) on 25, 26 and 27 of July 2018. These publications propose a system of internal control and risk management. Properly applied, they would limit unlawful behaviors by interested parties, such as boards of directors, who must take decisions on the basis of risk oversight, evaluation of internal control weaknesses and the analysis of preventive, detective and corrective controls, which should be implemented in a timely manner by senior management to mitigate the risks that limit the achievement of objectives. On the other hand, senior management and the operating personnel must run its management by directly tying the operational objectives, information and compliance to the seventeen principles that form the basis of the components of the internal control system, making it possible to identify shortcomings that must be reported immediately to the Board of Directors for timely restructuring, so as to comply with prior times and continuous control that are the absolute responsibility of the organization. Finally, the auditing of controls is executed later. The auditor should reformulate its process to minimize the risk of detection, because their work not only focuses on auditing or reviewing the effectiveness of the financial information, but it must also investigate the source of the same through the in-depth analysis of the internal control, compliance and management that are present in the administrative process that generated the financial process, to establish reasonable assurance on financial statements. The proposal is not limited only to mandatory compliance with regulations, policies and procedures, but goes much further, since the predominant criterion is the ethical, technical and vocational

education of those who put it into practice, establishing in this way preventive measures against fraud or errors caused by action or omission. To this effect, comprehensive human talent recruitment examinations should be put in place to assess behavioral trends to ensure the ethics, honesty, loyalty, respect and responsibility of the policies and the legal system, the commitment to and confidence in them, while avoiding inefficient and negative future behaviors that put them at risk.

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# **Energy poverty public policies: the fight against energy vulnerability in Spain**

Anaïs Varo Barranco

*University of Girona/Joint Doctoral Programme in Law, Economic and Business*

## **Introduction**

Energy poverty and energy vulnerability are topics that have gained social and political force over the last few years. At the academic level, although research has increased since 2000, it is still at a very early stage, and most studies have focused on aspects of conceptual building and measurement of the phenomenon. Reference shall be made to authors like Boardman, 1991, 2010; Bouzarovski & Petrova, 2015; Bouzarovski & Tirado Herrero, 2017; among others.

## **Objectives**

The aim of the research is to analyse the design and development of public policies for equity and energy justice (specifically, policies to tackle energy poverty), through the Spanish case (at its different levels of government). Factors that could enable or limit these policies are also analysed.

The object of the research are the energy poverty public policies that address energy poverty at state level (social tariff and regulated prices), at autonomous community level (policies developed in Catalonia, as the only autonomous community that has developed this type of policy), and at local level, under the umbrella of European supra-state energy policies and guidelines.

The research question proposed is: How have the new public policies against energy poverty arisen and been developed in Spain and what factors enable and limit them?

The purpose of the research is to understand the development of public policies to tackle the phenomenon of energy poverty, understood as a social problem in which basic rights are affected.

## **Methodological approach**

The methodology used in the research is based on an interpretative approach, which seeks to understand, in the political narrative on the design and building of energy poverty policies, their ideological grounds and how they impact on the current transformation of the welfare state.

The research method is a case study research design (with different levels or sub-cases) applied to the scope of public policy. The data collection techniques are plural, combining direct observation techniques, study of documentary sources, as well as in-depth interviews.

## Conclusions

The results of the analysis allowed us to understand what type of public policies are currently being developed in Spain to tackle energy poverty, and the contextual and ideological bases on which they are supported, as well as their scope and limitations.

Early results show how energy poverty policies in Spain have been concentrated at the local level, and most of them have been focused on income and, to a minor extent, on housing conditions. Public policies at the national level have tried to regulate the energy tariffs sector, but they have found great resistance from the private companies that control the sector, supported by European energy policies that prioritise consolidation of the internal free market above social dimensions in energy governance.

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**DOCTORAL PROGRAMME IN  
TOURISM**





# **Residents' perceptions of tourism in the Barri Vell neighborhood of Girona**

Lina Enderica Izquierdo

*University of Girona / Joint Doctoral Programme in Tourism*

Tourism has always been an agent of social, economic and cultural change, which directly or indirectly has imposed a change on the social interactions and traditional lifestyle of residents. Moreover, in the initial stages of tourism development, the first groups of tourists demand services causing uncertainty in the economic sphere and, generating great speculation and fluctuation in prices. In the end, this problem is reflected in the residents causing inconvenience for the local population.

