



KEEPING TRACK OF THE MOST
VULNERABLE: ALZHEIMER'S DISEASE



RESEARCH – TECHNOLOGY - INNOVATION
FOR SUSTAINABLE GROWTH

CARING FOR THE
VULNERABLE

A novel technology (smart system) to support people with Alzheimer's is now developed by Greek researchers.

AGRICULTURAL BY-PRODUCTS: THE
IMPORTANCE OF THEIR UTILIZA-
TION

Europe's transition towards a new lifestyle of greater recycling and re-use may boost competitiveness, foster sustainable growth and generate new jobs.

HIGH ADDED VALUE PRODUCTS
FROM INAB/CERTH

Life scientists from INAB/CERTH report the discovery of a novel design in programmable endonucleases (ZFNs) and its first use in tomato plant.

Newsletter CERTH in English



Opinions—Dr. Maria Panou

In this column, researchers from CERTH express their opinion regarding the research environment in Greece, make suggestions, express ideas and raise concerns about critical research issues in the country. In this issue, Dr. Maria Panou, researcher at the Hellenic Institute of Transport (HIT/CERTH), is the one who is providing valuable food for thought.

Below, some of her prominent utterances:

- The research plan in Greece is not perfect, still an important progress has been made until so far.
- Given the circumstances in the modern European research area interdisciplinary research is the only way to success
- In Greece, the process of conducting research is well known but we know little about the art of being an entrepreneur
- The private sector needs to play a more active role in supporting research



Intelligent system to support people with Alzheimer's disease

Greek researchers demonstrated the potential use of assistive technologies in people with dementia in fulfilling an important need: the improvement of clinical diagnosis and decision making meeting individual needs.

Already existing assistive Information and Communication Technology (ICT) approaches to support people with Alzheimer's, are based on a single or few devices and focused on specific problematic areas and domains including wandering, falling, sleep quality or daily tasks. However, scientists from Centre for Research and Technology Hellas/Information Technologies Institute (CERTH/ITI), the Aristotle University of Thessaloniki (AUTH) and the Greek Association of Alzheimer's Disease and Related Disorders (GAARD) developed a system which smartly collects and merges information from multiple sources. After collecting information, the

system performs complex kinds of reasoning in order to interpret and convert them into a high-level problem solving software for daily activities and impacts related to the disease. This holistic monitoring of all areas of interest is presented in tailored visualizations either on daily basis, to detect patterns and progress in time, or in-depth, to pinpoint problems and causes. These are applications for both clinicians/caregivers and participants, providing technology-aided, personalized non-pharmaceutical interventions, enhancing weekly clinical visits while maintaining human clinician-participant contact.

After a 4-months trial and clinical assessment, the proposed system was deployed in four different homes, introducing clinical non-pharmacological interventions to enhance the participants' quality of life and improve their cognitive functions and functionality. The adapted and personalized interventions based on regular sensor-based monitoring, combined with automatic or manually generated reminders, was found to improve clinical status and eliminate cognitive deficits in people with cognitive impairment. Another key strength of the proposed system is its ability to integrate technology into participant/caregiver everyday life thus helping them to face and address their real needs and problems.

The system has been developed in the framework of the EU FP7 project Dem@Care: Dementia Ambient Care – Multi-Sensing Monitoring for Intelligent Remote Management and Decision Support under contract No. 288199.



Expert group looks into protection of critical energy infrastructures for defence

On 17 October, the Protection of Critical Energy Infrastructures (PCEI) expert group, established in May of this year, met at the EDA under the chairmanship of the Hellenic Ministry of National Defence. The Ministries of Defence (MoDs) of Cyprus and Greece offered to take the lead on this project within the framework of the EDA.

Colonel Georgios Drosos, Head of the Infrastructure & Environment Department of the Hellenic MoD, was appointed as the group chairman. He stressed that the group's main objective was "to assess how EU legislation on the Protection of European Critical Energy Infrastructure can be applied by the defence sector in a holistic way".

