CYPRUS UNIVERSITY OF TECHNOLOGY

FACULTY OF GEOTECHNICAL SCIENCES AND
ENVIRONMENTAL MANAGEMENT

ACTIVITY REPORT

2014–2016

Limassol
October 2016

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Welcome Message

Welcome to the biennial report of the Faculty of Geotechnical Sciences and Environmental Management of the Cyprus University of Technology, which mainly describes our research activities during the period 2014-2016.

In terms of both education and research, our Faculty deals with topics that are at the heart of today's societal challenges. The agricultural and food sectors are increasingly important for providing adequate food supplies to a growing global population, but this has to be achieved without causing irreversible damage to human health and ecosystems. Besides its role for primary production and food security, agriculture can also be particularly beneficial for the environment by preventing the occurrence of problems such as soil erosion and land desertification.

Moreover, protection of natural resources and the environment under a changing climate and the need for improving resource efficiency are necessary ingredients for the transition to a sustainable global economy. Policy initiatives both in the European Union and by the United Nations and other international organisations demonstrate this priority: the way to a prosperous planet is through societies with low consumption of resources and low emissions.

These societal challenges call for interdisciplinary approaches. Our Faculty offers education on natural and technological sciences like chemistry, physics, microbiology, biotechnology and toxicology, with a focus on their environmental, food and agronomical aspects. Agricultural and environmental economics and management for policy support are also important parts of our curriculum and research output.

Although recently founded, our University has academic staff that is very active in research and heavily involved in international cooperation, while at the same time tutoring students and offering diverse services to society thanks to their expertise. Being part of a public University, we have the duty to return to society the resources it has invested in our people and our infrastructure. This booklet, providing an overview of a large part of the activities carried out at our Faculty, demonstrates that we are trying hard to fulfil this duty.

Regardless of the importance of research, however, a University would not exist without its students. Therefore, we provide at the end of this publication a list of all our Faculty's alumni since the establishment of the University. We hope to have educated these students properly, equipping them with both robust knowledge and critical skills for their future.

Dr. Theodoros Zachariadis

Associate Professor,
Dean of the Faculty

Χαιρετισμός

Με χαρά σας παρουσιάζουμε το παρόν τεύχος, που περιγράφει τις πρόσφατες ερευνητικές δραστηριότητες της Σχολής Γεωτεχνικών Επιστημών και Διαχείρισης Περιβάλλοντος του Τεχνολογικού Πανεπιστημίου Κύπρου.

Η Σχολή μας καλύπτει γνωστικά αντικείμενα που βρίσκονται στην καρδιά των σύγχρονων κοινωνικών προκλήσεων. Ο τομέας της γεωργίας και των τροφίμων καλείται να καλύψει τις διατροφικές ανάγκες ενός αυξανόμενου παγκόσμιου πληθυσμού, χωρίς να προκαλέσει ανεπανόρθωτη ζημιά στην ανθρώπινη υγεία και τα οικοσυστήματα του πλανήτη. Εκτός από τη συμβολή της στην πρωτογενή παραγωγή και τη διατροφική ασφάλεια, η γεωργία συμβάλλει αποφασιστικά και στην περιβαλλοντική προστασία, εφόσον αποτρέπει τη διάβρωση των εδαφών και την ερημοποίηση.

Επίσης, η προστασία του περιβάλλοντος και των φυσικών πόρων, κυρίως σε συνθήκες κλιματικών αλλαγών, και η ανάγκη για εξοικονόμηση πόρων στο πλαίσιο της μετάβασης σε μια βιώσιμη παγκόσμια οικονομία αποτελούν θεμελιώδεις στόχους του Οργανισμού Ηνωμένων Εθνών και της Ευρωπαϊκής Ένωσης. Σήμερα είναι διεθνώς αποδεκτό ότι η ευημερία του πλανήτη είναι εφικτή και διατηρήσιμη μόνο αν καταφέρουμε να έχουμε κοινωνίες με χαμηλή σπατάλη φυσικών πόρων και χαμηλές εκπομπές.

Τα παραπάνω απαιτούν συνεργασία μεταξύ πολλών επιστημονικών κλάδων. Η Σχολή μας θεραπεύει γνωστικά αντικείμενα των θετικών και τεχνολογικών επιστημών όπως η χημεία, η φυσική, η μικροβιολογία, η βιοτεχνολογία και η τοξικολογία, με έμφαση στις περιβαλλοντικές, διατροφικές και αγρονομικές πτυχές των επιστημών αυτών. Αναδεικνύουμε επίσης την οικονομική και διαχειριστική διάσταση των προβλημάτων που καλούμαστε να αντιμετωπίσουμε.

Είμαστε ένα Πανεπιστήμιο με λίγα χρόνια ζωής, αλλά με δραστήριο διδακτικό και ερευνητικό προσωπικό που έχει έντονη ερευνητική ενασχόληση και διεθνείς συνεργασίες, αλλά και διάθεση για προσφορά στους φοιτητές μας και στην κοινωνία. Ως μέρος ενός δημόσιου Πανεπιστημίου, έχουμε χρέος να ανταποδώσουμε στην κοινωνία την επένδυση που έχει κάνει σε μας. Ελπίζουμε ότι οι σελίδες του τεύχους αυτού θα αναδείξουν ένα μέρος του έργου που επιτελείται στη Σχολή μας.

Ένα Πανεπιστήμιο, όμως, δεν μπορεί να υπάρξει χωρίς τους φοιτητές του. Παρόλο ότι η παρούσα έκδοση εστιάζει στην έρευνά μας, στο τέλος έχουμε περιλάβει τα ονόματα όλων των αποφοίτων της Σχολής μας από την ίδρυση του Πανεπιστημίου μέχρι σήμερα. Ελπίζουμε να τους μεταδώσαμε, στο μέτρο που μπορούσαμε, καλές γνώσεις και κριτική σκέψη.

Δρ. Θεόδωρος Ζαχαριάδης

Αναπληρωτής Καθηγητής,
Κοσμήτορας της Σχολής

The Faculty and its Departments

I. The University

(www.cut.ac.cy)

The Cyprus University of Technology (CUT) is a newly established public university, which was founded by law in December 2003. It is one of the three state universities operating in the Republic of Cyprus. CUT has six Faculties and eleven academic Departments, able to offer education and high level research in primary fields of science and technology, at undergraduate and postgraduate levels. Currently it educates about 3,000 students and includes an academic and administrative staff of about 700 people.

Although it initiated its research activity very recently, CUT already participates in a significant number of research projects funded by national authorities and European programmes such as Research Framework Programmes FP7 and Horizon2020; the LIFE Programme; European Territorial Cooperation Programmes such as Interreg IIIB, Archimed, Interreg IVC, MED etc. The University has adopted research principles which conform to the European Union's declarations on the creation of the European Research Area (ERA).

For the first time in its brief history, the Cyprus University of Technology is ranked 401-500th in the Times Higher Education World University Rankings in 2016-2017. This highlights the University's devotion to quality research and teaching, and motivates its staff for higher international achievements.

The University's Faculties are:

- The Faculty of Geotechnical Sciences and Environmental Management
- The Faculty of Management and Economics
- The Faculty of Engineering and Technology
- The Faculty of Health Sciences
- The Faculty of Fine and Applied Arts
- The Faculty of Communication and Media Studies

The Faculty of Geotechnical Sciences and Environmental Management, which is presented in this Report, currently consists of two Departments: the Department of Agricultural Sciences, Biotechnology and Food Science; and the Department of Environmental Science and Technology. Brief information about each Department is provided below.

II. The Department of Agricultural Sciences, Biotechnology and Food Science (www.cut.ac.cy/abf)

The Department of Agricultural Sciences, Biotechnology and Food Science (ABF) was established and accepted its first students in 2007. By that time, the Department's staff comprised 2 faculty members, 2 members of Special Teaching Staff and 1 clerical officer. Professor Nicolas Ioannou (retired since September 2013) acted as the first Coordinator and later as the first Chair of the Department, followed by Associate Professor Christakis Papachristoforou (2012-2014) and Professor Andreas Katsiotis (2014-today). Within the remit of the Department's first Coordinator was the appointment of additional faculty members as well as the coordination with external advisory committees for the development of the Department's programs.

ABF offered its first undergraduate programme in 2007. The Department is admitting around 40 students per academic year through national examinations and offers a B.Sc. degree in Agricultural and Food Sciences with specialization in three basic areas: **(a) Crop Science & Technology, (b) Animal & Dairy Science and (c) Food Science & Technology.** For awarding the B.Sc. degree of the Department of Agricultural Sciences, Biotechnology and Food Science, students are required to complete 240 European Credit Units (ECTS).

In September 2012 the Department began offering its postgraduate programme leading to the award of the degree of **Master of Science (M.Sc.) in Agricultural Biotechnology.** The M.Sc. programme has a duration of 18 months (three semesters) and accepts around 15 students per year, distributed in the three main areas of Plant, Animal and Food Biotechnology.

The first undergraduate students successfully obtained their degrees in June 2011. The first M.Sc. degrees were awarded in 2014. The Department awarded the first doctoral title in 2012, followed by an additional two doctoral titles in 2014. By mid-2016 there were 18 PhD students in the Department.

ABF is housed in well-equipped and well-maintained **laboratory facilities**. Through public funding, adequate infrastructure was purchased to support both teaching and research. The Department is also using a greenhouse located in the broader area of Limassol, and is in the process of acquiring proper land for the creation of an experimental farm.

III. The Department of Environmental Science and Technology

(www.cut.ac.cy/est)

The Department was officially established in January 2008 with two academic staff members and one clerical officer. Its initial name was 'Department of Environmental Management', and the **first undergraduate (B.Sc.) students were admitted in September 2008**. Professor Ioannis Papadopoulos acted as the first Coordinator of the Department, followed by Professor Constantinos Varotsis who also became the first Department Chair (2011-2014), and then by Professor Costas Costa (2014-today). The undergraduate programme of the Department was modified in September 2010 so as to include additional courses in basic topics of Environmental Science and Technology in order to offer a more rigorous curriculum. Subsequently, the Department's name was formally changed to 'Department of Environmental Science and Technology' (EST), and its undergraduate degree is the **B.Sc. in Environmental Science and Technology**.

EST admits 30-40 undergraduate students every year. The goal of the undergraduate EST programme is to educate students in a combination of life and environmental sciences and technology to meet the worldwide needs in the area. This includes basic topics in Environmental Chemistry, Biology, Physics, Microbiology and Management, as a solid background for advanced and specialised topics that are taught during the last semesters.

In September 2010 the Department offered its first postgraduate programme **(M.Sc. in Energy Resource Management)**, which was the first M.Sc. programme offered by the University as a whole. In September 2011 EST started providing a second **M.Sc. programme in Environmental Bioscience and Technology**. Both programmes – having a duration of three semesters and each one admitting 10-20 students per year – have continuously been offered since then.

The first undergraduate and postgraduate students successfully obtained their degrees in June 2012. The first doctoral degree was obtained in the Department in July 2012. Until summer 2016, eight doctoral students had graduated with their Ph.D degree, while at the time there were 17 active Ph.D. students.

EST has extensive and modern **laboratory facilities**. Adequate infrastructure was purchased to support both teaching and research needs, initially thanks to public funding and later as a combination of public University funds and research infrastructure acquired by the Department's academic staff through competitive research grants.

Personnel*

I. Department of Agricultural Sciences, Biotechnology and Food Science

Name	*Rank*	*Specialty*
Katsiotis, Andreas	Professor	Plant Breeding/Plant Genetics
Tsaltas, Dimitrios	Associate Professor	Agricultural Microbiology & Biotechnology
Miltiadou, Despoina	Assistant Professor	Animal Science/Molecular Biology
Fotopoulos, Vasileios	Assistant Professor	Plant Physiology
Manganaris, Georgios	Assistant Professor	Arboriculture/Postharvest Physiology and Technology
Stavrinides, Menelaos	Assistant Professor	Entomology/Acarology
Papademas, Photis	Assistant Professor	Dairy Science and Technology
Tzortzakis, Nikolaos	Assistant Professor	Vegetable Crops/Aromatic plants/Postharvest Physiology and Technology
Tzamaloukas, Ouranios	Assistant Professor	Animal Science/Nutrition
Drouza, Chryssoula	Lecturer	Food Chemistry
Kanetis, Loukas	Special Teaching staff	Phytopathology/Crop Science
Botsaris, Georgios	Special Teaching staff	Food Microbiology
Goulas, Vlasios	Special Teaching staff	Physical Chemistry & Analysis
Pantelides, Iakovos	Special Teaching staff	Phytopathology/Plant Biotechnology
Hadjimichael, Panayiotis	Academic Staff Member	Principal Instructor
Retired:		
Ioannou, Nicolas	Professor	Phytopathology
Gekas, Vassilis	Professor	Food Engineering & Technology
Papachristoforou, Christakis	Associate Professor	Animal Science/Reproductive Physiology
Georgiadis, Costantinos	Academic Staff Member	Principal Instructor

* Contact details of each staff member can be found on the corresponding webpage of each Department, which is shown in the previous Section.

II. Department of Environmental Science and Technology

Name	*Rank*	*Specialty*
Varotsis, Constantinos	Professor	Environmental Bio-Catalysis
Costa, Costas	Professor	Environmental Chemistry & Catalysis
Zachariadis, Theodoros	Associate Professor	Energy & Environmental Economics & Policy
Charalambides, Alexandros	Assistant Professor	Renewable Energy Sources
Daskalakis, Evangelos	Assistant Professor	Computational Physics of the Atmosphere
Vyrides, Ioannis	Assistant Professor	Environmental Engineering
Koutinas, Michalis	Assistant Professor	Environmental Biotechnology
Antoniou, Maria	Assistant Professor	Water & wastewater treatment
Savva, Petros	Special Teaching Staff	Environmental Chemistry & Atmospheric Pollution
Andreou, Kostas	Special Teaching Staff	Soil Ecotoxicology
Koutsoupakis, Constantinos	Special Teaching Staff	Environmental Science
Vasquez, Marlen	Special Teaching Staff	Environmental Toxicology & Microbiology
Retired:		
Papadopoulos, Ioannis	Professor	Water and Soil Science
Serghides, Despina	Professor	Bioclimatic Architecture
Theopemptou, Charalambos	Lecturer	Environmental Policy

Administrative Staff

Zanti, Irini	Secretary of the Department of Agricultural Sciences, Biotechnology and Food Science (2007-2015)
Pillatsi, Sonia	Secretary of the Department of Agricultural Sciences, Biotechnology and Food Science (2016-)
Kiperesi, Zoula	Secretary of the Department of Environmental Science and Technology
Herodotou, Marina	Secretary of the Faculty

International Recognition, Outreach Activities & Social Service

As a result of their heavy involvement in international collaboration, the academic staff of our Faculty participates in a large number of national and international associations, scientific committees and advisory groups related to the topics of their research interests. For example, two Faculty members participated in the Domain Committees of the European COST programme (under its previous structure that changed in 2015), while several others take part as members of the Management Committees of individual COST Actions. Moreover, two members of the Faculty were national representatives of Cyprus in the Programme Committee of Food, Agriculture, Fisheries and Biotechnology of the European Commission's 7th Framework Programme, and in the Programme Committee on Climate Action, Environment, Resource Efficiency and Raw Materials of the European Commission's Horizon2020 Programme, respectively.

In the national scene, due to their expertise, our academic staff is frequently invited to testify in front of Committees of the Parliament of Cyprus, assist the Ministry of Education and Culture of Cyprus in the evaluation of educational programmes of private Universities, and participate in Committees set up by the national authority that is responsible for the recognition of higher education qualifications (KYSATS). They also appear in national media offering expert opinions on topical issues related to agricultural, food, energy or environmental policy; and give lectures to schools and professional associations on topics of their specialty.

It is particularly worth noting that several members of our staff have gained international recognition and are therefore invited to offer their expertise abroad. For example, in recent years Faculty staff has participated in the evaluation process of several Academic Institutions and Departments in Greece by contributing to the work of the Hellenic Quality Assurance Agency of Higher Education (HQAA). Moreover, Faculty staff have acted as evaluators of research proposals for the following organisations:

- European Commission (COST, FP7, Horizon 2020)
- European Science Foundation
- Austrian Science Fund
- Research Foundation of Flanders, Belgium
- Research Council of the Katholieke University of Leuven, Belgium
- National Research Agency of France
- Agriculture and Agri-Food Canada
- USA–Israel Binational Agricultural Research and Development Fund
- Israel Science Foundation
- Ministry of Education of Greece
- General Secretariat for Research and Technology of Greece
- National Commission of Scientific and Technological Research of Chile
- Ministry of Education, University and Research of Italy
- Foundation for Science and Technology, Portugal
- Qatar National Research Fund

Members of our academic staff have also served as external examiners of MSc theses and PhD dissertations in the following institutions:

- University of Antwerp, Belgium
- Aristotle University of Thessaloniki, Greece
- University of the Aegean, Greece
- Sant' Anna School of Advance Studies, Pisa, Italy
- University of Foggia, Italy
- University of Amsterdam, The Netherlands
- Tshwane University of Technology, South Africa
- University of Cranfield, UK
- University of Cyprus, Cyprus

Our academic staff are Associate Editors or members of the Editorial Board of the following international academic Journals:

- Advances in Horticultural Science
- Advances in Oceanography and Limnology
- BMC Plant Biology
- Energy Economics
- Frontiers in Crop Science & Horticulture
- Frontiers in Agricultural Biological Chemistry
- Frontiers in Plant Physiology
- Gene
- Journal of Catalysis
- Journal of Experimental Botany
- Journal of Horticultural Science & Biotechnology
- Journal of Plant Biology & Soil Health
- Journal of Post-Harvest Technology
- Phytoparasitica
- Plant Gene
- Plant Signaling & Behavior
- Small Ruminant Research

Furthermore, several Faculty members have been invited for keynote lectures in international conferences and for delivering short academic or training courses abroad.

Finally, an important recent development is that, at the initiative of the Faculty's Sustainable Energy Laboratory (SEL), Cyprus has become a member of the Knowledge and Innovation Community on Climate Change (Climate-KIC) of the European Institute of Innovation and Technology (EIT). Climate-KIC is the largest public-private climate change partnership and main EU initiative to build a low-carbon economy through education, entrepreneurship and innovation. The membership of Cyprus and the leading role of SEL in the local activities of Climate-KIC will greatly improve the international exposure of the University and our Faculty.

International conferences and workshops organised by Faculty members in Cyprus

- International Society for Horticultural Science V Postharvest Unlimited Conference, Paphos, June 2014
- Conference on "Environmental Tax Reforms at Times of Economic Crisis", co-organised with the European Commission Representation in Cyprus, Nicosia, June 2014
- Second Training School of the COST Action ES1202 (Water2020) titled "Wastewater Resource Recovery Technologies", Nicosia, October 2014
- 7th IDF International Symposium on Sheep, Goat and other Non-Cow Milk, Limassol, March 2015
- COST Action FA1104 Training School titled "Qualitative, physicochemical and phytochemical indicators of cherry fruit quality", Limassol, June 2015
- 4th International Conference on Sustainable Solid Waste Management, Limassol, June 2016
- Conference on "Investing for a Greener Future in Cyprus", co-organised with the European Commission Representation in Cyprus, Nicosia, June 2016

International patents owned in part by members of our Faculty

- Efstathiou A.M., Costa C.N. & Fierro J.L.G., Novel Catalyst for the NO Reduction to N2 with the use of Hydrogen Under Lean De-NOx Conditions. International Patent Cooperation Treaty: WO 03068390 (2002); US Patent: US 2005/0090393 (2006); European Patent: EP 1475149 A1 (2008); Australian Patent: AU 2003206981 A1 (2005); Spanish Patent: ES 2192985 (2003); Japanese Patent: JP2005516767 (2005).
- Efstathiou A.M., Savva P.G. & Costa C.N., Catalyst Containing Platinum on a Support Consisting of Nano-crystal Magnesium Oxide and Cerium Dioxide Towards H2-SCR. European Patent No. EP 08010888.8 (2010).
- Efstathiou A.M., Savva P.G. & Costa C.N., Catalyst Containing Platinum and Palladium for the Selective Reduction of NOx with Hydrogen (H2-SCR). European Patent No. EP 08010887.0 (2010).
- Costa C.N., Valanidou L., Savva P.G. & Theologides C., Novel Catalyst for the NO Reduction to N2 with the use of Ethanol or Ethanol-Hydrogen Mixtures Under Lean De-NOx Conditions. European Patent No. 10390001.5/EP10390001 (2010).
- Kashfi K. & Fotopoulos V., Method of Priming Plants Against Abiotic Stress Factors and Promoting Growth. International Patent No. PCT/US15/15380 (2015).
- *Patent pending*: Tapakis R. & Charalambides A., System and Method for Predicting Solar Power Generation. International Patent Application No. PCT/EP2016/055889 (2016).

I. Department of Agricultural Sciences, Biotechnology and Food Science

Overview

In spite of a substantial load of teaching and administrative work, the academic staff of the Department has been actively involved in numerous research projects and the submission of competitive research grants. Research is additionally boosted thanks to internal funding from the available (though limited) economic resources of the University.

The strengths of ABF for research is the existence of state-of-the-art analytical/molecular equipment, the willingness of all academic staff to be heavily involved in research initiatives and the existence of a critical mass of active research faculty. It is also noteworthy that the University provides incentives and support to faculty members to participate in competitive research. All these factors have led to a sizable number of publications in peer-reviewed journals with high impact factors, edited books and conference proceedings, as well as an international patent. ABF academic staff members have made a large number of presentations in international scientific conferences. Published results have been widely endorsed by the scientific community, as indicated by the large number of citations in the international literature.

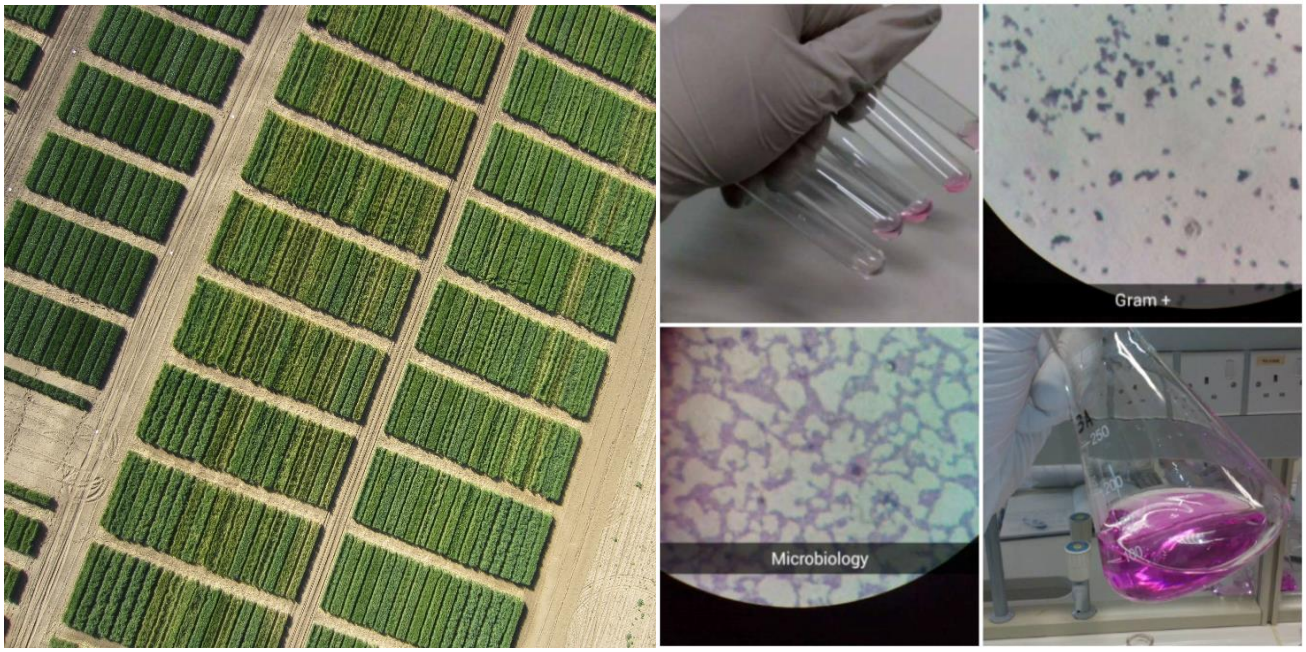
To support its focus on building strong interdisciplinary teams and generating world-class research, the ABF Department has established comprehensive research facilities, which can be broadly categorised according to its three divisions – Crop Science and Technology, Animal and Dairy Science, and Food Science and Technology. The specific divisions and their equipment are as follows:

Crop Science and Technology: LiCor 6400 photosynthesis meter, porometer, fluorometer, plant growth rooms, nitrate/nitrite probe, plant tissue culture incubators, EpiFluoresence Stereo Microscope, EpiFluoresence Microscope, VITEK, Laminar Flow Class II, genetic analyser, spectrophotometer plate reader, fluorescence spectrophotometer, ELISA plate reader, PCR, real time PCR, DNA electrophoresis, protein electrophoresis, 2D-protein electrophoresis, DNA hybridization oven, DNA cross linker, fermentor, nanodrop, gel documentation.

Animal and Dairy Science: Dairy production Unit (cheese vat, cheese pressing equipment), incubator, flow cytometer, laminar flow class II, DNA electrophoresis, PCR, Milkoscan, nano filtration unit, homogenizer, inverted fluorescent microscope, CO_2 incubator.

Food Science and Technology: Soxhlet extractor, texture analyser, spectrophotmeter, Gerber, distillators, vacuum packing machine, conductivity meter, water activity meter, automatic titrator, colorimeter, viscometer, fruit firmness tester, sample concentrator, Solid Phase Extraction Unit, Sonicator, bench top refractometer, Kjeldahl Unit, calorimeter, HPLC units (2x), GC-FID, GC-MS, FT-IR spectrophotometer, polarimeter, freeze-dryer.

Other general equipment includes various laminar flows Class I, fume hoods, electrophoresis fridges, incubators, centrifuges, shaker incubators, pH meters, vortexes, RO water, water distillation system, refrigerators and freezers -20°C, -40°C and -80°C. Finally, other Departmental facilities include a chemical storage room and a sterilisation room.



The international committee that conducted an external evaluation of the ABF Department in June 2015 commended "the highly motivated, dedicated, enthusiastic faculty members who have established a very good track record resulting in national and international recognition of their Department" and the Department's "excellent research infrastructure".

The following pages describe briefly the activities carried out by each research group of the ABF Department during the period 2014-2016. Interested readers may obtain more information by accessing the webpages of each group, or the general Departmental webpage (www.cut.ac.cy/abf).

