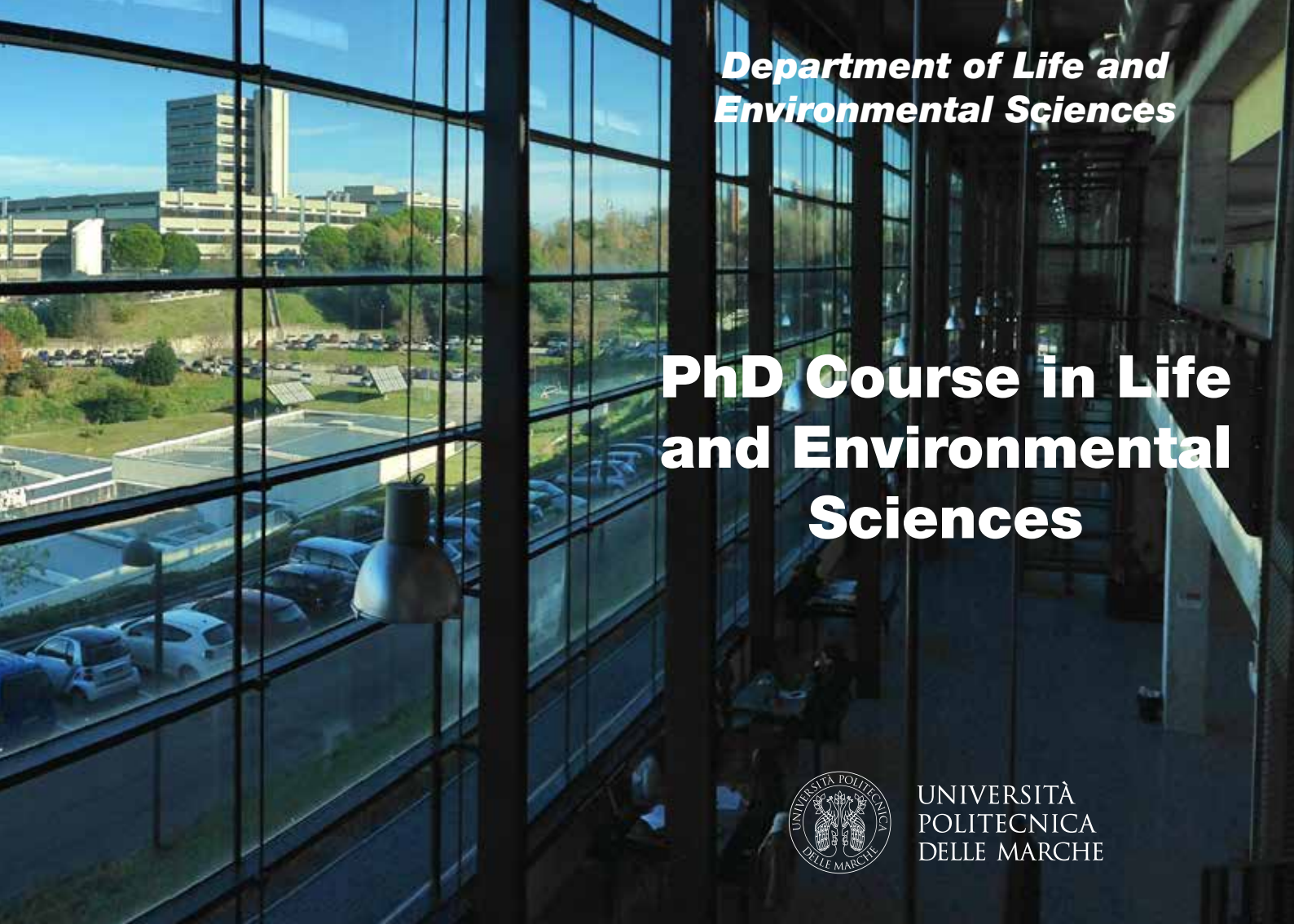


Department of Life and Environmental Sciences

PhD Course in Life and Environmental Sciences

UNIVERSITÀ POLITECNICA DELLE MARCHE

The Department of Life and Environmental Sciences (DiSVA) at UNIVPM was established in 2011 by merging a number of groups involved in a wide spectrum of fundamental and applied research topics in Biology and in Environmental Sciences. At present, the Department includes more than 55 permanent scientists and current research interests span many areas such as analytical, environmental and organic chemistry, structural biophysics, bioinformatics, cellular and molecular biology, biochemistry and genetics, microbiology, biotechnology, fungal, algal, plant and animal systematics, reproductive and developmental biology, marine biology and ecology, eco-toxicology, aquaculture and animal welfare, earth sciences, risk assessment, waste recover and emerging pollutants, disaster prevention. In the last five years, scientists at DiSVA published more than 150 papers per year, on average cited more than 2500 times per year (Scopus). These scientists directly collaborate with numerous research centers and Large Scale facilities worldwide coordinating and carrying out several national and international research projects. DISVA participates in the National Antarctic Research Program and is involved in international expeditions to the Arctic and the world's oceans. DiSVA has been selected as Department of Excellence by MIUR (the National Ministry of Education, University and Research), ranking 2nd out of 13 admitted in the area 05 (biological sciences), with an allocation of around 7 Million Euro starting from 2018 to 2022. The extensive new shared instrument facilities that have recently been added, and which include new research laboratories for high-throughput protein production, advanced microscopy and imaging, mass spectrometry and fluorescence cell sorting as well as a new aquarium of more than 200 tanks (for a total water volume of over 25000 L) for housing and care of marine and fresh water plants or animals, provide researchers and students with unusual access to contemporary research equipment.

DiSVA offers a Doctorate program of advanced studies based on three curricula (Marine Biology, Biomolecular Sciences and Civil and Environmental Protection), cooperating and collaborating in various combinations, with substantial overlap among the groups responsible for the different programs. In this way, diversity is combined with coherent overall student training and with the advantages of interaction among clusters of researchers with common interests and related expertise. The Doctorate projects address the most society challenges within the research areas that characterize the Department, including ecotoxicology studies, aquaculture and fish welfare, structural and computational biology, bio- and nano-technologies, microbial, virus and fungi community in marine environment, evo-devo and conservation studies, biodiversity, antibiotic resistance, functional diets and oxidative stress, reproductive biology, disaster prevention, renewable energy, waste recovery and others. In some cases, industrial partners or industrial clusters are directly or independently involved in innovative Doctorate projects. About 15 scholarships are available per year: 7 of them are granted by the Università Politecnica delle Marche, 1 from DiSVA inside the Department of Excellence funding, and the rest are co-funded by industrial partners and the Marche Region or by other research bodies, like CNR, Stazione Zoologica Anton Dohrn (Napoli) and others. In the last years, a few PhD positions were also funded inside the Marie Skłodowska-Curie action.

This brochure is dedicated to the Doctorate activities actually underway at DiSVA and was motivated by the desire to present the lived research experiences of doctoral students at DiSVA, as well as to introduce them with their motivation and passion. 40 students are presented in the brochure, and 7 are enrolled from foreign countries, proving the international character of the course.

Prof. Paolo Mariani
Director of the Department of Life and Environmental Sciences

Prof. Oliana Carnevali
Coordinator of the Doctorate Course in Life and Environmental Sciences

PhD Course in Life and Environmental Sciences

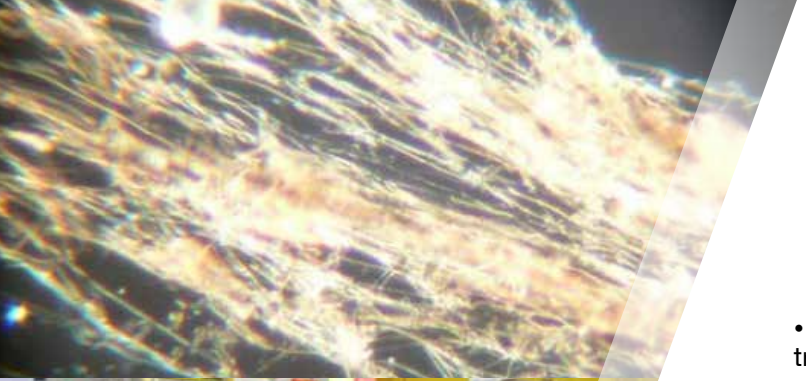
• Curriculum Marine Biology and Ecology (BEM)

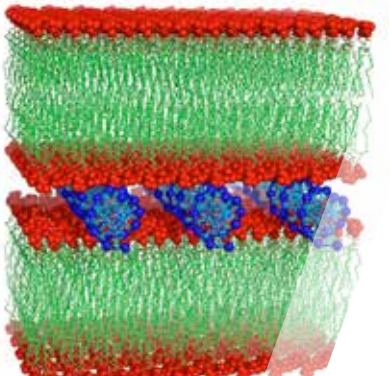
• The curriculum in “Marine Biology and Ecology” stems from the awareness of the scientific, but also social and economic issues related to the study and management of the marine environment and its resources. In the international context, today unavoidable in science, it has been prepared a curriculum leading to the formation of professionals able to move in marine research, both basic and applied. The curriculum in “Biology and Marine Ecology” aims to develop to the highest degree the ability of the student to conduct research and provide high-level expertise in the field of environmental management. The training program requires that the student acquires gradually but actively, theoretical knowledge, technical skills, methodological rigor and openness necessary for the typically interdisciplinary research in the field of marine biology. The student will be trained in research planning, its execution, collection and analysis of data and interpretation of results.

PhD Course in Life and Environmental Sciences

• Curriculum Civil and Environmental Protection (PCA)

• The PhD program in “Civil and Environmental Protection” addresses the need to develop models of human-environment interactions that are safe and sustainable. The increasing number of natural and anthropogenic disasters is putting a strain on the capacity of civil and environmental protection agencies in responding to increasingly complex emergencies and with progressively global implications. Hence, the need to train a new generation of researchers and managers in the field of civil protection, disaster risk reduction, and environmental protection, equipped with the necessary theoretical knowledge and managerial skills. They will need to operate locally and internationally, both for the immediate resolution of crisis, and for the strategic risk mitigation and natural resources management of a certain region. This program is geared toward a multidisciplinary approach on environmental protection and disaster risk reduction. The student will be trained on designing and managing research projects, data collection, and analysis and interpretation of results to define theoretical models. Moreover, the program, besides being a test-bed of students’ scientific rigor, their critical thinking skills and individual creativity, provides them an important opportunity to contribute to advance scientific knowledge in the field of civil and environmental protection.





PhD Course in Life and Environmental Sciences

• Curriculum Biomolecular Sciences (SB)

• The curriculum in “Biomolecular Sciences” proposes the training of experts to be included in strategic areas of either public and private scientific research or industry that deal with biomolecular sciences. Within the disciplines that relate to this scientific area, biological problems are studied and resolved through an interdisciplinary approach exploiting advanced techniques of chemical, molecular and cellular biology. Both the world of public and private research and of industry and manufacturing are increasingly inclined to accept new opportunities arising from life sciences and, in particular, biomolecular sciences. leading to new perspectives of work in the field of basic research and applied research. The curriculum will provide the future PhD all the necessary theoretical and practical knowledge that will enable him to fit into research groups, even in the industry, making his own original and positive contribution. The student will attain the necessary theoretical knowledge through specific advanced courses, and will acquire adequate practical skills in the laboratory under the constant and careful guidance of a Tutor within an original and multidisciplinary field of research. At the same time he will acquire the ability to critically evaluate the results obtained in his research and to present them to the scientific community.

ECOTOXICITY STUDIES ON MARINE SEDIMENTS - TUTOR PROF. OLIANA CARNEVALI

Name: Daniele Ancillai
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

For me, the PhD course of the "Università Politecnica delle Marche" is a great professionalized opportunity. It allows me to expand my academic knowledge and more to gain work experience. In my case, I can combine research and work together, and then combine passion and productivity at the same time. In Italy, research is going through a bad time, but it is thanks to opportunities like these that researchers are allowed to make themselves known and to emerge in a world that increasingly needs innovation and environmental sustainability, and the "Università Politecnica delle Marche" strives to make this happen, and it does so by preparing its students and doctoral students in the best way, offering constantly updated courses and highly professional teachers.