Each and every part of defence critical infrastructure needs to be protected appropriately to ensure that the overall energy supply chain can function properly. As Colonel Drosos said, maintaining and improving regional energy security and sustainability within the EU will contribute to achieving this goal. The expert group's chairman also stressed that possible shortfalls can be addressed by developing "projects of common interest for the defence sector".

Collaboration between defence and research

To promote joint efforts and scientific collaboration between the defence sector and the research community, Professor Athanasios Konstandopoulos, chairman of the board of the Centre for Research and Technology Hellas (CERTH) was appointed as the co-chairman of the group. Professor Konstandopoulos pointed out that "the task of securing Energy Strategic Autonomy in a highly connected world presents challenges and creates opportunities for strengthening collaboration between the research community

and the defence sector". He called on stakeholders "to face the challenges and exploit the opportunities."

To accomplish its goals, the PCEI expert group will use the expertise of EDA Member States' Ministries of Defence, national academic and research centres as well as EDA's partners: the European Commission DG ENERGY, Joint Research Centre, and the NATO Energy Security Centre of Excellence.

Air Commodore Peter Round, EDA Capability Armaments and Technology (CAT) Director, stated that "EDA aims through the PCEI Experts Group to identify common capability and research shortfalls and to address them collectively to help to achieve resilience of Armed Forces in Europe."

Denis Roger, EDA European Synergies and Innovation (ESI) Director, emphasized that "in times of crises, it is imperative to ensure the continued availability of secure and sustainable energy supplies and we are glad that EDA can contribute to this vital work by exploring the defence element of critical energy infrastructure."

The PCEI expert group is supported within EDA at an inter-directorate level (CAT and ESI) by CAT Project Officer Protect, Constantinos Hadjisavvas, and ESI Project Officer Energy and Environment Systems, Richard Brewin.

The next PCEI experts group meetings will be hosted by Cyprus in January 2017 and by Greece in March 2017. The meetings will be open to all the participating Member States of the Agency, the Agency's partners as well as other international organisations.

Background

Securing Energy Strategic Autonomy for European Defence (SESAED) is becoming more vital than ever for national and international security and economic prosperity due to the increased number of terrorist attacks, and the emerging threats from hybrid and asymmetrical warfare as well as vulnerability to the impacts of climate change and natural hazards across Europe.

Hence, Protection of Critical Energy Infrastructures was identified as one of the component areas to be examined as part of the Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF SEDSS) which was jointly launched by the Europe

an Defence Agency (EDA) and the European Commission in October 2015.

In May 2016, the PCEI Experts Group was established to explore PCEI further from a defence point of view. The Cypriot and the Hellenic Ministries of Defence (MoDs) offered to take the lead on this project within the framework of EDA. In this effort academic and research support is provided by the KIOS Research Center, the Cyprus University of Technology, the European University Cyprus, the Centre for Research & Technology, Hellas CERTH and the National Technical University of Athens (NTUA).

Thessaloniki real time and reliable traffic info. Plan your travel save time and money!

The Hellenic Institute of Transport (CERTH/HIT), with the support of the TaxiWay association, provides real-time traffic information in Thessaloniki using two innovative traffic sensors: Bluetooth detectors and Floating Car Data.



- A network of 43 Bluetooth detectors has been deployed by CERTH/HIT during the last 4 years. These sensors collect information on Bluetooth-enabled devices location which are used for estimating travel time in real time (at 15 minutes intervals) along the most important roads of Thessaloniki.
- A total of 1.200 vehicles from TaxiWay association share their location and speed in order to be used for estimating instantaneous speed on the road sections of Thessaloniki.

CERTH/HIT combines the above datasets with additional datasets provided by the Region of Central Macedonia for the estimation of the traffic status in terms of average speed and travel time in Thessaloniki, www.trafficthess.imet.gr and www.trafficpaths.imet.gr respectively, as well as open datasets from (<http://opendata.imet.gr/>). The platforms will provide information, both to citizens who wish to plan their trip and to universities, companies and developers who potentially need the data in their research. In addition, an alert system which alerts via email if selected roads are congested, is offered to all subscribed users.