Plant Breeding, Plant Genetics and Experimental Design Group

Head: Andreas Katsiotis, Professor

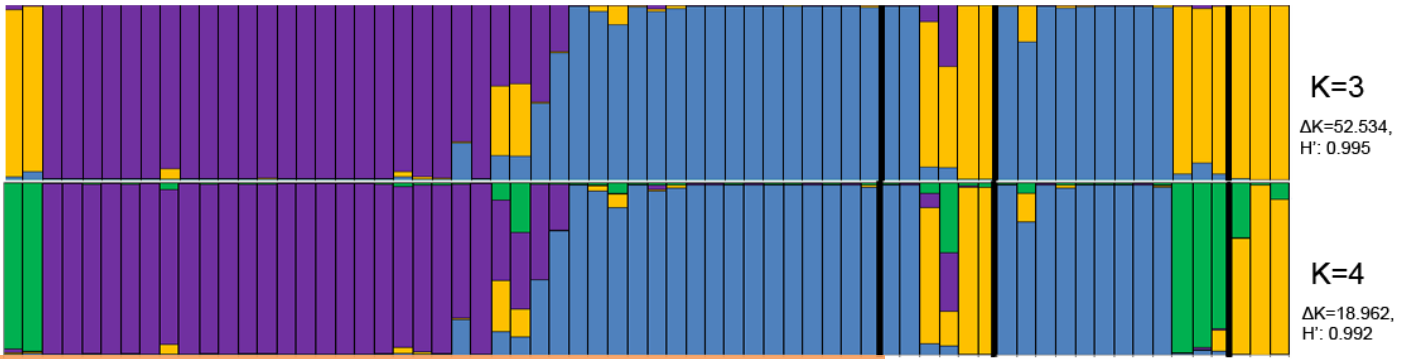
Team: Dr. Nikolaos Nikoloudakis, Angelos Kyratzis, Katerina Anestiadou, Stella Constantinou

Plant breeding is the art and science of manipulating heritable traits in order to develop new varieties with desirable characteristics. Breeding of new varieties that are high yielding, disease resistant, drought resistant, and adapted to local environmental and growing conditions are important for ensuring food security. In order to accomplish this task knowledge in a number of disciplines are necessary, such as botany, taxonomy, evolution, agronomy, plant pathology, plant genetics, principles of plant breeding, molecular biology, cytogenetics etc. Our group is focusing on a number of plants, including annual self-pollinated crops (such as wheat, oats, etc.), perennial crops (aromatic and herbal plants), and trees (olives), to name a few.

Current research areas include:

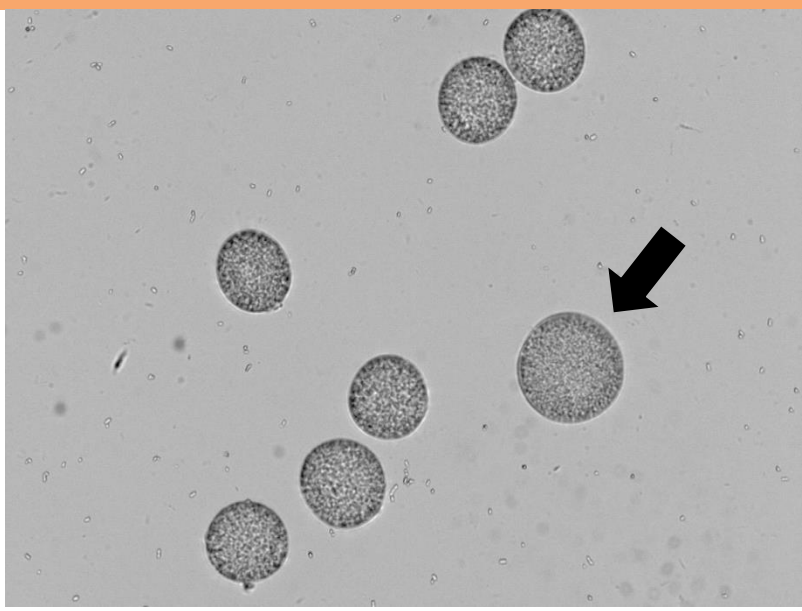
- Evaluation in three different environments of durum wheat local landraces, introductions of landraces grown in similar environmental conditions, and elite germplasm varieties that are resistant in low rainfall conditions.
- Evaluation of the olive germplasm in Cyprus and its contribution to contemporary cultivars.
- Evolutionary studies in oats, since a number of Avena species, which have contributed to the evolution of the hexaploid cultivated species, are grown in the wild.

In parallel smaller projects, such as studying the genetic erosion of landraces stored *ex situ*, production of *2n* gametes in diploid oat species, cytogenetic studies in olives are also initiated.



Genetic profile of the monumental olive trees in Cyprus. Bayesian cluster analysis and percentages of participation of each accession to genetic clusters (different colour), as inferred at K = 3 and K = 4.

***Avena ventricosa* pollen grains. Pollen grain with arrow (larger size pollen grain) contains a *2n* gamete.**



Members of the group have participated in international and local plant collection missions. A number of techniques are used, including molecular markers, molecular and conventional cytogenetic analysis, development of interspecific hybrids, sequencing, cloning, and field experimental plots.

The group has participated, as coordinators or partners, in a number of EU funded projects, as well as in nationally funded projects in Greece. We are collaborating with a number of universities, research institutes, germplasm banks, and organisations such as the European Cooperative for Plant Genetic Resources (ECPGR).

Selected publications

Nikoloudakis N. and Katsiotis A. (2015), Comparative molecular and cytogenetic methods can clarify meiotic incongruities in *Avena* allopolyploid hybrids. Caryologia, 68 (2), 84-91.

Psaroudaki A., Nikoloudakis N., Skaracis G. and Katsiotis A. (2015), Genetic structure and population diversity of eleven edible weeds of Eastern Crete. Journal of Biological Research, 22 (1) 7, doi: 10.1186/s40709-015-0030-7.

Nikoloudakis N., Bladenopoulos K. and Katsiotis A. (2016), Structural patterns and genetic diversity among oat landraces assessed by microsatellite markers and morphological analysis. Genetic Resources and Crop Evolution, 63 (5), 801-811.

Research Group on Agricultural Microbiology and Biotechnology

Head:	Dimitris Tsaltas, Associate Professor
Team:	Dr. Michalis Christoforou, Despoina Bozoudi, Maria Tsolakidou, Efi Aristidou, Elena Savva, Dimitris Anagnostopoulos, Elena Evripidou, Eftychia Michaelidou, Nondas Giannouris
Webpage:	*https://www.facebook.com/MicrobeAtCUT/*

Microbes from the Farm to the Fork

Globalization of the food supply has increased the range of plant, animal and foodborne pathogens as well as amplified health and economic impacts of a single contamination incident. At the same time quality foods require the thorough analysis of the biological substrate and/or the living organisms participating and interacting in their production in order to optimize it and prevent counterfeiting.

Production, processing, and distribution of food increasingly takes place across vast and complex networks—each part or pathway of which must be working optimally—without the introduction of contaminants that could taint the final product. Food safety, security and quality are equally affected by and contribute to the main concepts of "Farm to Fork". "Farm to fork" is the global approach to reassure that food and feed have been traced from the very beginning steps of their production in the field, the farm, the greenhouse, the sea or even the bioreactor, till the point are served to us.

At the same time microorganisms are responsible in a positive way for the production of food in direct and indirect ways. Microorganisms are creating or transforming food to special food. Fermentations are responsible for a whole new list of products at all levels of agriculture and food production. From the farm to the fork, microbes orchestrate the transformation of biological matrices for the benefit of the environment, the plants, the animals and the humans. Fermentations are nowadays under deep explorations. From the soil and the rhizosphere to cheese, wine and the animal/human gut we need to unravel and understand the real role of microbes. Their role to our Health.

Through a strong belief in "Farm to Fork", the Group of Agricultural Microbiology and Biotechnology at CUT is engaging in research activities all along the farm to fork chain. Microbial ecology research along the food supply chain using all modern molecular biology techniques to study the interactions of microbes with their host and the food matrices.

Our Group is divided in three interacting divisions: Plant & Soil Microbiology, Food Safety and Food Fermentations. We work on plant pathogens, mycotoxigenic fungi in must products and human pathogens on leafy vegetables. Following further the human pathogens from vegetables and meat microflora, we demonstrate possible risks for humans from antibiotic resistance acquired through use and misuse of antibiotics in agriculture.

Our group also works towards understanding and supporting quality and safety of traditional fermented products of Cyprus. Characterizing their microflora evolution, we are contributing to

the full profiling of these products and the development of starter cultures. Modern tools of molecular ecology and biotechnology offer new perspectives in microbial characterization. Contribution to scientific research and knowledge is summed up by the development of a culture collection from all the ongoing projects, fully supporting the European motto for "Knowledge Based Bio-Economy". Our culture collection will be our documented "knowledge trust" for the future, creating bio-based opportunities for the Group as well as for the society. All these give ample proof that we live in a Microbial World requiring serious efforts in exploration.

The following paragraphs provide a brief list of past and current work of the group.

A snapshot of past work

- Ecology of *Phytophthora infestans* in Cyprus causing late blight of potato and validation of disease forecast models and study of fungicide resistance of Cypriot isolates
- Identification and geographical distribution of Potato Cyst Nematodes in Cyprus and evaluation of potato resistant varieties

A snapshot of current work

- Dissecting the role of ethylene production from the fungus *Verticillium dahliae* in tomato wilt disease
- Study of current status of grapevine trunk diseases in Cyprus
- Dissecting the role of compost and compost related microorganisms in controlling plant pests and diseases, promoting plant health and growth while enhancing soil biodiversity and protecting soil from erosion and desertification
- Study of human pathogens microflora in various growing systems (conventional, hydroponic, organic, aquaponics)
- Isolation and characterization of autochthonous microflora of Trahana, Commandaria and Pitsilia Cured Meats for the development of artisanal starter cultures

Funding and collaborations

Dr. Tsaltas is an American Society of Microbiology Ambassador for Cyprus and ASM International mentor, a member of the board of the Hellenic Phytopathological Society and a founding member and member of the Board of the Greek Phytiatry Society. He is national representative of the International Food Association and leading the international efforts of the Association on research and education for Traditional Foods. The group is member of the University's ERATOSTHENIS Research Center and participates at the COST Action FA1303 on Grapevine Trunk Diseases. Funding is secured from EU (FP7) and national as well as University funds. The group is also funded from local industries through scholarships and offered services.

Selected publications

Bozoudi D. and Tsaltas D. (2016), Grape microbiota: Potential and opportunities as starter cultures. Invited Book Chapter in "Grape and Wine Biotechnology", Edited by A. Ananga, ISBN 978-953-51-4773-2. Accepted.

Aspri M., Bozoudi D., Tsaltas D. and Papademas P. (2016), Raw donkey milk as a source of enterococcus diversity: Assessment of their technological properties, safety characteristics and probiotic potential. Food Control. DOI: 10.1016/j.foodcont.2016.05.022.

Lawson P. and Tsaltas D. (2014), Application of Molecular Methods for Microbial Identification in Dairy Products. Edited by P. Papademas in Dairy Microbiology. CRC Press. ISBN 9781482298673

Tsaltas D. (2015), Microbial quality and safety of fruits and vegetables. A MEDian approach. Proceedings of the World Food Day 2015 - Food and Nutrition for Health "Mediterranean Food and Nutrition", ISBN: 978-961-93845-2-7.

Research Group on Animal Nutrition and Genetics

Head:	Despoina Miltiadou, Ouranios Tzamaloukas, Assistant Professors
Team:	Christos Papachristoforou (Associate Professor, retired), Simoni Simeou, Constantina Constantinou (PhD candidates), Maria Nikola, Savvas Kanaris, Constantinos Damianou (BSc students)
Webpage:	*www.cut.ac.cy/abf*

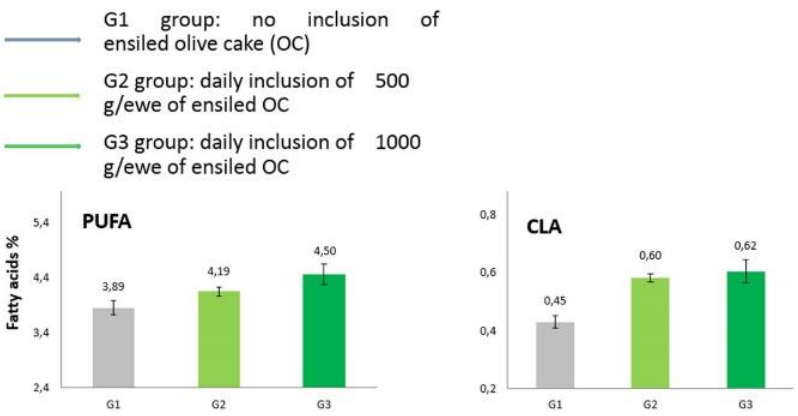
Milk production is one of the most important activities of the agri-food sector in Cyprus since more than 80% of the agricultural land is cultivated for forage production, while ruminants provide the raw material (fresh milk) to local dairy industry producing the main export of the country (halloumi cheese).

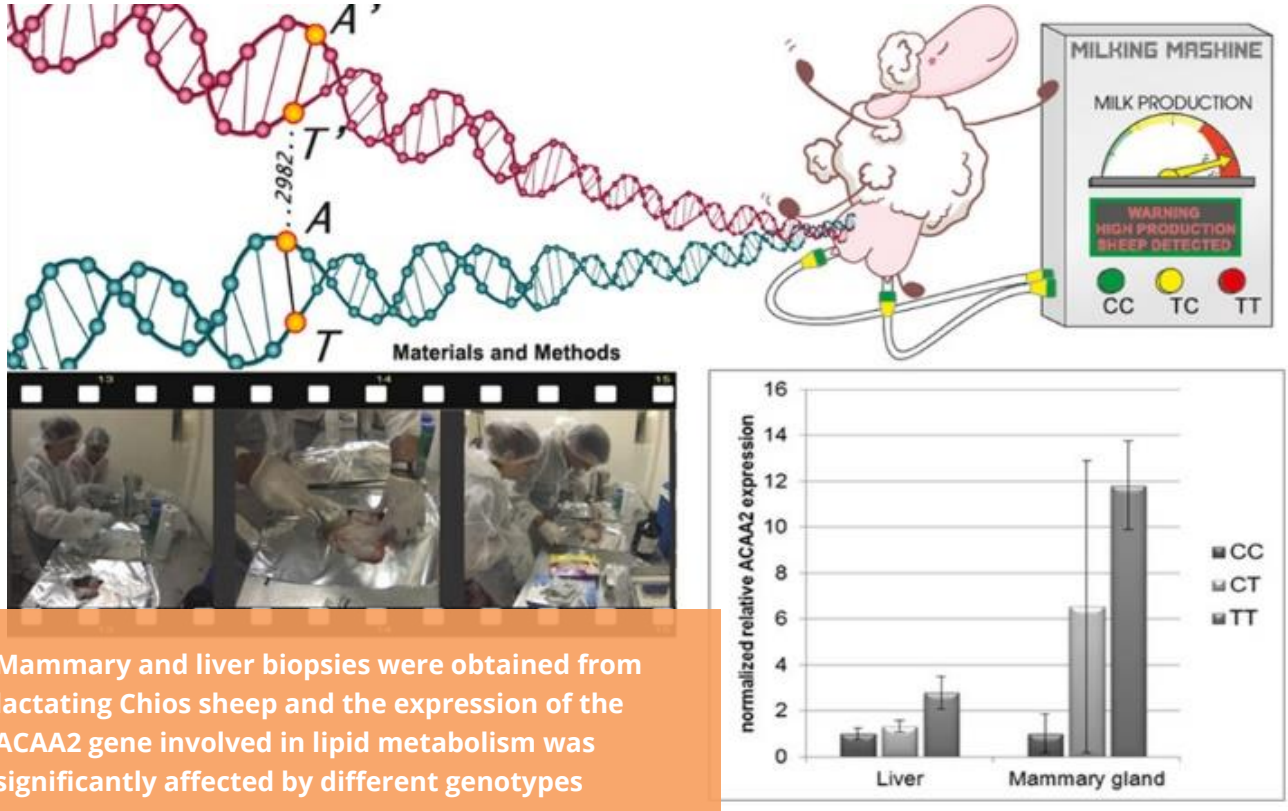
Farm production in Cyprus is at the state of transition after the assertion in the EU and tries to adjust to the new environment competing in the European and local markets. To ensure its survival and further development within the EU must improve its competitiveness by reducing costs and by improving quality of milk products. These are the main subjects of our group through research undertaken in animal nutrition, optimum management and gene identification and functioning associated with production traits in ruminants.

Recent findings of our group, related mainly to small ruminants, have been announced in international conferences and published in peer review journals covering the following subjects:

- candidate genes affecting milk quality and milk yield in Chios sheep
- nutritional supplementation with alternative feeds (such as olive cake and Dried distillers grains)
- research on lipids regarding fatty acid profile of milk and dairy products
- comparison of organic and non-organic milk produced in Cyprus
- investigation of different weaning method proposed for sheep and goats for the benefits of the farmer and the milk quality
- research in mammary and liver gene expression and regulation through management or nutrition.

Beneficial for human health fatty acids such as polyunsaturated (PUFA) and conjugated linoleic acids (CLA) were significantly increased in milk from sheep supplemented with olive oil byproduct





Mammary and liver biopsies were obtained from lactating Chios sheep and the expression of the ACAA2 gene involved in lipid metabolism was significantly affected by different genotypes

We participate in numerous national and international projects, while our group has extensive experience in coordinating projects attracted from Cyprus Research Foundation and co-funded by EU as well as projects funded and supported by the local dairy industry (Christis-Charalambides and associate farms). We have develop an extensive network of local and international collaborators and we are members of international associations and networks involved in animal and dairy science such as the European Association of Animal Production, related COST Actions FA0805, sheep-chip consortium, while we advise the government of Cyprus on their long-term policies on milk production. Our group also has extensive activities in exchanging students and research associates for the needs of collaborative projects through Erasmus+ and project funding between our university and the local dairy industry, governmental departments and globally known institutions, including partners at Moredun and Roslin institute in United Kingdom, INRA in France, ARO in Israel and several universities and institutions in Greece such as the Agricultural University of Athens, Aristotle University and University of Ioannina.

Selected publications

Brown C., Orford M., Tzamaloukas O., Mavrogenis A. and Miltiadou D. (2014), Assessment of inbreeding resulting from selection for scrapie resistance: a model for rare sheep breeds. Veterinary Record 175 (24), p. 624.

Tzamaloukas O., Orford M., Miltiadou D. and Papachristoforou C. (2015), Partial suckling of lambs reduced the linoleic and conjugated linoleic acid content of marketable milk in Chios ewes. Journal of Dairy Science, 98 (3), pp. 1739-1749.

Symeou S., Hager-Theodorides A., Psifidi A., Tzamaloukas O., Banos G. and Miltiadou D. (2016), Association of the ACAA2 gene with dairy traits in Chios sheep. Proceedings of the 67th Annual Meeting of the European Federation of Animal Science (EAAP 2016), Belfast.

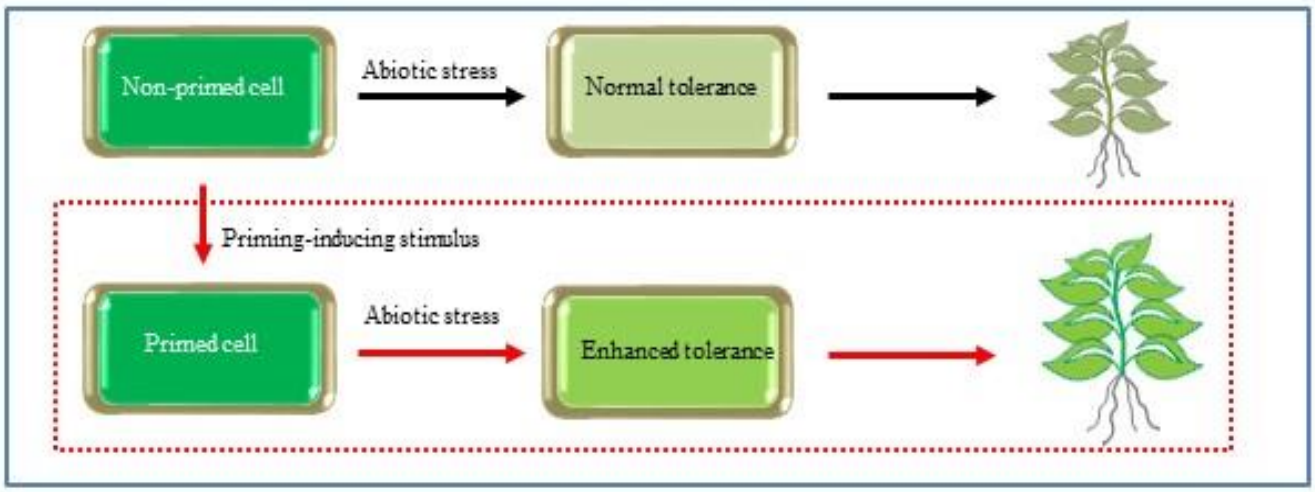
Plant Stress Physiology Group

Head:	Vasileios Fotopoulos, Assistant Professor
Team:	Dr. Andreas Savvides, Egli Georgiadou, Chrystalla Antoniou, Maria Solomonidou, Rafaella Xenofontos, Giannis Pavlou
Webpage:	*plant-stress.weebly.com/*

The increased frequency and extent of global climatic changes and associated extreme environmental events remarkably influence plant growth and development, ultimately affecting crop productivity throughout the world. Our research group has extensive research experience in plant stress physiology, biochemistry, molecular biology and biotechnology with emphasis on the study of oxidative and nitrosative signalling cascades involved in the plant's response to abiotic and biotic stress factors. Its staff and collaborators are comprised of plant physiologists, biochemists, molecular biologists and analytical chemists. Through our work we try to decipher the cellular mechanisms that orchestrate plant responses to such stress factors, while at the same time evaluating means of their amelioration. This is primarily done with chemical priming, which involves exposure to a priming agent such as a natural or synthetic chemical compound. Chemical priming presents opportunities for more effective use of plant priming in plant stress physiology studies and crop stress management.

We participate in numerous national and EU-funded research projects and are members of international associations and networks such as the International Plant Proteomics Organization, as well as COST Actions FA0605, FA1106 and FA1306. Our group also has extensive experience in hosting international exchange students through Erasmus+ and COST STSM programs, including students from Poland, Greece, Austria and Spain.

Pretreatment using a priming-inducing stimulus (e.g., chemical compound) results in enhanced cell tolerance and amelioration of stress-induced plant growth inhibition.



Alfalfa plants (A) under drought stress, (B) well-watered, (C) pre-treated with melatonin and drought-stressed, (D) pre-treated with melatonin and watered.

Our network of collaborators extends globally, including partners at VIB in Belgium, Max Planck Institute in Germany, City University of New York in the US and the University of Barcelona in Spain. In addition, we have experience in the establishment of intellectual property rights resulting from research carried out in our labs, leading to international patent WO 2015123273.A1. Attempts are currently being made to license the patented technology through a short-tech research project co-funded by the inventors' affiliating Institutes (CUT and CUNY; 'NOSH'-TEC').

Selected publications

Savvides A., Ali S., Tester M. and Fotopoulos V. (2016), Chemical priming against multiple abiotic stresses: mission possible? Trends in Plant Science 21, 329-340.

Filippou P., Antoniou C., Obata T., Harokopos E., Van der Kelen K., Kanetis L., Aidinis V., Van Breusegem F., Fernie A.R. and Fotopoulos V. (2016), Kresoxim-methyl primes Medicago truncatula plants against abiotic stress factors via altered reactive oxygen and nitrogen species signalling leading to downstream transcriptional and metabolic readjustment. Journal of Experimental Botany 67, 1259-1274.

Zarza X., Atanasov K.E., Marco F., Arbona V., Carrasco P., Kopka J., Fotopoulos V., Munnik T., Gómez-Cadenas A., Tiburcio A.F. and Alcázar R. (2016), Polyamine Oxidase 5loss-of-function mutations in Arabidopsis thaliana trigger metabolic and transcriptional reprogramming and promote salt stress tolerance. Plant Cell and Environment, doi: 10.1111/pce.12714.

CUT Fruit Sciences/Postharvest Group

Head:	George Manganaris, Assistant Professor
Team:	Savvas Constantinou (PhD student), Margarita Hadjipieri (PhD student), Egli Georgiadou (PhD student), George Sismanidis (MSc student), Nicolas Valanides, Epifanios Efstathiou (featured undergraduate students)
Webpage:	*www.cut.ac.cy/fruitsciencesgroup*

The increasing globalisation of the fresh produce sector necessitates long-term transport and the demand for high quality products stresses the need for innovative and sustainable preharvest and postharvest technologies. In particular, prevention of postharvest losses is of major importance for global food and nutritional security. Provided that ca. 30-40% of fresh produce never consumed and given the world demographic growth and the forecasted climate change, it is becoming a major challenge for human society to provide sufficient amount of high nutritional and sensory quality food. Towards to this aim, a multidisciplinary approach that encompass advanced preharvest and postharvest protocols is needed to be employed in order to preserve qualitative attributes, provide safe produce of high nutritional value and employ sustainable energy use.

The Fruit Sciences/Postharvest Group was established by Dr. George Manganaris upon his recruitment at CUT in January 2009. Thanks to the synergies and support by post-doctoral research associate Dr. Vlasios Goulas (currently academic staff of the Department) the Group managed to set up and routinely run an array of assays related to qualitative, physicochemical and biochemical properties of fresh produce. In addition, taking advantage of the state-of-the-art core facilities of the Department, we have additionally employed high throughput analytical and molecular approaches, jointly with other Faculty members.

Our group has extensive research experience in issues related to postharvest physiology and technology of fresh produce, with special reference to fruit crops. Particular attention is given in the elucidation of fruit ripening syndrome with emphasis in the development of physiological disorders and their responsiveness to chilling temperatures. Over the last years, our group additionally worked with indigenous/traditional (unexplored) cultivars, as well as the assessment of fruit quality with the employment of nondestructive tools.

Further, we have established synergies with internationally renowned research groups. Already, active collaboration exists with University of California at Davis, University of Padova, Aristotle University of Thessaloniki, NMR Center at University of Ioannina and Mediterranean Agronomic Institute at Chania.

Fruit Sciences/Postharvest website includes details about group members, external partners, research projects and other synergies. Furthermore, details about publications, facilities, established protocols, conferences and seminars supported by our group can be retrieved.

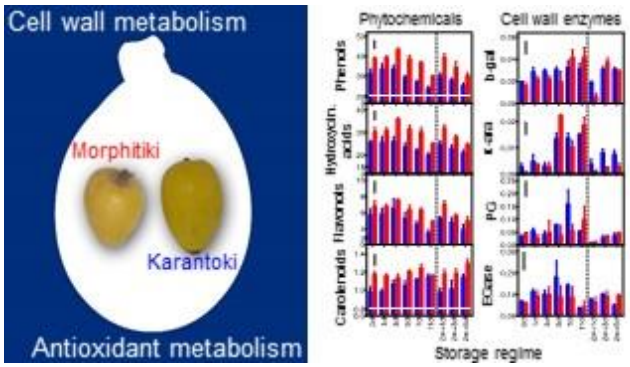
Notably, we have participated/participate in a significant number of funded research projects and/or self-funded synergies. The PI is an active member of international associations and networks such as International Society for Horticultural Sciences (ISHS, Council member), European Fruit Research Institute Network

(EUFRIN, board member), COST Actions FA1104, CA15636. Our group also has extensive experience in hosting renowned scientists and organizing well-attended seminars and training schools, as well as hosting students from abroad.