Another effect is observed in the cultural sphere where the customs and behaviour of the local population are influenced by the nature of the visitors. (Monterrubio, Mendoza, Fernández, & Gullete, 2011).

As we simultaneously evaluate the aforementioned changes, we see that tourism is increasingly becoming woven into the old city centers causing physical changes in the urban layout (Richards, 2016); which range from changes in the physical space and its use by locals to increased mobility problems. Therefore, within the academic community, it is important to study the populations in question, in order to identify their perceptions regarding the growth of tourist activities in their cities.

The present investigation has been carried out in the old town, of the city of Girona referred to as Barri Vell, which has undergone some alterations due to an increase in tourists in certain seasons in recent years. These changes mainly refer to festivities of regional significance and in peak summer months, which have generated discomfort and thereby some disagreements among the residents. Within this framework, this study seeks to understand and analyse the residents' perceptions of tourism in this city. Further, it also aims to identify the alterations generated in the old town due to the influence of the tourists on the city.

The methodology proposed is qualitative in accordance with the discursive analysis method. Thirty-five interviews were conducted with residents and with local business owners specifically catering for tourists in the old town, who were part of the sample of this study. With the information obtained, we focused on and analysed local perceptions towards change in the intensity of use of spaces in the old town as well as towards the visible physical changes to the old town in public spaces. This analysis can serve to identify the elements that influence the host's perception of tourism within the public spaces of their local sphere.

Key words: Perceptions, Girona, Residents, Host.

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# **Contributions to a community-based tourism emergent theory: community agency, governance and community-based enterprises**

María José Fernández-Aldecua

*University of Girona, Spain*

## **Objectives**

This paper aims to contribute on the building of a community-based tourism (CBT) theory, defined it as a community-driven governance and as a community-based entrepreneurship, considered here as the political and economic dimensions of a community agency, respectively. Indigenous traditional governance fits well with both dimensions of community agency, under a CBT model.

## **Methodology**

From a contingent approach, three cases are analyzed of indigenous communities at Oaxaca, Mexico, where community-driven governance (named *usos y costumbres*) has a strong influence on their CBT projects and in management of community-based enterprises. This study applied grounded theory (GT), a useful methodological procedure in the creation of a new theory. Accordingly, this is an inductive, qualitative method research, based on constant comparisons. Data was collected through 35 semi-structured interviews at five stages, during the period 2011-2017.

## **Conclusions**

Results indicate that there is a strong link between CBT, governance and entrepreneurship. When CBT arises on indigenous communities, if traditional governance stays strong, the same will happen with CBT, and if traditional governance weakens, CBT will weaken. In any case, emergence and development of community-based enterprises on a CBT model depends on community-driven governance evolution.

## **Keywords**

Community-based tourism, community agency, governance, indigenous entrepreneurship, Oaxaca.

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## **Is it possible to develop sustainable tourism through development aid programmes?**

Milena Santiago E.; Alfons Martinell S.

*University of Girona*

Tourism as an economic activity during the last decades “has experienced continued growth and increased diversification becoming one of the fastest developing economic sectors in the world” (UNWTO,2013). Tourism has become one of the key sectors for economic development and job creation throughout the world, and it is estimated to represent 10% of global GDP according to the World Tourism Organization (2017), and it makes a considerable contribution to the global economy through direct, indirect and induced contributions. According to the report made by the World Travel & Tourism Council (2017), tourism activity directly contributed US\$ 2.3 trillion and 109 million jobs worldwide, contributing with US\$ 7.6 trillion to the global economy and supported 292 million jobs in 2016.

The recognition of the importance and potential contribution of tourism to development strategies and to the global development agenda makes it suitable for conducting studies on the impacts of tourism and sustainability through international cooperation. This research seeks to determine the level of effectiveness of some projects of cooperation through tourism activity in Colombia.

The object of the study is to analyse the international cooperation for development in Colombia through sustainable tourism, and to determine if these programmes seek to reduce poverty, promote gender equality and ensure environmental sustainability through the development of successful and innovative activities that favour social and economic growth, while minimizing the potential negative impacts. In short, the aim is to design a methodological tool to analyse and evaluate sustainable tourism planning processes.