The above has been implemented by CERTH-HIT and now it is the official transport pilot of the Big Data Europe project, the first project implementing at large scale Big Data technologies in Europe along the seven societal challenges. In addition, CERTH-HIT has been awarded by GRNET for the implementation of the Big Data Warehouse for Mobility (BD W4M) project with the provision of access to its virtual machines in the framework of the 'Ταξιδεύοντας στο μονοπάτι της Έρευνας' of the «Προηγμένες Δικτυακές Υπηρεσίες για την Ερευνητική και Ακαδημαϊκή Κοινότητα».

Sustainable technologies for exploitation and reuse of by-products from the agricultural supply chain



1st Prof. L. Han, Dean of Engineering, China Agricultural University, Beijing, 4th Mr. Phil Hogan, EU Commissioner for Agriculture and Rural Development, 6th Prof. A. J Deeks, President Univ. College Dublin, 7th Prof. S. Ward, AGROCYCLE coordinator, 9th Dr. A.I. Karabelas, Director NRRE/CPERI/CERTH

In the context of the Circular Economy, with the motto "closing the loop", the European Commission adopted the ambitious target of stimulating Europe's transition towards a new lifestyle, which through greater recycling and re-use, may boost competitiveness, foster sustainable economic growth and generate new jobs, with benefits for both the environment and the economy.

Europe is generating 1.3 billion tons of waste annually, of which 700 million tons are agricultural waste. Alongside the supply chain of the agricultural products (i.e. production, processing, transportation and consumption) significant quantities of both solid and liquid waste and by-product streams are produced. Management of these streams is difficult due to their characteristics including high organic load, seasonal production, existence of non-biodegradable substances etc. However, agricultural waste can be used as raw materials for energy recovery, production of bio-fertilizers, chemicals, and high-added-value products.

The **Laboratory of Natural Resource and Renewable Energies** (NRRE) of CPERI/CERTH, in collaboration with the Institute of Applied Biosciences (INEB/CERTH), participates in a major Horizon 2020 project named "AGROCYCLE - Sustainable techno-economic solutions for the agricultural value chain".

This large-scale project (coordinated by the University College – Dublin) involving 25 partners from EU, Hong Kong and Mainland China, aims to develop, demonstrate and validate novel processes, practices and products for the sustainable use of agricultural waste, co-products and by-products (AWCB), of representative agricultural sectors of EU and China. Specifically, the project comprises: mapping the agri-food waste streams and determining exploitation pathways, demonstration of production technologies for optimized biofuels and bio-fertilizers, development of advanced methods for exploitation of wastewaters from the agri-food processing industries, production of novel high-added-value products, development of new value chains through exploitation of AWCB, definition of business methodologies and models, and finally, assessment and recommendations for improvement of the existing legislative framework to promote the concept of Circular Economy within the agri-food supply chain.

AGROCYCLE project (June 2016 – May 2019) aims to achieve a 10% increase in the recycling and exploitation of agricultural waste by 2020, and to demonstrate successful paradigms of new and sustainable techno-economic and environmental exploitation practices, maximizing the use AWCB via the creation of new sustainable value chains

High added value products through the application of a novel design of enzymes



Life scientists from INAB report the discovery of a novel design in programmable endonucleases (ZFNs) and its first use in tomato plant. The target gene is a transcription factor (TF) that regulates plant growth and development and the results provide new insights into how the TF affects tomato plant. The research was published in the *Journal of Plant Cell Reports* (31 July 2016).

The last fifteen years, biologists have learned how to target genes using engineered endonucleases and study the efficiency of these molecular tools. In this new research, the scientists from CERTH, report on an alternative design for ZFNs and methodology to deliver them in seeds in a single-step procedure which resulted in high efficiency of mutagenesis and heritable mutations in tomato crop.

Leading author Zoe Hilioti, a CERTH-INAB principal investigator, thinks ZFNs is likely to have high impact on molecular-based breeding in plants leading to tailor-made products for different end users, people with special dietary needs included.