Marine Biology and Ecology

Summary: As we know, harbor sediments are characterized by different physical composition and contaminant levels and their reuse as a resource is now strongly controlled by Italian legislation through Decree n. 173/2016. My work is based on this new Decree, that is an important tool in which the concept of dredged materials must become a resource: because sediments contribute to the coastal sedimentary balance, it can be a precious reuse material that replaces the natural one. Thanks to this, the old "Pass-To-Fail" model is passed in favor of a "Weight-Of-Evidence" approach, an approach based on the integration of multiple lines of evidence. In this way it's possible to classify the different harbor zone by integrating ecotoxicological and chemical parameters. This is also a cause of a lot of problems for those who, like Italian Regional Agencies, have to put into practice this Decree since a number of difficulties including the impossibility to conduct all the ecotoxicological tests, the seasonality, chemical reference values do not include the geological and characteristics information of the various areas, and the impossibility to add local L1 values in the ISPRAs software are the most common. For these reasons, the main objective of this project is to evaluate the goodness of this Decree and to develop alternatives to the proposed methods to solve critical issue. Between 2017 and 2018, I analysed (in collaboration with ARPAM's ecotoxicological laboratory) more than 100 sediment samples, which were subjected to a battery of three ecotoxicological tests (on Vibrio fischeri - solid phase, acute toxicity -, Phaeodactylum tricornutum and Crassostrea gigas - chronic toxicity -). Once again, the use of the bivalve C. gigas was central in the study of ecotoxicity: the method was improved, as well as the experience of the operator in recognizing the various morphologies proposed by the embryos in response to the toxicity of sediment eluate and the search for a molecular response based on what was observed during the experiment.
In fact, the essay with C. gigas is very sensitive to pollutants in the sediments.To confirm that the changes of biomarkers analysed in molecular response are caused exclusively by contaminants in the sediments, future experiments should be conducted with sediment eluates filtered and sterilized. The presence of bacteria in the sediments, the formation of anoxic layers, could affect and influence the conduction of the ecotoxicological test with C. gigas, modifying its "weight" also in terms of evaluation by the software of ISPRA, SediqualSoft. In case of bacterial interference, it should be interesting to investigate which species could be present in the port sediment samples and if they could alterate C. gigas development.

Sexually mature specimens of C. gigas, from Guernsey Sea Farm (UK).

THE CHALLENGES OF PAST AND PRESENT IN THE ASSESSMENT OF THE MEDITERRANEAN SEA SHARKS' POPULATIONS STATUS – TUTOR PROF. CARLO CERRANO

Name: Filippo Bargnesi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

The PhD program at the Polytechnic University of Marche gave me the possibility to work in an exciting and innovative research project. I had the possibility, thanks to the connections of the Department of Life and Environmental Science, to collaborate with important world experts in biodiversity and conservation, traveling in several parts of the world to develop different sections of my research program. I had the possibility to do fieldwork in South Africa and Mozambique, and to visit and collaborate with researchers of important institutions such as the Hopkins Marine Station (Stanford University) and the Monterey Bay Aquarium. On the other hand, my PhD is partially funded by a private enterprise (Cattolica Aquarium, Parco Le Navi Soc. Coop.) where I had the possibility to be part of a dynamic team that stimulated me in searching for new research topics and ideas.

Summary: shark conservation seems to be one of the priorities for several hotspot biodiversity of the world, including the Mediterranean Sea. The 2016 IUCN regional assessment of the Mediterranean Sea includes 44 species of sharks, 57 % of the species are considered as Threatened and 22 % are listed as Data Deficient, that means that there is a lack of data to assess the local status of their populations: one of the most common and widespread problems in making assessment and consequential protection measures on sharks. Scientific campaigns and fisheries information seems not to have enough observation effort to collect data on them. Sharks seem to be at present time one of the most rare and elusive species in the area and new strategies need to take place. In that view, my project uses both historical ecology and genetics, and Citizen Science as tools for supporting data collection and try to make a clearer picture of the present and past situation in terms of conservation for several shark species in the area.

Presentation at the 53rd European Marine Biology Symposium (Oostende, Belgium, 17-21 September 2018)

A diver taking a picture of a shark (ph: Filippo Bargnesi, Ponta Do Ouro, Mozambique)

DIVERSITY AND EVOLUTION OF MICROBIOMES ASSOCIATED WITH INVERTEBRATES INHABITING ANTARCTIC ECOSYSTEM – TUTOR PROF. ANTONIO DELL'ANNO

Name: Emanuela Buschi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Attending to doctoral school of Department of Life and Environmental Sciences is a very useful experience. My PhD, that is co-funded by Stazione Zoologica Anton Dohrn, is giving me the opportunity to work with lots of scientists with different expertises, learning a method useful for my future. I had the opportunity to participate to different oceanographic campaigns and field activities, both in Italy and abroad, giving me the chances to improve my English language and my capability to operate in a research team. Overall, this experience permitted to me to grow as a scientist: open and curious about the things, critic and rigorous in the work.

Summary: Increasing studies on microbiomes are demonstrating their important role in animal's life. Microbes can contribute to sustain the development, health and fitness of their hosts. This could be particularly true in isolated and extreme environments, such as the Antarctic ecosystem, where the host and its microbiome could evolve together establishing peculiar and strict interactions. In this contest my PhD project aims at studying the diversity and functions of microbiomes associated with different marine benthic invertebrates collected in Antarctic ecosystem; evaluating the influence of environmental factors on shaping the taxonomic composition of these associations; exploring the origin of microbes associated with benthic invertebrates; identifyng the nature of the interactions and the potential co-evolution relationships.

Dissection of one of target species investigated (Aglaophamus trissophyllus)

Sampling through Van Veen grab at Adelie Cove (Ross Sea)

Marine Biology and Ecology

CYANOBACTERIA SULPHUR METABOLISM UNDER PALEOENVIRONMENTAL CONDITIONS – TUTOR PROF. MARIO GIORDANO

Name: Lucia Gastoldi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Ever since I was a child I wished I could work on something related with the sea despite the fact I had no idea about what it could imply to be a Marine Biologist at that time. After the master's degree in the Marine Biology, the Ph.D experience has seemed to be the natural next step and I'm glad the UNIVPM gave me the chance to continue following my dreams. This doctoral school is helping me to improve my theoretical and practical skills in microalgal biology and physiology training me to be a competitive candidate in the next step of my career in the research field. Furthermore, I had the change to collaborate with different scientists around the world who helped me with their experience. Moreover, the UNIVPM Ph.D program has created the opportunity to spend almost one year in Tokyo during which I could, first, experience different ways to approach the research in the university and, in addition, I could learn and applied to my project several interesting techniques.

Summary: my Ph.D project regards how the variations in the oxidizing environmental conditions through Eons can influence the functionality of different ATP sulphurylase (ATPS) isoforms, and, thus, the first step of the sulphur assimilation pathway in the photosynthetic aquatic Cyanobacteria. To do that, I'm recreating the Proterozoic ocean environment as it was supposed to be as far as we know today. This period was chosen since is the one during which the First Great Oxygenation Event (GOE) developed: for this reason, it seems to be highly probable that the variations in the oxygen and carbon atmospheric and oceanic concentrations were higher and faster than the following geological Eons. Within this thesis, I intend to evaluate (1) how sulphur assimilation varied in paleo reconstructed environment comparing with modern ones considering the activity, the regulation and the amount of ATPS proteins, and (2) the sulphur isotopes fractionation variation in the two experimental conditions, thanks to a collaboration with the Earth-Life Science Institute in Tokyo.

Cyanobacteria culture - freshwater and seawater species

Cyanobacteria preparation for physiological analysis

SWORDFISH, XIPHIAS GLADIUS (LINNAEUS, 1758), GENETIC VARIABILITY ASSESSMENT WITHIN THE MEDITERRANEAN SEA - TUTOR PROF. VINCENZO CAPUTO BARUCCHI

Name: Tommaso Righi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

The PhD school of Università Politecnica delle Marche allows you to carry out your research by choosing from various scientific disciplines. The PhD school goal is to train independent, capable researchers. For this purpose, UnivPM offers several courses to improve knowledge and capabilities needed for a researcher. Moreover, students are supported to engage in conference and seminar and to gain experience in external institutes.

Summary: The fish population are frequently composed of different stocks, which are genetically isolated through behavioural and/or distributional differences Identification of the population structure, as a fundamental biological unit, is an essential prerequisite for the correct management of the fish resource. Today Mediterranean swordfish are managed as single homogeneous stock and is considered the only that is not well-managed. My PhD project focused to investigate the population genetic structure of swordfish in the Mediterranean Sea, using multiple molecular markers, to clarify the structure of swordfish population, to properly manage this species

Automatic DNA extraction from tissue

Field activities: sampling of swordfish during the landing of commercial fishing.

Marine Biology and Ecology

THE USE OF UNCONVENTIONAL PRODUCTS IN AQUACULTURE
TUTOR PROF. IKE OLIVOTTO

Name: Jorge Arturo Vargas Abúndez
Nationality: Mexico
Previous University: National Autonomous University of Mexico (UNAM) - Ciudad de México, México

Challenging. Living abroad and studying at UnivPM was challenging. Other traditions and ways of thinking I found at UnivPM which I had to learn and to follow. Professors are important figures in their research fields and you can learn from them. I had to learn to be more organized and responsible, since this is of prime importance at UnivPM. People at the Uni speak fluent English but knowing Italian was really important to interact with them. Learning Italian have been a great opportunity. There are free language courses at UnivPM. The UnivPM offer scholarships for national and international students which enable me to do PhD Finally, the UnivPM also offers opportunities to do research, attend courses and congress abroad and within Italy, with funds destinated exclusively to these kind of activities.

Summary: Aquaculture production is dependent on either industrially produced feeds, farm made feeds or natural food organisms. As with other farming enterprises, feed represents a large proportion of expenditure, with fish meal and fish oil being the main feed ingredients. The use of these ingredients is due to their ability to provide high grade animal protein and essential lipids for growing high value aquaculture species. However, the use of wild fish to feed farmed fish places direct pressure on fisheries resources. Research to develop substitutes for these feed ingredients is now focused on commodities such as oilseeds (especially soybeans), meat byproducts (such as blood meal and bone meal), microbial proteins and recently on insects. Insects are seen by the scientific community as novel promising feed protein and lipid sources because of their animal origin, their ability of growing on a great variety of organic compounds, and to the fact that their consumption in animal farming is not in direct competition with human nutrition. Thus, researchers are investigating the appropriate levels of insect inclusion and the potential negative effects on farmed fish. On this regard, a number of studies have showed that fish meal replacement higher than 30% by weight often decreases fish growth, although a total replacement with BSF has been already successfully tested in Atlantic salmon. My research activity focused on the understanding of key biological responses of the inclusion in fish feeds of unconventional products such as, the black soldier fly (BSF) (Hermetia illucens) on two fish models, a freshwater (zebrafish, Danio rerio) and a marine model (the false clownfish, Amphiprion ocellaris).

Discussing interesting histochemical findings in zebrafish ovaries.