PI has acted as convenor in the organization of three international conferences: V ISHS Postharvest Unlimited Conference (246 delegates from 43 countries), 25th Congress of the Hellenic Society of Horticultural Science (330 delegates) and the Final meeting of COST Action FA1104 "Sustainable production of high-quality cherries for the European market" (140 delegates). PI is also co-convenor of the 3rd ISHS Horticulture in Europe Conference.

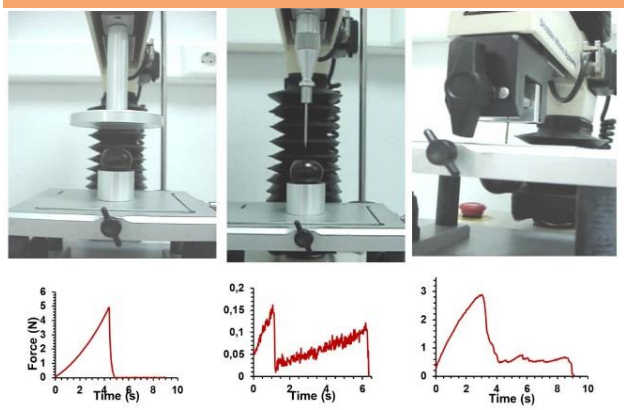
To date, Dr. Manganaris is the author of 40 scientific papers (19 as senior author) in peer-reviewed journals (1030 citations, h-index=18). Data from his work have also been presented in review papers (5), book chapters (7) and full texts in Conference proceedings (9). He is the Editor of the Proceedings of the 25th Hellenic Symposium of Horticultural Sciences and of the International Postharvest Unlimited Symposium, (Acta Horticulturae 1079).

Dr. Manganaris is an Associate Editor of the Journal of Horticultural Science & Biotechnology, an Editorial Board Member in Frontiers in Plant Science, and a member of the editorial of 'Postharvest Biology and Technology' while he has handled over 340 reviews as ad hoc reviewer in 54 refereed journals. He was appointed by the Hellenic Quality Assurance Agency of Higher Education to participate in the External Evaluation process (as a committee member) of four Departments in Greece. He has been also assigned to evaluate competitive research proposals from different countries (France, Belgium, Poland, Greece), as well as examiner of MSc thesis/PhD dissertations (Italy, United Kingdom, Greece).



Cell wall metabolism and antioxidant properties of indigenous loquat cultivars [*Food Chemistry* 2014, 155, 227-234]

Establishment of a complete set of analysis to determine textural properties of sweet cherry fruit [*Frontiers in Plant Science* 2015 6:959]



Selected publications

Drogoudi P., Pantelidis G.E., Goulas V., Manganaris G.A., Ziogas V. and Manganaris A. (2016), The appraisal of qualitative parameters and antioxidant contents during postharvest peach fruit ripening underlines the genotype significance. Postharvest Biology & Technology, 115, 142-150.

Minas I.S., Vicente A.R., Dhanapal A.P., Manganaris G.A., Goulas V., Vasilakakis M., Crisosto C.H. and Molassiotis A. (2014), Ozone-induced kiwifruit ripening delay is mediated by ethylene biosynthesis inhibition and cell wall dismantling regulation. Plant Science 2014, 229, 76-85.

Manganaris G.A., Goulas V., Vicente A.R. and Terry L.A. (2014), Berry antioxidants: small fruits providing large benefits. Journal of the Science of Food & Agriculture, 94, 825-833.

Sustainable Agriculture Group (SAG)

Head: Menelaos Stavrinides, Assistant Professor

Team: Dr. Vassilis Litskas, Athanasia Mandoulaki, Andri Varnava, Kostas Michael, George Lysandrou, Aggela Michael, Stavroula Louka

Webpage: *www.cut.ac.cy/abf/staff//m.stavrinides*

The production of sufficient amounts of food to support the rising global population under climate change and preventing the deterioration of valuable ecosystem services is a major challenge for the international scientific community. In Cyprus, the implementation of sustainable practises in agriculture and the adaptation to climate change are essential for the long term support of valuable ecosystems, local communities and the sustainability of the agricultural sector. Accordingly, the Sustainable Agriculture Group (SAG) research is focused on promoting and enabling the long term conservation of High Nature Value Farmlands (HNVF) in Cyprus and on assessing the impact of climate change on agriculture by invastigating its effects on major crops and pests, such as tomato and spider mites. The SAG comprises agricultural scientists from different disciplines such as entomologists, plant scientists, ecologists and environmental scientists.

Currently, SAG coordinates an EU project, the AgroLIFE project [LIFE13 BIO/CY/001114] that is co-funded by the LIFE+ programme. The duration of the AgroLIFE project is three (3) years, with a total budget of 575,520 Euro. AgroLIFE aims to protect, to conserve and to enhance the biological diversity and ecosystem services in two important HNVF in Cyprus, the vineyards in Commandaria region and the carob groves in Anogyra region. Our team coordinates and participates in a series of conservation actions (Figs. 1 - 2) that focus on restoration of traditional hedgerows and planting of floral strips (Fig. 1), restoration of stonewalls and creation of microhabitats for important conservation species, reinstatement of traditional grazing regimes to mitigate over-grazing and under-grazing problems in carob groves and

Fig. 1. **AgroLife work on the field for the restoration and diversification of traditional hedgerows and planting of floral strips.**

Fig. 2. **A SAG team member working for plant and arthropod monitoring for the AgroLife project.**

implementation of sustainable agricultural practices in both vineyards and carob groves. The impact of the conservation actions is monitored through biodiversity monitoring (Fig. 2) and study of ecosystem services. Through our work we try to promote sustainable agricultural methods and to highlight the importance of biodiversity protection and conservation in farmlands. Our goal is to contribute to the establishment and development of agro-environmental policy and measures in Cyprus.

The SAG also participates in the JPI-FACCE project "Genomite: New generation sustainable tools to control emerging mite pests under climate change". Our work in Genomite is to assess the effects of climate change on phytophagous and predatory spider mite species that are highly important for global agriculture. For this, we are using the CLIMEX model to create the Bioclimatic Envelope (BE) for the herbivorous spider mite *Tetranychus urticae* and the invasive *Tetranychus evansi* as well as the predators *Neoseiulus californicus* and *Phytoseiulus persimilis*. We are using presence/absence records and data for the biology of the species to map their current distribution. The future areas with favourable environment for the species are projected after inserting the climatic data generated after using the IPCC Representative Concentration Pathways (RCPs) and General Circulation Models (GCMs). The obtained Ecoclimatic Index (EI), a measure for the climatic suitability for the species in a particular area, is used to develop the Biological Control Index (BCI) (Fig. 3) as a tool to assess the effects of climate change on biological control of the herbivorous spider mites. Our goal is to identify those agricultural areas worldwide that will be vulnerable to these pests and contribute to the adaptation of the agricultural sector on the effects of climate change in pest management programmes.

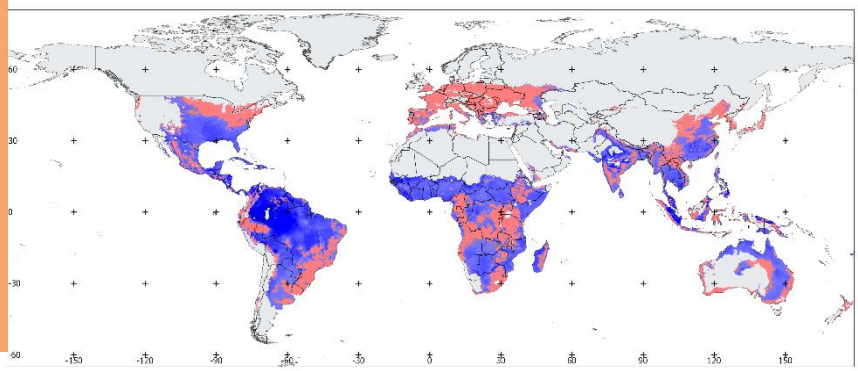


Fig. 3. **The BCI for the herbivore *Tetranychus urticae* and its predator *Neoseiulus californicus* using the CLIMEX model. Areas in blue indicate that the future climatic conditions favour *T. urticae* more than the predator indicating risks for effective biological control of the pest.**

SAG has also worked on the development of the Agro-Environmental Indicators for Cyprus. The group has close collaboration with Cypriot (Ministry of Agriculture, Rural Development and Environment, Open University of Cyprus, SMEs) as well as international partners (INRA/France, CSIC/Spain, East Malling Research/UK) and has received funding from private and public entities from Cyprus and EU.

Selected publications

Martinou A.F. and Stavrinides M.C. (2015), Effects of sublethal concentrations of insecticides on the functional response of two mirid generalist predators. PLoS ONE, 10. DOI: 10.1371/journal.pone.0144413

Zappalà L., Biondi A., Alma A., Al-Jboory I.J., Arnò J., Bayram A., Chailleux A., El-Arnaouty A., Gerling D., Guenaoui Y., Shaltiel-Harpaz L., Siscaro G., Stavrinides M. et al. (2013), Natural enemies of the South American moth, Tuta absoluta, in Europe, North Africa and Middle East, and their potential use in pest control strategies. Journal of Pest Science, 86: 635-647.

Litskas V.D. et al. (2013), Variation of energy flow and greenhouse gas emissions in vineyards located in Natura 2000 sites. Ecological Indicators, 27: 1-7.

Research Group on Dairy Science and Technology

Head: Photis Papademas, Assistant Professor

Team: Maria Aspri, Kallis Souroullas, Charoulla Kkese, Melina Theocharous, Christina Ioannou

Webpage: *web.cut.ac.cy/dst*

Dairy Products are a major part of the worldwide food production and the dairy industry is considered a colossal business. It is inevitable that research on Dairy Science and Technology is needed in producing safe, nutritious, quality dairy products.

As we are situated in the Eastern part of the Mediterranean we have the opportunity to work with milk types other than the cow. Therefore, our group has extensive research experience in non-cow milk such as sheep, goat and donkey milk. We are very much interested in characterising and "adding-value" through research to traditional dairy products and we have worked significantly over the years on sheep/goat Halloumi cheese (i.e. authentication, feeding regimes/areas of production, characterisation of the product).

Moreover, over the last couple of years the study of donkey milk is a major research objective of our group, where the potential positive medical effects of donkey milk to humans with specific health issues (i.e. immunity related disorders) are studied through an international multi-disciplinary approach. We have also extensively studied the microbiome of donkey milk and used some of the isolated lactic acid bacteria to produce fermented products with bio-functional properties.

Additionally, we participate in EU-funded projects such as the ERASMUS+ project "eFoodScience", where we are producing teaching material for modules in "Functional Foods". The generated material will be openly available through an online platform. Our group also has extensive experience in hosting international conferences such as the

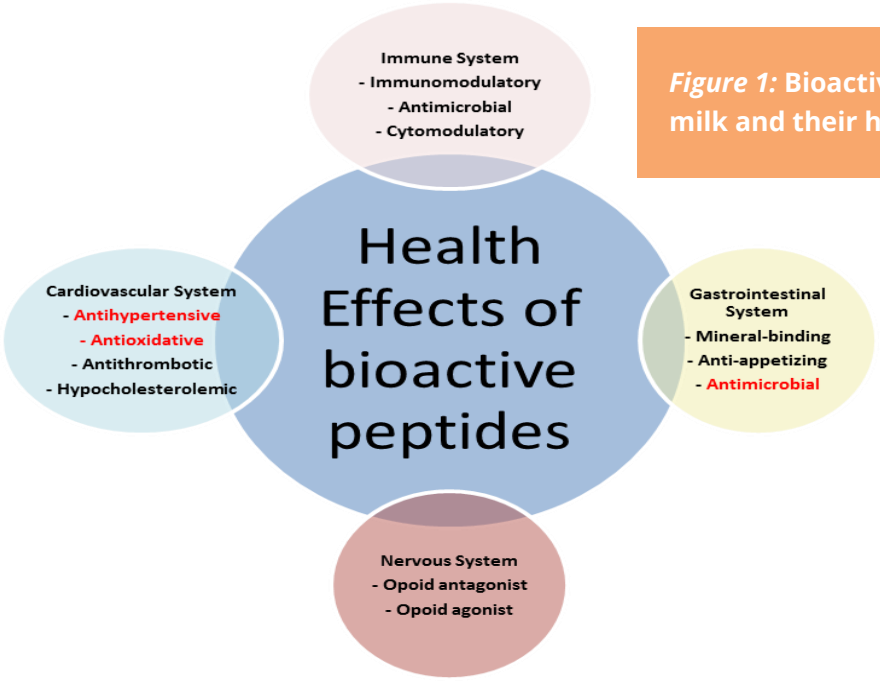


Figure 1: **Bioactive peptides in donkey milk and their health implications.**

7th IDF International Symposium on Sheep, Goat and other non-Cow Milk which was hosted in Limassol, Cyprus in 2015.

our group participate as experts in projects on donkey milk (Veterinary School, University of Milan, Italy), and in Special Interest Groups, such as the "Traditional Products" of the ISEKI Food

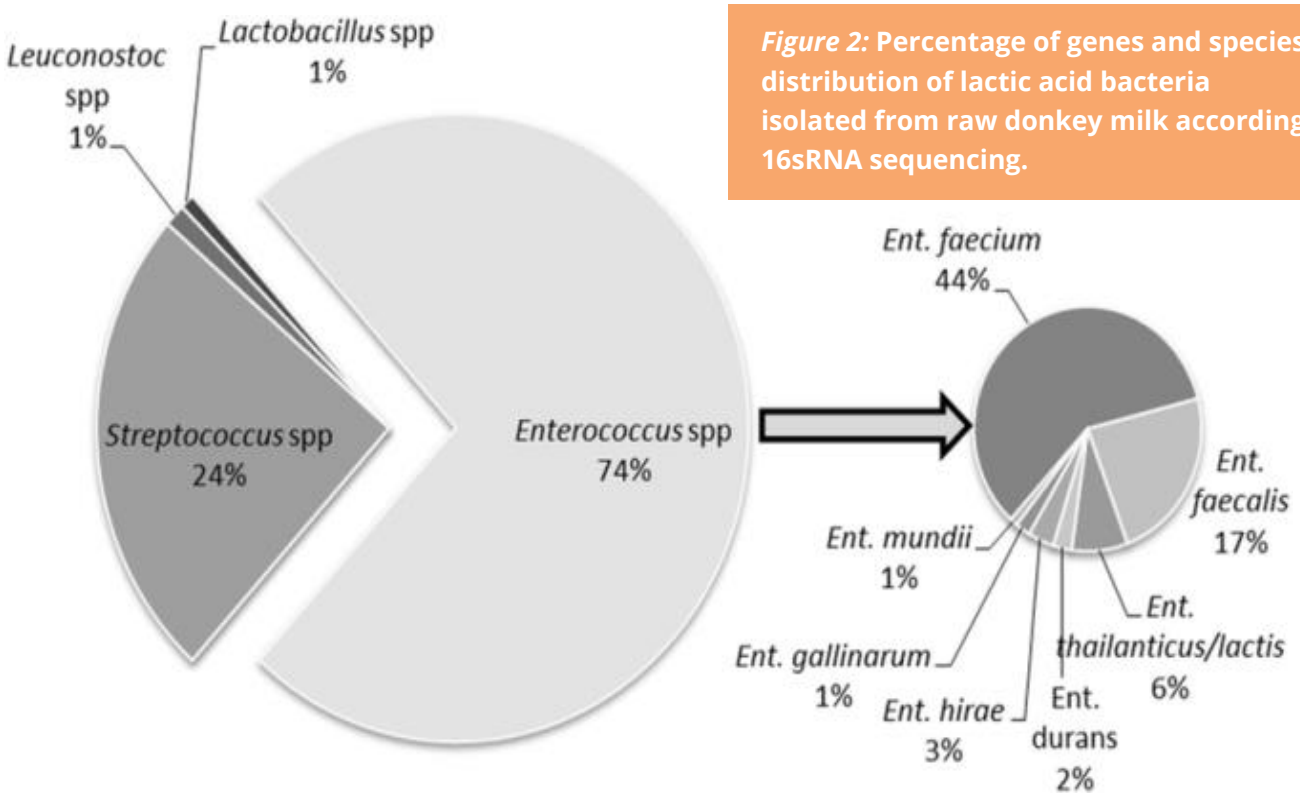


Figure 2: **Percentage of genes and species distribution of lactic acid bacteria isolated from raw donkey milk according to 16sRNA sequencing.**

Our network of collaborators includes partners at Parma University and Molise University in Italy, University College Dublin in Ireland, Queen's University Belfast in the UK, Aristotle University Thessaloniki, in Greece. In addition, members of

Association. Additionally we have participated/organised numerous outreach activities such as public talks, science fairs and others, in an attempt to promote Dairy Science and Technology research and education in Cyprus.

Selected publications

Aspri M., Bozoudi D., Tsaltas D., Hill C. and Papademas P. (2016), Raw donkey milk as a source of Enterococcus diversity: Assessment of their technological properties and safety characteristics. Food Control, doi: 10.1016/j.foodcont.2016.05.022.

Osorio M.T., Koidis A. and Papademas P. (2015), Major and trace elements in milk and Halloumi cheese as markers for authentication of goat feeding regimes and geographical origin. International Journal of Dairy Technology (67) 1-9.

Dairy Microbiology – A practical Approach (2014), P. Papademas, ed., CRC Press, Taylor & Francis Group, Boca Raton, USA, ISBN 9781482298673.

Hydro-Aromatic Plants

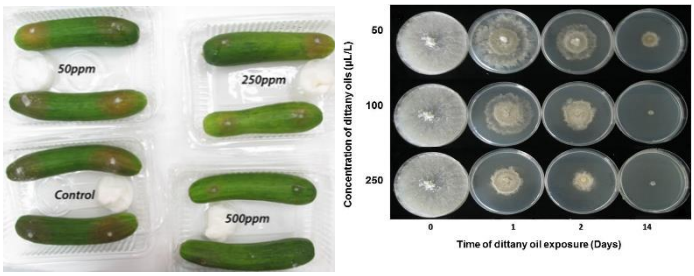
Head:	Nikolaos Tzortzakis, Assistant Professor
Team:	Antonios Chrysargyris (PhD student), Aristeidis Stamatakis (PhD student), Vicky Thermofilia, Panayiota Xylia, Varnavas Zorpas, Eleftheria Papakyriacou, Myria Anastasiou, Omiros Antoniou
Webpage:	*www.cut.ac.cy/hydro-aromatic-plants*

Plant nutrition and food safety is of great concern nowadays, attracting scientist's research interests, while crop adaptation to several abiotic and biotic factors is evidenced due to climatic changes. Our group has extensive research experience in plant nutrition and plant physiology/ biochemistry in soil as well as in hydroponics for vegetables and aromatic/medicinal plants. Additionally the group has more than 12-years' experience in Postharvest Science dealing with fresh produce preservation under natural sanitizers, essential oils and ozone with antimicrobial properties under pathogenic, physiological and biochemical/ molecular approaches. Its staff and collaborators are comprised of plant physiologists, plant pathologists, biologists, food scientists, biochemists, and analytical chemists.

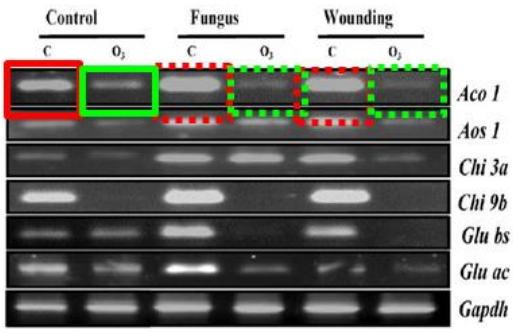
Through our work we try to optimise appropriate nutrition for crop needs as well as to alleviate induced resistance occurred mainly by abiotic stresses. Moreover, natural products are examined as putative sanitizers against postharvest disease with possible enhancing inputs in fresh produce quality and storability. We have recently constructed a fully automate greenhouse in hydroponics, examining crops in horizontal and vertical scale of development.

We participate in numerous national and EU-funded research projects, coordinating the HYDROFLIES, ESSOFRESH, SALTAROMA and VITISMART projects. We are members of international associations and networks such as COST Actions FA1106 and EUVRIN. We have great experience in farmers and agronomist training and short courses/ summer schools.

Our network of collaborators extends globally, including partners at University of Cranfield (UK), Tshawane University of Technology (South Africa), Volcani Centre (Israel), Reims University (France), Universitat de les IllesBalears (Spain), Marche



(a) Antifungal activity of essential oils.



(b) Ozone induce resistance in tomato fruit

(A) Spearmint in DFT, (B) Lettuce in Zig-Zag, (C) Lettuce in pumice and sawdust, (D) Tomato in perlite, (E) Lettuce in NFT

Polytechnic University (Italy), University of Crete (Greece), MAICh (Greece), Technical Education Institute of Crete (Greece) as well as municipalities, unions and SMS.

Members of the group experienced in committees of international conferences (2nd QMAP, WWPR2012, IWA Regional Workshop, WWMST2013, Postharvest Unlimited., SHE2016, 4th International Conference on SSWM).

Selected publications

Chrysargyris A., Panayiotou C. and Tzortzakis N. (2016), Nitrogen and phosphorus levels affected plant growth, essential oil composition and antioxidant status of lavender plant (Lavandula angustifolia Mill.). Industrial Crops & Products, 83: 577-586.

Tzortzakis N., Chrysargyris A., Sivakumar D. and Loulakakis K. (2016), Vapour or dipping applications of methyl jasmonate, vinegar and sage oil for pepper fruit sanitation towards grey mould. Postharvest Biology and Technology, 18: 120-127.

Tzortzakis N.G., Taybi T., Roberts R., Singleton I., Borland A. and Barnes J. (2011), Low-level atmospheric ozone exposure induces protection against Botrytis cinerea with down regulation of ethylene-, jasmonate- and pathogenesis- related genes in tomato fruit. Postharvest Biology and Technology, 61:152-159.

Petousi I., Fountoulakis M., Tzortzakis N., Dokianakis S., Stentiford E.I. and Manios T. (2014), Occurrence of micro-pollutants in a soil-radish system irrigated with several types of treated domestic wastewater. Water, Air, & Soil Pollution, 225: 1791-1799.

Research Group on Food Chemistry and Analysis

Head:	Chrysoula Drouza, Lecturer
Team:	Aggelina Kritioti, Eleni Michailidou, Georgia Xadri, Vasilios Ioannou, Georgia Nicolaou, Smaragda Spanou
Webpage:	*http://www.cut.ac.cy/abf/staff/chryssoula.drouza*

Food quality has a direct impact on human health and is a major concern of consumers worldwide. Food chemistry is involved in elucidating both the composition of the raw material / final products and the changes occurring in food during its production, processing, storage and cooking.

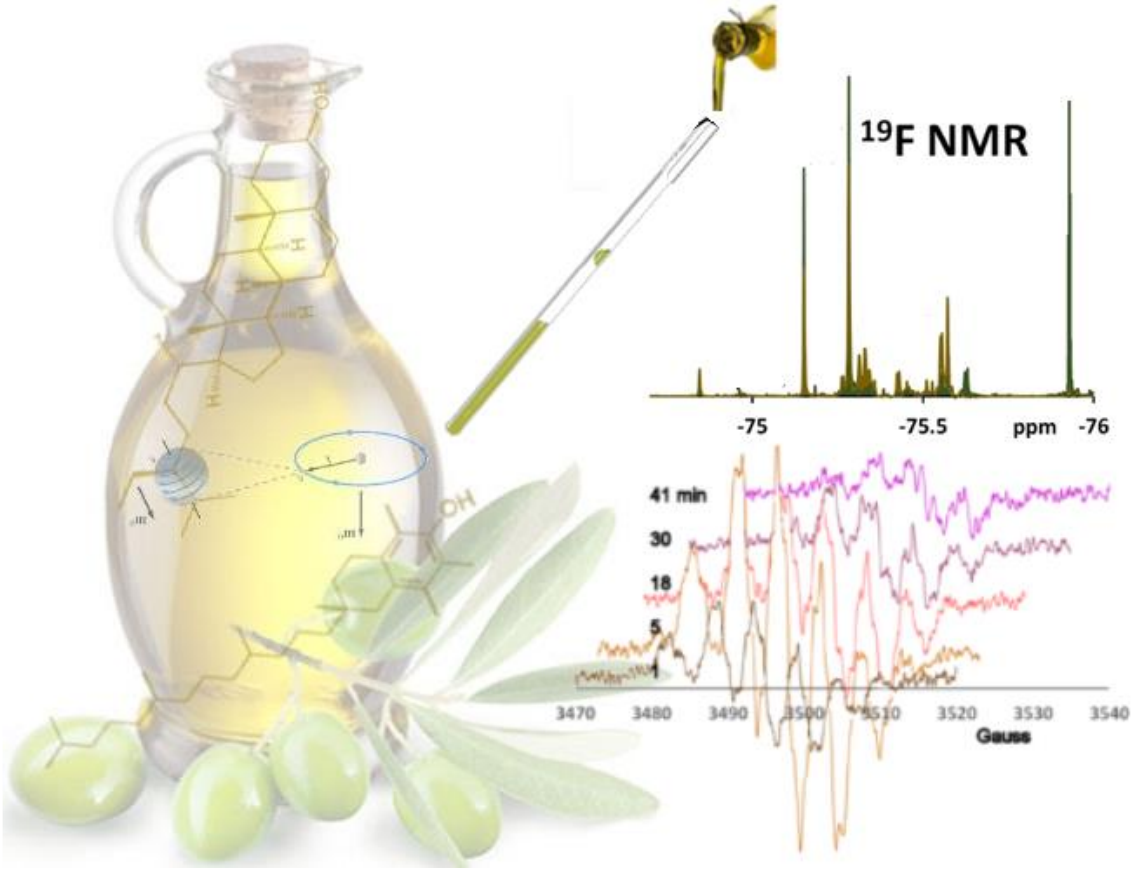
A comprehensive evaluation of foods requires that analytical techniques evolve along with the available technology. As a result, a major objective in food chemistry is concerned with the application and continuous development of analytical methods. This aspect is particularly important when following possible contamination of foods with substances which may involve a health risk or interfere with fraud in nutrient evaluation of food. Our research group has extensive research experience in issues related to food composition, chemical changes of food as part of processing or storage, and developing methods to trace important biomolecules in the food matrix. Therefore, our group has been involved in the following research projects:

- Investigation for the determination of markers for the discrimination/authenticity of food, such as olive oil, wine, honey and other food products
- Study of the mechanisms of food oxidation
- Study of the changes in the composition of food and its metabolites during processing, aging and/or storage
- Development of new methods for the analysis of food components with high impact to the adulteration, authenticity and deterioration of food.

We utilise several advanced techniques such as (i) chromatographic: gas chromatography (GC-MS/FID), High Performance liquid chromatography (HPLC-PDA/fluorescence/RI/UV); and (ii) spectroscopic: 1H (1 and 2D), 13C, 51V, 19F, 31P Nuclear Magnetic spectroscopy (NMR), Electron Paramagnetic Spectroscopy (EPR), UV-vis spectroscopy; (iii) electrochemical: CV-voltammetry.