This study explores the role, impact and effectiveness of aid programs focused on the sustainable development of tourism in local communities in different regions of Colombia, and identifies the most relevant aspects of planning and developing sustainable tourism. The research has been divided into three phases: first, identification and analysis of the development aid programmes, their location and their influence on the tourist activity through the case study research method; second, identification and discussion of the impacts and the effectiveness of the implementation of sustainable tourism, and third, proposals and guidelines. Content analysis reveals that some aspects of development aid programmes in tourist activity that can be successful, but without the full involvement of all the stakeholders, may not produce the expected results, and may even produce negative impacts, which would make tourism an unsustainable product in the long term.

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# **Sustainable gastronomic tourism: a comparative analysis of sustainable indicators for the study of the rural communities of Veracruz and Catalonia**

Mariana Monserrat Sosa Tinoco, Silvia Aulet, Maria Dolors Vidal Casellas

*Universitat de Girona / Joint Doctoral Programme in Tourism*

## **Abstract**

This research aims to present a methodology for sustainable indicators for rural communities from two gastronomic destinations, which are characterized by similar geographies, with great natural and cultural wealth. For this reason, we propose a new sustainable indicator involving gastronomy as a driver of life quality improvement, whose ultimate goal is the sustainable human development of territories. Thus, tourism is one of the means.

## **Objective**

Four gastronomic destination experiences will be analysed in Veracruz, Mexico and Catalonia, Spain, each with their own difficulties and special conditions. The key to success will be linked to the gastronomic community, and community participation is essential in the planning process. Culture is the basis of tourist attraction, but as it becomes a generator of development, several difficulties may appear in the implementation of sustainable indicators.

## **Hypothesis**

In order to verify the hypothesis that the use of gastronomic experiences is a means of increasing development, quality of life and the sustainable products of each region, we ask the following questions in relation to rural community tourism: How can gastronomic tourism help in the development of a region and the promotion of local products, while maintaining the landscape? What is rural community tourism and how is it positioned with regard to other destinations? Can gastronomic tourism be promoted as responsible tourism? Why has this form of tourism been gaining popularity in recent years? Are there experiences of this kind in Mexico? Are there experiences of this kind in Catalonia? Are sustainable tourism indicators a viable method for evaluating a gastronomic destination?

## **Methodology**

In order to achieve this, we have started to analyse and develop a frame on current similar destinations in Veracruz in Mexico and Catalonia in Spain. Information will be gathered on the context of the regions, the demography and their gastronomic and local experiences. This will be based on references to sustainable indicators promoted by the United Nations World Tourism Organization (UNWTO), also case studies from the Mexican Secretary of Tourism (SECTUR), references to sustainable indicators by

the United Nations Development Programme (UNDP) and United Nations Educational Scientific and Cultural Organization (UNESCO).

## **Conclusions**

Finally, a comparison of results will be made to verify the sustainable tourism status of each community and a methodology of gastronomic indicators will be proposed for specific destinations.

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# **MASTER COMMUNICATIONS**



# Design of optimal tuned range-separated functionals for the evaluation of nonlinear optical properties

Pau Besalú-Sala, Pedro Salvador, Josep Maria Luis

*Institut de Química Computacional i Catàlisi and Departament de Química, Universitat de Girona, Campus de Montilivi, E-17003 Girona, Spain*

## Hypothesis and objectives

Great attention has been paid to several materials characterized by presenting a large nonlinear optical response, as they are commonly used in optical rectification, modern waveguides, optical communication technology, optical switching and signal processing. At the molecular level, the linear and nonlinear optical properties are given by the linear polarizability ( $\alpha$ ) and first ( $\beta$ ) and second ( $\gamma$ ) hyperpolarizabilities, respectively.

Density Functional Theory (DFT) is based on the property calculations from the electron density. The advantage of these methods is the reasonably-high accuracy of the results with a low computational cost. The downside is the failure in some applications. In the particular case of the evaluation of linear and nonlinear optical properties (NLOP) of oligomers and molecular chains, DFT methods overestimate by several orders of magnitude the exact values. The main reason for this incorrect behavior of DFT methods is the definition of the exchange-correlation potentials which, for example, does not account for the long-range charge polarization induced by an external electric field acting on a conjugated oligomer.<sup>1</sup> Nevertheless, the range-separated functionals (RSF) clearly improve description of NLOP.<sup>2</sup> RSF work on the premise that the electron-electron operator ( $1/r_{12}$ ) can be split into long-range (LR) and short-range (SR) regions, which use different methods of calculation. Usually, the partitioning is carried out by means of an attenuating function, the error function (erf).