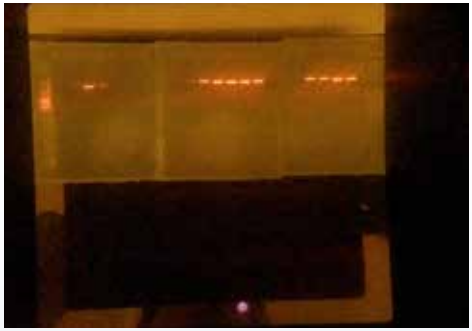
Sampling clownfish for biometry, histology and molecular analysis

PSEUDO-NITZSCHIA SPP. IN THE ADRIATIC SEA: MORPHOLOGICAL CHARACTERIZATION, PHYLOGENETIC RELATIONSHIPS, SEASONAL DISTRIBUTION AND TOXIN CONTENT - TUTOR PROF. CECILIA MARIA TOTTI

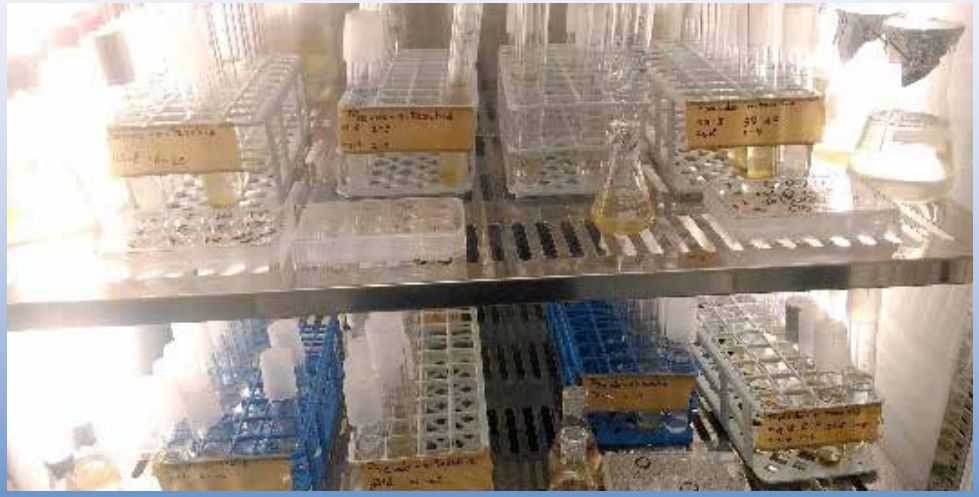
Name: Sonia Giulietti
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

I chose the Polytechnic University of Marche for my PhD because it is one of the most important university on the field of marine science. I have the honor and pleasure of working with the most important Italian researchers. Furthermore, the university offers many opportunities, including seminars, to know and collaborate with students and researchers from different scientific fields in order to encourage multidisciplinarity.

Summary: Pseudo-nitzschia is a pennate diatom and is a common representatives of the northern Adriatic diatom communities occurring throughout the year often causing intense blooms (abundances up to 106 cells/l). Some species of the genus Pseudo-nitzschia are well known to produce domoic acid (DA) involved in Amnesic Shellfish Poisoning (ASP). The existence of cryptic and/or pseudocryptic species (e.g. P. delicatissima complex) makes identification at the species level problematic. My PhD project is to characterize Pseudo-nitzschia species, during an annual cycle, in the NW Adriatic Sea.



Band of stained DNA after agarose gel electrophoresis



Cultured strains from Senigallia (IT) maintained at standard condition of light and temperature

Marine Biology and Ecology

REPRODUCTIVE DYNAMICS OF THE ATLANTIC BLUE FIN TUNA (THUNNUS THYNNUS) AND THE SWORDFISH (XIPHIAS GLADIUS) IN THE MEDITTERANEAN SEA: NEW INSIGHTS AND FUTURE PERSPECTIVES – TUTOR PROF. GIORGIA GIOACCHINI

Name: Luca Marisaldi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Being enrolled into a Doctoral school was my not secretly hidden dream of the last years, at least since I started studying at the University. At the Università Politecnica delle Marche I found a very dynamic and stimulating working environment with many international collaborations, opportunities and networks. Sometimes there are though periods with lot of deadlines, experiments and sampling activities but all of it helped me how to better schedule my duties, be more efficient and work smart.
Of course, the PhD is a challenging experience but I would surely recommend this choice to other young students to boost their future career in both academia and business sectors.

Marine Biology and Ecology

Summary: Big fish, big challenges! My research topic has to do with the Atlantic blue fin tuna (Thunnus thynnus) and the swordfish (Xiphias gladius) and in particular with their reproductive biology.
Actually, I am investigating the endocrine and local control of reproduction in both species by combining modern sequencing technologies and macroscopic approaches. A particular focus of the project is to elucidate the molecular pathways at the gonadal level involved into the transition from sexually immature to mature individuals.
The scientific output of this project is directly delivered to management agencies and institutions in order to develop more sustainable fishing activities and to ensure these natural resources for future generations.

Analysis and processing of sequencing results requires also lot of computer-based work

Routinely collected measures of fishery-dependent catches help us to understand the health status of the fish stocks

MICROBIOME, METABOLIC AND TROPHIC PHENOTYPIC TRAITS IN THE ADAPTABILITY OF MARINE SPONGES TO OCEAN ACIDIFICATION – TUTOR PROF. ANTONIO DELL'ANNO

Summary: A massive influx of carbon dioxide (CO_2) due to the anthropogenic activities is causing the Ocean Acidification (OA) phenomenon. The carbonate system of the world oceans is rapidly changing and the pH of the seawater is fastly lowering. This changes will have significant consequences on marine taxa, especially those "calcifiers", who build shells, skeletons and carbonate structures. Thousands of experiments on OA have been done reproducing high CO_2 conditions in the laboratories, but Volcanic CO_2 seeps provide a unique opportunity to investigate the in situ response of marine organisms to OA. Marine Sponges are among the oldest of Metazoans, considered an important component of benthic fauna all over the world and are predicted to become "winners" in a future seawater-acidified scenario, although there is still a poor amount of studies on this topic. My project is aimed to understand how Marine Sponges could respond and/or adapt to ocean acidification considering microbial changes, metabolic profiles and isotopic analyses and is focused on the CO_2 vents System on the Island of Ischia, in the gulf of Naples.

Name: Valerio Mazzella
Nationality: Italian
Previous University: Università degli studi di Napoli Federico II - Napoli

The Doctoral school in Life and Environmental sciences of the Università politecnica delle Marche is one of the most important in Italy. The school is well organized at all the levels and all the help and the support is provided for the PhD studentship. My project in particular is co-funded between the university and the Stazione Zoologica A. Dohrn and for this reason I have the opportunity to work in several different places earning knowledge and having stimulating work experiences.

Electron microscope session at Università politecnica delle Marche

Sampling session at Ischia CO_2 Vents

Marine Biology and Ecology

THE EVOLUTION OF ALGAL SULFUR METABOLISM
TUTOR PROF. MARIO GIORDANO

Name: Daniel Pousa Kurpan Nogueira
Nationality: Brazilian
Previous University: Universidade Federal do Rio de Janeiro, Brasil

Coming from Brazil was particularly difficult, being Ancona completely different from my hometown. In this sense, people from Università Politecnica delle Marche - students, professors and employees - were very helpful on making me feel comfortable around here. Furthermore, the University facilities are adequate and its undeniable that we are surrounded by highly qualified professors and/or researchers. In my field of study, phycology, the 'Università Politecnica delle Marche' group is extremely productive and well-known throughout the world. and I fell proud to be part of it now.

Summary: Microalgae are the main components of the phytoplankton, a group of photosynthetic organisms that are responsible for most of the primary production on Earth. Due to the great importance of this group, it is essential to understand its composition and distribution throughout the ocean. Some hypothesis associate phytoplankton evolution to the sulfate concentration in oceans, that varied substantially through ages. Sulfate assimilation is often assumed to be conserved in all photosynthetic organisms. However, the available information is mostly limited to vascular plants. Recent evidences suggest that sulfur assimilation could occur in different ways among different groups of algae that compose the phytoplankton. Our study, hence, aims on assessing such differences in sulfur assimilation.

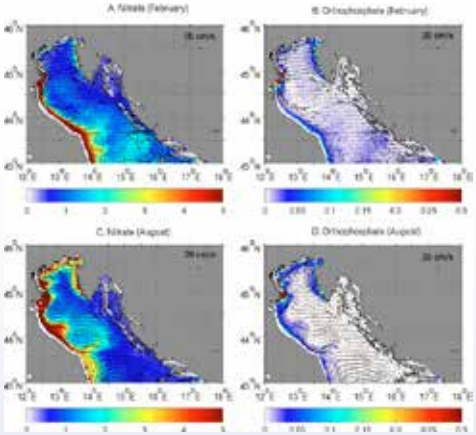
Microalgae cultures representing different groups of algae (diatom, green alga and cyanobacteria).

EVALUATION OF THE ECOLOGICAL STATUS OF THE ADRIATIC SEA THROUGH THE DEVELOPMENT OF NEW IN-SITU ANALYTICAL METHODOLOGIES – TUTOR PROF. CRISTINA TRUZZI

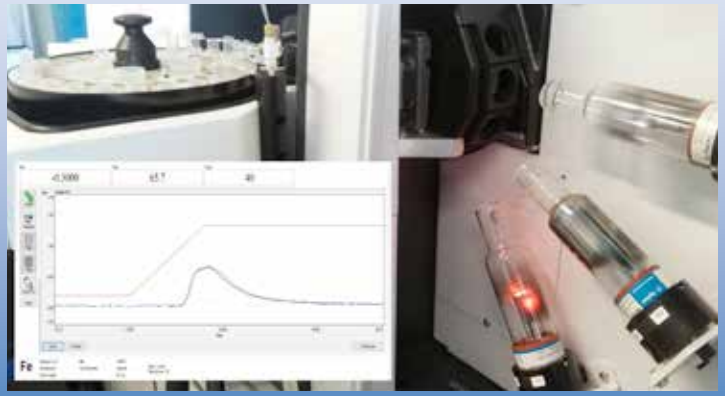
Name: Federico Girolametti
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Marche Polytechnic University offers an excellent list of PhD courses. During my short (until now) experience in the Department of Life and Environmental Sciences, in the "Analytical Chemistry for Environment and Food Lab", I had the opportunity to learn how to improve the capacity to work in a laboratory, to cooperate with different figures of a research group and handle with research projects. With a series of common lessons with PhD students from other faculties, the course offers the possibility to get in touch with different people and cultures. Moreover, students who want to spend a period abroad have the chance to work in a foreign research institution for a certain period. Finally, I think the University is located in a very beautiful place, with a mix of sea and country landscapes typical of central Italy!

Summary: everal recent studies reported in the Adriatic Sea a possible risk that the abundance of species and the protection of their full reproductive capacity is not guaranteed overtime due to a limiting amount of phosphorous (compared to the availability of nitrogen). My research topic focuses on two points: carrying out a survey on the state of health of the Adriatic Sea, determining the level of nutrients (nitrate, nitrite, ammonium, phosphate and silicate) and trace elements (such as Fe, Co, Ni, Mn, Cu, Cr, As, Cd, Pb, Zn, Hg…) in seawater in relationship with the hydrological parameters (temperature, salinity, EC, pH, DO, % Oxygen Saturation, Eh, Chl a, turbidity) and seasonal variables and assessing a control and improvement of the ecological status with the managed use of treated urban waste water.



Orthophosphate (mmol/m3) and velocity fields (cm/s) monthly averages in the period of August in the northern Adriatic Sea (Polimene et al. 2006)



Spectrophotometer for the analysis of trace elements with the Atomic Absorption spectrum of iron (Fe)

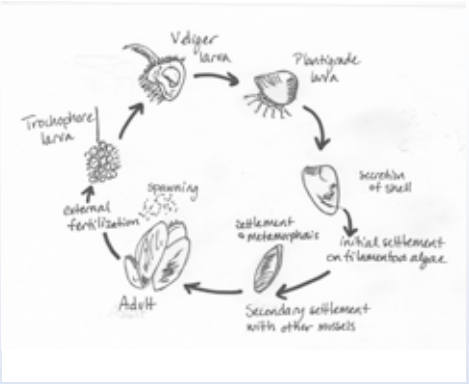
Marine Biology and Ecology

EPIGENETIC ALTERATIONS IN THE MOLLUSC M. GALLOPROVINCIALIS AFTER EXPERIMENTAL EXPOSURE TO SPECIFIC EMERGING CONTAMINANTS – TUTOR PROF. FRANCESCO REGOLI

Name: Claudia La Vecchia
Nationality: Italian
Previous University: Università degli Studi di Napoli Federico II, Napoli

My impression of doctoral school:
Working on my PhD in Life and Environmental Sciences department is a rewarding experience. The doctoral school help me not only to broaden my research interests and experience but allow me to better explore who I want to become as a scientist. The department challenges students to be independent, creative researchers and supports their growth in this role. I have been constantly challenged and provoked to think of new research ideas; the faculty, students, and staff are all very helpful, supportive, and approachable and make me feel like I am an integral part of the community. I have the opportunity to work very closely with several faculty members and also with some research centres, benefiting a great deal from their expertise. I believe that this experience will help me develop as a creative, knowledgeable, and independent researcher.