When scientists disrupted the TF, tomato grew either taller or shorter as it does when the TF is intact. In

addition, variation in plant architecture, flowering dates and fruit production occurred. The researchers concluded that the TF regulates pleiotropic phenotypes and is a useful target for plant breeding.

Pleiotropy is a biological phenomenon difficult to understand and the current research provides clues on how single-gene mutations can lead to variation of the same trait with fitness effects suggesting that evolution is advanced by small changes in single genes, Hilioti said.

Scientists still do not know many details about how the TF works in plant metabolic pathways. Future study of how the TF affects metabolic profiles may lead to a fuller understanding of the TF, Hilioti said, such as fruit metabolites and their effects on human health.

Co-authors include Ioannis Ganopoulos, a postdoctoral scholar; Sabna Ajith, a postdoctoral scholar from India; Ioannis Bossis professor of epidemiology and animal biosecurity from Agricultural University of Athens and Athanasios Tsaftaris from INAB, Professor in genetics and plant breeding.

FastAR is selected by the Innovation Radar of EU Commission



The Augmented Reality technology FastAR (Fast Augmented Reality) [1] developed from the Multimedia, Knowledge, and Social Media Analytics Laboratory [2] during the project Live+Gov [3] was selected from the Innovation Radar initiative of the European Commission [4]. FastAR is capable of converting webpages into Augmented Reality (AR) experiences with low effort. Particularly FastAR exploits the structure that characterizes the majority of webpages that have been developed with the same Content Management System (CMS), in order to automate the conversion of the webpage to an AR channel that presents the same information in a more appealing manner. This technology targets in reducing the time required today for publishing AR content, thus enabling non-experts to

implement such AR experiences. FastAR was one among 16 other technologies selected for competing in the category "ICT for Society" [5]. The first phase of the competition aimed at advertising information about each technology, prompting the general public to vote for each technology in an electronic voting system of EU. By collecting sufficient votes, FastAR was qualified to the second phase and had the opportunity to pitch in a board of venture capitalists and business angels within the event of ICT Proposers Day in Bratislava. Although, our team did not win the final prize, it was an important opportunity for advertising FastAR and the Centre for Research and Technology Hellas (CERTH), and an educative experience for the FastAR team as well.

[1]<http://arexporter.mklab.iti.gr/>

[2] <http://mklab.iti.gr/>

[3]<http://liveandgov.eu/>

[4]<https://ec.europa.eu/digital-single-market/en/innovation-radar>

[5]<https://ec.europa.eu/digital-single-market/en/innovators#ICT>

High qualified personnel in the Field of Transport

Transport is a rapidly developing and changing sector, facing problems in developing, attracting and retaining appropriate workforce. The sector is increasingly depending on specialized equipment and products. Future jobs will therefore require new and advanced skills in engineering, as well as in supporting operations, but at the same time, the growing interdisciplinary character of transport activities will also require professionals with developed skills in safety, security, logistics, IT, behavioural sciences, marketing and economics. As a consequence, new training and education methodologies and tools need to be developed (e.g. face-to face classrooms, on the job training, web-based training, immersive virtual learning environments /IVLE, etc.), addressing the different needs of the various skill levels (from low skilled workers to high skilled managers/researchers), while also incorporating lifelong learning aspects.



SKILLFUL Project is part of the effort addressing this challenge.

The vision of SKILLFUL is to identify the skills and competences needed by the Transport workforce of the future (2020, 2030 and 2050 respectively) and define the training methods and tools to meet them.

SKILLFUL aims are threefold:

- to critically review the existing, emerging and future knowledge and skills requirements of workers at all levels in the transportation sector, with emphasis on competences required by important game changers and paradigm shifters (such as electrification and greening of transport, automation, MaaS, etc.);
- to define the key specifications and components of the curricula and training courses that will be needed to meet these competence requirements optimally, with emphasis on multidisciplinary education and training programmes;
- to identify and propose new business roles in the education and training chain, in particular those “knowledge aggregator”, “training certifiers” and “training promoter”, in order to achieve European wide competence development and take-up in a sustainable way.