We have recently developed a new experimental approach for recording the composition of edible oils, by labelling their components with 19F nuclei which is active in 19F NMR spectroscopy providing the ability for measuring several bioactive components of edible oils in few minutes. Another new approach has been applied for the detection of bioactive components in food by utilising new metal-organic probes to induce paramagnetic signal in the complex food matrix characteristic of its components providing quantification and/or information for the mechanism of food deterioration. These new methods are being exploited to characterise food and discriminate it on the basis of botanical and/or geographical origin, with high economic impact on the local and the international community.

Our network of collaborators includes partners at the Agricultural University of Athens, Department of Food Science & Human Nutrition, the Sector of



Food Chemistry of the University of Ioannina, the Department of Chemistry of the University of Patras, the Department of Chemistry at the University of Cyprus, the Department of Food Science & Technology at the University of Lleida, Spain, and academic members from Departments of the Cyprus University of Technology.

We have participated in several national and EU-funded research projects while Dr. C. Drouza has experience in coordinating funded Infrastructure research projects. We are members of international associations and networks including COST Action CM1305 "Explicit control over Spin-States in Technology and biochemistry" (ECOSTBIO), COST Action TD1203 "Food Waste Valorisation for Sustainable Chemicals, Materials and Fuels (EUBis)", the International Forum on Industrial Bioprocesses (IFIBiop) and the Association of Cypriot Chemists.

Selected publications

Vlasiou M. and Drouza C. (2015), 19F NMR for the speciation and quantification of the OH-molecules in complex matrices, Analytical Methods, 7, 3680-3684.

Stylianou M., Drouza C., Giapintzakis J., Athanasopoulos G.I. and Keramidas A.D. (2015), Aerial oxidation of a VIV – iminopyridine hydroquinonate complex, the VIV-semiquinonate radical intermediate trap. Inorganic Chemistry, 54 (15), pp 7218–7229.

Servetas I., Berbegal C., Camacho N., Bekatorou A., Ferrer S., Nigam P., Drouza C. and Koutinas A.A. (2013), Saccharomyces cerevisiae and Oenococcus oeni immobilized in different layers of a cellulose/starch gel composite for simultaneous alcoholic and malolactic wine fermentations. Process Biochemistry, 48, 1279-1284

Research Area: Integrated Disease Management - Plant Pathology

Head: Dr. Loukas Kanetis, Special Teaching Staff

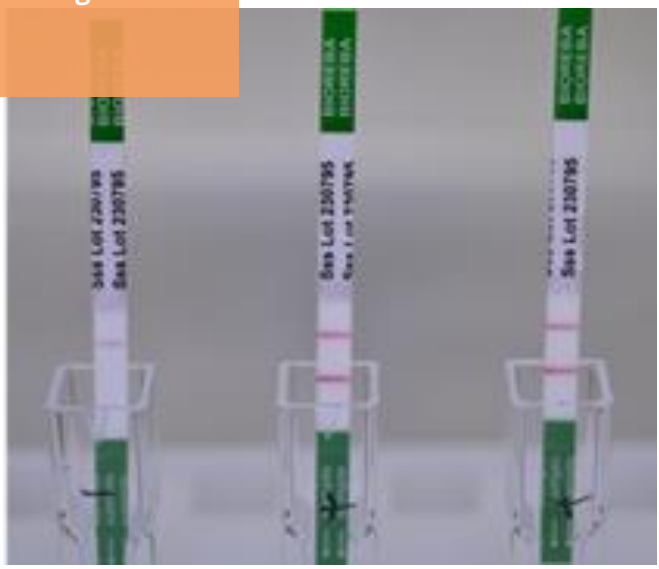
Team: Andreas Charidemou, Georgios Makris, Solonas Solonos

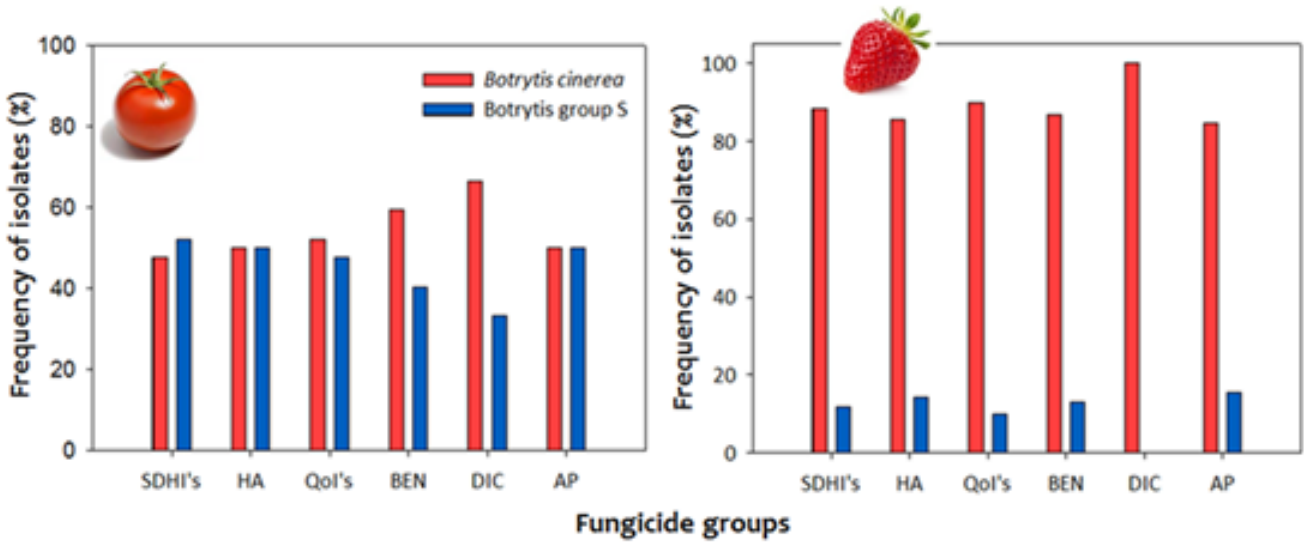
Our major research goals are: **[1]** The etiology, the epidemiology and management of important, existing and emerging plant diseases affecting Cyprus crop production using chemical, cultural and biorational approaches; **[2]** The phenomenon of site-specific fungicide resistance (detection, mechanisms involved in the development and selection of resistance, and development of anti-resistance strategies); **[3]** To evaluate and develop alternative means to synthetic pesticides (pre- and postharvest); **[4]** The ecology of mycotoxigenic fungi and the factors affecting toxin production for developing strategies to reduce toxin contamination of fresh produce.

Since potato production is the most dynamic sector of Cyprus primary agricultural production, we have performed research on major diseases affecting the crop. The population structure of the potato late blight pathogen, *Phytophthora infestans*, has been studied using SSR genetic markers and the presence of a "new", highly aggressive pathotype commercial varieties was identified. Similar studies have been conducted on *Rhizoctonia solani* and the potential effect of the local population on rotational hosts was evaluated. Recently, we reported also the presence of the potato powdery scab in Cyprus, caused by *Spongospora subterranea.*

Greenhouse horticulture is an expanding production system in Cyprus with gray mold causing significant crop losses. Recently, we concluded research, where we monitored the status of fungicide resistance within *Botrytis cinerea* populations and its genetic structure was dissected. Present results, along with

First report of *S. subterranean* f. sp. *subterranea* in Cyprus, based on symptomatology, morphological characteristics, as well as serological and pathogenicity data.





Distribution of *Botrytis* species resistant to botryticides with different modes of action. Isolates were collected from tomato and strawberry covered crops in Cyprus.

information from ongoing research, will be used in developing management strategies for this important disease under Cyprus conditions. We are also conducting research on novel antimicrobial agents for the management of *B. cinerea* and other pathogens with promising results.

We are also interested in the connection between mycotoxigenic fungi and food safety. Thus, we have studied the etiology of pre- and postharvest pomegranate fruit rots and the capacity of the implicated fungal species in toxin production. Research is also being conducted on the natural incidence of fumonisin B2 in pomegranates caused by *Alternaria* spp. field infections. A similar project is in progress for grapes and *Aspergillus* spp. With colleagues from Italy we are also investigating the molecular machinery implicated in fumonisin production.

Furthermore, we have developed a strong interest in the etiology and epidemiology of emerging plant diseases in Cyprus. Among others, we have developed and characterized, collaboratively, GFP-transformed strains of *Alternaria alternata*, for investigating the infection process of pomegranate blossoms that results in fruit rots.

Selected publications

Kanetis L., Testempasis S., Goulas V., Samouel S., Myresiotis C. and Karaoglanidis G.S. (2015), Identification and mycotoxigenic capacity of fungi associated with pre- and postharvest fruit rots of pomegranates in Greece and Cyprus. International Journal of Food Microbiology, 208, 84-92.

Kanetis L., Papayiannis L.C., Samouel S. and Iacovides T. (2016), First report of potato powdery scab, caused by Spongospora subterranea f. sp. subterranea, in Cyprus. Plant Disease, 100(5), 1010.

Kanetis L., Tsimouris D. and Christoforou M. (2016), Characterization of Rhizoctonia solani associated with black scurf in Cyprus. Plant Disease, doi.org/10.1094/PDIS-10-15-1238-RE.

Research Area: Food Technology and Microbiology

Head: Dr George Botsaris, Special Teaching Staff

Team: Kyriaki Nikolaou, Nikolas Markantonis, Eleni Savva, Anastasia Taki, Eleni Hadjibei

Our research focuses in three interrelated areas within Food Technology / Biotechnology and Food Microbiology:

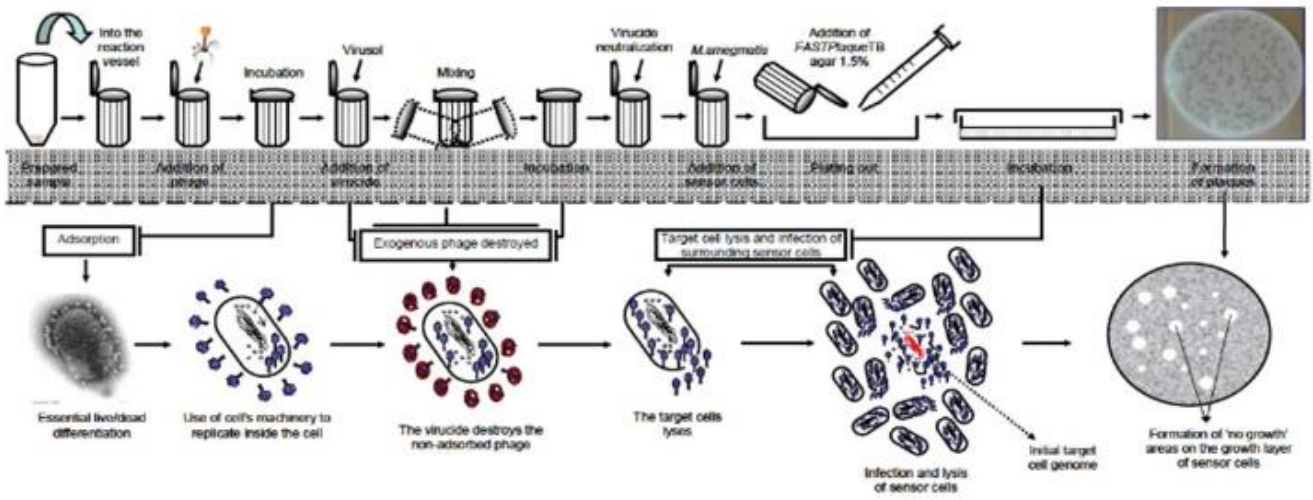
- Application of bacteriophage in food and veterinary diagnostics and in the biological control of bacterial diseases
- Detection and control of foodborne pathogens and other important microorganisms in the food supply chain
- Development of novel functional foods and their shelf-life evaluation.

The detection of food borne pathogens via the application of a combine bacteriophage detection and molecular confirmation by PCR is a very promising tool in food and veterinary diagnostics.

The philosophy of this method is based on the detection of the targeted species of bacteria with the use of bacteriophage and the molecular identification of the species by PCR. This method has the ability to identify viable cells in less than 24 hours. The methodology we use for detecting MAP is schematically presented in Figure 1.

The phage amplification assay is faster and more sensitive compared to the conventional culture and other immunological detection methods. These advantages are shared with molecular detection methods like the PCR and qPCR. The phage amplification assay though, has the vital advantage of being able to differentiate between live and dead cells. This advantage is of critical

Figure 1: Bacteriophage detection method of *Mycobacterium avium* subspecies *paratuberculosis*



Graphic representation of the bacteriophage detection method. The steps of the method are presented on the top of the diagram and at the bottom the scientific details are analysed. Following infection with bacteriophage the sample is treated with a virucide to destroy the exogenous phage and culture step on a lawn of sensor cells follows. A positive indication is the formation of plaques at the end point of the assay. Each plaque contains a copy of the initial target cell genome which provides species identification following PCR.

importance when analysing processed food samples.

Following the successful application and validation of our method in milk and dairy products, we have recently applied with success the method in powder infant formulas. The results describe an alternative method to detect *Mycobacterium avium* subspecies *paratuberculosis* (MAP), in less than 24 hours, compared to 3 months minimum required by the conventional culture method. In addition the phage-PCR method developed, is more sensitive thus providing a reliable diagnostic tool to assist the efforts to reduce the exposure, especially of infants and children, to MAP.

Towards the effort to improve food borne pathogen detection and monitoring in the food chain and in close association with the Cyprus Veterinary Services, we have recently completed a study which announced the prevalence of *Listeria* spp. and *Listeria monocytogenes* in the dairy herds in Cyprus (Figure 2).

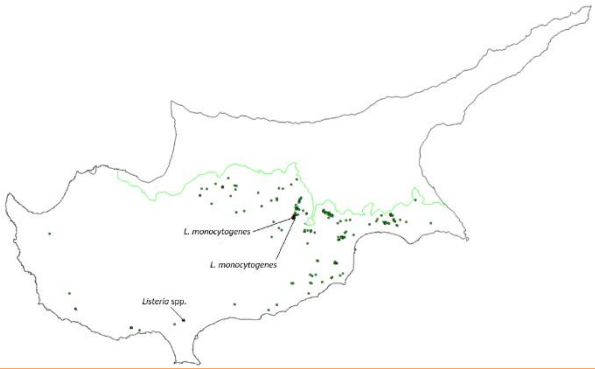


Figure 2. Prevalence of *Listeria* spp. and *L. monocytogenes* in bulk tank cow's milk from all the dairy herds in Cyprus. The dots represent the location of the farms and the three positive farms are highlighted.

There is an increasing need to better understand the prevalence of *L. monocytogenes* in the environment and food, given the rise of listeriosis in Europe, as reported by EFSA. Other projects are also now initiated aiming at recording the prevalence of other important foodborne bacterial pathogens and viruses.

Finally, the technological development and shelf-life evaluation of novel functional foods is gaining major interest, considering the shift towards healthier products in the developed countries and the resulting increase of the functional food market. Our research interests in the area, focus on the development of novel yoghurt based products assessing the effects of functional ingredients on the viability of probiotic microorganisms and on the organoleptic quality.

Collaborating with the local industry in a number of small projects we have managed to produce results that merited publication in scientific journals, whilst offering also solutions to problems encountered. We will continue working in close association with government services and the local industry in an attempt to provide solutions to the industry and assist the authorities in their efforts to monitor and control the prevalence of foodborne pathogens throughout the food chain.

Selected publications

Botsaris G. and Taki A. (2015), Effect of high pressure processing on the microbial quality throughout the shelf-life of vacuum-packed sliced ham and frankfurters. Journal of Food Processing and Preservation, 39, 840-845.

Botsaris G., Kanetis L., Slaný M., Parpouna C. and Makris K. C. (2015), Microbial quality and molecular identification of cultivable microorganisms isolated from an urban drinking water distribution system (Limassol, Cyprus). Environmental Monitoring and Assessment, 187, 1-10

Botsaris G., Swift M. M. C., Slana I., Liapi M., Christodoulou M., Hatzitofi M., Christodoulou V. and Rees C. E. D. (2016), Detection of viable Mycobacterium avium subspecies paratuberculosis in powdered infant formula by phage-PCR and confirmed by culture. International Journal of Food Microbiology, 216, 91-94.

Botsaris G., Nikolaou K., Liapi M. and Pipis C. (2016), Prevalence of Listeria spp. and Listeria monocytogenes in Cattle Farms in Cyprus using Bulk Tank Milk Samples. Journal of Food Safety, doi: 10.1111/jfs.12265.

Research Area: Food & Natural Products Research and Analysis

Head: Dr. Vlasios Goulas, Special Teaching Staff

Team: S. Constantinou, C. Tamboukari, P. Aresti, C. Kalogirou, D. Nicolaou, E. Pelava

Our mission is to perform profound research with state-of-the-art equipment in the field of food of plant origin, natural products, and functional food science. Particular attention is given in three areas of specific expertise: (i) characterization of food of plant origin, natural products and their bioactive constituents, (ii) discovering new bioactive compounds and/or extracts for food industry, and (iii) the impact of processing and cooking methods on bioactive composition of foods. An array of chromatographic, spectroscopic and physico-chemical methods has been developed/modified to achieve our objectives.

The characterization of food and natural products as well as and their constituents is the primary scope of our research. We provide information about a wide variety of different characteristics of foods, including their composition, physicochemical and textural properties. We emphasize to the bioactive composition of foods of plant origin and natural products with the employment of the state-of the-art analytical methodologies. The phytochemical characterization is of great importance for plant foods and natural products as phytochemicals are linked with health effects. They also can be exploited as markers for the authenticity and origin of food. In period 2014-2016, we characterized foods of plant origin with emphasis to local products such as Commandaria dessert wine, carob products, olive oil etc.

Another current topic of interest is to discover natural food additives in order to replace synthetic ones. In this effort, natural products such as herbs and medicinal plants are an extraordinary reservoir of novel chemodiverse molecules. Our team is strongly activated in discovering safe and low cost food additives of natural origin. We explored Mediterranean flora in order to pinpoint biological active plant extracts and/or individual phytochemicals. In particular, plant material such as *Salvia fruticosa, Sideritis syriaca*, *Ceratonia siliqua*, and *Pistacia lentiscus* (fruit, leaves, and resin) were evaluated as antioxidant, antimicrobial and antifungal agents for food industry. Furthermore, the findings were exploited to develop innovative edible coating for fresh produce or to formulate novel functional foods.

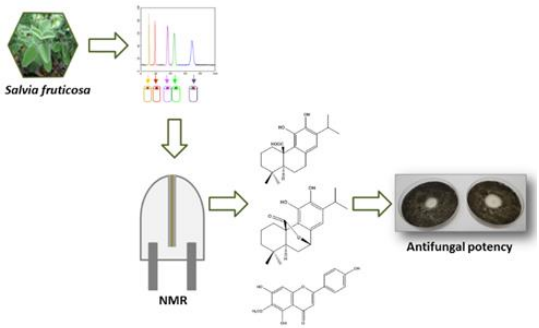


Fig 1. Discovering antifungal compounds in Salvia fruticose

Over the past few years, there has been an increasing consumer's interest toward functional food which, beyond the basic function of supplying nutrients, claims to have health-promoting or disease-preventing properties. In this respect, it is of paramount importance to

have processing methods which preserve not only the nutritional and sensorial quality but also the bioactivity of certain of their constituents.

Thus, the impact of processing and cooking methods on bioactive composition of food has been studied by our team. In particular, we determined the effect of hot-air drying on the quality and bioactive composition of aromatic plants. Furthermore, the dehydration procedure of grapes destined for the production of Commandaria is also studied in order to improve the quality of final product. Moreover, the stability of bioactive compounds under ultrasound treatment was investigated since many application of ultrasound power in food processing has been proposed.

A network of collaborators including partners at Research and Development of Functional Food Centre (CIDAF) in Spain, Department of Pharmaceutical Sciences in Antwerp (Belgium) and Department of Chemistry in Ioannina (Greece) has been established. In addition, synergies with other members of Academic staff at ABF Department and local organizations such as Department of Agriculture (Quality Products Section) have been created. Finally, results from our research have been presented in 16 scientific papers and 3 review papers in peer-reviewed journals.

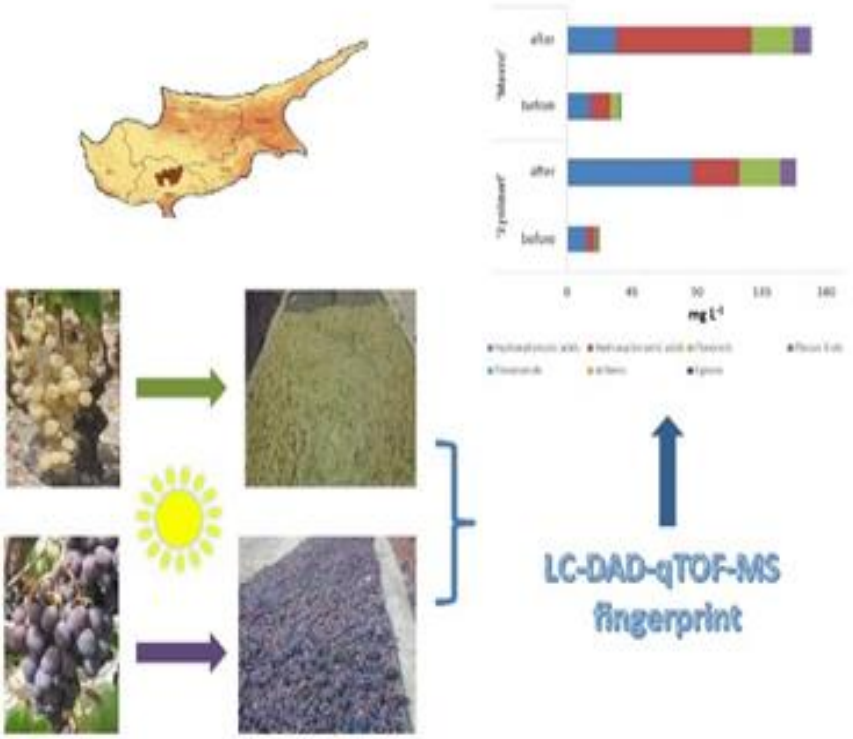


Fig 2. Effect of dehydration on bioactive composition of grapes destined for the production of Commandaria

Selected publications

Goulas V., Exarchou V., Kanetis L. and Gerothanassis I.P. (2014), Evaluation of the phytochemical content, antioxidant activity and antimicrobial properties of mountain tea (Sideritis syriaca) decoction. Journal of Functional Foods, 6, 248-258.

Exarchou V., Kanetis L., Charalambous Z., Apers S., Pieters L., Gekas V. and Goulas V. (2015), HPLC-SPE-NMR characterization of major metabolites in Salvia fruticosa mill. Extract with antifungal potential: Relevance of carnosic acid, carnosol, and hispidulin. Journal of Agricultural and Food Chemistry, 63, 457-463.

Goulas V., Orphanides A., Pelava E. and Gekas V. (2015), Impact of thermal processing methods on polyphenols and antioxidant activity of olive oil polar fraction. Journal of Food Processing and Preservation, 39, 1919-1924.

Research Area: Plant Pathology, Plant Microbe Interactions

Head: Dr. Iakovos Pantelides, Special Teaching Staff

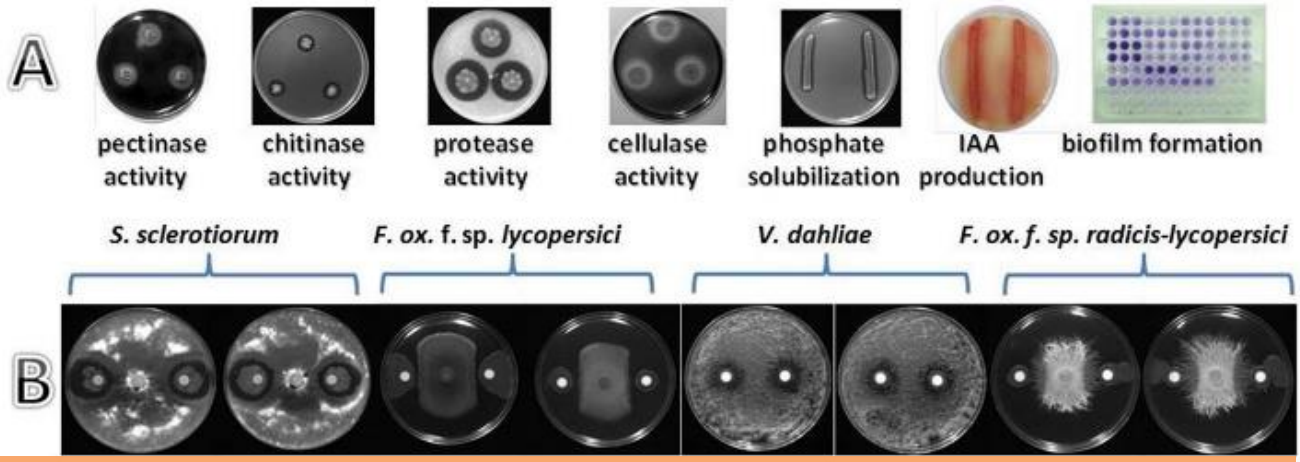
Team: Stella Papageorgiou, Anastasis Antoniou, Michalis Aristeidou, Anna Kyriakou, Natalia Fanega Sleziak

Plant pathogenic microbes as well as unfavorable growth conditions can be a threat for plant growth. Approximately 25% of the world's crop yield is lost every year due to diseases caused by fungi, bacteria, viruses and other pathogens and pests. Protection of plants is mainly based on chemical products. Their use can potentially threaten humans' health and pollute the environment. In order to reduce our dependence on chemical pesticides new strategies have been developed.

Today Integrated Management plans are being widely adopted. This strategy brings together the understanding of pathogens' life cycles and their interactions with the plants and the environment. The protection plans combine a variety of non-chemical methods for managing plant diseases such as biological control. These strategies demand in depth knowledge of the plant-microbe encounters which can be friendly or hostile.

Our research focuses in interrelated areas within Plant Pathology and Biotechnology:

- Detection, evaluation and exploitation of beneficial microbes, which associate with plant aerial parts and roots and provide plants with an array of antimicrobial metabolites, hormones and plant growth promoting enzymes.
- Investigation of plant – microbe interactions at molecular level in order to decipher the relationships between pathogenicity factors and defence mechanisms of plants.
- Evaluation and application of eco-friendly methods to control plant pathogens.



In vitro screening of bacterial isolates for (A) plant growth promotion characteristics and (B) antagonistic activity against soil-borne fungal pathogens

Over the last couple of years we have been working with a compost from recycled plant material showing suppressive properties against the wilt pathogens of tomato. Microorganisms present in the compost were proven to be responsible for the suppressive properties observed and acted as plant growth promotion inducers. We identified the microorganisms of the compost that colonised the rhizosphere of plants by sequencing of the 16S and ITS region of the rRNA gene. The isolates were then evaluated for their biological activity against several soil-borne plant pathogens. A substantial number of the bacterial isolates exhibited profound antifungal activity and were further evaluated for plant growth promotion characteristics. Our results revealed that a number of rhizobacterial isolates exhibit multifaceted beneficial characteristics and could potentially be used as plant growth promoting and biological control agents.