Summary: my research interests are related to investigate the cause-effect relationship between specific environmental factors and epigenetic modifications triggering adaptive response. I will focus on the study of Environmental Epigenetic in the marine organism Mytilus galloprovincialis representing an ideal animal sentinel for environmental monitoring studies in coastal areas. The goal of this PhD project will be to determine the role of DNA methylation during developmental and adult stages of M. galloprovincialis and to investigate if exposure to specific Emerging Contaminants (ECs) has persistent epigenetic effects on the phenotype of this species. Understanding the potential epigenetic alterations following exposure to specific ECs could have important implications to predict and better understand the effects of toxicant exposure at the individual, population and ecological levels.



Life cycle diagram mussels

The term "environmental epigenetic" refers to alterations in phenotype triggered by environmental stimuli.

EFFECTS OF MULTIPLE STRESSORS ON MARINE ECOSYSTEMS
TUTOR PROF. ROBERTO DANOVARO

Name: Ettore Nepote
Nationality: Italian
Previous University: Università di Genova - Genova

From my point of view a Ph.D. course on Marine Biology and Ecology in the Polytechnic University of Marche is an important experience contributing significantly to my professional skills development. Indeed, the high competences of the professors and researchers allow a constant growth in the research area of the students. Moreover, the high variability of the work in field activity including oceanographic cruises and sampling on the beach, as well as in laboratory represents a significant incentive.

Summary: My research activity is focused on the effects of multiple stressors on coastal marine environments with specific attention to the European Union Habitat Directive 92/43/EEC and the sites of community interest (IT5320005 and IT5320006). I investigate the potential effects of beach nourishment, desalinization, cable deployment, infrastructures at sea, habitat degradation and pollution on benthic assemblages

Laboratory activity with laboratory hood

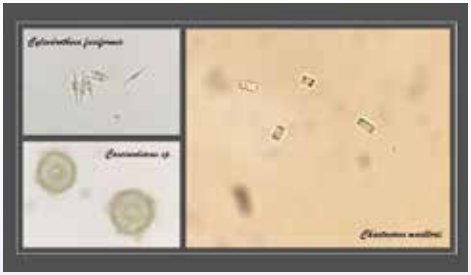
Laboratory activity with microscope

Marine Biology and Ecology

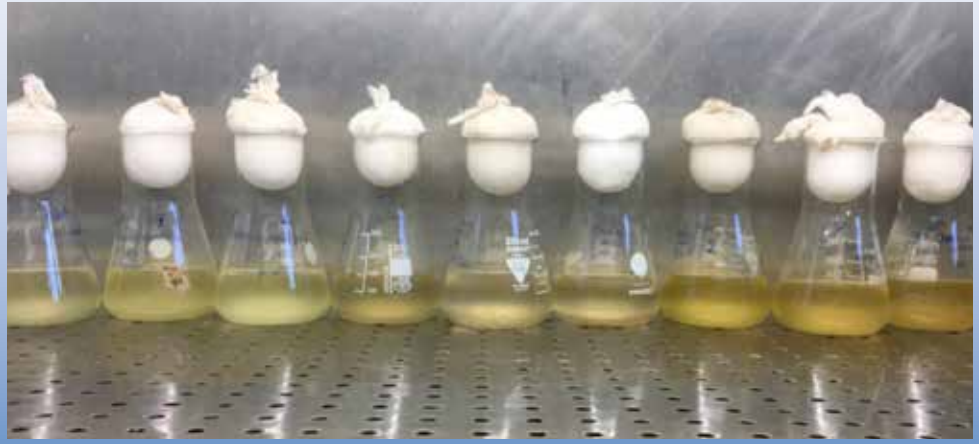
Name: Alessandra Petrucciani
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

The environment of this University gives us the possibility to know well each other, share knowledge and enrich our formation with different approaches. Furthermore, we can participate to interesting seminars and lessons that are not strictly linked to our project, with the aim to make our experience more complete. I work with a PhD student from Brazil, so we can also share traditions and cultures and we could also experience working in laboratories abroad. I would have the opportunity to collaborate with different partners that, with my supervisor, will contribute to improve my formation and to cooperate to reach the same challenge. I think that this experience could lead us to open our minds and to stimulate our curiosity, preparing us to be creative researchers.

Summary: The principal aim of my research project is the comprehension of the processes that lead to the speciation of diatoms. These microalgae are important oceans' primary productors, which strongly affect global food webs. Microalgae's radiation is linked to size, shape and nature of their siliceous outer shell (frustule), due to its need to respond to well-defined challenges. Experiments will be conducted on pennate and centric diatoms, cultured under paleochemistries representing the ocean at different key points in time and assessing the impact of the growth regimes on morphology and mechanical properties of frustules. These highly developed cell walls are especially suited for the study of the interaction among physiology, biomechanics and environmental changes that shape evolution.



Optic microscope images of different shapes studied diatoms



Flasks containing diatoms monospecific cultures

EFFECTS OF PROBIOTICS AND MICRONUTRIENTS ON SKELETAL DEVELOPMENT IN MODEL FISH AND AQUACULTURE SPECIES – TUTOR PROF. OLIANA CARNEVALI

Name: Jerry Maria Sojan
Nationality: Indian
Previous University: Erasmus Mundus Masters in Aquaculture from University of Highlands and Islands, Scotland, University of Crete, Greece, University of Nantes and University of Aberdeen, UK.

UNIVPM has provided a good facility for my doctoral programme. Facilities are good and everyone is very cooperative towards international students like me. The supervisors and lab mates are very helpful and kind. Overall, I am very happy to take my PhD here

Summary: Early Stage Researcher in Biomedaqu project- Marie Skłodowska-Curie Actions - Innovative Training Network (ITN)The effects of probiotic bacteria on the skeletal development of fishes, particularly on the modulation of the key genes responsible for osteoblastogenesis, are studied in this project. Since zebrafish has been established as a vertebrate model for biomedical research, the findings of this research could provide data for the use of probiotics as support to human skeletal treatment. I want to try different types of probiotics, synbiotics and micronutrients such as boron on zebrafish larvae, transgenic lines of zebrafish, VSa13 and VSa16 cell line cultures and also on aquaculture species like seabream and meagre to study effects of probiotics application on skeletal development. Also, we are conducting fin regeneration studies on Killifish after probiotics administration. Techniques like histology, bone and cartilage staining, qPCR, transcriptome analysis, FTIR, Raman spectroscopy, proteomics studies, cell culture etc will be used for various analysis.(https://www.gigabiomedaqu.uliege.be/cms/c_4685453/en/jerry-maria-sojan)
“This project has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 766347”

Preparation of chemical reagents for staining zebrafish larvae to observe skeletal development after probiotics treatment

Working with zebrafish

Marine Biology and Ecology

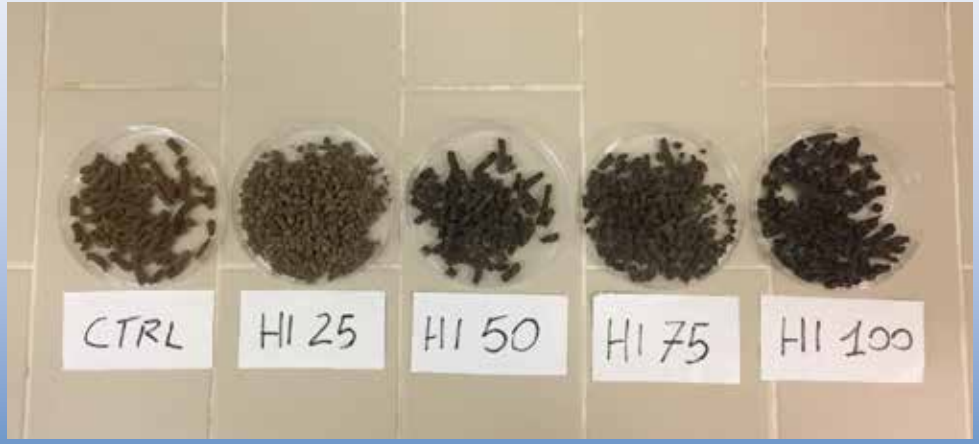
FUTURE FEEDS IN AQUACULTURE: INSECTS AS A NEW INGREDIENT FOR FISH CULTURE
TUTOR PROF. IKE OLIVOTTO

Name: Matteo Zarantoniello
Nationality: Italian
Previous University: Università Politecnica delle Marche

I'm working on my PhD in the department of Life and Environmental Sciences that provides a very sociable and engaging environment within which to develop as a scientist. The department challenges students to be creative, independent and resourceful. We are highly encouraged to explore collaborative relationship with colleagues from different laboratories. Furthermore, there are diverse opportunities to acquire knowledges in different fields through a wide range of elective courses and seminars. Finally, the opportunity to work closely with my tutor allows me to gain experience and to acquire new skills every day, indispensables features to become a better scientist.

Summary: Intensive fish farming relies on the use of feeds based on fish meal and oil as optimal ingredients. However, the use of wild fish to feed farmed species places direct pressures on fisheries requiring more sustainable ingredients for aquafeed formulation. According to the concept of circular economy, insects represent good candidates to replace fish meal and fish oil in aquafeeds. My PhD project is aimed to: improve fatty acid composition of insects through the enrichment of growth substrate; formulate new diets with insect meal (Hermetia illucens, black soldier fly); test the diets in different fish species including experimental models (Danio rerio, zebrafish) and finfish. A multidisciplinary approach will be applied to better understand fish's physiological responses to the new diets.

Example of tanks for zebrafish maintenance, from larvae to 6-months-adult.



Diet based on fish meal (ctrl) and diets with 25, 50, 75 and 100% replacement of fish meal with black soldier fly meal.

Marine Biology and Ecology

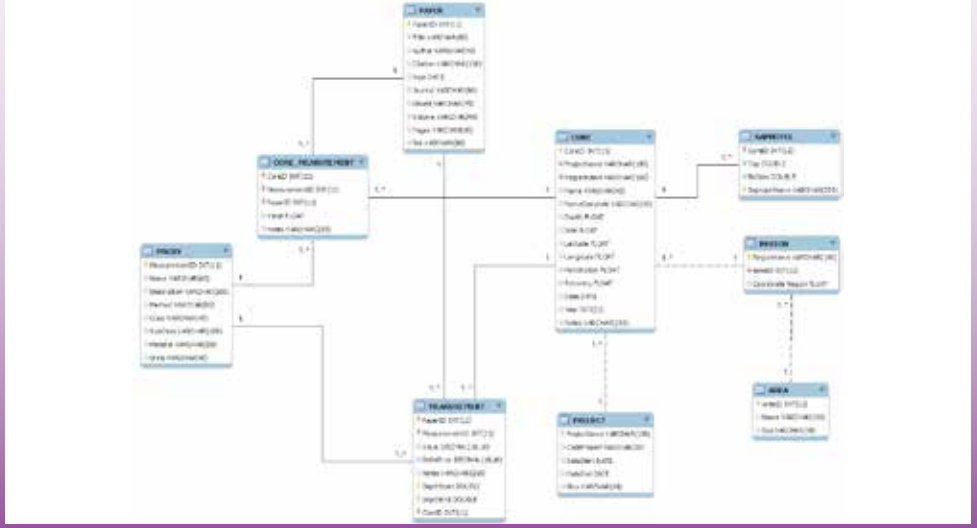
THE USE OF NEW TECHNOLOGIES IN THE SAPROPEL STUDIES
TUTOR PROF. ALESSANDRA NEGRI

Summary: Science advances and with it the storage of large amounts of data. The need to use this data efficiently, quickly and safely is possible thanks to the Big data analytics that allows us storage and relationship data in order to obtain new knowledge. My research focused on a specific interval of time corresponding to the deposition of the most recent sapropel (S1). I constructed a database that would allow me to to extract hidden patterns and new knowledge through the use of "data analytics".
The database, BEyOND (Big palEo OceaN Data), contains 139 sediment cores data (97 cores in the Mediterranean sea) and a total of 1.750 proxies.