The 20th anniversary of APTL



The Aerosol Particle Technology Laboratory (APTL) of the Chemical Process & Energy Resources Institute (CPERI) celebrated 20 years of active and successful presence in the fields of Clean Energy and Sustainable Mobility.

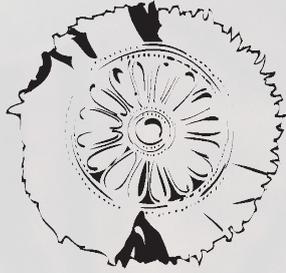
The 20th anniversary was celebrated with an International Conference titled “*Aerosol & Nanoparticle Technologies to Meet Global Challenges in Emission Control and Clean Energy*”. This conference was held on the 2nd and 3rd of June 2016 at CERTH’s central auditorium.

The plenary lecture of the conference was given by Prof. David Kittelson (University of Minnesota, USA), world recognized scientist in combustion generated nanoparticles, while APTL members presented the laboratory’s past, present and future activities.

A Focus Discussion session on “Challenges and Opportunities for Collaboration” was also organized during the first day. This was coordinated by Dr. Athanasios G. Konstandopoulos, Director of APTL, with panelists being Prof. Athanasios Nenes (Georgia Tech. USA), Mr. Oliver Bischof (TSI GmbH, Germany), Dr. Bianca-Maria Vaglieco (Istituto Motori-CNR, Italy) and Mr. Odisseas Spanos (Spanos Industries A.E., Greece).

During the second day, well-known researchers – all of them APTL’s close collaborators – presented their scientific work in the fields of emission control. (A. Mayer, TTM Switzerland); K. Reavell, Cambustion Ltd, UK; Dr. A. York, Johnson Matthey, UK), synthesis of advanced nanomaterials (Prof. J. L. Castillo, UNED, Spain; Prof. P. L. Garcia-Ybarra, UNED, Spain), structure and properties of combustion nanoparticles (Dr. Y. Drossinos, EC-JRC, Italy; Dr. K. Eleftheriadis, NCSR “Demokritos”, Greece), future engines and future fuels (Dr. S. Di Iorio, Istituto-Motori CNR, Italy; Dr. A. Loukou, KIT, Germany; Dr. C. Beatrice, Istituto-Motori CNR, Italy; Dr. A. Lapas, CERTH, Greece) and thermochemical processes for energy production and storage (Dr. M. Roeb, DLR, Germany; Dr. A. Stamatidou, LUAS, Switzerland).

All participants celebrated APTL’s 20th anniversary at a dinner-party that was held at the Thessaloniki’s Science Center & Technology Museum “NOESIS”.



ΕΚΕΤΑ

ΕΘΝΙΚΟ ΚΕΝΤΡΟ
ΕΡΕΥΝΑΣ & ΤΕΧΝΟΛΟΓΙΚΗΣ
ΑΝΑΠΤΥΞΗΣ

The Centre for Research and Technology-Hellas (CERTH) founded in 2000 is one of the leading research centres in Greece and listed among the TOP-20 E.U. institutions with the highest participation in competitive research grants.

Today CERTH includes the following five institutes with indicated major fields of research:

- **Chemical Process & Energy Resources Institute (CPERI)** Sustainable & Clean Energy, Environmental Technologies, Chemical & Biochemical Processes, Advanced Functional Materials
- **Information Technologies Institute (ITI)** Informatics, Telematics and Telecommunication Technologies
- **Hellenic Institute of Transport (HIT)** Land, Sea and Air Transportation as well as Sustainable Mobility services
- **Institute of Applied Biosciences (INAB)** Agri-biotechnology, Health Translational Research, Informatics for big bio-data
- **Institute for Research & Technology of Thessaly (IRETETH)** Agrotechnology, Mechatronics, Biomedicine and Kinesiology

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