## Methodology

In this work, polyacetylene's NLOP were computed for different values of the attenuating parameter ( $\omega$ ). First, the functionals were calibrated using benchmark NLOP obtained with post-HF method, CCSD(T). It has been studied the dependence of the optimal  $\omega$  with the chain size. Furthermore, we could reproduce the NLOs obtained with the benchmark with a maximum relative error of 0.6 % only by tuning  $\omega$  values from  $C_2H_4$  to  $C_{12}H_{14}$ .

The next step is to deduce a general expression that will allow to compute the ideal  $\omega$  for each monomer of the polyacetylene series. Furthermore, this expression would be implemented in a general software code, which we are currently developing, in order to automatize the calculation of the exact NLOP.

$$\frac{1}{r_{1,2}} = \frac{1 - [\alpha + \beta \cdot \text{erf}(\omega \cdot r_{1,2})]}{r_{1,2}} + \frac{[\alpha + \beta \cdot \text{erf}(\omega \cdot r_{1,2})]}{r_{1,2}}$$

Equation 1. General formula for the  $1/r_{1,2}$  operator in range-separated functionals.

## **Conclusions**

This analysis will improve and facilitate the understanding of the performance of NLOP calculations by the optimal tuned RSF for one of the most challenging polymers, thus contributing to the development of new materials with interesting properties in the engineering field.

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# **Parc Natural de Cap de Creus Interpretation Center**

Fèlix Breton Coll

*EPS UdG / Universitat de Girona*

## **Hypothesis and objectives**

The purpose of this project is to conduct research for the development of an architectural and urban project for an Interpretation and Visitor Centre at the Parc natural de cap de Creus. The research project aims to:

1. Find a new location for the Interpretation Centre based on my urban study and analysis
2. Analyse alternative approaches and concepts of interpretation centre, broadly understood as an engaging architectural project that encapsulates the biological and geological value of the park and introduces the visitor to its environment and scenic beauty
3. Redefine the program for the Interpretation Centre based on a study of its functions from a contemporary point of view, against the grain of conventional interpretation centres that tend to perform the merely informational functions of a museum
4. Finally, establish the project tools for the architectural design of the Centre as an autonomous and experimental project, based on the environmental architecture and smoothly integrated with the natural landscape of the park

## **Methodology**

The first phase of the project has involved conducting research on the work methodologies that have allowed to determine the current state of the question and to develop an urban analysis of the studied area. The following information has been gathered and analysed:

- Interpretation centres in areas of natural interest within the Spanish territory
- Latest advances in sustainable architecture for their application in the Interpretation Centre
- Studies and projects of landscape, urban, and architectural design conducted in the studied area

The second phase has comprised the design of a project of architectural and landscape intervention in the park based on the principles described above.

## **Conclusions**

- Based on my research, the area around Punta Falconera (Roses), containing a series of currently obsolete 1940s military installations (including five bunkers), has been identified as a potential site of intervention meeting all the requirements for introducing visitors to the park.
- The existing architecture has been deemed amenable to rehabilitation to house the Interpretation Centre of the park and other alternative uses (such as

temporary accommodation for visitors and an exterior-interior itinerary offering intuitive exploration of the Centre and parts of the park).

- Lastly, capitalizing on the properties of the existing underground architecture, it has been possible to conceive the Centre as an autonomous and experimental project harmoniously integrated with the natural environment of the park.