Map of the Mediterranean Sea with the locations and depths of cores

Name: Rubén Amezcua Buendía
Nationality: Spain
Previous University: Universidad de Granada (UGR) Granada, Spain

The UNIVPM is located in an amazing place of the city where you can breath of sea breeze.
The cooperation between students in the Department of Life and Environmental Sciences is really good.
The UNIVPM offers funds destined to attend courses and congresses abroad and within Italy.
My integration as a foreign student has been really easy.



The relational schema of database

Civil and Environmental Protection

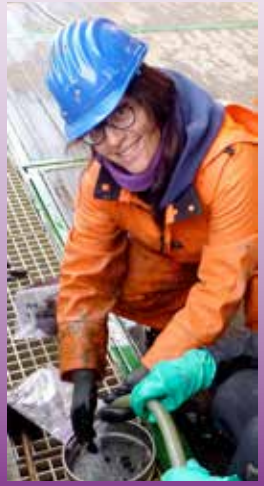
PATTERNS AND ENVIRONMENTAL DRIVERS OF DIVERSITY AND COMMUNITY COMPOSITION OF MEIOFAUNA (FORAMINIFERA) AND MACROFAUNA IN THE KVEITHOLA TROUGH (NW BARENTS SEA) – TUTOR PROF. ALESSANDRA NEGRI

Name: Alessandra Caridi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

The PhD of Università Politecnnica delle Marche offers intense teaching programs and seminars, letting us to improve our Knowledge. Moreover, gives us several opportunities to work and spend a period abroad. During my PhD I had the opportunity to acquire new skills and to collaborate with excellent researchers.
I will take advantages of this opportunity to become a good researcher!lead us to open our minds and to stimulate our curiosity, preparing us to be creative researchers.

Summary: My PhD Thesis focus on the Kveithola Trough which is an abrupt and narrow sedimentary system located in the NW Barents Sea. This basin importance resides in the fact that appears today as a stagnant environment, strongly affected by low-oxygen conditions with possible ongoing seep activity and for this reason it has been object of a Scientific cruise during last June 2016. The hydrographic, bio-geochemical conditions and the possible existence of gas seepage activity of the area have been investigated during the Eurofleets 2- BURSTER cruise, on which I was aboard as researcher. The aim of my work is then to analyze the patterns and environmental drivers of benthic biota and more specifically the macrofaunal community structure coupled to the study of benthic foraminiferal meiofauna in order to understand their ecological adaptation to these particular conditions

Field and laboratory work



Civil and Environmental Protection

RECOVERY AND RESTORATION OF MARINE ENDANGERED HABITATS AND ECOSYSTEMS
TUTOR PROF. ANTONIO DELL'ANNO

Name: Zaira Da Ros
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Working on my Ph.D. in the Department of Life and Environmental Science is a very useful experience which makes me grow every day in the scientific world. This doctoral school challenges students to be independent, creative researchers and supports their growth in this role. My PhD experience has allowed me to explore different arguments, from microbiology to setting of laboratory experiments. I have often the opportunity to work in the field. In particular, I used my diving skills to collect samples from different sites where we have settled up restoration experiments.

Summary: Anthropogenic activities and global climate changes are modifying the biodiversity of marine ecosystems. Changes of marine biodiversity can alter the ocean's stability, food provisioning, water quality and biogeochemical cycles in a relevant way. Restoration of marine endangered ecosystems (the act of bringing a degraded habitat back into, as nearly as possible, its original conditions) is one of the aims of the EU 2020 Biodiversity Strategy. During my Ph.D. course, I have conducted several laboratory experiments to assess the recovery of endangered hard bottom species following simulated anthropogenic impacts. I have analyzed, through extensive field works, strategies and tools for restoring shallow-water hard and soft bottom species, evaluating also the effects of the restoration on different attributes of ecosystem functioning.

The mechanical apparatus used during simulated resuspension experiments that I have conducted to assess corals' recovery capacity after trawling and mining activities

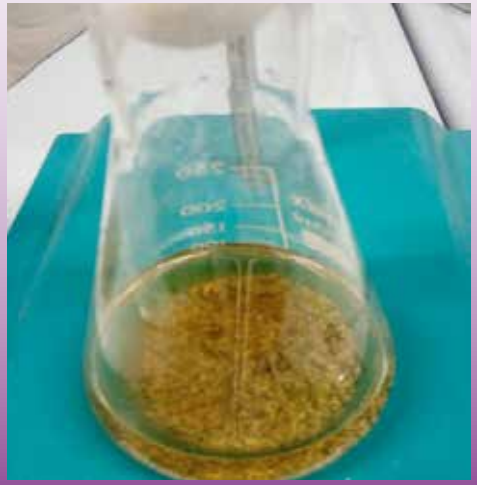
Civil and Environmental Protection

BIOTECHNOLOGIES FOR METAL RECOVERY FROM WASTES
TUTOR PROF. FRANCESCA BEOLCHINI

Name: Alessandro Becci
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Marche Polytechnic University offers an excellent list of PhD courses. The doctoral school help me to enhance my academic knowledge and to improve the capacity to work in a laboratory. The department incentives student to be independent, motives the creative research and sustains our development. The opportunity to work with other interdisciplinary researchers allows me to gain experience and to increase my knowledge, indispensables skills to become a better scientist. The PhD course could be useful to become a future researcher.

Summary: The aim of my research is the development of a sustainable processes for the metal recovery from printed circuit boards (PCBs). With the term "sustainability" are taken into account three main aspects: technical, environmental and economic. The creation of urban mining activities for the metal recovery from waste electrical and electronic equipment, could have a double benefit: the waste revaluation (circular economy pillars) and decrease of traditional mines dependency. The focus of my study is on biotechnologies. Biohydrometallurgical strategies are gaining increasing prominence in this field. Indeed, the microorganism use could be more cost efficient and environmentally friendly than the chemical approaches.



Bioleaching experiment with acidophilic bacteria

Glass fixed bed column packed with algae

Civil and Environmental Protection

DEVELOPMENT OF INNOVATIVE SYSTEMS TO CONTAIN THE ODOROUS IMPACT OF INDUSTRIAL PLANTS – TUTOR PROF. FRANCESCA BEOLCHINI

Name: Gabriele Pietro Bigi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

This doctoral project is allowing me to expand my knowledge in the environmental field and in particular it integrates perfectly with my work. In fact, in the company (PAN ECO srl) where I am doing my PhD, we deal with the sampling and analysis of atmospheric emissions caused by the factories present in our territory; these industrial activities (for example painting activities) represent the main causes of emission of bad smells in the atmosphere causing discomfort for the population. My goal is to try to find innovative ways to reduce these emissions.
Surely this research project will allow me to increase my knowledge about odorous emissions, which represent a rather innovative topic in the environmental sector.

Civil and Environmental Protection

Summary: The two companies identified in the Marche region with problems associated with the odor impact of industrial production are:
- Garofoli S.p.A (Castelfidardo, AN), world leader in the design, production and sale of doors;
- Azienda Agricola Valle dell'Asino (Osimo, AN), that deals with the treatment of special non hazardous waste (vegetable waste, wooden cellulosics and paper).
In the company "Garofoli S.p.A." the innovative emissions abatement system consists in the UV painting that allows to reduce odouros emissions as it requires a lower quantity of paints thanks to a greater yield and it uses paints with a lower content of VOCs (10-20%) compared to traditional solvent-based paints (70-80%). Instead, in the company "Azienda Agricola Valle dell'Asino", the innovative emissions abatement system consists in the waste treatment through the use of earthworms (worm farming); vermicomposting process involves interactions between earthworms and microorganism to biodegrade organic waste.

UV painting

MODELLING DISASTER RISK REDUCTION: EXPLORING SOCIAL-ECOLOGICAL INTERACTIONS TO BETTER INFORM TRANSFORMATIVE ADAPTATION – TUTOR PROF. FAUSTO MARINCIONI

Summary: Human development relies on its interactions with the natural environment. Thus, in order to enable the persistence of humankind in the long period, we need to better comprehend how to reduce the risk of disaster by studying a complex system, namely a Social-Ecological System (SES), that is by adopting a social-ecological perspective. In particular, we need to understand how human systems can enhance their ability to coexist with natural systems, and how they should be re-shaped. The aim of this research project is to better understand how the human and the natural components of a SES interact, in order to define which attributes (resilience and sustainability) and how they should be nurtured by humans. Case studies will then allow to test the model and to compare the performance of different SESs.

Alessandra Colocci presenting a poster at the 4th Global Summit of Research Institutes for Disaster Risk Reduction in Kyoto, Japan in March 2019

Name: Alessandra Colocci
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

The Doctoral School offers three distinctive Doctoral Curricula in Sciences. Within them, the Civil and Environmental Protection (PCA) Curriculum itself is highly varied, enabling to explore the PCA theme through different perspectives. This multidisciplinary approach allows the PhD student to choose and follow the most suitable research path to his/her interests and aspirations. The courses provided help to strengthen the knowledge base needed for a researcher, and so do the field trips proposed. The Doctoral School also supports and pushes its students to engage in conferences and seminars, not to mention internships in external institutes, most useful to consolidate and refine the student's competences.

Civil and Environmental Protection

Alessandra Colocci presenting her research during the VIII Giornata Di Studio "Oltre La Globalizzazione" MOSAICO/MOSAIC at the Università del Piemonte Orientale in Novara, Italy

POLYCYCLIC AROMATIC HYDROCARBON (PAH) BIOACCUMULATION IN DEMERSAL ADRIATIC FISH – TUTOR PROF. ANNA ANNIBALDI

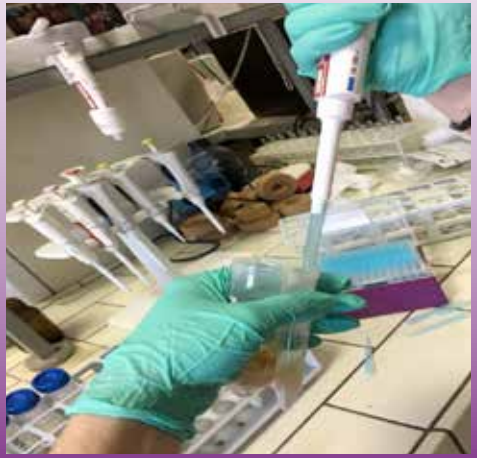
Name: Emanuela Frapiccini
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

In my opinion, the PhD training course could be useful both to become future researchers and to occupy positions or institutional roles in a national and international organizations, not exclusively to undertake a university career. For myself, the purpose of the PhD lessons should be to show how a highly qualified person, such as PhD student, can spend his training to meet the various needs present in the world of business and research. I think only the common courses of PhD that are held in the University are useful for this purpose.

Summary: Chemical pollution is one of the main environmental issues in the world today and the interest of understanding the link between pollutant exposure and harmful effect for human, increases. PAHs are persistent organic pollutants that can bioaccumulation in biota and posing a great risk to human health. PAH bioaccumulation is a complex phenomenon governed by many factors. Novelty of my research is evaluated the influence of season, PAH physicochemical characteristics and individual-related factors (i.e. body size, gender, age and reproductive status) on the contamination of demersal fish by PAHs. This approach was performed using a most efficient PAH extraction method (Quechers) from edible tissues of fish, chosen on the basis of their economic and ecological relevance.

UHPLC System for chemical analysis

QuEChERS extraction technique



Civil and Environmental Protection

SUSTAINABLE STRATEGIES FOR MARINE SEDIMENT BIOREMEDIATION
TUTOR PROF. FRANCESCA BEOLCHINI

Name: Melanie Hekeu
Nationality: Cameroon
Previous University: Covenant University, Nigeria

Marche Polytechnic University is a very research-oriented university that offers various research disciplines and I have had an enriching experience here. The University encourages researchers to undergo internships abroad and I had this opportunity to work at Arizona State University for a three months' internship. For me, this University offers an enabling environment for a researcher to learn and to explore multidisciplinary approaches in his research.

Summary: Frequent oil spills around the world, together with various industrial activities have caused huge quantities of polyaromatic hydrocarbons (PAHs) deposits in the marine environment. Since they do not easily biodegrade once introduced in the environment, a large proportion end up accumulating in marine sediments.
The accumulation of PAHs in sediments constitutes a major threat to the survival of marine biodiversity, hence my research focuses on sustainable bioremediation of PAH contaminated marine sediments. The objective is to optimize existing bioremediation approaches by combining various promising and existing approaches and evaluate the environmental cost associated with each of these bioremediation processes.