At the same time our plant-microbe research has focused on the investigation of the interaction of the soil-borne fungus *Verticillium dahliae* with a broad range of plant hosts. Our goal is to decipher the role of ethylene in disease severity of plants through the ACC pathway. This has been performed by overexpressing a *V. dahliae* native *ACC deaminase* gene under the control of two fungal promoters. The virulence of the mutant strains was evaluated with pathogenicity assays and pathogen quantification *in planta* by qPCR. Due to the interesting results the *ACC deaminase* gene was further investigated by its disruption and the resulting mutants were evaluated as well for their growth characteristics, virulence and ethylene production. Experimental work in progress will further unravel the pathogenicity mechanisms of an important pathogen that cannot be dealt with the existing available strategies.

We participate in numerous research projects at national and international level and are members of international associations (e.g. Mediterranean Phytopathological Union, Hellenic Phytopathological Society), as well as COST Actions (e.g. FA1405 "Using three-way interactions between plants, microbes and arthropods to enhance crop protection and production").

We have established a network of collaborators all over the world including partners at Utrecht University in the Netherlands, Pennsylvania State University in the US and Agricultural University of Athens in Greece.

We have also established collaborations with the local industry in an effort to offer solutions to practical problems encountered whilst disseminating our findings in numerous international conferences and scientific journals. We work in close association with plant protection agronomists of governmental services and the private sector in an attempt to provide appropriate measures and solutions and assist their efforts to monitor and control the diseases caused by plant pathogens.

Selected publications

Pantelides I.S., Christou O., Tsolakidou M.-D. et al. (2015), Isolation, identification and in vitro screening of grapevine yeasts for the control of black aspergilli on grapes. Biological Control 88, 46-53.

Pantelides I., Papageorgiou S., Antoniou A. et al. (2015), Molecular identification and functional diversity of microorganisms isolated from the rhizosphere of plants grown in a suppressive soil substrate. Rhizosphere 4, p114.

Tsolakidou M.-D., Pantelides I. S., Tzima A.K. et al. (2014), Investigating the role of ACC deaminase gene in pathogenicity of the soilborne fungus Verticillium dahliae, XVI IS-Molecular Plant Microbe Interactions, P061.

II. Department of Environmental Science and Technology

Overview

One of the main missions of the EST Department is to promote basic and applied research in the field of Environmental Sciences and Technology, and to facilitate the mobility of its students, researchers and academics through international research cooperation.

Despite the small size of the Department and the considerable teaching and administrative workload faced by all academic staff members, EST's collective research output has been very substantial and internationally recognised. The very satisfactory research performance has been acknowledged by the international committee of renowned academics who conducted an external evaluation of the Department in December 2014. In its concluding statement of their evaluation report that was submitted to the University's Rector, the Committee wrote that the University 'should be proud' of the EST Department in view of its research achievements and prospects.

The Department's laboratories possess state-of-the-art equipment such as:

- Atomic Absorption Spectrophotometer (AAS)
- Inductively Coupled Plasma – Mass Spectrometer (ICP-MS)
- Ion Chromatograph (IC)
- High Performance Liquid Chromatograph (HPLC)
- Gas Chromatograph – Mass Spectrometer (GC-MS)
- Surface and Pore Analyser (BET)
- Fourier Transform Infrared Spectrophotometer (FTIR) coupled with DRIFTS Cell
- TOC/TON analyser
- Gas Chromatograph (GC)
- Fermentors
- Ultraviolet-Visible Spectrophotometers
- Microscopes
- Fluorescence Spectrophotometer
- Fats, Oils and Grease (FOG) portable analyser
- Gas emissions analyser
- Material Printer
- Freeze dryer
- Fully automated and computerized gas and liquid flow panels
- Low and High temp ovens
- Incubators
- Portable gas analysers (NO_x, CO/CO_2, VOCs, Microbial load, H_2S, NH_3, O_3, CH_4)
- IR and thermal cameras
- Fast Cameras
- Centrifuges
- Sound meters
- pH meters
- Vortexes
- RO water

- Water distillation system
- Conductivity meters
- Soil sampling equipment
- Refrigerators and freezers

The following pages describe in more detail the major activities carried out during 2014-2016 in the Department's research groups and laboratories. Interested readers may obtain more information by accessing the webpages of each group, or the general webpage of the Department (www.cut.ac.cy/est).

Laboratory of Environmental Biocatalysis and Biotechnology (LEBB)

Head: Constantinos Varotsis, Professor

Our lab is mainly working on Biosurface Spectroscopy, which is a new research field. In the graph at the top of next page, it is the red area in the centre, which lies at the intersection of three established fields of research – biology, surface science and spectroscopy.

More specifically, work at LEBB focuses on the following topics:

Structure and function of proteins

Electron transfer coupled to proton translocation is the basic mechanism of energy generation in most living organisms, but the molecular mechanism is not understood. A key enzyme in all eukaryotic and most prokaryotic electron transfer systems is cytochrome *c* oxidase, which accepts electrons derived from food and donates them to oxygen, generating a pH and electrical gradient to drive ATP synthesis. We are studying the bacterial cytochrome *c* oxidases ba_3 from *Thermus thermophilus* which differ in peptide composition from the mammalian cytochrome c oxidase but carry out the reduction of Oxygen (O_2) to water (H_2O), the oxidation of carbon monoxide (CO) to carbon dioxide (CO_2) and the reduction of Nitric oxide (NO) to laughing gas (N_2O) by using the same metal centers to catalyze the process.

Marine biofilm matrix

Marine microorganisms of the Marine *Roseobacter* Lineage *(Roseovarius nubinhibens, Roseobacter sp, Roseobacter denitrificans, Roseobater litoralis)* have demonstrated a diverse range of physiological and morphological features such as gas vacuoles, sulfur metabolism, secondary metabolite production that suggest unique adaptations to various marine environments. The role of these microorganisms as information carriers in the biotechnology industry is investigated. We are studying by the application of Biosurface spectroscopy the properties and constituents of the self-produced matrix of hydrated extracellular polymeric substances (EPS) that make biofilm the most successful form of life on earth.

Nanobiotechnology: Interaction of nanoparticles with proteins / Relation to bio-reactivity of the nanoparticle

In depth understanding of such interactions which direct towards generating bio-compatible nanomaterials with controlled surface characteristics in a biological environment.

Metal-Bacteria interactions at the mineral surface

The acidophilic iron(II) ion-oxidizing bacteria *Thiobacillus ferrooxidans* and *Leptospirillum ferrooxidans* are the most important mesophiles for the extraction of metals from sulfidic ores. Little is known about the interfacial processes leading to the degradation of metal sulfides because of the complex interaction of electrochemical, biochemical and surface-specific mechanisms. The project involves the study of cellular interactions with metal species in the aqueous environment. Strains of *Acidothiobacillus ferroxidans* have been associated with growth on mineral surfaces showing varying capacities to complex and accumulate metals. It is intended that results obtained from this study would contribute towards a greater understanding of

cell-mineral interactions in an aqueous environment, in a simulation of the interfacial forces around bacterial phospholipid bilayers. The microbial oxidation of graphite by *Acidithiobacillus* is probed by FTIR and Raman imaging.

Protein-drug interactions

Cytochrome bc_1 is a major drug target for the treatment and prevention of malaria and in the treatment of toxoplasmosis. The interactions of the antimalarial drugs Artemisinin and Artesunate with the bc_1 complex are investigated by biosurface spectroscopy.

Glycolysis of plant and food proteins

Heat treatment of foods leads to glycation of individual protein-bound amino acids such as lysine and arginine. Substantial amounts of up to 1000 mg of Amadori compounds (mainly fructodelysine) and up to 75 mg of advanced glycation end products are ingested with the daily diet. The majority of these products cannot pass the intestinal barrier and enter into circulation and could therefore serve as a substrate for bacterial fermentation. Degradation of fructoselysine has already been shown. The characterization of advanced glycation end products as well the antioxidant properties of heterocyclic reaction intermediates and the antimicrobial activity of glucosamine-derived flavour compounds are under investigation by a combination of spectroscopic techniques. The glycation products have a great potential to establish an effective industrial method to generate efficacious antioxidant compounds which can be used in food technology.

Laboratory of Environmental Catalysis

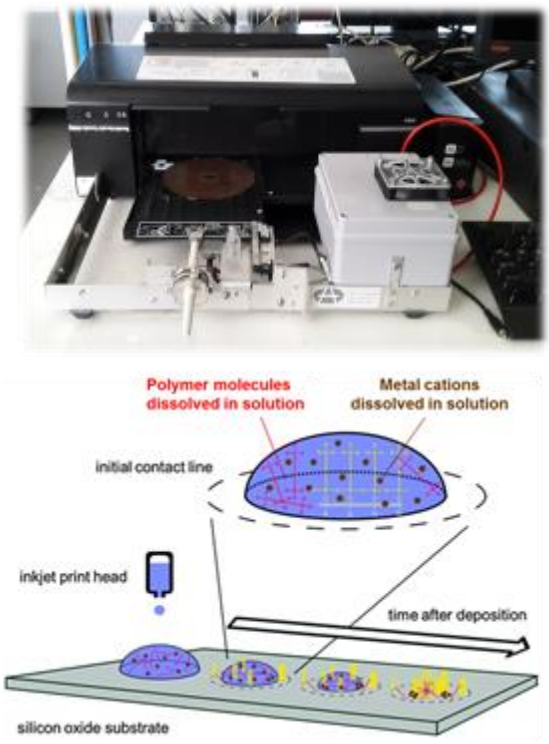
Head: Costas N. Costa, Professor

Team: Dr. Christodoulos P. Theologides, Dr. Georgios Olympiou, Charoula Piskopianou, Barbara Constantinou, Vasiliki Chatziiona, Stathis Theofilou, Nantia Pandelidou

Webpage: *www.catlab.ac.cy*

Environmental catalysis has continuously grown in importance over the last 2 decades not only in terms of the worldwide catalyst market, but also as a driver of advances in the whole area of catalysis. The development of innovative "environmental" catalysts is also the crucial factor towards the objective of developing a new sustainable industrial chemistry. In the last decade, considerable expansion of the traditional area of environmental catalysis (mainly NOx removal from stationary and mobile sources, and VOC conversion) has also occurred. The research group of the Environmental Catalysis Lab has extensive research experience in both traditional as well as new areas of environmental catalysis such as: (i) catalytic technologies for liquid or solid waste reduction or purification, (ii) catalysis for greenhouse gas control, (iii) use of catalysts for user-friendly technologies and reduction of indoor pollution, and (iv) reduction of the environmental impact of transport.

Among others, our group is currently investigating novel methods for catalysts development through "Printing". "Catalysts Printing", is a modern method that may be used for the accurate manipulation and tuning of the properties of catalytic materials. Very recently, our pioneer research on the bactericidal properties of silver supported catalysts led to some very important findings that may trigger a whole new sector, that of antimicrobial catalysis.

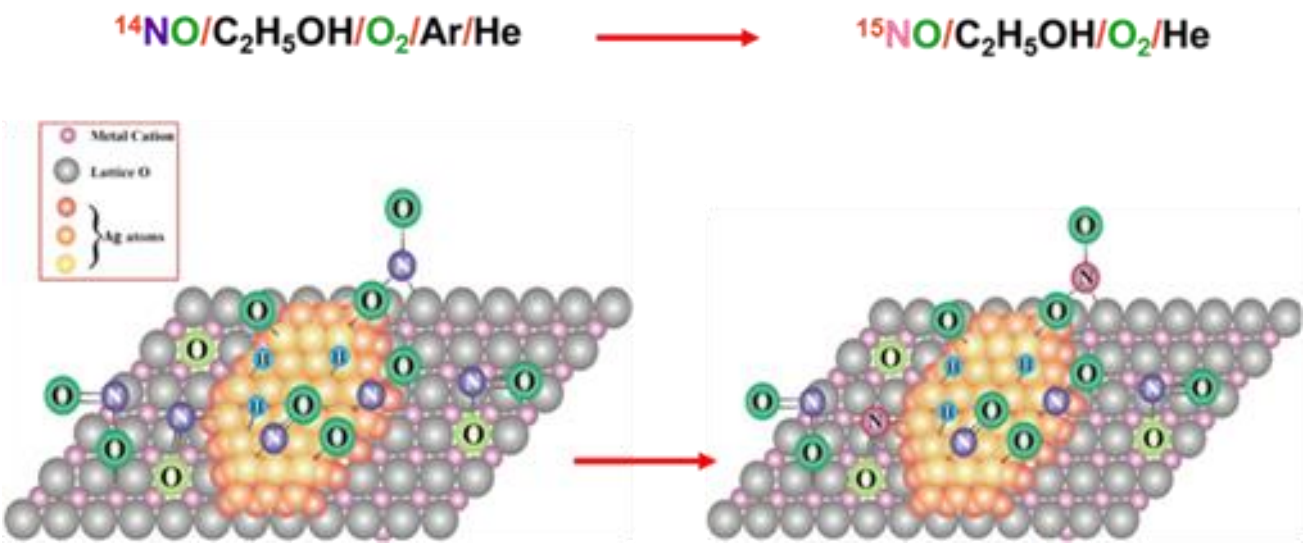


Custom designed ink-jet printer for catalytic materials printing (top) and schematic representation of the printing process (bottom).

In particular, our work concerns catalytic, kinetic, characterization and mechanistic studies, including the application of novel transient (TPD, TPSR, TPO and TPH) and isotopic techniques (SSITKA) for the elucidation of the mechanism of catalytic reactions (at a molecular level), utilizing the cutting-edge instrumentation that is available at the Lab of Environmental Catalysis.

The Lab of Environmental Catalysis participates in numerous EU-funded and national research projects since its foundation. The lab has been able to attract more than 2 million euro of external funding during the 8 years of its operation. Are senior lab staff are members of international associations and networks such as the European Federation of Catalysis Societies (EFCATS), the International Water Association (IWA), the International Solid Waste Association (ISWA) and Waste-to-Energy Research and Technology Council (WTERT).

Our network of academic collaborators extends globally, including partners (universities and research institutes) from Spain, Italy, France, Greece, UK, Germany, Slovenia, Latvia, Russia, Israel, Jordan and the USA. In addition, our network of cooperation includes a large number of industrial collaborators such as Linde Engineering AG (Germany-License Agreement), Wartzila (Finland – Research Cooperation), Heraeus Holding GmbH (Germany-License Agreement) and Ricardo Engineering (UK - Research Cooperation).



Schematic representation of the Steady-State Isotopic Transient Kinetic Analysis (SSITKA) technique, used for the elucidation of the mechanism of catalytic reactions.

Selected publications

Savva P.G. and Costa C.N. (2011), Hydrogen Lean DeNOx as an Alternative to the Ammonia and Hydrocarbon Selective Catalytic Reduction (SCR), Catalysis Reviews, 53/2, 91.

Valanidou L. and Costa C.N. (2011), A Highly Active, Selective and Stable Ag/Mg-Ce-Al-O Catalyst for the NO/C2H5OH/O2 Reaction, Appl. Catal. B: Environmental, 107, 164-176.

Theologides C.P., Olympiou G.G., Savva P.G., Pantelidou N.A., Constantinou B.K., Chatziiona V.K., Valanidou L.Y., Piskopianou C.T. and Costa C.N. (2014), Novel Catalytic and Mechanistic Studies on Wastewater Denitrification with Hydrogen, Water Science and Technology, 69(3), 680-686.

Babatsouli P., Palogos I., Michalodimitraki E., Costa C. and Kalogerakis N. (2015), Evaluation of a MBR Pilot Treating Industrial Wastewater with a High COD/N Ratio, Journal of Chemical Technology and Biotechnology, 90(1), 26-33.

Research Group on Energy and Environmental Economics and Policy (3EP)

Head:	Theodoros Zachariadis, Associate Professor
Team:	Dr. Apostolos Michopoulos, Dr. Adamos Adamou, Vasiliki Voulgari, Isidoros Ziogou, Kyriakos Sialis, Costas Hadjikyriakou
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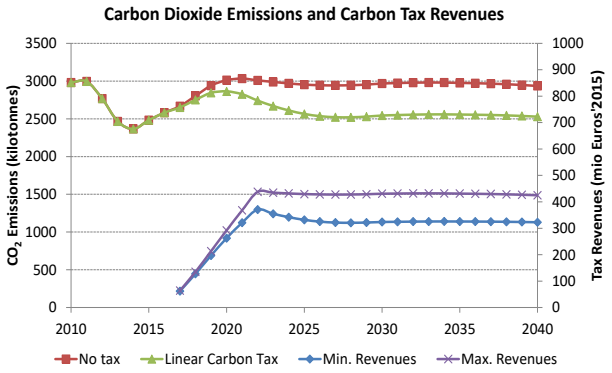
Energy and environmental policy research, in Europe and around the world, is at a crossroads. It becomes increasingly evident that interdisciplinary approaches are required in order to assist governments and societies in making informed decisions to meet the global challenge for environmentally and socially sustainable economic development. Purely technological or purely economic approaches are useful but have clear limitations. Policy analysis in a globalised world can become realistic and meaningful if it takes into account knowledge from both natural sciences / engineering and socio-economic sciences.



Evolution of CO_2 emissions in Cyprus with and without enforcement of a carbon tax on the sectors that are not subject to the EU Emissions Trading System. The potential range of net government revenues is also shown.

Our research group performs policy analyses of energy and environmental issues in an essentially interdisciplinary manner. Its staff and collaborators comprise engineers, economists, physicists, hydrologists and climate modellers. Through our work we try to answer questions on:

- The trade-offs of policy instruments for decarbonising European road transport;
- Environmental tax reforms and their contribution to economic welfare;
- The optimal combination of conventional and renewable energy technologies for an environmentally sustainable buildings sector;
- The economic impacts of climate change and, more broadly, the real costs of unsustainable development and what combination of technological incentives and market-based instruments can help change path in an economy;
- The optimal energy mix for Cyprus and the associated costs of attaining it in a carbon-constrained world.

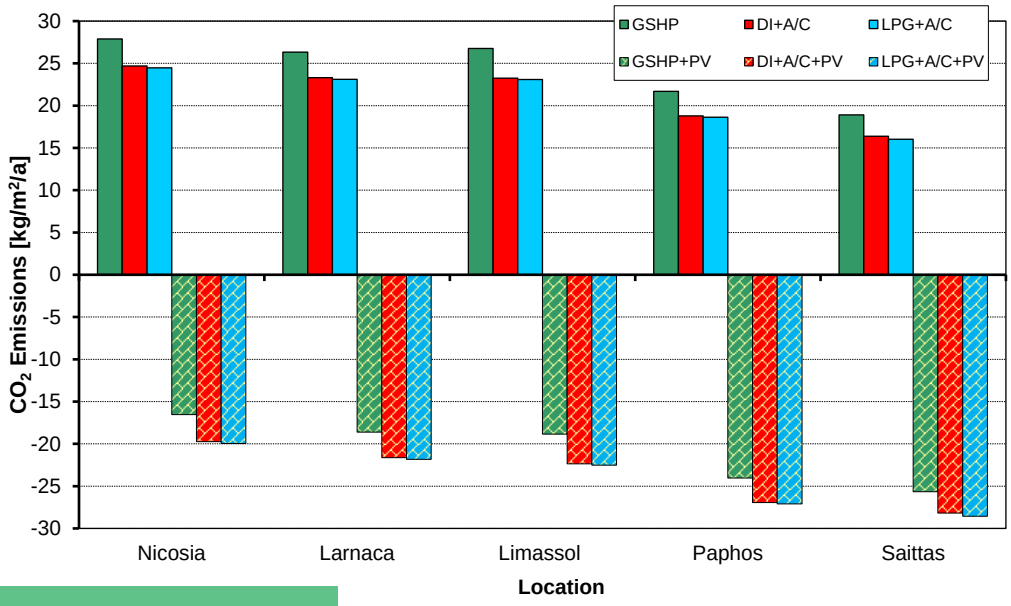
We participate in numerous national and EU-funded research projects and are members of international associations and networks such as the European Association of Environmental and Resource Economists, the International Association for Energy Economics and the European Technology Platform on Renewable Heating & Cooling (RHC-Platform).

We advise the government of Cyprus on their long-term Renewable Energy and Energy Efficiency Action Plans, the economic impacts of climate change and cost-effective national water management strategies. We have been collaborating with the International Renewable Energy Agency (IRENA) and the German Organisation for International Cooperation (GIZ) in order to provide long-term analyses of the energy

system of Cyprus and the potential for energy efficiency improvements and decarbonisation options.

Another current topic of interest is urban energy and environmental modelling. Cities account for 72% of European population, and urban activities are major contributors to air pollution and climate change, while at the same time cities are extremely vulnerable to impacts from such environmental issues. At the same time, urban areas are growing worldwide because they are centres of economic activity and offer their residents opportunities for a better life. Based on our experience in energy modelling of buildings and transport modes, we collaborate with experts across several disciplines (civil, electrical and mechanical engineering, urban planning and economics) in order to identify technological and policy options for the transition to environmentally, economically and socially sustainable cities.

In the broader field of economic and environmental policy, we participate in the board of Green Budget Europe, a Brussels-based expert platform on environmental fiscal reforms. In 2015 we formulated a concrete proposal to the Cyprus Ministry of Finance for a Green Tax Reform, underlining that the recent economic crisis of Cyprus offers a great opportunity to reconcile economic growth and job creation with environmental protection. Environmental taxes are less detrimental to employment and growth than other direct and indirect taxes, hence we proposed a reform that would reduce social security contributions and implement a carbon tax and other environmental charges. Our proposal is in line with recommendations from the European Commission and the International Monetary Fund, and is under consideration by the Finance Ministry of Cyprus.



Direct and indirect carbon emissions from a multi-family building with different heating and cooling system configurations.

Selected publications

Adamou A., Clerides S. and Zachariadis T. (2014), Welfare Implications of Automobile Feebates: A Simulation Analysis. The Economic Journal, 124, 420-443.

Zachariadis T. and Taibi E. (2015), Exploring Drivers of Energy Demand in Cyprus – Scenarios and Policy Options. Energy Policy, 86,166–175.

Michopoulos A., Tsikaloudaki A., Voulgari V. and Zachariadis T. (2016), Evaluation of ground source heat pump systems for residential buildings in warm climates. Energy Efficiency, doi: 10.1007/s12053-016-9431-1.

Zachariadis T. (2016), After 'dieselgate': Regulations or economic incentives for a successful environmental policy? Atmospheric Environment, 138, 1-3.

Sustainable Energy Laboratory (SEL)

Academics: Alexandros G. Charalambides, Assistant Professor
Stylianos Yiatros, Assistant Professor

Team: Dr Olympia Nisiforou, Dr Rogiros Tapakis, Ioannis Kourouklides, Chryso Chatzinikola, Stefani Peratikou

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The research work/interests of the Sustainable Energy Laboratory (SEL) lie primarily in three main areas: (a) the effect of cloud presence on energy production from solar systems, (b) the fabrication, combustion and emission characteristics of novel green fuels and (c) on the social aspect of promoting the use of renewable energy and energy saving. Furthermore, the staff members of SEL are actively involved in entrepreneurship, aiming to bring research outcomes to life, through the formation of Start-ups. Over the last five years, the staff of SEL was able to attract more than 15 research projects totalling to about €2,000,000 in funding in the following research areas:

Solar Energy Predictions

One of the major problems of meteorological forecasts, is the low temporal and spatial resolution of solar irradiance forecasts, which are unable to estimate the sudden fluctuations of irradiance over a specific relatively small area, caused by clouds obscuring the sun. So far, traditional approaches regarding forecasting of the state of the sky or incident solar irradiance have been developed using either meteorological data from satellite imagery or specialised equipment. The use of meteorological data cannot give the desired results as it would be required to use real time images from geostationary satellites to cover a specific area. Apart from the high cost of the data, satellite images have very low temporal (~30 min) and temporal (1km2) resolution which are inadequate for accurate forecasting. Alternatively, incident solar irradiance and cloud/dust motion measurements could be forecasted using accurate specialised equipment such as a grid of ground based cameras or irradiance sensors to record the state of the sky. Contrary to existing methodologies, SEL is working on a novel, innovative approach in nowcasting the state of the sky and incident solar irradiance using data from the metering systems of grid connected PVs, without the necessity of using additional equipment. A dense network of PVs providing continuous data will enable very high temporal and spatial resolution of forecasts. However, due to the nature of clouds, the nowcasting horizon will be intra hour (1-60 minutes).

EnergyLab

Wastewater treatment using Macroalgae

There is a need for new, state-of-the-art waste management systems that make animal operations economically viable and

environmentally friendly. The farmers have an obligation to ensure that agricultural wastes will not cause pollution to the environment or harm to human health. SEL staff are developing a seaweed-based filtration system for the secondary treatment of livestock wastewater streams, while at the same time generate bioproducts (biofuels, bioplastic, etc) from the excess biomass.

Energy Efficient Buildings

One of the projects of SEL is ENERFUND, funded by the European Union's Horizon 2020 programme and poses itself the ambitious objective to enhance funding investments for deep renovation of buildings, working on three components: public awareness and trust, funding schemes and incentives and trustworthy retrofitting opportunities.

Entrepreneurship

Over the last 3 years, Drs Charalambides and Yiatros have been involved in ClimateLaunchpad, the world's largest green ideas competition organised by Climate-KIC, funded by the European Institute of Innovation & Technology. Furthermore, Dr Charalambides is an MIT Disciplined Entrepreneurship Certified Trainer, while both of them are familiar in delivering courses based on the Business Model Canvas.

Cultivation of *Ulva lactuca, Padina pavonica, Jania rubens* and *Cystoseira compressa*

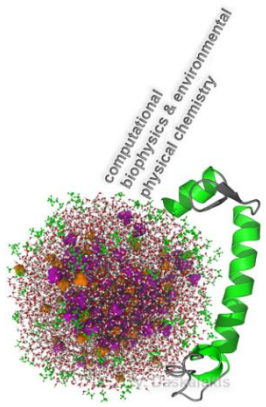
Selected publications

Kountouriotis A., Aleiferis P.G. and Charalambides A.G. (2014), Numerical Investigation of VOC Levels in the Area of Petrol Stations, Science of the Total Environment,. 470-471, 1205-1224.

Tapakis R. and Charalambides A.G. (2013), Equipment and Methodologies for Cloud Detection and Classification: A review, Solar Energy, 95, 392-430.

Research Group on Computational Environmental Modeling (CEM)

Head:	Vangelis Daskalakis, Assistant Professor
Team:	Mrs. Anastasia Salameh, Mr. Sotirios Papadatos (Ph.D candidates)
Webpage:	*www.cut.ac.cy/est/staff/evangelos.daskalakis/?languageId=2*



Computer simulations of atmospheric particles or biomolecular systems have grown rapidly in the last decades. This is mainly due to the increase in the available computational power that has enabled the researchers to pass from systems of a few atoms, to large protein complexes in a solvated environment. Molecular Dynamics (MD) has become an important research methodology when one wants to probe such systems at the atomic scale with an increasing number of degrees of freedom. All atom MD Simulations employ classical and statistical mechanics based on the Newtonian Equations of motion from microscopic properties to the macroscopic picture of a system. Thus, the structure and dynamics of molecular systems are revealed in microscopic detail. Combined with *ab initio* methods, based on quantum chemistry, the MD methodology has allowed the accurate description of the abundant liquid water in atmospheric particles (*Sci Rep* 2015, 5:14358), as well as the study of protein activity (*J Chem Theory Comput* 2015, 11:5897-5905).