## Figures

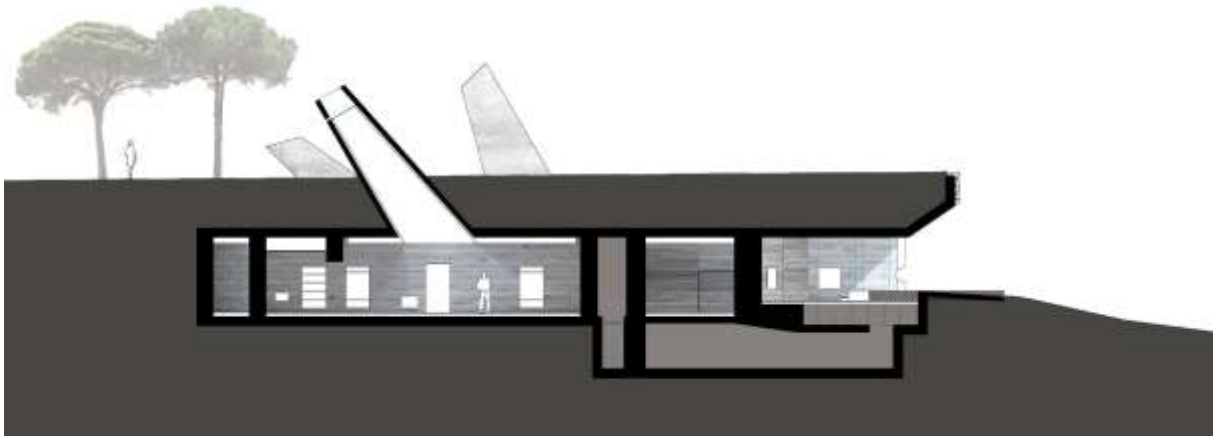


Figure 1. Architectural concept

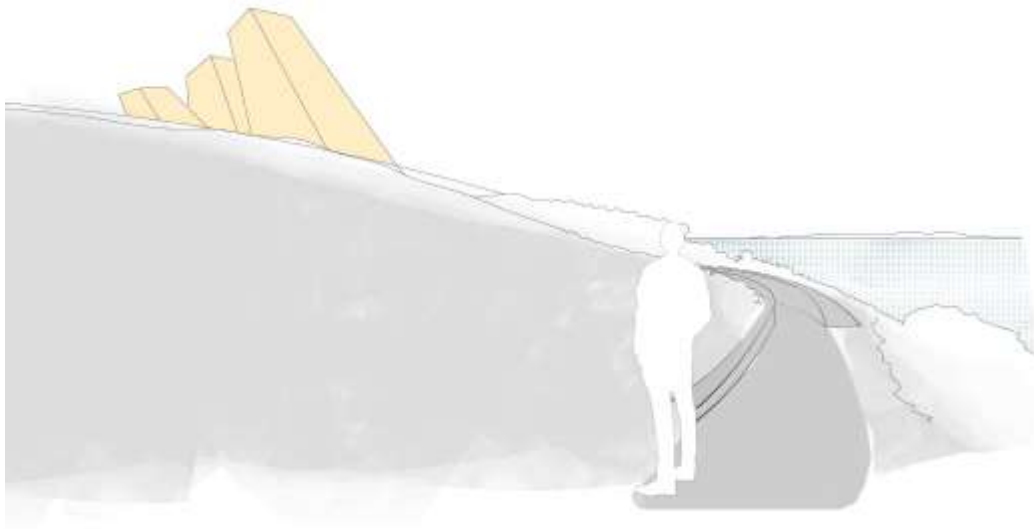


Figure 2. Architectural promenade

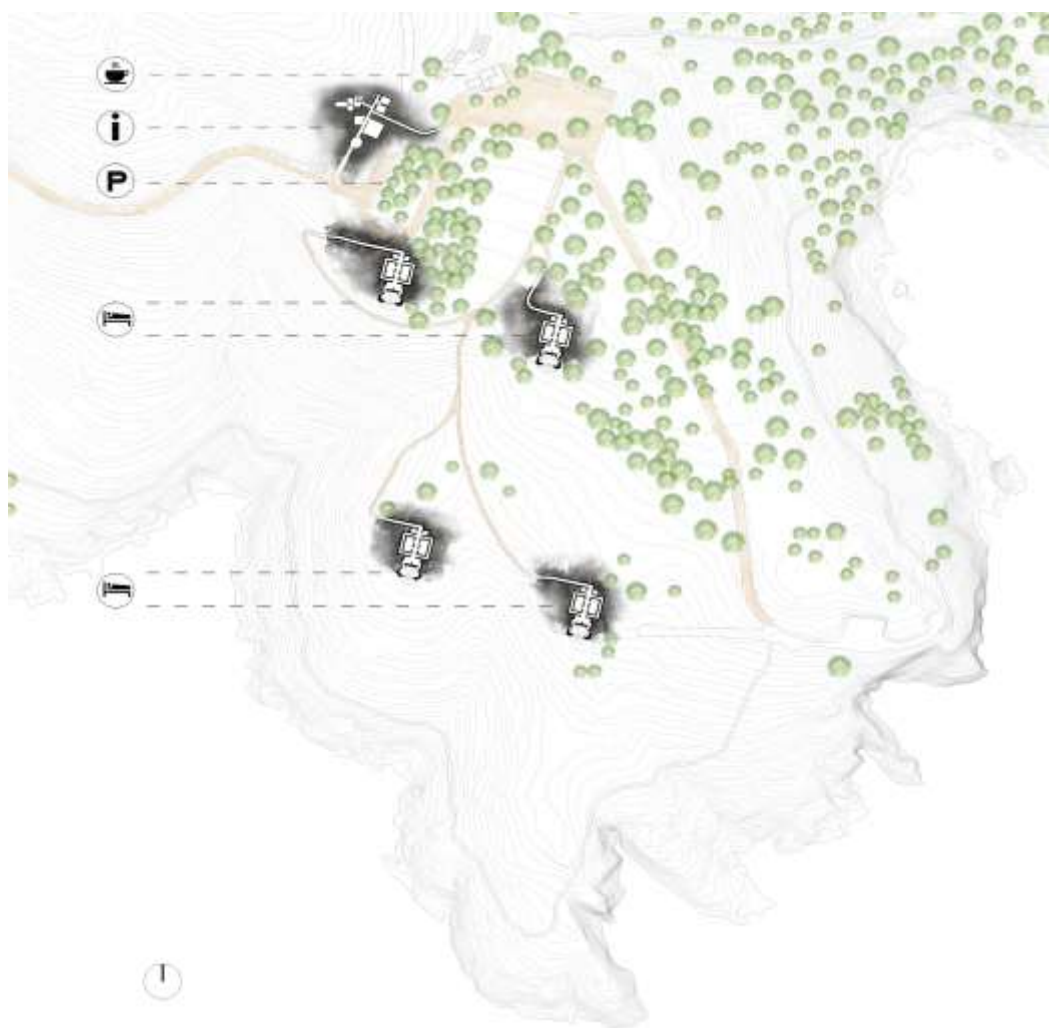


Figure 3. Program of the interpretation centre

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## **The manuscript tradition of the occitan-catalan verse narrative (13-15th centuries)**

Laura Gallegos Ambel

*Universitat de Girona*

Since Limentani (1977) categorized the Occitan verse narrative as an «eccezione», the expression has become commonplace and repeated until considered a fact, with wide-ranging effects for the study of this genre, both in the Occitan and the Catalan traditions. At first sight, I have identified three aspects that weigh on its consideration as exceptional, which has actually meant marginal: the ratio of anonymity, the number of *unica* and the apparent lack of luxury of its manuscripts. However, the *novas rimadas* constitute an interesting corpus, closely related to troubadour culture, highly important to understand its reception, and quantitatively relevant within the Catalan tradition.

Regarding the Catalan verse narrative, the general tendency to date them towards the end of the 14<sup>th</sup> century, long after the 13<sup>th</sup>-century Occitan *novas*, has created the impression of a gap, reflected by the chasm observed in critical studies. This has been reversed by Cabré and Winiarski (2016), who suggest a group of love works, extant only in a Catalan manuscript, and close in content to the troubadour tradition, are to be dated at the turn of the 14<sup>th</sup> century (maybe even within the troubadour period). Their first results have begun shifting the critical paradigm, stressing a possible continuity between Occitan and Catalan narrative poems, but have also highlighted that much remains unknown.

Following this rationale, the main aim of my Master's dissertation is to provide the first census of verse narrative, gathering both Occitan and Catalan works, and offering known information about the manuscripts that copy them. Based on available bibliography (which also suffers from a sharp divide between Catalanist and Occitanist scholars), the census has been compiled in a Microsoft Access database, structured in 3 tables: manuscripts, works and authors. This avoids the arbitrary segregation of works (the criteria to do so are patently inconsistent in available studies) and allows me to explore the trends of this corpus as a *continuum*. It is complemented by a critical account of the factors that have guided previous studies of this genre and a preliminary examination of the research lines that might represent a way forward, especially regarding manuscript data. For example, I have already detected the problems created by the lack of linguistic studies about this genre or the *scripta* used by scribes, while most of the manuscript witnesses have no comprehensive analysis and there is no hypothesis about their criteria of compilation.