Ozone Pre-treatment to enhance sediment biodegradation

Ongoing Marine Sediment Bioremediation Experiments with various Nutrient Ammendments

Civil and Environmental Protection

THE QUANTIFICATION OF THE IMPACTS OF THE CORINALDO TREATMENT PLANT (MBT), COMPARED TO THE POTENTIAL IMPACT OF THE WASTE DISPOSED WITHOUT PRE-TREATMENT, CAN BE A USEFUL TOOL TO EVALUATE THE USEFULNESS OF THE PRE-TREATMENT PROCESS – TUTOR PROF. FRANCESCA BEOLCHINI

Name: Lorenzo Magi Galluzzi
Nationality: Italian
Previous University: Università degli Studi di Urbino Carlo Bo - Urbino

The doctoral school of the Polytechnic University of Marche represents for me the possibility of translating the twenty-year experience gained in the management of landfills, applying the most advanced environmental management systems (EMAS), in scientific research. The possibility of developing research in the field of environmental protection is fundamental to promote sustainable development. The aim of the doctoral school is also to create ever greater interaction between the world of work and research. The possibility of improving one's own preparation through the different courses that UnivPM offers together with conferences and seminars, represent a fundamental investment for knowledge.

Summary: The research aims to define the best practices for the management of urban solid waste. The Corinaldo landfill for solid urban waste represents the laboratory on a real scale to verify the effects of the preliminary treatment (MBT) on the main emissions generated by the landfill (leachate and biogas). The research ultimately proposes to analyze the real effects of the application of the rules defined in the community field and to identify any corrective measures able to obtain a better overall environmental performance

View of the Corinaldo site (mechanical biological treatment plant and landfill)

Civil and Environmental Protection

COMPARATIVE STUDY ON MACROZOOBENTHIC COMMUNITIES FROM TWO COASTAL AREAS WITH DIFFERENT LEVELS OF RESILIENCE AND HUMAN IMPACTS – TUTOR PROF. CRISTINA DI CAMILLO

Name: Afghan
Nationality: Pakistan
Previous University: Abdul Wali Khan University Mardan, Pakistan

The motivation behind coming to Marche Polytechnic University for my PhD was that I was planning to focus my PhD research work on marine environments after graduating in Environmental Sciences. I had an idea about the interesting work being done here in the field of marine environments, but I am even more happy and satisfied after working with my supervisor and lab colleagues so far. I am really impressed with the professionalism and commitment everyone puts in their work here and maintain a productive and friendly atmosphere. Apart from the lab work, the courses intended for PhD sound really useful to look for external opportunities and exposure. My experience on campus has been great and I am really enjoying my research work here as international student.

Summary: Aim of the project is to fill the knowledge gap about benthic communities from beaches with/without barriers. Our first hypothesis is that communities living in natural beaches differ in abundance and species composition respect to beaches with barriers. Second hypothesis is that - in each site - the fauna structure changes over time in relation to abiotic factors.
To test our hypotheses, we perform periodic samplings on the intertidal zone of two different beaches (beach with barriers vs natural beach). Each sample will be analysed at our lab to identify the collected organisms. At the end, we will analyse data considering abiotic factors and evaluate our results.

Extracting a sample at Torre Cerrano

Taking measurements before sampling

DEVELOPMENT OF INNOVATIVE AND ECO-COMPATIBLE BIOTECHNOLOGIES FOR IN SITU RESTORATION OF CONTAMINATED MARINE SEDIMENT – TUTOR PROF. ANTONIO DELL'ANNO

Name: Enrico Astarita
Nationality: Italian
Previous University: Università degli studi di Napoli Federico II - Napoli

The Ph.D. Course in Life and Environmental Sciences represents a great opportunity, both for professional and personal growth.
The required independent approach to the research is balanced by the helpful support of Tutor and colleagues.
Besides the research activities and courses, UNIVPM provides several really interesting seminars also with visiting Professors from all over the world, that represents a big chance to face different points of view on many scientific topics.

Summary: The coastal marine environment is highly treated by human activities. The contamination has a strong impact on marine life and ecosystems, often representing a danger for human life.
In Falconara Marittima (Ancona), the decommissioned chemical industry has strongly impacted the coastal marine ecosystem leading to the identification of this area as a site of national interest (SIN).
Microorganisms are able to remove or at least reduce the contamination level thanks to their metabolism.
My project aims to find advanced and innovative biotechnologies for reducing environmental risk through the identification and exploitation of selected microbes, bacteria and fungi, involved in the reduction of the contamination.

YPD (Yeast Peptone Dextrose) agar plates for yeast growth

Isolated fungi

Civil and Environmental Protection

INTEGRITY CONSERVATION OF COASTAL ENVIRONMENTAL: NEW PROCEDURES FOR THE MANAGEMENT OF BEACH LITTER – TUTOR PROF. STEFANIA PUCE

Name: Cinzia Cesarano
Nationality: Italian
Previous University: Università degli studi di Napoli Parthenope – Napoli

My impression about the PhD school of Università Politecnica delle Marche is very positive. The organization of courses is efficient. Preparation and professionality of tutor and co-tutor professors is very elevated. Manly I have appreciated the seminars provided by national and international highly qualified experts. I am persuaded that both courses and seminars will be useful for my present and future research activities.

Summary: In the last decade the role of Citizen Science in the scientific research is improving. An increasing number of people pay specific attention to the beach ecosystems. One of the main goals of my PhD research activities is to analyze a set of existing Citizen Science strategies for the marine and coastal environment monitoring, e.g. the Reef Check project. In this framework, monitoring protocols for the Mediterranean Sea have been developed since 2008. Among these, "MAC Emerso", the beach monitoring protocol, represents an extraordinary opportunity to take part in an ambitious project of scientific research and to empower the people to save our oceans through education, research and conservation. The final aim of my study is to suggest good practices of beach ecosystems fruition in order to limit habitat damages and increase the awareness of the role of trophic sources as well as of the danger of beach litter.

Mediterranean beach monitoring guide

Work instrument to take samples for beach monitoring in the framework of Citizen Science project

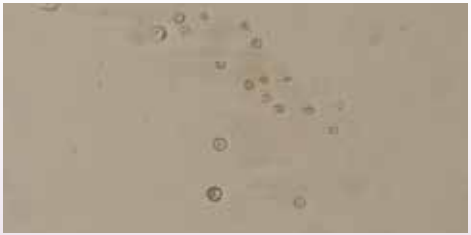
Civil and Environmental Protection

CHARACTERIZATION OF MONO AND DI-RHAMNOLIPIDS AND THEIR APPLICATION IN BIOREMEDIATION PROCESSES – TUTOR PROF. FRANCESCO SPINOZZI

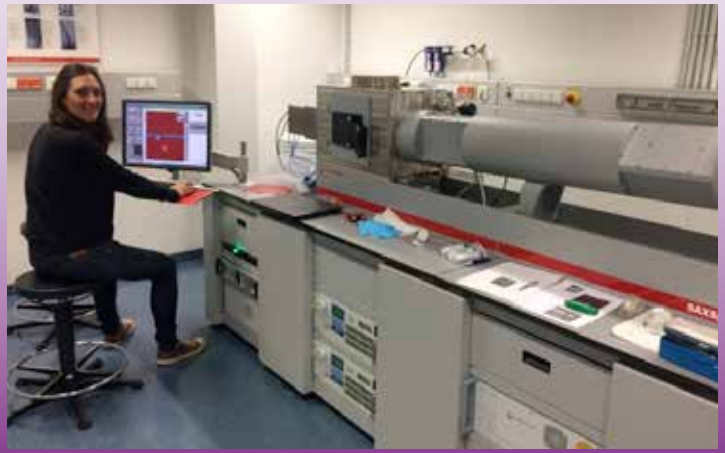
Name: Alessandra Marega Motta
Nationality: Brasilian
Previous University: UEL - Universidade Estadual de Londrina - Brasil

I am really glad that I chose to do my phD in the Università Politecnica delle Marche. I am part of the Molecular Biophysics group. Even if this is just my first year, I have already seen that people are very kind and helpful, what creates a very good environment for foreign students like me. I believe that doing my PhD here will give me the opportunity work in an interdisciplinary context. Also it may give me the chance to have experiences in international research institutions and universities. I am sure that I am going to be able to develop a great research for my PhD degree.

Summary: bioremediation is a cleanup method for contaminated soil and water and uses microorganisms or their substances to degrade contaminants into less toxic compounds. Biosurfactants are the substances produced by microorganisms to give them the ability of making substrates available to be uptake by the cells. Rhamnolipids are a class biosurfactants that could enhance petroleum biodegradation. They are mainly a mixture of two class of biomolecules, whose polar head could contain mono or di-rhamnose sugars. It is important to analyze the individual contribution of each class in order to exploit rhamnolipids for specific uses. My goal is to perform a chemical-physical characterization of mono and di-rhamnolipids, using X-Ray diffraction (XRD) and SAXS (Small Angle X Ray Scattering) techniques. Also toxicity tests will be performing through interaction with GUV (Giant Unilamellar Vesicles). The experiments will be carried out on water with concentrations of salt to get closer to characteristics of sea water. To evaluate the effect on the hydrocarbons, the experiments will also be taken with different concentrations of oil.



Production of GUV (Giant Unilamellar Vesicles) at Università Politecnica delle Marche



SAXS experiments at Graz University of Technology – TU Graz, in Austria

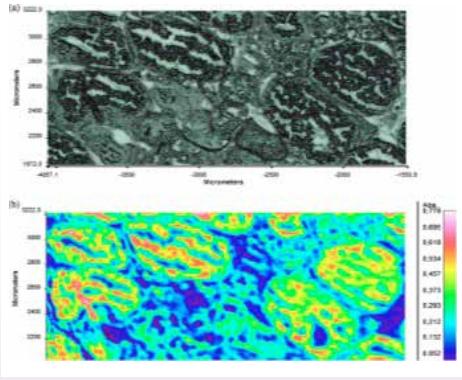
Civil and Environmental Protection

A VIBRATIONAL APPROACH TO DETECT THE EFFECTS OF POLYFLUORINATED COMPOUNDS IN DANIO RERIO – TUTOR PROF. ELISABETTA GIORGINI

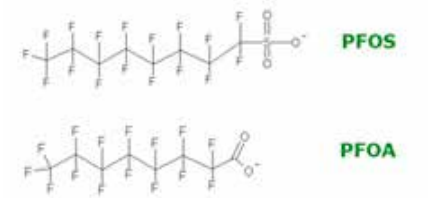
Name: Chiara Pro
Nationality: Italian
Previous University: Università degli Studi di Torino - Torino

I am attending the Civil and Environmental Protection Curriculum of the PhD school of the Department of Life and Environmental Sciences. My PhD experience has started just 6 months ago and I can say that this period has been very useful to create the basis for my whole PhD period: we, as students, are strongly suggested to get in touch with all the other PhD students, attending lessons, courses and a lot of seminars together. The first period is usually made of approaching, so I am starting achieving new skills, studying new things, meeting a lot of people. The most important thing, for me, of the PhD program is that you can model your PhD course building your own path, the way it is better for you.

Summary: The aim of my PhD project is to study and monitor the influence of polyfluorinated (PFCs) and perfluorinated compounds in the experimental model Danio Rerio, applying two advanced microspectroscopies: Fourier Transform InfraRed Microspectroscopy (FTIRM) and Raman Microspectroscopy (RMS). These compounds are anthropogenic and act as marine pollutants: they are an enormous problem that has been revealed just in the last period, especially in the north of the Adriatic sea. This vibrational approach will be able to achieve a large dataset of spectral biomarkers that will be obtained from Danio Rerio, for a hopeful application also in wild species. The main effects and structures studied will be the hepatic metabolism and the oocyte quality



Microphotography and IR map of a Zebrafish ovary.