Our research group focuses on computational studies of small gaseous or large biological molecules involved in processes of environmental and biological significance. As such, one can consider Ice Nucleation (IN), New Particle Formation (NPF) and Cloud Condensation Nuclei (CCN) formation in the Atmosphere. On the other hand, the biophysics behind the functionality of heme proteins and the plant photoprotection process are highly relevant to a changing climate in terms of biosensor development and production of tolerant plants. The lab's computational cluster consists of 7 rack servers of 12-cores at 2.66GHz, 32GB RAM per server, running in parallel.

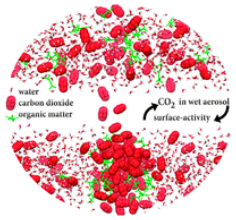
The numerical methodologies – empirical and ab initio – employed in our research group have also made extensive use of the High Performance Computing (HPC) Cy-Tera facilities at the Cyprus Institute (CyI), in nine projects since 2012 (2.5bn core-hours). Access has also been granted to the HPC PRACE facilities at Salomon/ Czechia, at the National Supercomputing Center of the Technical University of Ostrava (2.3bn job-hours). These projects have become fruitful with publications in peer-reviewed journals or international conferences: 79th Harden Conference, Austria 2016; New Biological Frontier, Taiwan 2015; IGACGP-IGAC on Atmospheric Chemistry, Brazil 2014.

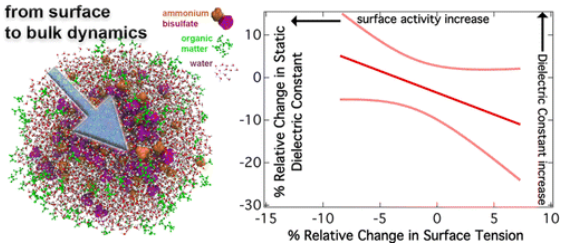
Research in our group is multi-disciplinary, from Atmospheric Physical Chemistry, to Computational Biophysics related to the Environmental Science. From selected research projects, we report herein some results in detail:

– **Organic matter (OM) uptake in cloud droplets** produces water-soluble secondary organic aerosols (SOA) via aqueous chemistry. These play a significant role in aerosol properties. We have reported the effects of OM uptake in wet aerosols, in terms of the dissolved-to-gas carbon dioxide nucleation using MD simulations. Carbon dioxide has been implicated in the natural rainwater as well as seawater acidity. Variability of the cloud and raindrop pH is assumed in space

and time, as regional emissions, local human activities and geophysical characteristics differ. Based on the MD simulations we proposed that the presence of surface-active OM promotes the dissolved-to-gas carbon dioxide nucleation in wet aerosols, even at low temperatures, strongly decreasing carbon dioxide solubility.

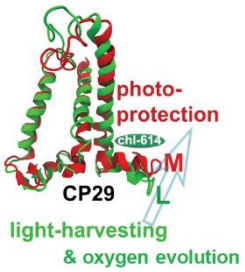
– **The properties of the liquid− gas interface** in the presence of surface-active organic matter, and the bulk response to changes of the resulting surface tension are key factors in assessing cloud microphysics or condensation/ evaporation dynamics for atmospheric particles. A fundamental question rises on how we can induce changes in the bulk of





an aquatic droplet by varying its surface-activity. The challenging aspect of answering such a question arises from the fact that water exerts complexity in its interactions giving rise to many anomalous properties. In a recent study, we employ MD simulations on salty aquatic droplets, associated with NPF in the atmosphere. We have presented a correlation between surface tension and a bulk property like the static dielectric constant, which is closely related to the water activity in Köhler theory of droplet formation and growth. We thus have correlated surface to bulk properties. A very useful result of our study is that surface-active organic matter on the surface of a salty droplet can alter the solvent properties of water in terms of water orientation/water activity measured by the static dielectric constant in the bulk.

– **Photosystem II (PSII)** is known as the "engine of life" on earth. Photosynthetic antenna complexes of higher plants absorb photons, for photochemical utilization and they rapidly switch into a more dissipating state (energy trap), which safely converts excess energy into heat. The elucidation of the protein conformational changes upon this switch are vital in understanding the main photoprotective mechanism in plants. The identification of key components of a central mechanism that regulates the balance between photosynthesis, and photoprotection can provide a basis for biochemistry that increase our understanding regarding plant sensitivity to stress. On this line, we have employed the MD methodology for the CP29 minor Light harvesting Complex (LHC) from spinach. The associated protein conformational changes have revealed a sensitive domain and a potential Non Photochemical Quenching (NPQ) pathway.



Selected publications

Salameh A., Vorka F. and Daskalakis V. (2016), Correlation between surface tension and the bulk dynamics in salty atmospheric aquatic droplets. Journal of Physical Chemistry C, 120(21), 11508-11518.

Daskalakis V., Charalambous F., Demetriou C. and Georgiou G. (2015), Surface-active organic matter induces salt morphology transitions during new atmospheric particle formation and growth. RSC Advances, 5(78), 63240-63251.

Daskalakis V., Charalambous F., Panagiotou F. and Nearchou I. (2014), Effects of surface-active organic matter on carbon dioxide nucleation in atmospheric wet aerosols: A molecular dynamics study. Physical Chemistry Chemical Physics, 16(43), 23723-23734.

Daskalakis V. and Hadjicharalambous M. (2014), Hexagonal ice stability and growth in the presence of glyoxal and secondary organic aerosols. Physical Chemistry Chemical Physics, 16(33), 17799-17810.

Ioannidis N.E., Papadatos S. and Daskalakis V. (2016), Energising the light harvesting antenna: Insight from CP29. Biochimica et Biophysica Acta (BBA) - Bioenergetics, 1857, 1643-1650.

Environmental Bioprocessing Group

Head: Michalis Koutinas, Assistant Professor

Team: Maria Patsalou, Chrystalleni Yiangou, Stella Parmaki, Katerina Ioannou, Eftychia Makri, Valentinos Andreou, Eleni Kyriakou

Petrochemical processes have provided low cost production routes for fuels, plastics, and chemicals for over 50 years. Nevertheless, the escalating impact on the environment and the inevitable depletion of fossil feedstocks make it essential that benign, sustainable alternatives be developed commercially in a cost-effective and expedited manner. Biomass-based industrial waste streams could be regarded as sustainable feedstocks for the development of a new industrial sector that integrates chemical and material production into existing industries.

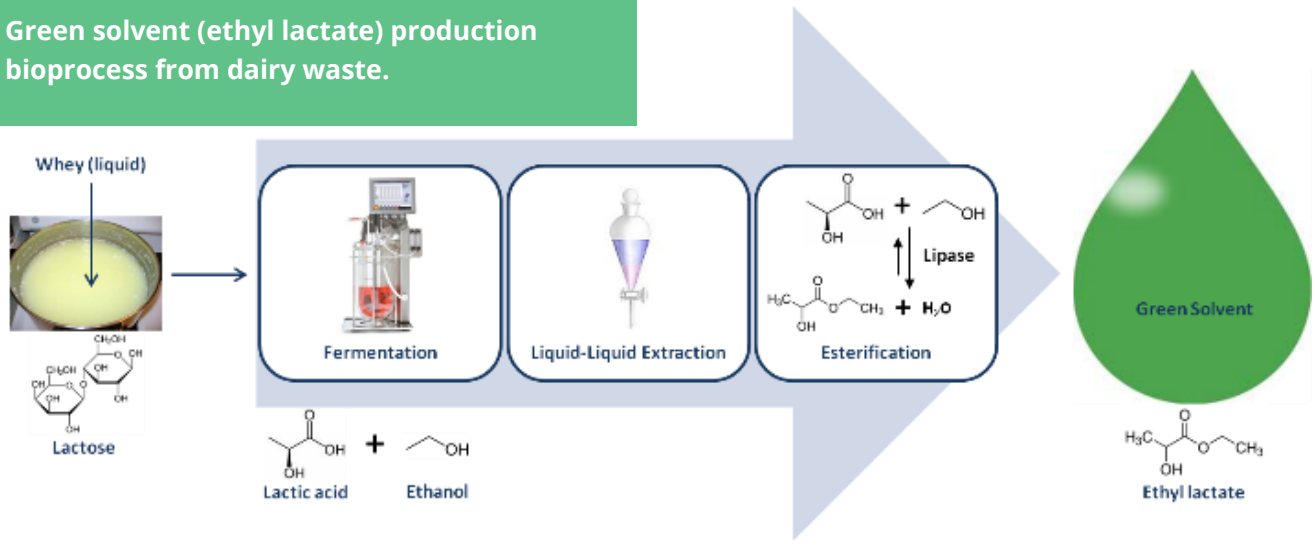
Our group applies systems engineering and advanced experimental techniques in order to provide solutions to important biological problems. Our interests are in line with EU priorities for waste and natural resources, focusing on the following areas:

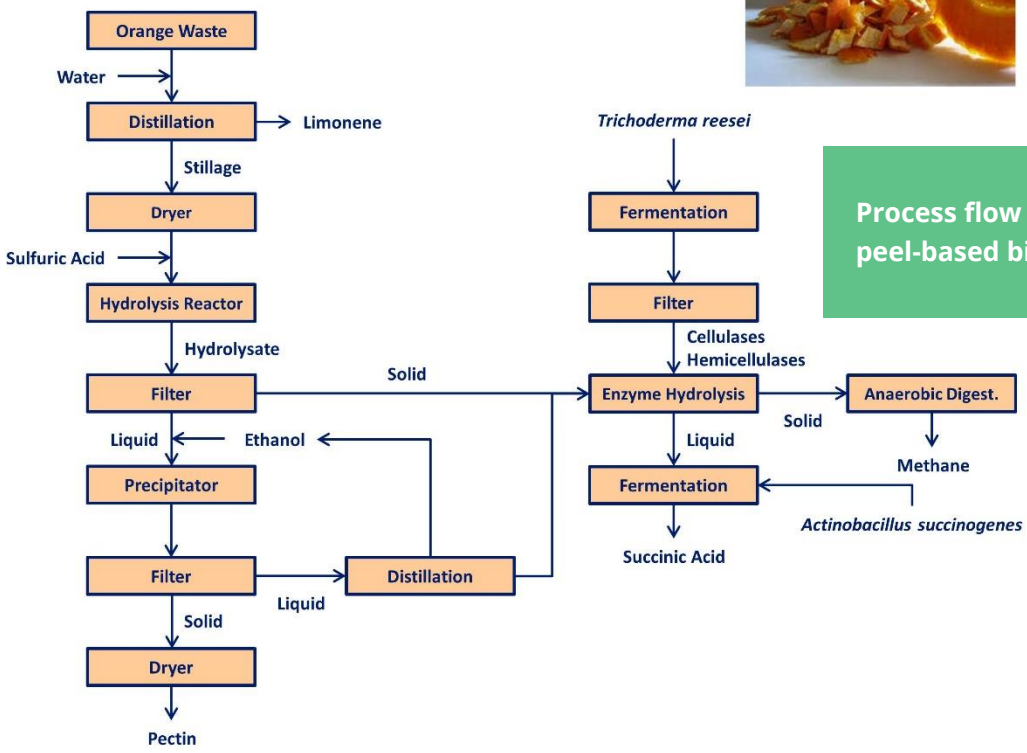
- Biotechnological applications for the production of added-value chemicals, biomaterials and biofuels from waste;
- Application of biological systems for the treatment of toxic and persistent pollutants from wastewater as well as the treatment of solid waste emitted from natural gas drillings;
- Development of mathematical models for understanding specific metabolic properties of the strains employed and the function of the bioprocess applied;
- Utilisation of advanced molecular techniques for detecting specific microbial strains used in applied bioprocesses and quantification of important metabolic properties;

We participate in industrially and EU-funded research projects and are members of international associations and networks including the International Forum on Industrial Bioprocesses (IFIBiop) and COST Action TD1203 “Food Waste Valorisation for Sustainable Chemicals, Materials and Fuels (EUBis)”.

Current research at the Environmental Bioprocessing Lab is evaluating the potential of a

Green solvent (ethyl lactate) production bioprocess from dairy waste.





Process flow sheet of the orange peel-based biorefinery.

bioprocess for the production of green solvents from naturally derived feedstocks. The concept is based on fermenting the organic content of a renewable resource into the targeted alcohol and acid, transfer of the two intermediate products into a suitable solvent via liquid-liquid extraction and esterification into the desired ester employing lipases. We have exemplified this idea through effective production of ethyl lactate from cheese whey.

Another topic of interest involves the development of a citrus peel-based biorefinery for the production of succinic acid, d-limonene, pectin and biogas. Distillation is initially employed for d-limonene extraction, followed by acid hydrolysis and precipitation for pectin isolation, while enzyme hydrolysis of the cellulosic content is conducted to form a sugar rich media employed in succinic acid fermentations. The remaining organic content is fed into an anaerobic digester to produce biogas, targeting a zero-waste process.

In the broader field of environmental biotechnology and sustainable biorefineries, we participate in a Water Joint Programming Initiative targeting the valorisation of food wastewater containing alkaloids for the production of added-value products, as well as in an industrial project concerned with bioremediation of solid waste emitted from the exploration of natural gas in Cyprus.

Selected publications

Koutinas M., Patsalou M., Stavrinou S. et al. (2016), High temperature alcoholic fermentation of orange peel by the newly isolated thermotolerant *Pichia kudriavzevii* KVMP10. Letters in Applied Microbiology, 62, 75-83.

Koutinas M., Menelaou M. and Nicolaou E.N. (2014), Development of a hybrid fermentation-enzymatic bioprocess for the production of ethyl lactate from dairy waste. Bioresource Technology, 165, 343-349.

Koutinas M., Kiparissides A., Silva-Rocha R. et al. (2011), Linking genes to microbial growth kinetics – an integrated biochemical systems engineering approach. Metabolic Engineering, 13, 401-413.

Head: Ioannis Vyrides, Assistant Professor

Team: PhD students: Efi Drakou, Panagiotis Charalambous. Researcher: Nasia Kafa.

Msc Students: Stavros Ioannou, Rafaela Constantinou. Bsc Students: Christos Giakoumis, Irena Kyprianidou, Stefani Ioannou, Evagelia Panagiotou

Webpage: *www.facebook.com/Environmental-Engineering-Lab-Cyprus-University-of-Technology-169868080059059/info/?tab=overview*

Anaerobic digestion (AD) is one of the most promising biotechnologies for converting diverse organic substrates, ranging from high solid feedstocks as well as municipal and industrial wastewaters, to energy-rich biogas. Over 14,000 commercial AD plants are already in operation in Europe, while Germany alone has more than 8000 plants. The produced biogas is used for combined heat and power (CHP) generation, and/or upgraded to biomethane to be used as transportation fuels, or injected into natural gas grid. Using biogas for CHP generation or transportation fuels is a well-established process in developed countries. However, producing biogas alone might not be economically competitive, especially due to the volatility of market and price indexes of fossil fuels. One approach to expand AD application is to identify and explore alternative products/chemicals apart from bioenergy production by adopting the biorefinery approach. Based on the anaerobic digestion biorefinery concept (Figure 1) our research was separated in 4 domains:

A) Anaerobic digestion process and novel strategies to increase methane production.

A1) Use of compatible solutes in addition to Anaerobic Digestion as a novel strategy to alleviate environmental stress. One fundamental strategy for cells to survive under osmotic and other environmental stresses is by accumulation of organic solutes called "compatible solutes". The high external osmotic pressure is balanced within

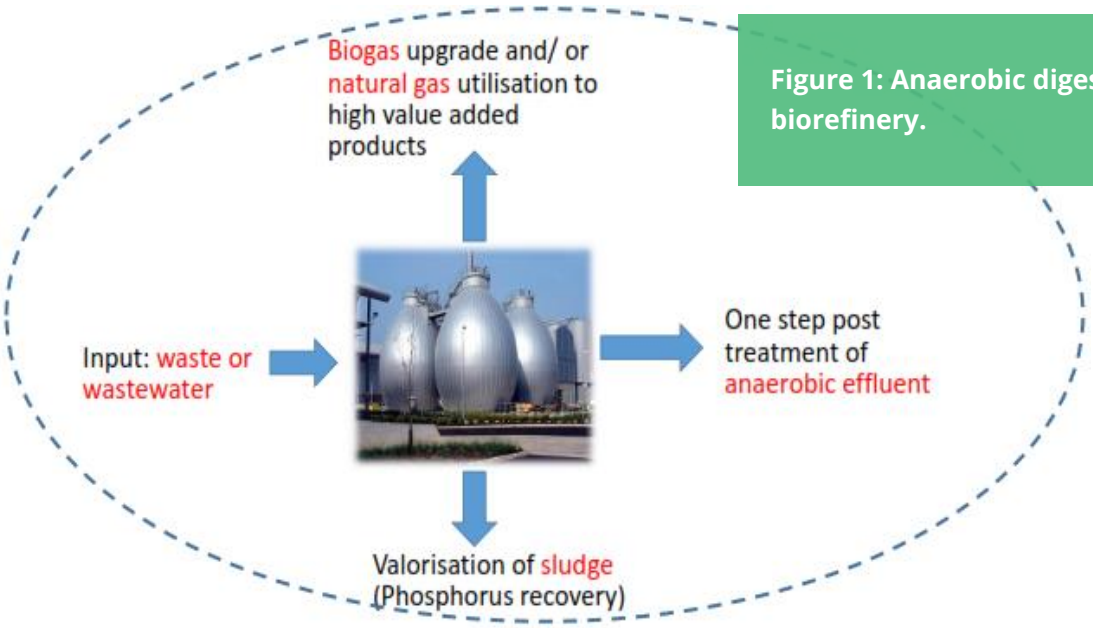


Figure 1: Anaerobic digestion biorefinery.

the cytoplasm by organic compatible solutes without the need for special adaptation of the intracellular enzymes. Based on this cell mechanism, we found that exogenous addition of compatible solutes in anaerobic biomass and inside the bioreactor significantly increases its performance under stress conditions.

A2) Bioaugmentation with isolated strains at anaerobic digester in order to increase the biodegradation of recalcitrant waste such as bilge and dairy wastewater.

A3) Direct interspecies electron transfer (DIET) via conductive materials can provide significant benefits to anaerobic methane formation in terms of production amount and rate. We examine new conductive materials and we study fundamentals aspect regarding the electron flow and microbial diversity as well as the performance of this at various wastewater.

B) Extraction of high value added products from anaerobic digester sludge. In several European countries anaerobic digestate has been used in agriculture as a fertilizer. There are however, several factors restricting this option such as undesirable substances to sludge (heavy metals, pathogens and organic pollutants) which potentially pass on food-chain. As a result, the treatment of sludge and the extraction of high value added product from sludge is a top priority.

B1) We investigated the use of selected microbial consortium such as acidophilic or sulphate reducing bacteria for phosphorous recovery from sludge. Moreover, we examined low cost absorbing material for phosphorous recovery from the extracted effluent.

B2) In addition, we examined the feasibility of metals extraction from sludge and investigated several metal recovery technologies.

C) To upgrade biogas and or conversion to high value added products

C1) Biogas upgrading by hydrogen utilization using hydrogenotrophic methanotrophs. During this process, additional H2 is provided in the anaerobic bioreactor and this is consumed by the hydrogenotrophic methanogens and results in higher CH4 in the biogas. This novel technology can offer a solution to the storage problem of renewable energy produced by solar and wind technologies.

The renewable energy can be converted to H2 by electrolysis and this can be inserted into an anaerobic bioreactor.

C2) Conversion of biogas and/ or natural gas to liquid fuels or high added value products. Methane serves as a carbon and energy source for a group of aerobic bacteria known as methanotrophs. There are many potential products that could be generated by such as methanol, biopolymers, surface layers, lipids, methanol, organic acids, ectoine and vitamin B12.

D) The effluent from anaerobic digester contains high concentration of ammonia and phosphorous. We investigated various biological process for the one step treatment of this stream such as simultaneous aerobic heterotrophic nitrification denitrification.

Selected publications

Theofanous E., Kythreotou N., Panayiotou G., Florides G., and Vyrides I. (2014), Energy production from piggery waste using anaerobic digestion: current status and potential in Cyprus. Renewable Energy, 71, 263-270.

Nicolaidis C. and Vyrides I. (2014), Closing the water cycle for industrial laundries: An operational performance and techno-economic evaluation of a full-scale membrane bioreactor system. Resources, Conservation and Recycling, 92, 128-135.

Xenofontos E., Tanase A. M., Stoica I. and Vyrides I. (2016), Newly isolated alkalophilic Advenella species bioaugmented in activated sludge for high p-cresol removal. New biotechnology, 33(2), 305-310.

Water Treatment Laboratory (AQUA)

Head: Maria G. Antoniou, Assistant Professor

Team: Dr. Theodora Fotiou, Nikoletta Tsiarta, Elena Nikolaou, Iosef Boraei, Miltiadis Samanis, Socratis Fotiou, Danae Pantelidou

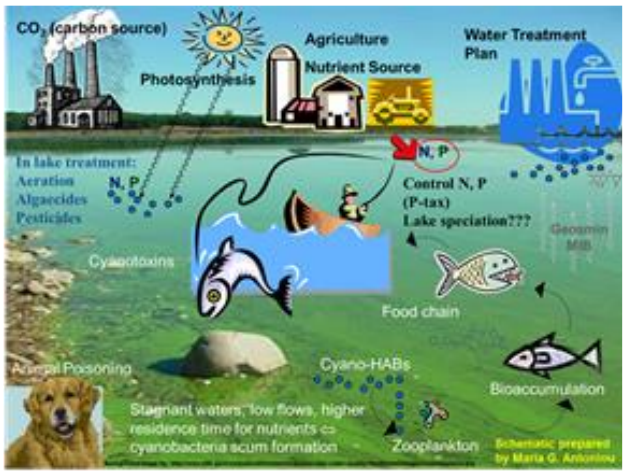
Webpage: *WTL-AQUA.weebly.com*

Worldwide water shortage increase and water quality depletion from microbial and chemical compounds, pose significant challenges for today's water treatment industry. Emerging contaminants (ECs) like pesticides, hormones, medical drugs, as well as naturally occurring toxic metabolites, detected at trace concentrations, necessitate treatment and are currently found in monitoring lists of Environmental Agencies worldwide. To adequately address this problem research efforts are currently focusing both on the development of new advanced oxidation technologies, but also the enhancement of existing conventional technologies.

The Water Treatment Laboratory- AQUA research group of CUT engages in activities that seek to provide solutions for ECs removal at source or during water treatment. Recently, AQUA has started recording the effects of ECs in agriculture and specifically on hydroponically grown crops in collaboration with the Hydro-Aromatic Plants of CUT. The majority of group's research activities focus on monitoring, analysis, and treatment of cyanobacterial contaminated water and the toxic metabolites they release (cyanotoxins).

Cyanobacteria (blue-green algae) are phototrophic microorganisms and represent an essential component of the food web in all aquatic ecosystems. However, certain strains form cyanobacteria harmful algal blooms (Cyano-HABs) which directly affect water quality by producing undesirable color, taste, odor and by releasing harmful cyanotoxins into the water. Human activities (i.e., sewer runoffs, overuse of fertilizers) and global warming have resulted in an increasing prevalence and persistence of Cyano-HABs globally. Cyano-HABs in Lake Taihu in China, (2007) and Lake Erie in USA (2014) have forced restrictions on water availability for more than 2 million people combined. Cyanotoxins are categorized based their chemical structure into cyclic peptides, alkaloids and lipopolysaccharides (LPS). Their physical-chemical properties and toxicity vary based on their structure. Reported LD50 for cyanotoxins can be as low as 50 μg/kg and efforts are currently been made to have them included in the new Drinking Water Directive list of regulated compounds.

Figure 1: Cyanobacteria harmful algal blooms occurrence and their adverse effects in the ecosystem.



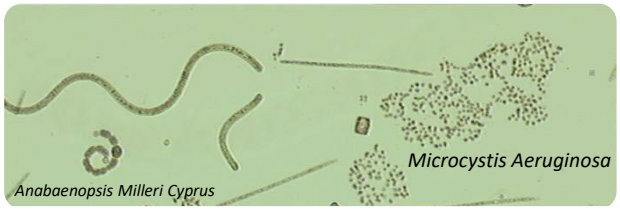
Being an active member of COST Action ES1105, CYANOCOST (Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management) has resulted in the formation of strong collaborations between AQUA and research groups in Europe as well as the USA. Current group activities related to cyano-HABs include:

- Monitoring of surface water for cyanobacteria and cyanotoxins (in collaboration with WDD and CYANOCOST).
- In-lake treatment of cyanobacteria and cyanotoxins with never before tested oxidants (in collaboration with the IBED group of the University of Amsterdam).
- Enhancement of the photocatalytic degradation of cyanotoxins with the addition of sulfate-radical generating oxidants (in collaboration with the CyanoSol group of Robert Gordon University).
- Method validation for new cyanotoxins (in collaboration with University of Wageningen).
- Monitoring the effects of cyanobacteria and cyanotoxins on hydroponically grown cultures (in collaboration with the Hydro-Aromatic Plants group of CUT).

In addition to our research activities, we advise the Water Development Department (WDD) with in-lake monitoring on the formation of cyanobacterial scum, the detection of cyanotoxins during water treatment, and practices for reducing the formation of taste and odor compounds.

AQUA has been involved in research topics including the removal of pharmaceuticals through light activation of sulfate and hydroxyl radical producing oxidants in an in-house-build collimated beam reactor, the removal of pharmaceuticals with TiO_2 photocatalysis (in collaboration with Prof. Evan's Diamadopoulos, Technical University of Crete), the removal of PAHs from different types of soil through chemical oxidation, the removal of emerging contaminants from water via peroxymonosulfate activation with various iron sources (Fe^{+2}, Fe^{+3}, ZVI) (in collaboration Dr. Sergio Rodriguez and Dr. Aurora Santos, Universidad Complutense de Madrid), and monitoring the quality of coastline waters in collaboration with Dr. George Botsaris (Department of Agricultural Sciences, Biotechnology and Food Science, CUT) and the Public Health Services of Limassol Municipality, and Department of Fisheries and Marine Research.

Figure 2: Cyanobacteria species in the Polemidia Dam (Limassol District).



Selected publications

Antoniou M.G. et. al., Photocatalytic Degradation of Organic Contaminants in Water: Process optimization and degradation pathways, Photocatalysis: Applications. Edited by Dionysios D. Dionysiou, Junhua Ye,Jenny Scheider, Gianluca Li, Puma, Detlef W. Bahnemann. Published 2016 The Royal Society of Chemistry, Energy and Environment Series. doi: 10.1039/9781782627104-00001.

Antoniou M.G, Sichel C., Andre K. and Andersen H.R. Novel pre-treatments to control bromate formation during ozonation. Journal of Hazardous Materials, 2016, doi: 10.1016/j.jhazmat.2016.03.041.