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# The sentimental memories of Francesc Pujols

Alba Gonzàlez i Padrós

*Universitat de Girona*

## Abstract

Francesc Pujols (1882-1962) was a philosopher, writer, art critic, humourist and one of the most controversial personalities of his time. However, many of his manuscripted works remain not only unpublished but also completely ignored. Our project presents one of these works: a long manuscript consisting of several letters directed to the woman he loved, Esther Antich. In this document, Pujols recounts and reflects on the romantic relationships he maintained throughout his life, hence providing new, valuable but also utterly sincere and intimate insights into his biography and thought.

The main objective of this project is to provide an accurate edition of the manuscript, including its diplomatic transcription, language standardization, ordination and annotation, in conjunction with an introductory study aimed to contextualize and ease the understanding of the manuscript.

As the first part of the study, we address the text from a biographical perspective. While some research has been carried out regarding his youth and adulthood there is little published on the author after 1942. This document, which can be dated to 1954, narrates various significant episodes from the period which were previously completely unknown. Likewise, these memories allow us to trace Pujols' relationships with several remarkable women such as Esther Antich, Amèrica Cazes or Mercè Nicolau. We intent to relate these relationships to other aspects of Pujols' biography and to offer a biographical outline of these women.

Next in order, our study centres on framing the text from a literary perspective. Concretely, we focalize on Pujols' use and conception of eroticism, widely present in almost all his literary production but notably in this document, by reason of describing the author's own life experience.

The third and last part examines the philosophical concepts either explained or assumed in the manuscript. We pay special attention to the discussion on determinism, responsibility and freedom, since it is analysed at length and is one of the author's major philosophical concerns in this period of his life.

In conclusion, as we hope to have shown the document and our research are relevant contributions to the studies on Francesc Pujols. However, a number of manuscripted works are yet to be published. Our project is only a small step up the ladder towards his recognition.

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# **Infertility process and coping strategies: a gender perspective**

López Portillo, Mireia <sup>1</sup>

<sup>1</sup> *Universitat de Girona*

## **Introduction**

Assisted Reproduction is a specialty of medicine that is currently in full growth. The social, labor and economic reality, lengthens women and men to take the path to fatherhood, increasing the people having to face a diagnosis of infertility. Data collected by the Spanish Society of Infertility (SEF) in 2016, point out that there are already more than 25,000 babies born in Spain through various techniques of assisted reproduction, being Spain the country in Europe with the highest percentage of realization of Assisted Reproduction Treatment (ART).

## **Objectives**

The aim of this study is to identify what types of coping strategies men and women use to face an ART. There are a large number of publications and scientific contributions that focus on researching and innovating on techniques and ART. Usually the medical, physiological and biological factors of this process are the main landmarks. However, understanding the condition of infertility as a multidimensional and bio-psycho-social aspect, my goal is to investigate that essential psychological and social part, under studied and researched in the scientific field.

## **Hypothesis**

The main research hypothesis is that there are two differential profiles of coping with the diagnosis of infertility: a female profile where approaches strategies are mostly used, such as emotional discharge, and a male profile where avoidance strategies tend to be used, as for example the seeking alternative rewards. This fact may involve differences in the approach of the common "problem", lead to psychological distress in the couple and make it even more complex

## **Methodology**

A quantitative transversal, descriptive and observational study has been carry out. To know the gender differences, the Spanish version of the Coping Responses Inventory-Adult Form (CRI-A) of Kirschner et al., (2008) was applied to 75 women (average age: 38,56) and 75 men (average age: 39,26), who were carrying out an ART in a fertility clinic.

## **Conclusions**

The results obtained show that, in general, the scores would be within the average, which evidences that there is no gender predisposition in the use of any coping strategies against the problem of Infertility diagnosis. The exhausting medical controls may not allow the couples to look at him/herself and give voice to their feelings and emotional situation. Provide new reflections to improve the emotional attention in the psychology units, would help to reduce the lack of current publications, the main limitation of this study.









**Escola de Doctorat**

Centre d'Informació i Assessorament  
dels Estudiants (CIAE)

C/ M. Aurèlia Capmany, 38

Campus Montilivi

17003 Girona

Tel. +34 972 418 048

sec.edoctorat@udg.edu

telegram: UdGdoctorat

**[www.udg.edu/doctorat](http://www.udg.edu/doctorat)**