Zebrafish and perfluorinated pollutants

Civil and Environmental Protection

MONTECRISTO AND GIGLIO ISLANDS: BENTHIC COMMUNITIES OF TWO ISLANDS WITH DIFFERENT LEVEL OF PROTECTION – TUTOR PROF. STEFANIA PUCE

Summary: The main aim of my PhD project is to compare the benthic communities of hydrozoans, sponges and bryozoans of two islands with different level of protection: Montecristo Island, which is an Integral Reserve, and Giglio Island, undergone to high anthropic pressures. Moreover, I will analyse the amount of heavy metals, in the water, sediments and Posidonia leaves of the two islands, and the presence of microplastics, both in the water column and gastric cavity of hydrozoan polyps.

Map of the two analyzed islands.

Name: Camilla Roveta
Nationality: Italian
Previous University: Università degli Studi di Genova - Genova

The PhD school of Università Politecnica delle Marche is well organized and really motivated to promote new activities and courses. Having started my PhD only in November, I just have a small experience in this university, but I can say that it is a stimulating environment in which you can learn and have nice experiences. It opens us to both the national and international scientific world, leading us to expand our knowledge and facing us with different realities.

Sample analyzed in the field

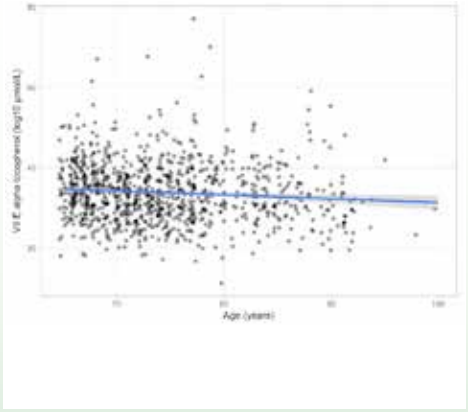
Civil and Environmental Protection

ROLE OF NUTRITIONAL FACTORS IN COGNITIVE AGING OF OLDER SUBJECTS
TUTOR PROF. TIZIANA BACCHETTI

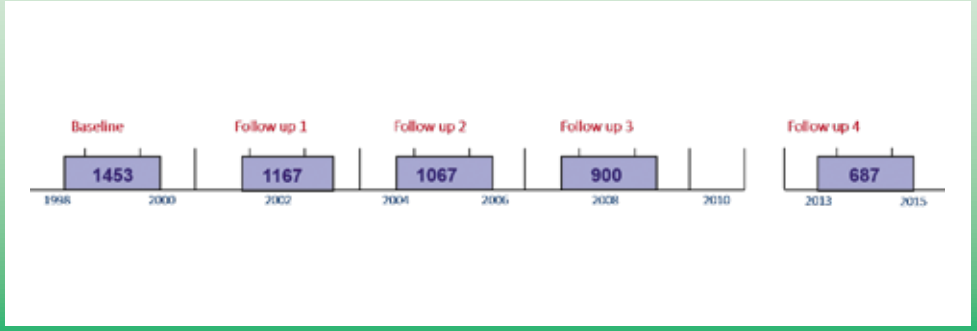
Name: Barbara Carrieri
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

Every PhD cycle does not have many students, compared to a degree course. This allows you to get to know each other easily and exchange information on own research and experiences. The training offers the possibility to choose the courses to follow. This allows to follow the subject that interests most and excites. Moreover, the lessons often include hours to spend in the laboratory.

Summary: Dementia is a devastating condition leading to negative health outcomes and high healthcare costs. Given that its prevalence is increasing worldwide, and that there are no treatments available, identifying modifiable risk factors to avoid its occurrence will probably be a fundamental strategy to reduce the number of individuals affected. Among the factors that might confer protection there is vitamin E. Published data on vitamin E and cognitive function are controversial.
My research uses the data of the epidemiological study called Invecchiare in Chianti (InCHIANTI), which started in the 1998, in Tuscany (i.e. Greve in Chianti, Bagno a Ripoli). In the follow-up at 9 years, data obtained showed a relation between vitamin E and cognitive stability. My research focus on the data collected in the 12 years follow-up, with the aim to confirm the beneficial effect of vitamin E on cognitive function during aging.



Plasma vitamin E levels decrease with aging



Plasma vitamin E levels decrease with aging

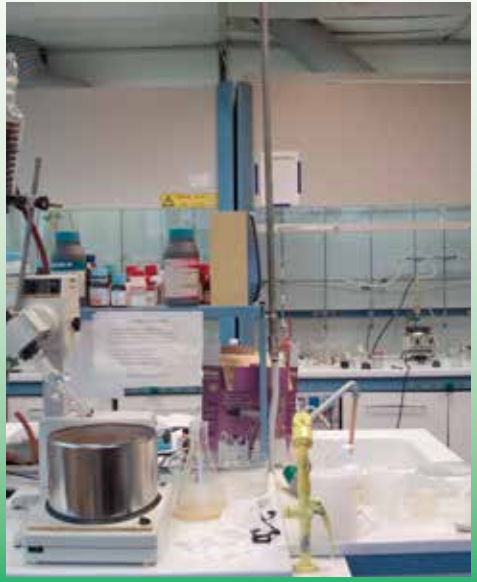
α-HYDRAZIDO ACIDS FOR ANTIBACTERIAL ACTIVITY - TUTOR PROF. SAMUELE RINALDI

Name: Giulia Guerra
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

"The observation is one of the most powerful tools that a scientist needs to be a real scientist". This was one of the first things that my academic tutor taught me when I started my Ph.D. course at Università Politecnica delle Marche.
Working close with very skilled professors and researchers helps you gain more experience every day and be more and more capable, giving your best. The school also provides lectures and various activities where students have the possibility to know better other colleagues and their research projects.
We are also encouraged to go abroad for attending or taking part in seminars, conferences or for having some experience working in foreign research institutes.
Passion. Knowledge. Tenacity. They are mainly what you need to do science and, in my opinion, the UNIVPM teaches this very well.

Summary: Antibiotics abuse in recent years allowed several bacterial strains to develop resistance to the most used antibiotics, getting a seriously worldwide problem. Thus, there is the need to find new drugs and a possible solution is to mimic the action of natural AntiMicrobial Peptides (AMPs). Since the AMPs interact with the bacterial membrane destroying it, it is unlikely for bacteria to develop resistance, getting them promising. My Ph.D. work is focused on the synthesis of mimics of antimicrobial peptides (SMAMPs), in particular on small amphiphilic molecules, the small SMAMPs. I have synthesized several potential antibacterial compounds with a wide-spectrum activity, based on an α-hydrazido acid skeleton. Moreover, several biological experiments have also been done, like the evaluation of their antimicrobial activity or assays of hemolysis to ascertain if these compounds can be useful for biological applications.

Hemolysis experiments in laboratory of microbiology



Laboratory of organic synthesis

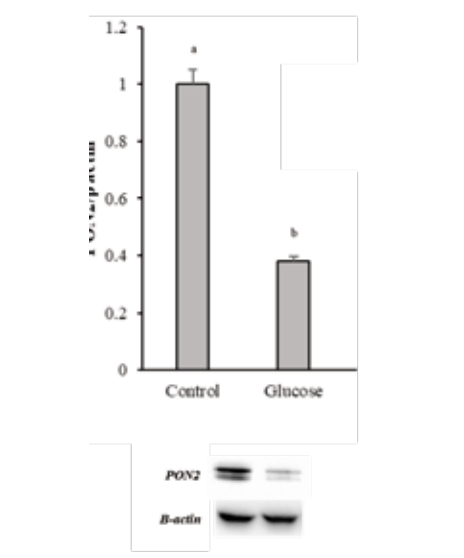
Biomolecular Sciences

ROLES OF PARAOXONASES IN NORMAL AND PATHOLOGICAL CONDITIONS
TUTOR PROF. TIZIANA BACCHETTI

Name: Camilla Morresi
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

I'm at the 3rd year and I can say that the PhD course is an important opportunity for every student who wishes expand their knowledge. Classroom lessons and the Erarmus project are excellent tools to growt professionally and learn new techniques. Our University with various projects promotes the exchange of ideas and knowledge among students from different countries. This is very important for a professional active growth.

Summary: Paraoxonase (PON) is a group of enzymes present in three forms (PON1, PON2, PON3). Each PON form plays an important role in the human body and they exhibit antioxidant, antiatherosclerotic, and anti-inflammatory influences, but differences in enzyme's activity and localization indicate that PON1, PON2 and PON3 have got different functions in the human body. Aim of my PhD project is to investigate the roles of PONs in normal and pathological conditions and the factors involved in the modulation of their expression and activities. In particular, using different cell models, the effect of hyperglycemia on PONs expression and activity and the impact on redox state, integrity and function of cells have been studied. Moreover, the role of diet-derived bioactive molecules (e.g polyphenols) in the modulation of PONs expression and activity and in the protection against cell glyco-oxidative damage have been investigated.



Effect of hyperglycemia on Paraoxonase 2 (PON2) expression. CaCo2 cells treated for a week in absence (Control) or in the presence of high glucose (25mM)

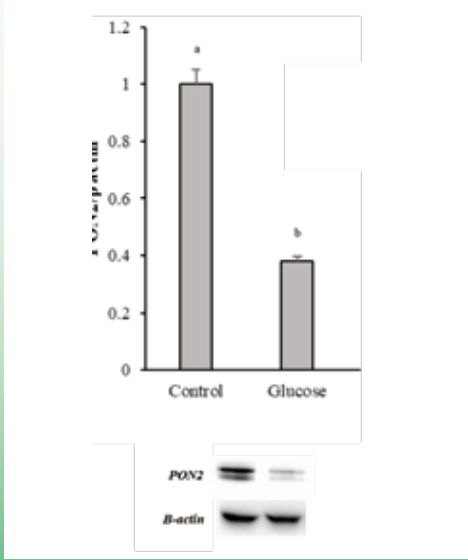
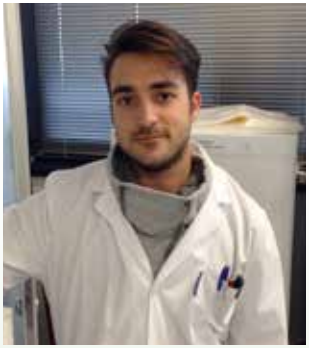


Figure 2: Effect of hyperglycemia on Paraoxonase 1 (PON1) expression. CaCo2 cells treated for a week in absence (Control) or in the presence of high glucose (25mM)

Biomolecular Sciences

IDENTIFICATION OF THE PARACRINE SIGNALS INVOLVED IN TISSUE REGENERATION
TUTOR PROF. FRANCESCA BIAVASCO



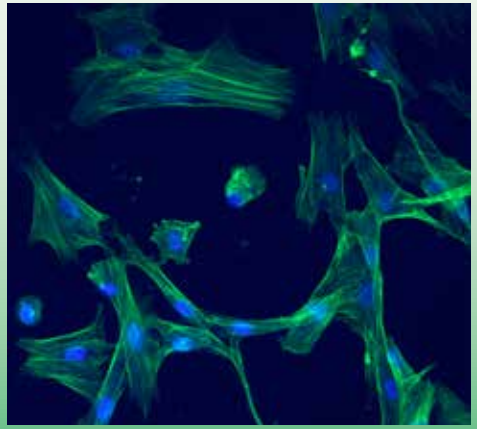
Name: Salvatore Vaiasicca
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

I'm a PhD student in the department of Life and Environmental Sciences, Curriculum Biomolecular Sciences, Polytechnic University of Marche (UNIVPM). In my opinion, the PhD training course provides the opportunity to perform a 360-degrees complete scientific project, since the student acquires the theoretical knowledge, the proper practical laboratory skills and the ability to critically evaluate the results obtained in his own research. The PhD experience allows to cooperate with different scientific figures with different expertise. On the other hand, the PhD training course reveals the negative sides about the research, by the comparison with the international scientific background. However it represents a pivotal step to become an independent researcher and a better scientist.