Faassen E.J., Antoniou M.G. et al. (2016), A collaborative evaluation of LC-MS/MS based methods for BMAA analysis: Soluble bound BMAA found to be an important fraction. Marine Drugs, 14(3), 45.

Research Area: Hydrogen Production & Use in Internal Combustion Engines

Head: Dr. Petros G. Savva, Special Teaching Staff

1. Scope of Research Activity

The scope of the research performed concerns the production of hydrogen (H_2) via electrolysis and further use as a fuel additive for the reduction of fossil fuel consumption in Internal Combustion Engines (ICE). The ICE performance as well as its gaseous emissions were also studied.

2. Experimental

A fully operational H2 production engine has been developed and implemented on various stationary power generators (40, 300, 400 and 1707.7 HP) and boilers (7655 kW – producing 1t of vapor/h) in Cyprus. The specific end-of-pipe technology requires no modifications or interventions on the engine as the feed stream is added to the air supply of the engine. The feed stream that is led to the engine consists of a mixture of hydrogen, air and fuel. It is also known that hydrogen combustion produces 121 kJ/g energy while petroleum 45.4 kJ/g. At the same RPM, the engine produces more torque from less hydrocarbon fuel. More torque from less fuel at the same engine speeds verifies that higher pressure from a faster burn, acting through a longer effective power stroke, produces more torque and more work from less fuel. It is important to note that hydrogen is produced on site (via electrolysis) and used immediately in the combustion process without storage needs (hydrogen on demand). Combustion of hydrogen produces only water thus contributing to the reduction of emissions of CO, CO_2, PM and HC because the amount of gasoline used is reduced. Emissions are further reduced because of the improved combustion of gasoline, which is due to the presence of hydrogen in the cylinder. Reducing HC, PM and CO causes a slight rise in the production of CO_2, but as less fuel is used, the actual concentration of CO_2 in the exhaust is lower. Moreover, flame initiation is enhanced and hence flame propagation reduces ignition delay and combustion period in both compression ignition and spark ignition engines. The chain reaction initiated by hydrogen and oxygen causes a simultaneous ignition of all primary fuel. As it all ignites at once, no flame front exists and hence there is no pressure wave to create knock. Better combustion also leads to reduced carbon build-up in the engine, thus extending engine lifetime.

3. Results

The results of the aforementioned experiments showed a significant reduction of fuel consumption (20-40%) and greenhouse gas emissions (10-40%), while the performance of all ICE was enhanced. Experiments have been also performed in the presence of biofuel in the fuel stream (20%), reducing fuel consumption further. The use of electricity to perform the dissociation of H2O is negligible in all experiments, while experiments are scheduled to perform electrolysis with the use of renewable energy sources.

4. Collaborations and award

This work has drawn the attention of “MAN Diesel and Turbo” in Copenhagen-Denmark, “Ricardo” UK and ALIEN Transfer Technologies, with whom confidentiality agreements have been signed and a fruitful collaboration has been built, also in view of the new EU regulations on ships concerning monitoring, reporting and verification of CO_2 emissions. The research performed concerning hydrogen production and implementation has also won the local Climate-KIC competition (2015).

Research Area: Soil Science

Head: Dr. Kostas Andreou, Special Teaching Staff

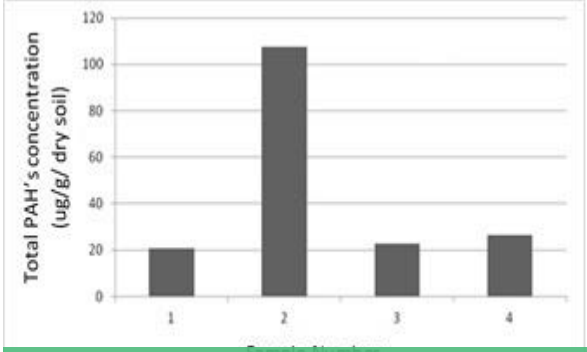
Webpage: *www.facebook.com/soilcyprus/*

Soil is an essential and non-renewable natural resource in scarcity. Human activity and natural phenomena led to soil degradation that ultimately cause the irreversible loss of the soil. However, the legislative framework in Europe regarding the protection of soil is scattered across many European Directives and national legislation. In Europe and worldwide there is now a strong movement towards the implementation of a strong legislative framework that will safeguard the soil environment.

Our research team performs research on soil related subjects addressing the following issues amongst others:

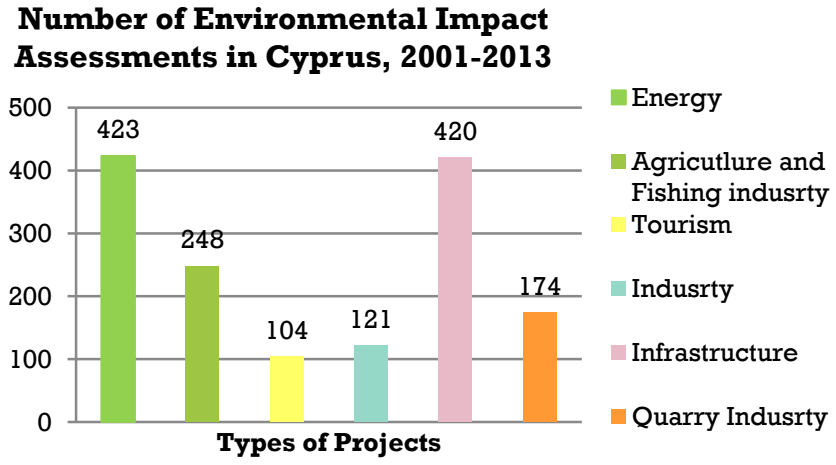
- Soil pollution and remediation technologies (ex-situ and In-situ)
- Soil in urban areas: Characteristics, Services and Problems
- Soil Organic Matter dynamics in arable land;
- Effects of desertification in Cypriot soils and their characteristics

Beyond our core research theme, another research topic of our group are Environmental Impact Assessments of various projects, plans and programmes. Environmental Impact Assessment is a useful tool for the environmental design of projects, plans, programs and even policy that is essential to the lifecycle of aforementioned actions.



Total concentration of 16 PAH's (Polycyclic Aromatic Hydrocarbons) in urban soil samples from the Nicosia area, Cyprus.

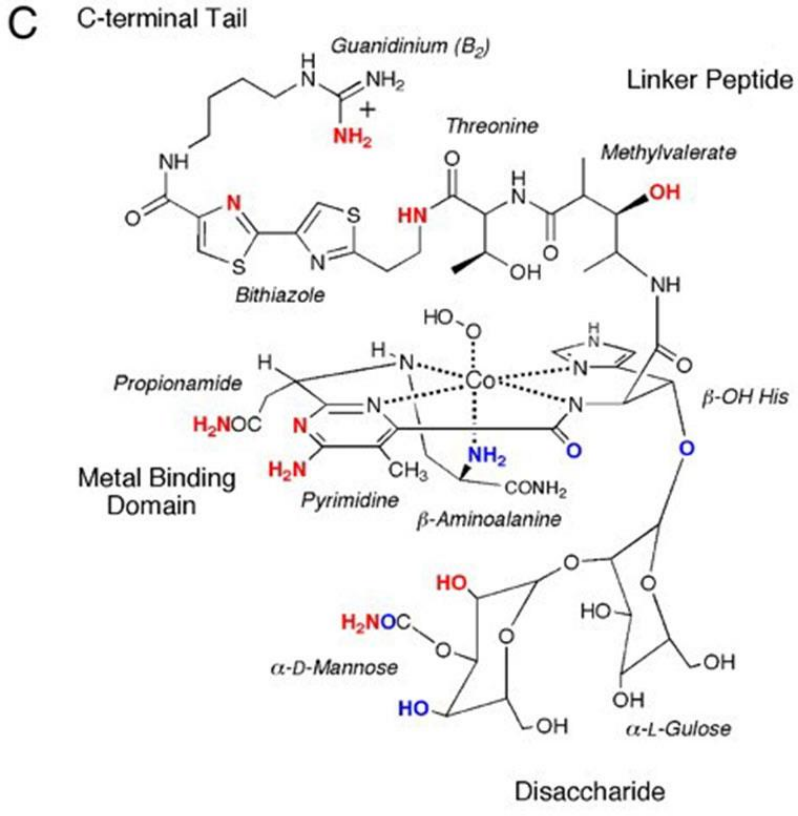
We participated in several EU-funded research projects and are members of international networks such as the Global Soil Partnership of the Food and Agriculture Organization of the United Nations. We have a close collaboration with many governmental departments and agencies in Cyprus and academic institutions abroad. We are also involved in various projects consulting local authorities, governmental and private organizations on environmental issues related to our interests.



Head: Dr. Constantinos Koutsoupakis, Special Teaching Staff

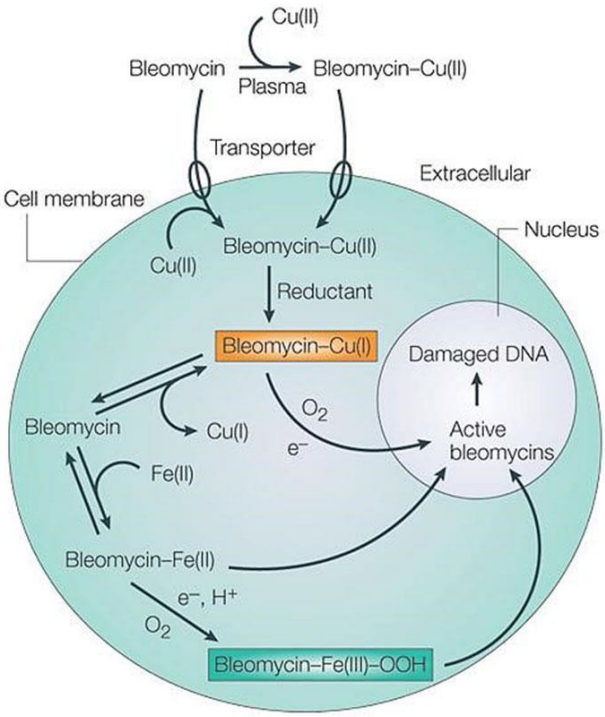
Team: Konstantina Mina, Marilena Louka, Agathangelos Christoforou

Bleomycins (BLMs, see Figure below) are a group of natural glycopeptides produced by Steptomyces verticillus that have potent antitumor activity against lymphomas, head and neck cancers and testicular cancer. The BLMs' therapeutic efficacy is proposed to be related to their ability to cause both single-stranded (ss) and double-stranded (ds) DNA damage in the presence of the required cofactors (Fe(II) or Cu(I), O_2 and a one-electron reductant) (see Figure on top of next page). The ds-DNA cleavage events have long been believed to be the major source of BLMs' cytotoxicity.



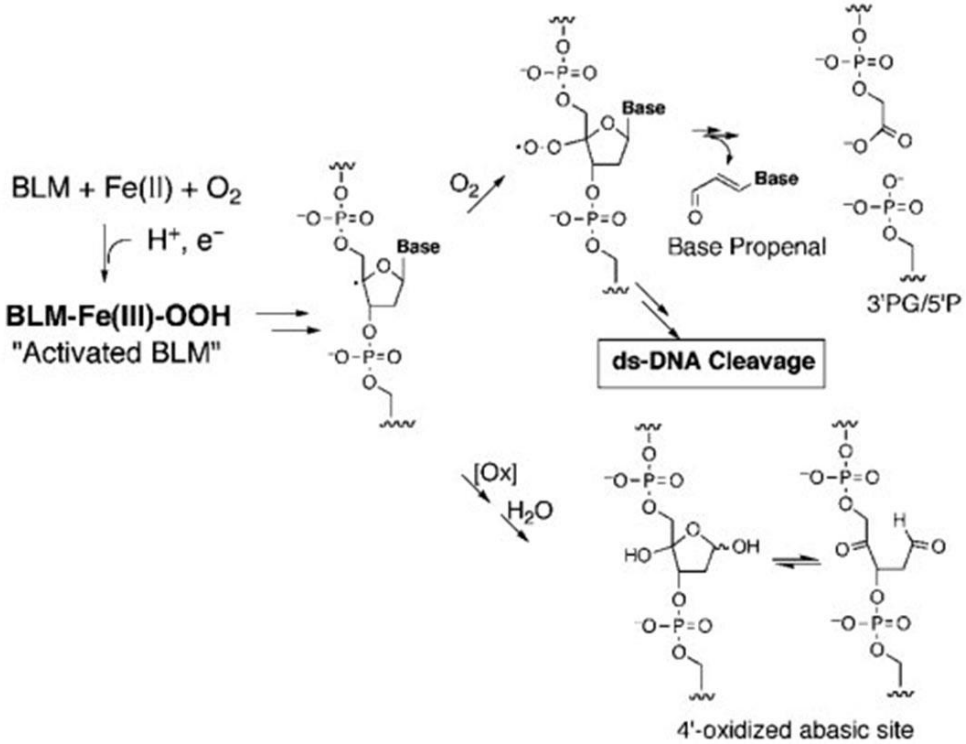
The cytotoxic effect of BLM is believed to result from the drug's ability to bind iron, activate oxygen, and cleave DNA and RNA. Furthermore, the iron complex of the drug (Fe-BLM), is remarkably selective in both the sequences that are cleaved, with a preference for 5′-GyPy-3′ sequences (i.e. pyrimidine bases that lie 3′ to a guanine), and in the chemical mechanism, with the initial event being abstraction of the 4′-hydrogen from the deoxyribose ring (see Figure on bottom of next page). Several features of Fe-BLM have been identified that may explain the ability to activate oxygen, such as the presence of a delocalized π-electron buffer around iron and the strong ironpyrimidine π-backbonding. In contrast, the structural features of Fe-BLM responsible for the sequence and chemical specificity of the DNA degradation reaction remain obscure.

Indeed, there have been reports implicating almost every region of the Fe-BLM molecule, including the C-terminal bithiazole and dimethylsulfonium groups, the N-terminal metal binding site, the primary amine of the β-aminoalanine residue, and the "linker region" that connects the metal binding site with the bithiazole group, as being responsible, at least in part, for the sequence



selectivity of Fe-BLM-mediated DNA degradation. While many of these reports appear to provide conflicting results, the one requirement from all of these studies is that for sequencespecific cleavage of DNA to occur, both the metal binding site and bithiazole moiety must be intact.

In this work, we aim to characterize spectroscopically changes in the metal binding site of Fe-/Cu-BLM induced by complexation with DNA, using optical, and Fourier transform infrared (FTIR) spectroscopies. This way we obtain structural information regarding the local environment of the metal site of Fe-/Cu-BLM. We also extended our studies to Fe-/Cu-BLM bound to the self-complementary hexanucleotides, d(CGCGCG) and d(ATATAT), with the intent of detecting structural changes in the metal binding site that correlate with the sequence specificity of DNA cleavage.



Selected publications

Koutsoupakis C., Soulimane T. and Varotsis C. (2012), Journal of Biological Chemistry, 287, 37495-37507.

Koutsoupakis C., Soulimane T. and Varotsis C. (2015), Chemistry – A European Journal, 21, 4958-4961.

Research Area: Environmental Toxicology (oikotoxicologia)

Head: Dr. Marlen I. Vasquez, Special Teaching Staff

Team: Christina Modestou, Ioanna Stavrinidou, Marios Papageorgiou, Elena Tampouri, Anthi Zachariou

Webpage: *www.oikotoxicologia.wordpress.com*

At present, it is estimated that more than 100 million created or discovered (www.cas.org). This fact has led to the production of an immense variety of products and to a significant improvement of our lives both qualitatively and quantitatively. At the same time though, an increasing concern exists regarding the unintended exposure of humans and the environment to this myriad of chemical compounds. The implementation of the chemical and medicinal legislations (e.g. REACH) try to tackle some of these concerns. Since the possible effects from the exposure to these substances is to a large extent still unknown, many of them need toxicological evaluation to ensure they are safe for human health.

The research efforts are focused not only on well-known pollutants but also on contaminants of emerging concern or xenobiotics. These compounds are considered as alien to life and can end up directly or indirectly in the environment after their partial removal from the various treatment processes. From intake, these compounds are subjected to transformation as well. Since the concentrations quantified in the environment are relatively low (ng-μg/L), it is difficult to quantify and to assess possible effects to biological systems. However, published data is continuously being accumulating and indicate that detrimental effects can be observed at these concentrations. A great effort is being put into unveiling chronic and mixture effects that resemble the actual environmental exposures.

Apart from this, the scientific interest is now given on the effects that may be caused on the levels of population and ecosystem.

In order to overcome chemical pollution various technological treatments are usually applied or under development. For instance, advanced wastewater treatment processes using ozonation, photocatalysis, microfiltration, etc. The efficiency of all these novel processes should be monitored not only with regards to the removal of the parent active compounds, but also to the inactivation of their toxic properties. It has been already documented that through various treatment processes transformation products, with greater biological potency than the parent compounds.

To this end, our Research Group envisage to eradicate deleterious effects on biological systems from contaminants of emerging concern through the following directions:

- Developing effect-based bioassays targeting on baseline toxicity (acute and chronic testing) or specific modes-of-action (estrogenicity, genotoxicity, mutagenicity, gene expression profiling) for assessing effects to humans and the environment.
- Implementing environmental monitoring schemes for chemical (routine parameters and trace metals) and biological quality assurance (battery assay approach, microbiological parameters).

- Deciphering the microbial key players in the process of decontamination of affected environments (contaminants of emerging concern decomposers).

One of the main targets on the near future is to increase understanding on the effects at the population and ecosystem level through the development and monitoring of sensitive effect-based biomarkers. Special attention will be given to the marine ecosystem.

In order to achieve our goals our group cooperates with a multinational, interdisciplinary and intersectoral network of scientists and practitioners that includes biologists, microbiologists, chemists, physicists, environmental engineers, chemical engineers, bioinformaticians, science communicators, etc. We have managed to create collaborations with the governmental, non- governmental and private sector and plan to reinforce them and expand.

During 2014-2016, 6 M.Sc. and 4 B.Sc. dissertations have been successfully completed. Apart from this, we have been granted 3 ERAMUS+ grants for mobility for training purposes and transfer of knowledge.

For the first time, we could get a glimpse of the microbiological richness of protected ecosystem of *Posidonia oceanica*. The isolated fungi were able to decompose azo dyes, indicating the production of laccases, enzymes able to untargeted break down of xenobiotics. They can therefore be used for biotechnological applications. This work was performed in collaboration with the Department of Fisheries and Marine Research.

Apart from this, we have an active participation in the COST Action New and emerging challenges and opportunities in wastewater reuse (NEREUS) network. Dr. Marlen I. Vasquez was elected as Representative of the Blue Circle Society which is the network of Early Career Investigators within the Action.

All this effort has led to the funding of two national projects and one European (Water JPI 2014 in collaboration with Dr. Michalis Koutinas and Dr. Ioannis Vyrides) and to the preparation of a book chapter, two conferences presentations and the submission of two research articles.

Selected publications

Vasquez M.I., Tarapoulouzi M., Lambrianides N., Hapeshi E., Felekkis K., Saile M., Carsten Sticht C., Gretz N. and Fatta-Kassinos D. (2016), Assessing the potential of pharmaceuticals and their transformation products to cause mutagenic effects. Implications in the gene expression profiling. Environmental Toxicology and Chemistry, doi: 10.1002/etc.3444.

Vasquez M.I., Michael-Kordatou I., Kümmerer K. and Fatta-Kassinos D. (2015), Bioassays currently available for evaluating the biological potency of pharmaceuticals in treated wastewater. Wastewater Reuse and Current Challenges. Part of the series The Handbook of Environmental Chemistry (Fatta-Kassinos D, Dionysiou DD & Kümmerer K, eds), pp. 49-80. Springer Publishing, USA.

Vasquez M.I., Lambrianides A., Schneider M., Kümmerer K. and Fatta-Kassinos D. (2014), Environmental side effects of pharmaceutical cocktails: What we know and what we should know. Journal of Hazardous Materials 279: 169–189.

ANNEX I
List of students who graduated up to 2016

Ph.D. in Agricultural Science, Biotechnology & Food Science

Christoforou, Michalakis	Cleridou, Niki	Orphanides, Antia-Antigoni

Ph.D. in Environmental Science and Technology

Theologides, Christodoulos	Zoumides, Christos	Katafygiotou, Martha
Christou, Anastasis	Theophilou, Marios	Nisiforou, Olympia
Tapakis, Rogiros	Nicolaides, Antonis	

M.Sc. in Plant Biotechnology

Antoniou, Anastasis	Assiotou, Anna	Georgiou, Stavros
Keveze, Maria	Kourdoulas, Panagiotis	Rousos, Charalampos
Varnava, Androulla	Anestiadou, Aikaterini	Papageorgiou, Stella
Ioannou, Timothea	Michail, Angela	

M.Sc. in Food Biotechnology

Agathokleous, Maria	Antoniou, Katerina	Evripidou, Irini
Manti, Nicoletta	Parmaxi, Ioanna	Charalampous, Zinovia
Christodoulou, Aristi	Aristidou, Efi	Kyprou, Katerina
Nikolaou, Kyriaki	Savva, Eleni	Markantonis, Nikolas
Xylia, Panagiota		

M.Sc. in Animal Biotechnology

Neophytou, Kyriaki	Christofi, Sotiris	Zintilas, Constantinos
Constantinou, Constantina	Constantinou, Maria	Savva, Eleni
Arminiotou, Panagiota	Koina, Aikaterini	Michail, Charalampia
Pelekanou, Angela		

M.Sc. in Energy Resource Management

Constantinou, Vasiliki	Maou, Rodia	Michail, Michalis
Xenofontos, Filio	Ekonomou, Georgios	Anastasiou, Natasa
Achas, Nikolas	Georgiou, Athos	Giannakou, Dimosthenis
Giatrou, Michalis	Dyspyrou, Dimitra	Eleftheriou, Eleftheria

Kourougianni, Revekka	Kyprianou, Andreas	Kyriakou, Eleni
Marasinou, Maria	Michail, Florentia	Omirou, Omiros
Panteli, Elena	Piskopianou, Charoula	Fedonos, Sofia
Charalampous, Constantinos	Charalampous, Savvas	Chrysostomou, Georgia
Avraam, Avraam	Herakleous, Christina	Theophanous, Petros
Karaiskakis, Panagiotis	Kerimis, Marios	Koulermou, Andreas
Koutra, Nitsa	Constantinou, Barbara	Lamprianou, Anastasia
Mouzouras, Menelaos	Nearchou, Dimitris	Panagiotou, Magda
Papastavrou, Chrystalla	Peratikou, Stefanie	Sapouchi, Negar
Sergiou, Chariklia	Stavrou, Vasos	Hadjiiona, Vasiliki
Andreou, Loukia	Achilleos, Androula	Demetriou, Demetrios
Dimosthenous, Georgios	Theocharous, Efstathios	Constantinou, Katerina
Pateras, Eleftherios	Pieridis, Antonis	Fitides, Aris
Hadjizacharia, Maria	Hadjinicola, Chryso	Christophi, Michalis
Giannaki, Panagiotis	Ioannides, Polyvios	Kanatzia, Aphroditi
Koupparis, Sotiris	Michaelidou, Marilena	Papasolomontos, Nikolas
Symeou, Andreas	Taki, Michalis	Ttofi, Irini
Charpa, Stella	Andreou, Fytoula	Loukaidou, Katerina
Michail, Nikolas	Moyseos, Andreas	Papasofokli, Kyriaki
Pafitis, Christodoulos	Trichinas, Andreas	Antoniou, Michail
Georgiou, Adriana	Theodoulou, Margarita	Ioannou, Charalampos
Loizou, Antonia	Magidou, Marina	Protopapa, Eleni

M.Sc. in Environmental Bioscience and Technology

Theophanous, Elisavet	Andreou, Eleni	Demetriou, Christina
Eleftheriou, Efstathia	Menelaou, Maria	Nicolaides, Charalampos
Nikolaou, Eurydiki	Xenofontos, Eleni	Panagiotou, Christos
Patsalou, Maria	Tampouri, Elena	Tsaggari, Nicoletta
AgathAngelou, Maria	Andreou, Georgios	Antoniou, Maria
Aresti, Demetrios	Yiangou, Chrystalleni	Constantinou, Anastasia
Neophytou, Maria	Salamech, Anastasia	Tittoni, Androulla
Fidiou, Andri	Charalampous, Panagiotis	Anagiotou, Elena
EvAngelou, Anastasia	Efstathiou, Panagiota	Ioannou, Neophyta
Katzi, Maria	Modestou, Christina	Stylianou, Kyriakos
Sokratous, Artemis	Charalampous, Fevronia	Georgiou, Thanasis
Georgiou, Sofia	Constantinides, Viktor	Michail, Fotoula
Nikolaou, Efthymia	Panagiotou, Myrianthi	Panagiotou, Fostira
Papadatos, Sotirios Dionysios	Prodromou, Panagiota	Stavrinou, Stella
Christou, Ourania		

B.Sc. in Agricultural Science, Biotechnology & Food Science

2011:

Antoniou, Eleftherios	Antoniou, Chrystalla	Arestopoulou, Irini
Blasiou, Manolis	Georgiou, Maria	Theodoulou, Theodoulos
Theodorou, Panagiotis	Iosif, Maria	Markou, Panagiota
Paschali, Flora	Stelikou, Antonia	Toumazou, Menelaos
Tsiahli, Eleni	Hadjigeorgiou, Maria	Hadjiloizi, Martha
Christodoulou, Georgia	Psilogeni, Georgia	

2012:

Andreou, Eleni	Aristidou, Efi	Georgiou, Constantina
Gregoriou, Athanasios	Gregoriou, Christina	Eleftheriou, Efstathia
Karaolis, Constantinos	Koinas, Marios	Kourdoulas, Panagiotis
Kyprou, Katerina	Constantinou, Andria	Markouli, Eleftheria
Panagiotou, Myrianthi	Papamichael, Sotiroulla	Parpouna, Christiana
Pipi, Anna	Savva, Eleni	Taki, Anastasia
Tsaggari, Nicoletta	Tsimouris, Demetrios	Hallouma, Pantelhs
Charalampous, Zinovia	Hasiotis, Stathis	Hadjittofi, Maria
Christodoulidi, Ioanna	Christodoulou, Theognosia	Christodoulou, Maria
Christou, Ourania	Christofi, Christiana	Chrysostomou, Maria

2013:

Viktoros, Irini	Giannakou, Eugenia	Demetriou, Maria
Theodorou, Maria	Kotanides, Anestis	Kyprianou, Giorgos
Kyprianou, Kyriaki	Kyriakidou, Maria	Kyriacou, Panagiota
Constantinou, Despo	Makris, Fedon	Neophytou, Loucas
Nikolaou, Michaella	Panagi, Eleni	Papageorgiou, Stella
Pissides, Andreas	Siakou, Melpomeni	Siantona, Anastasia
Terzian, Stavros	Hadjicosta, Myria	Hadjisavva, Athina
Christodoulou, Maritsa		

2014:

Andreou, Angela	Apostolidou, Chara	Aresti, Orestia
Vasiliou, Antonia	Germanou, Panagiota	Georgiadou, Irini-Chrysovalanto
Demetriou, Eleftheria	Zosima, Stella	Theophilou, Athanasia
Ioannou, Antigoni	Ioannou, Myrofora	Karanikki, Penelopi
Karyos, Raphael	Kyriacou, Maria	Kostari, Salomi
Lazari, Maria	Laoutari, Florentia	Loizidou, Maria
Loizou, Eleni	Makris, Giannos	Michail, Andria

Nicolaidou, Erato	Paraskeva, Maria	Pelava, Elias
Petrou, Christiana	Sophocleous, Loucas	Stylianou, Eleni
Fragkoudi, Ioanna	Harilaou, Constantinos	Christodoulou, Souzana
Christodoulou, Charalampia	Psaki, Olga	

2015:

Angelidou, Ioanna	Athanasiou, Maria	Aristodemou, Anastasia
Christoforou, Andreas	Anastasiou, Marios	Andreou, Andreas
Aresti, Polyxeni	Gavriel, Georgios	Gavriel, Kalliopi
Yiangou, Christiana	Demetriades, Demetrios	Theodotou, Despina
Kouppi, Georgia	Laoutari, Sotiroula	Louca, Andreas
Maurotheris, Lefteris	Mikallou, Maria	Michael, Petroulla
Michaelidi, Eugenia	Mousikos, Panagiotis	Nikolaou, Elias
Xenofontos, Maria	Onoufriou, Giorgos	Polydorou, Constantina
Saranti, Eugenia	Solonos, Solonas	Spanou, Smaragda
Soteriou, Maria	Tampoukari, Chrystalla	Fantousi, Andrea
Hadjimichael, Yiannis	Christou, Chrysanthi	

2016:

Ioakim, Stella	Kontos, Ioannis	Nicolaidou, Theopisti
Omirou, Koralia	Solomou, Maria	Charalampous, Nicolas
Artemi, Christina	Vasou, Artemis	Vesiari, Eleni
Georgiou, Eleni	Heracleous, Theodoros	Kalogirou, Chariklia
Kleanthous, Niki	Klokkari, Georgia	Constantinou, Andri
Louca, Stavroula	Maos, Andreas	Mariou, Maria
Markou, Lia	Michail, Athanasia	Michail, Christodoulos
Nikola, Maria	Nikolaou, Melani	Nikolaou, Raphael
Xenofontos, Rafaella	Panagiotou, Christakis	Papadopoulos, Agathoklis
Papapanagiotou, Zoi	Peratikou, Styliana	Poullaidis, Pavlos
Sergiou, Efstratios	Taliadoros, Demetrios	Hadjivasiliou, Loucas
Chrysanthou, Demetrios		

B.Sc. in Environmental Management

2012:

Agathokleous, Margarita	Anemou, Maria	Heracleous, Christina
Theophanous, Thalia	Ioannou, Argyro	Kyriacou, Nicoletta
Constantinou, Barbara	Nestoros, Elena	Xenofontos, Eleni
Peratikou, Stefanie	Souroullas, Constantinos	Sophocleous, Anna
Hadjiiona, Vasiliki		

2013:

Andreou, Elena	Andreou, Loukia	Andreou, Neophytos
Antoniou, Maria	Achilleos, Androula	Georgiou, Spyroula
Demetriou, Rodothea	Eleftheriou, Antonis	EvAngelou, Anastasia
Efstathiou, Panagiota	Zavrou, Angelina	Ioannou, Neophyta
Katzi, Maria	Laou, Elena	Michail, Angela
Neophytou, Maria	Poli, Marilena	Fidiou, Andri
Charalampous, Georgia	Charalampous, Fevronia	Hadjinicola, Chryso
Christodoulou, Georgia		

B.Sc. in Environmental Science and Technology

2014:

Adamou, Anastasia	Alexandrou, Sotiris	Andreou, Elena
Georgiou, Sofia	Giannakou, Stella	Heracleous, Valentina
Mina, Constantina	Michail, Fotoula	Nearchou, Irini
Nicolaou, Georgia	Nikolaou, Ethymia	Stavrinou, Stella
Tsaggaridou, Kalliopi	Christodoulou, Charalampos	Chrysanthou, Andreas

2015:

Themistocleous, Evelina	Theophanous, Eva	Mikrommati, Georgia
Nikolaou, Eleni	Panagiotou, Fostira	Paisi, Niki
Hadjicosta, Marina	Christodoulou, Eleni	Christodoulou, Theano
Vrachnou, Ioannis	Giasoumi, Georgios	Demetriou, Constantinos
Ioannou, Stavros	Kyriakides, Constantinos	Kyriacou, Constantina
Kyriacou, Rafaela	Komodromou, Stella	Constantinou, Rafaela
Mina, Filippos	Michail, Elena	Parmaki, Stella
Paschali, Petros	Peshi, Thekla	Tsangari, Xanthi
Tsiarta, Nicoletta	Fragou, Andreas	Fotiou, Panagiota
Fotiou, Socrates	Chatzigeorgiou, Christina	Hadjiprokopiou, Stefanie
Christou, Georgia		

2016:

Georgiou, Chrystalla	Theodorou, Loucas	Markoulli, Maria
Andronikou, Maria	Antoniou, Stelios	Aresti, Arestis
Achilleos, Panagiotis	Vakana, Maria	Vasiliou, Andria
Vorka, Flora	Vourka, Irini	Georgiou, Georgia
Gregoriou, Stavroula	Demetriou, Demetrios	Demosthenous, Chrystalla
Eleftheriou, Marinos	Erotokritou, Angela	Efstathiou, Andria
Theophilou, Efstathios	Kaiser, Chrysovalanto	Kyprianou, Moisis

Lazaris, Kyriacos	Louca, Marilena	Loizou, Eleni
Mantzipas, Raphael	Menikea, Christia Carolina	Boraei, Iosif
Neophytou, Alexandra	Nikolaou, Soteria	Ekonomidou, Evi
Palates, Charalampos	Papageorgiou, Marios	Papamarkou, Raphael
Pavlidou, Eleana	Pitsillidou, Emily	Samanis, Miltiadis
Stamatov, Dimitar	Charalampous, Andreas	

ANNEX II
List of research projects (ongoing or completed) during 2014-2016

I. Projects funded or supported by European Union programmes

Project Title	Funding Programme	Own Budget (€)	Total Budget (€)	Period	Contact person
CASCADE: CAtastrophic Shifts in drylands: how CAn we prevent ecosystem Degradation?	7th Framework Programme	150,000 (involving also other University Faculties)	6,070,000	2012-2015	Dimitrios Tsaltas
AgroLIFE: To promote and enable the conservation of High Nature Value Farmlands in Cyprus	LIFE+ Biodiversity	107,511	575,309	2014-2017	Menelaos Stavrinides
Genomite: New generation sustainable tools to control emerging mite pests under climate change	JPI Agriculture, Food Security & Climate Change (FACCE)	99,000	1,745,000	2014-2017	Menelaos Stavrinides
JUNIPERCY: Improving the conservation status of the priority habitat type 9560* (Endemic forests with Juniperus spp.) in Cyprus	LIFE+ Nature	15,000	1,183,922	2012-2015	Menelaos Stavrinides
e-Food Science - Design, development and pilot testing of freely accessible online educational material, for a common group of modules intended for Food Science students	Erasmus+ Programme	28,150	177,000	2014-2017	Photis Papademas
Sustainable Management of Biotic and Abiotic Parameters in Hydroponic Cultures (HYDROFLIES)	INTERREG-IV	165,000	995,000	2012-2015	Nikolaos Tzortzakis; Menelaos Stavrinides; Costas N. Costa
Toward a sustainable viticulture: Improved grapevine productivity and tolerance to abiotic and biotic stresses	FACCE SURPLUS ERA-NET	120,000	2,417,000	2016-2019	Nikolaos Tzortzakis
Sustainable management of livestock waste for the removal/recovery of nutrients (LIVEWASTE)	LIFE+ Environment Policy and Governance	560,000	2,147,182	2013-2016	Costas N. Costa

Project Title	Funding Programme	Own Budget (€)	Total Budget (€)	Period	Contact person
Risk Assessment Analysis on Offshore Platforms in South East Mediterranean Area (RAOP-MED)	Neighbourhood and Partnership Instrument (ENPI-CBCMED)	306,000	1,676,410	2013-2015	Costas N. Costa
Prevention and Combating of Marine Pollution in Ports and Marinas (PREMARPOL)	INTERREG-IV	185,000	1,000,000	2011-2014	Costas N. Costa
Development and Application of Integrated Coastal Management Plans in Rhodes and Cyprus	INTERREG-IV	100,000	870,000	2012-2015	Costas N. Costa
ODYSSEE-MURE 2012 – Monitoring of EU and national energy efficiency targets	Intelligent Energy Europe programme	10,500	1,928,000	2013-2015	Theodoros Zachariadis
European Energy and Environmental Policy at a Crossroads	Lifelong Learning programme – Jean Monnet	28,500	28,500	2013-2016	Theodoros Zachariadis
ODYSSEE-MURE, A Decision Support Tool for Energy Efficiency Policy Evaluation	Horizon2020 programme	31,355	1,795,000	2016-2018	Theodoros Zachariadis
European Energy Efficient Buildings Map (ENERMAP)	Climate-KIC	95,000	95,000	2013-2015	Alexandros Charalambides
Development of a Geo-spatial Environmental and Decision Support System for Incident Management and Impact Analysis	EUREKA	120,000	155,880	2012-2014	Alexandros Charalambides
ENERFUND: Building Retrofit Potential	Horizon2020 programme	154,375	1,539,253	2016-2018	Alexandros Charalambides
Projects LinkSCEEM & PRACE: High-Performance Computing production grants (4.1bn total CPU-core hours)	7th Framework Programme	-	-	2012-2016	Evangelos Daskalakis
Bioorganic novel approaches for food processing wastewater treatment and valorisation: Lupanine case study (BIOORG4WASTEWATERVAL+)	WATERWORKS 2014 COFUNDED CALL	130,000	835,355	2016-2019	Michalis Koutinas

II. Projects funded by the Research Promotion Foundation of Cyprus

Project Title	Own Budget (€)	Total Budget (€)	Period	Contact person
Improvement of lipid fraction in ovine milk and halloumi cheese, towards healthier local products	159,844	171,020	2012-2014	Despoina Miltiadou; Ouranios Tzamaloukas
Genetic characterisation and the influence of aquaculture on native European seabass populations in Cyprus	112,840	129,926	2011-2014	Despoina Miltiadou
Molecular analysis and biotechnological applications of olive plant enzymes involved in phenolic compounds with antioxidant activity	11,748	140,000	2012-2014	Dimitrios Tsaltas; Vasileios Fotopoulos
Application of Microscopic FTIR and Raman Imaging to Food Biotechnology	180,000	180,000	2011-2014	Constantinos Varotsis
Options for sustainable agricultural production and water use in Cyprus under global change (AGWATER)	22,300	138,290	2012-2014	Theodoros Zachariadis
Ground Source Heat Pump systems for nearly zero energy buildings: Energy, environmental and economic assessment for Cyprus	97,520	97,520	2013-2015	Theodoros Zachariadis
Effect of Clouds on Solar Irradiance	25,500	25,500	2014-2015	Alexandros Charalambides
Cogeneration of clean water and renewable energy from waste water using macroalgae	80,500	87,500	2012-2014	Alexandros Charalambides
PROGNOSIS (Patent Filing)	20,000	20,000	2016-2018	Alexandros Charalambides

III. Projects funded or supported by other national and international sources

Project Title	Funding Organisation	Own Budget (€)	Total Budget (€)	Period	Contact person
Investigating the role of ethylene produced by soilborne phytopathogenic fungus *Verticillium dahliae*, in pathogenicity of tomato	State Scholarships Foundation of Greece	30,800	30,800	2012-2015	Dimitrios Tsaltas
Selection of autochthonous yeasts from Cyprus vineyards as starter cultures in vinification	Ministry of Agriculture, Natural Resources & Environment of Cyprus	119,040	217,000	2014-2018	Dimitrios Tsaltas
Development of 28 Agro-Environmental Indicators for the assessment of the impacts of agriculture on the environment in Cyprus	Ministry of Agriculture, Natural Resources & Environment of Cyprus	25,000	25,000	2013-2014	Menelaos Stavrinides
Deployment of essential oils for the preservation of fresh produce in Crete-ESSOFRESH	Ministry of Education of Greece	-	82,000	2012-2015	Nikolaos Tzortzakis
Ozone application for improving postharvest handling of edible horticultural products	Ministry of Education of Greece	-	600,000	2011-2014	George Manganaris
The effect of maturity stage and postharvest storage treatments on quality attributes and phytochemical profile of peach (*Prunus persica* L.) fruit	Ministry of Education of Greece	-	100,000	2012-2015	George Manganaris
Tackling invasive plant species: The case of *Ailanthus altissima* Mill. Swingle	Ministry of Education of Greece	87,500	87,500	2012-2014	Vasileios Fotopoulos
Study of the effect of production method (organic vs. conventional) on the quality of fat in milk and dairy products of Cyprus	Christis-Charalambides Dairy Industry Ltd.	57,500	57,500	2011-2014	Ouranios Tzamaloukas
Probing the surface of CuFeS2 using spectroscopy techniques	Hellenic Copper Mines Ltd	50,000	50,000	2012-2014	Constantinos Varotsis

Project Title	Funding Organisation	Own Budget (€)	Total Budget (€)	Period	Contact person
Energy Roadmap for Cyprus	International Renewable Energy Agency	11,140	11,140	2014	Theodoros Zachariadis
Support for the formulation of a comprehensive medium and long-term energy efficiency strategy for Cyprus	GIZ - German Organisation for International Cooperation	14,274	14,274	2016-2017	Theodoros Zachariadis
Selection of microbial strain to enhance copper bioleaching from low grade ore	Hellenic Copper Mines Ltd	30,000	30,000	2012-2014	Ioannis Vyrides

ANNEX III
Publications of Faculty staff in 2014-2016*

2014

Adamou, A., Clerides, S., & Zachariadis, T. (2014). Welfare implications of car feebates: A simulation analysis. Economic Journal, 124(578) doi: 10.1111/ecoj.12094

Andra, S. S., Makris, K. C., Botsaris, G., Charisiadis, P., Kalyvas, H., & Costa, C. N. (2014). Evidence of arsenic release promoted by disinfection by-products within drinking-water distribution systems. Science of the Total Environment, 472, 1145-1151. doi: 10.1016/j.scitotenv.2013.11.045

Andra, S. S., Makris, K. C., Charisiadis, P., & Costa, C. N. (2014). Co-occurrence profiles of trace elements in potable water systems: A case study. Environmental Monitoring and Assessment, 186(11), 7307-7320. doi: 10.1007/s10661-014-3928-x

Berri, A., Vincent Lyk-Jensen, S., Mulalic, I., & Zachariadis, T. (2014). Household transport consumption inequalities and redistributive effects of taxes: A repeated cross-sectional evaluation for France, Denmark and Cyprus. Transport Policy, 36, 206-216. doi: 10.1016/j.tranpol.2014.08.007

Brown, C., Orford, M., Tzamaloukas, O., Mavrogenis, A. P., & Miltiadou, D. (2014). Assessment of inbreeding resulting from selection for scrapie resistance: A model for rare sheep breeds. Veterinary Record, 175(24), 624. doi: 10.1136/vr.102503

Christoforou, M., Pantelides, I. S., Kanetis, L., Ioannou, N., & Tsaltas, D. (2014). Rapid detection and quantification of viable potato cyst nematodes using qPCR in combination with propidium monoazide. Plant Pathology, 63(5), 1185-1192. doi: 10.1111/ppa.12193

Christou, A., Filippou, P., Manganaris, G. A., & Fotopoulos, V. (2014). Sodium hydrosulfide induces systemic thermotolerance to strawberry plants through transcriptional regulation of heat shock proteins and aquaporin. BMC Plant Biology, 14(1) doi: 10.1186/1471-2229-14-42

Christou, A., Georgiadou, E. C., Filippou, P., Manganaris, G. A., & Fotopoulos, V. (2014). Establishment of a rapid, inexpensive protocol for extraction of high quality RNA from small amounts of strawberry plant tissues and other recalcitrant fruit crops. Gene, 537(1), 169-173. doi: 10.1016/j.gene.2013.11.066

Christou, A., Manganaris, G. A., & Fotopoulos, V. (2014). Systemic mitigation of salt stress by hydrogen peroxide and sodium nitroprusside in strawberry plants via transcriptional regulation of enzymatic and non-enzymatic antioxidants. Environmental and Experimental Botany, 107, 46-54. doi: 10.1016/j.envexpbot.2014.05.009

Christoulaki, M., Gouma, S., Manios, T., & Tzortzakis, N. (2014). Deployment of sawdust as substrate medium in hydroponically grown lettuce. Journal of Plant Nutrition, 37(8), 1304-1315. doi: 10.1080/01904167.2014.881870

Colli, L., Joost, S., Negrini, R., Nicoloso, L., Crepaldi, P., Ajmone-Marsan, P., Abo-Shehada, M., Al Tarrayrah, J., Baret, P., Baumung, R., Beja-Pereira, A., Bertaglia, M., Bordonaro, S., Bruford, M., Caloz, R., Canali, G., Canon, J., Cappuccio, I., Carta, A., Cicogna, M., Cortes, O., Dalamitra, S., Daniela, K., Dobi, P., Dominik, P., Dunner, S., D'Urso, G., El-Barody, M.A.A., England, P., Erhardt, G., Ertugrul, O., Prinzenberg, E.-M., Ibeagha-Awemu, E., Strzelec, E., Fadlaoui, A., Fornarelli, F., Garcia, D., Georgoudis, A., Lühken, G., Giovenzana, S., Gutscher, K., Hewitt, G., Hoda, A., Brandt, H., Istvan, A., Juma, G., Jones, S., Karetsou, K., Kliambas, G., Koban, E., Kutita, O., Fesus, L., Lenstra Johannes, A., Ligda, C., Lipsky, S., Luikart, G., Marie-Louise, G., Marilli, M., Marletta, D., Milanesi, E., Nijman Isaäc, J., Obexer-Ruff, G., Papachristoforou, C., Pariset, L., Pellecchia, M., Peter, C., Perez, T., Pilla, F., D'Andrea, M., Niznikowskian, Roosen, R., Juttak, Scarpa, R., Sechi, T., Taberlet, P., Taylor, M., Togan, I., Trommetter, M., Valentini, A., Van Cann Lisette, M., Vlaic, A., Wiskin, L., Zundel, S. (2014). Assessing the spatial dependence of adaptive loci in 43 European and Western Asian goat breeds using AFLP markers. PLoS ONE, 9(1) doi: 10.1371/journal.pone.0086668

* Based primarily on the Scopus® database as of September 2016.

Dagianta, E., Goumas, D., Manios, T., & Tzortzakis, N. (2014). The use of treated wastewater and fertigation in greenhouse pepper crop as affecting growth and fruit quality. Journal of Water Reuse and Desalination, 4(2), 92-99. doi: 10.2166/wrd.2014.048

Daskalakis, V., & Hadjicharalambous, M. (2014). Hexagonal ice stability and growth in the presence of glyoxal and secondary organic aerosols. Physical Chemistry Chemical Physics, 16(33), 17799-17810. doi: 10.1039/c4cp02290d

Daskalakis, V., Charalambous, F., Panagiotou, F., & Nearchou, I. (2014). Effects of surface-active organic matter on carbon dioxide nucleation in atmospheric wet aerosols: A molecular dynamics study. Physical Chemistry Chemical Physics, 16(43), 23723-23734. doi: 10.1039/c4cp03580a

Dinler, B. S., Antoniou, C., & Fotopoulos, V. (2014). Interplay between GST and nitric oxide in the early response of soybean (glycine max L.) plants to salinity stress. Journal of Plant Physiology, 171(18), 1740-1747. doi: 10.1016/j.jplph.2014.07.026

Drouza, C., Vlasiou, M., & Keramidas, A. D. (2014). Synthesis, characterization of dinuclear vanadium(III) hydroquinonate- iminodiacetate complexes. Inorganica Chimica Acta, 420, 103-111. doi: 10.1016/j.ica.2013.12.033

Fariello, M. -I., Servin, B., Tosser-Klopp, G., Rupp, R., Moreno, C., Cristobal, M. S., Boitard, S., Arranz, J.J., Banos, G., Barendse, W., El Beltagy, A., Benenwitz, J., Bishop, S., Bunger, L., Calvo, J., Carta, A., Cemal, I., Ciani, E., Cockett, N., Coltman, D., Dalrymple, B., D'Andrea, M., Distl, O., Drogemuller, C., Erhardt, G., Eythorsdottir, E., Gietzen, K., Gill, C., Gootwine, E., Gupta, V., Hanotte, O., Hayes, B., Heaton, M., Hiendleder, S., Jialin, H., Kantanen, J., Kent, M., Kijas, J., Larkin, D., Lenstra, J.A., Li, K., Longhurst, T., Ma, R., McCulloch, R., MacHugh, D., McWilliam, S., McEwan, J., Maddox, J., Malek, M., Mdomar, F., Miltiadou, D., Monteagudo Ibez, L.V., Nicholas, F., Nowak, K., Oddy, V.H., Paiva, S., Pardeshi, V., Pemberton, J., Pilla, F., Porto Neto, L.R., Raadsma, H., Roberts, C., San Cristobal, M., Sechi, T., Scheet, P., Shariflou, M., Silva, P., Simianer, H., Slate, J., Tapio, M., Vattathil, S., Whan, V. (2014). Selection signatures in worldwide sheep populations. PLoS ONE, 9(8) doi: 10.1371/journal.pone.0103813

Filippou, P., Bouchagier, P., Skotti, E., & Fotopoulos, V. (2014). Proline and reactive oxygen/nitrogen species metabolism is involved in the tolerant response of the invasive plant species ailanthus altissima to drought and salinity. Environmental and Experimental Botany, 97, 1-10. doi: 10.1016/j.envexpbot.2013.09.010

Fotopoulos, V., Antoniou, C., Filippou, P., Mylona, P., Fasoula, D., Ioannides, I., & Polidoros, A. (2014). Application of sodium nitroprusside results in distinct antioxidant gene expression patterns in leaves of mature and senescing medicago truncatula plants. Protoplasma, 251(4), 973-978. doi: 10.1007/s00709-013-0573-0

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Goulas, V., Exarchou, V., Kanetis, L., & Gerothanassis, I. P. (2014). Evaluation of the phytochemical content, antioxidant activity and antimicrobial properties of mountain tea (sideritis syriaca) decoction. Journal of Functional Foods, 6(1), 248-258. doi: 10.1016/j.jff.2013.10.014

Goulas, V., Kourdoulas, P., Makris, F., Theodorou, M., Fellman, J. K., & Manganaris, G. A. (2014). Comparative polyphenolic antioxidant profile and quality of traditional apple cultivars as affected by cold storage. International Journal of Food Science and Technology, 49(9), 2037-2044. doi: 10.1111/ijfs.12507

Goulas, V., Minas, I. S., Kourdoulas, P. M., Vicente, A. R., & Manganaris, G. A. (2014). Phytochemical content, antioxidants and cell wall metabolism of two loquat (eriobotrya japonica) cultivars under different storage regimes. Food Chemistry, 155, 227-234. doi: 10.1016/j.foodchem.2014.01.054

Goulas, V., Vicente, A. R., & Manganaris, G. A. (2014). Structural diversity of anthocyanins in fruits. Anthocyanins: Structure, biosynthesis and health benefits (pp. 223-248)

Kanellis, A. K., & Manganaris, G. A. (2014). Antioxidants and bioactive compounds in fruits. Fruit ripening: Physiology, signalling and genomics (pp. 99-126)

Kanetis, L., Vasiliou, A., Neophytou, G., Samouel, S., & Tsaltas, D. (2014). First report of downy mildew caused by peronospora belbahrii on sweet basil (ocimum basilicum) in Cyprus. Plant Disease, 98(2), 283. doi: 10.1094/PDIS-07-13-0759-PDN

Katafygiotou, M. C., & Serghides, D. K. (2014). Analysis of structural elements and energy consumption of school building stock in cyprus: Energy simulations and upgrade scenarios of a typical school. Energy and Buildings, 72, 8-16. doi: 10.1016/j.enbuild.2013.12.024

Katafygiotou, M. C., & Serghides, D. K. (2014). Indoor comfort and energy performance of buildings in relation to occupants' satisfaction: Investigation in secondary schools of cyprus. Advances in Building Energy Research, 8(2), 216-240. doi: 10.1080/17512549.2013.865554

Katafygiotou, M. C., & Serghides, D. K. (2014). Thermal comfort of a typical secondary school building in Cyprus. Sustainable Cities and Society, 13, 303-312. doi: 10.1016/j.scs.2014.03.004

Klados, E., & Tzortzakis, N. (2014). Effects of substrate and salinity in hydroponically grown cichorium spinosum. Journal of Soil Science and Plant Nutrition, 14(1), 211-222. doi: 10.4067/S0718-95162014005000017

Kountouriotis, A., Aleiferis, P. G., & Charalambides, A. G. (2014). Numerical investigation of VOC levels in the area of petrol stations. Science of the Total Environment, 470-471, 1205-1224. doi: 10.1016/j.scitotenv.2013.10.064

Koutinas, M., Menelaou, M., & Nicolaou, E. N. (2014). Development of a hybrid fermentation-enzymatic bioprocess for the production of ethyl lactate from dairy waste. Bioresource Technology, 165(C), 343-349. doi: 10.1016/j.biortech.2014.03.053

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Makris, K. C., Andra, S. S., & Botsaris, G. (2014). Pipe scales and biofilms in drinking-water distribution systems: Undermining finished water quality. Critical Reviews in Environmental Science and Technology, 44(13), 1477-1523. doi: 10.1080/10643389.2013.790746

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Minas, I. S., Vicente, A. R., Dhanapal, A. P., Manganaris, G. A., Goulas, V., Vasilakakis, M., Molassiotis, A. (2014). Ozone-induced kiwifruit ripening delay is mediated by ethylene biosynthesis inhibition and cell wall dismantling regulation. Plant Science, 229, 76-85. doi: 10.1016/j.plantsci.2014.08.016

Nicolaidis, C., & Vyrides, I. (2014). Closing the water cycle for industrial laundries: An operational performance and techno-economic evaluation of a full-scale membrane bioreactor system. Resources, Conservation and Recycling, 92, 128-135. doi: 10.1016/j.resconrec.2014.09.001

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Papademas P. (ed.), (2014). Dairy Microbiology – A practical Approach. CRC Press, Taylor & Francis Group, Boca Raton, USA, ISBN 9781482298673.

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Pashardes, P., Pashourtidou, N., & Zachariadis, T. (2014). Estimating welfare aspects of changes in energy prices from preference heterogeneity. Energy Economics, 42, 58-66. doi: 10.1016/j.eneco.2013.12.002

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Solomou, N., Stamatoglou, A., Malamis, S., Katsou, E., Costa, C. N., & Loizidou, M. (2014). An integrated solution to wastewater and biodegradable organic waste management by applying anaerobic digestion and membrane bioreactor processes. Water Practice and Technology, 9(4), 464-474. doi: 10.2166/wpt.2014.051

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