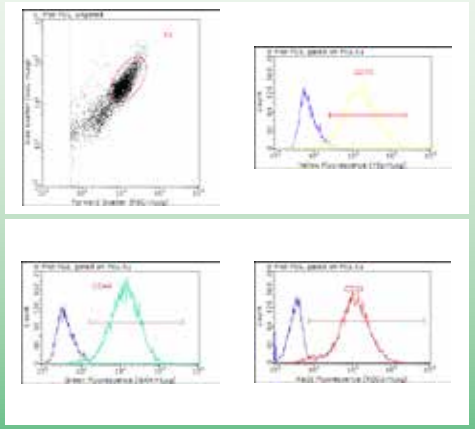
Biomolecular Sciences

Summary: The topic of my study aims to identify the paracrine signals involved in tissue regeneration and immunotherapy; the study involves the use of live cells, or their derivatives, to modulate the function of endogenous cells whose functionality has been compromised. Understanding the molecular mechanisms at the basis of cell communication is crucial to develop innovative approaches for cell therapy. This communication involves numerous paracrine signals that are exchanged between cells, which have been reported to modulate the behavior of a precise target cell type. One example is the established cross-talk between cancer cells and immune cells or between stem cells and immune cells.

Furthermore, regenerative medicine is a newly emerging and multidisciplinary field which draws on biology, medicine and genetic manipulation for the development of strategies aimed at maintaining, enhancing or restoring the function of compromised/injured tissues or organs. I would like to link these two topics and thus, my study concerns the interactions between different cell types; a particular focus is dedicated to released soluble factors and to the cells response to the treatment with different substances. This will allow to observe the interactions between different cell types and the involved molecular mechanisms, that will be investigated through different molecular biology techniques.



Human Chorionic Villi-MSC structure: the cell nucleus was highlighted by the hoesch blue probe against the cytoskeleton, stained with the green probe Actingreen.



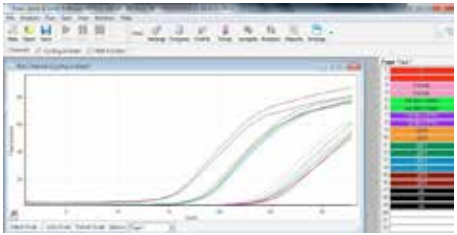
Human Mesenchymal Stem Cell-associated markers: detected by flow-cytometry using specific antibodies (CD73; CD44; CD29)

ANTIBIOTIC RESISTANCE AND BACTERIAL PERSISTENCE IN CYSTIC FIBROSIS-RELATED LUNG INFECTIONS – TUTOR PROF. FRANCESCA BIAVASCO

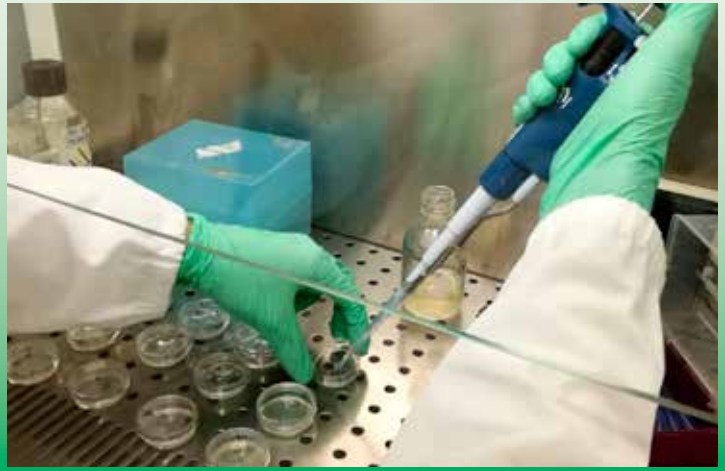
Name: Nicholas Cedraro
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

The continuous challenges of the doctoral course are training our abilities and enriching our skills, teaching us how to overcome difficulties to reach the best results. We are not a big university, but there is a common and strong desire to grow and to compare to an international level that stimulates our everyday work. Here at the Univpm there's a great atmosphere, and the relationships with professors, colleagues and staff are always friendly and highly constructive. Moreover, working with such a sea view is priceless.

Summary: The increase of the antibiotic resistance is one of the most alarming health care problems worldwide and tends to become a real emergency in the next future. This issue represents a life threat in immunocompromised and hospitalized patients: in particular in cystic fibrosis patients, chronic lung infections caused by multidrug resistant bacteria are the main cause of mortality. In our laboratory, our research activity is focused on two great topics: 1) testing of new natural compounds able to act synergistically with known antibiotics, in order to counteract resistant bacterial infections, 2) studies of the evolution of persistent and viable but non-culturable cells (able to survive under antibiotic treatment) in in vitro biofilm models, and evaluation of the possible role of the antibiotic therapy itself in their formation.



Species-specific bacterial quantification through Real-Time qPCR



Manipulation of bacterial in vitro biofilms for the evaluation of the Viable But Non-Culturable (VBNC) cells.

RECOMBINANT MEMBRANE PROTEIN PRODUCTION FOR STRUCTURAL STUDIES
TUTOR PROF. PAOLO MARIANI

Name: Lucrezia Savini
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

I think that The PhD course of the "Università Politecnica delle Marche" is an excellent opportunity to exploit the knowledge acquired during years of study, to expand my skills and acquire soft skills by learning what it means to work in a team.
I learning to pursue results, plan objectives, manage economic resources, it solves problems independently.
I had the opportunity to travel, to learn to work in multicultural teams through stimulating, different and complementary experiences thanks to relationships with other universities and research centers. In my opinion this course teaches us to be autonomous and creative, time passes quickly and we are at the end of the day without realizing it, looking for "the result" that at first seems unattainable, but in the end gives you the greatest satisfaction!

Summary: The main aim of my PhD is focused on the production of recombinant proteins of biotechnological, pharmaceutical and agro-food interest. The production and purification of proteins is the key point to carry out structural and functional analyses.
During my first year of PhD, I produced the Human transferrin receptor1 (CD71). This is a homodimeric transmembrane protein. The main function of this receptor is to import iron into the cell in response to changes of concentration in the intracellular part of this essential element. CD71 has also been shown to be an active vector for several molecules, such as the human pathogenic virus, arenavirus and hepatitis, etc. Recently, CD71 has been seen as a vector for the Plasmodium vivax, the most common malaria parasite.
It is therefore clear that the study of this protein is of particular interest.

Mammalian cell colture in incubator

Load samples in to SDS-PAGE

INNOVATIVE STRATEGIES OF DELIVERY FOR ANTIOXIDANTS IN ARTIFICIAL EYEDROPS FOR SCAVENGING ACTION AGAINST FREE RADICALS AND AS COADJUTANT IN OCULAR DISEASES – TUTOR PROF. ROBERTA GALEAZZI

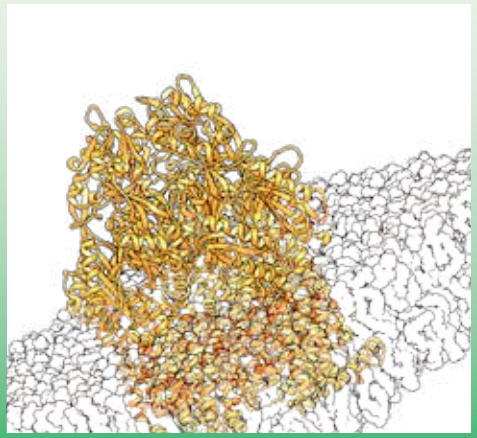
Name: Mattia Cantarini
Nationality: Italian
Previous University: Università di Camerino - Camerino

I try to overcome the challenges in Life Sciences field with the skills of a chemist. My curiosity towards pharmacological targets for drug design has ever been attracted from potential applications in biomolecular area. Today, my PhD EUREKA project in biomolecular sciences cofounded by UNIVPM and SOOFT Italia – SPA, might give me the opportunity to fulfil my expectations. In the laboratories where I carry out my research, a continuous exchange of ideas with my colleagues is useful to generate a dynamic environment of healthy competition to improve my own scientific background. Multidisciplinary studies are mandatory and they require versatility and strong determination. My supervisor encourages me for building both transversal knowledge and collaborations with other research groups in order to cooperate for the resolution of scientific problems. During my PhD course, I hope to improve my skills and to enjoy myself with new scientific challenges.

Biomolecular Sciences

Summary: my research project focuses on ocular pathologies mainly characterized from the excessive presence of free radicals due to action of macrophages (as glaucoma, age-related macular senile, retinopathies and bacterial infections). Free radicals are unstable chemical species with high reactivity.
Excessive concentrations of radicals are harmful for retina because damage cell in an irreversible way, involving ageing and, in last issue, cellular death. New derivatives from natural antioxidant compounds have been investigated in order to avoid retina damage.
Computational technics of molecular modelling are involved to reach lipophilic compounds able to insert itself in tear film to restore homeostatic state of the cornea, protecting from oxidative stress processes.
Although, ophthalmic formulations containing antioxidants are already in trade. Often the low availability of the active ingredients for inadequate adsorption requires the presence of cytotoxic coadjutants.
Therefore, need to obtain pharmaceutical formulations useful to promote absorption, in particular intra-corneal, to improve availability of active compounds towards prevention of damage oxidative stress, without the use of toxic excipients.

Prediction of binding modality between ligand-protein through molecular docking



Research of new biological targets for structure based drug design

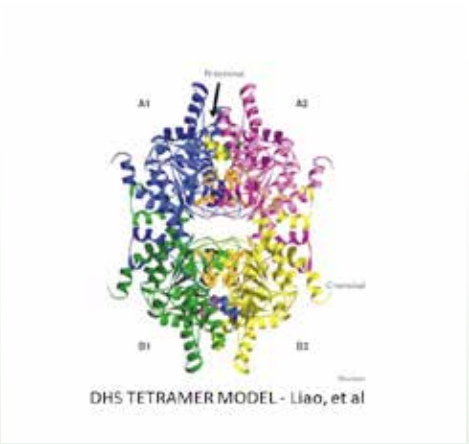
3D DETERMINATION OF THE STRUCTURE OF IF5A-DHS COMPLEX
TUTOR PROF. ANNA LA TEANA

Name: Mattia D'Agostino
Nationality: Italian
Previous University: Università Politecnica delle Marche - Ancona

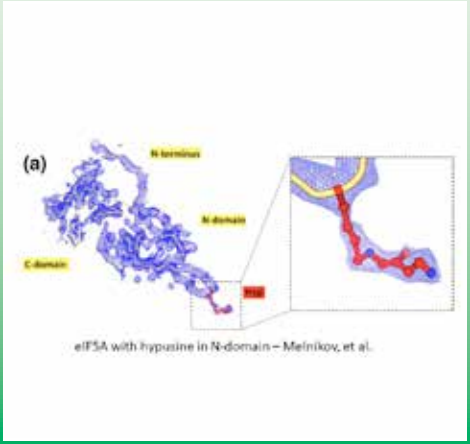
I started the doctoral school in "Biomolecular Science" at the "Università Politecnica delle Marche" in November and I'm proud for the work that I've done until now thanks to the laboratories and instruments of the Department of Life and Environmental Sciences. The phD course is full of lessons and advices that allow the phD students to make experience in their working enviroment. The doctoral school in Biomolecular Science is an awesome experience, a forward step into my university career. Each day is an adventure with new and different experiments and results, it's beautiful to find the practice part of our program study. I am really happy of this job and focus and determinate to reach every day new undiscovered data!

Biomolecular Sciences

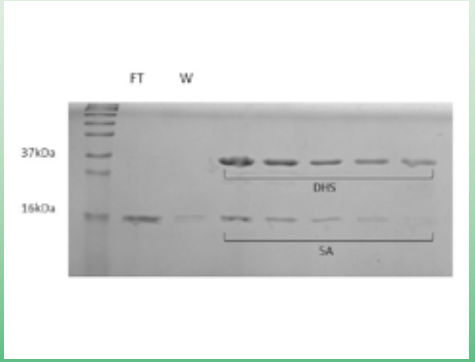
Summary: My phD project focus on the study of one of the universally conserved traslation factor: the Initiation factor 5A (IF5A) that is important in the elongation phase of the traslation mechanism. The Eukaryotic traslation initiation factor 5A is a protein that contains the unusual amino acid hypusine that derives from one post-traslation modification of a lysine. This modification is essential for the fuction of the protein. Hypusination is carried out in two consecutive enzymatic reaction: the first one by the deoxyhypusine sinthase (DHS) and the second one by the deoxyhypusine hydroxylase. My goal is to obtain a structural characterization of the complex between the IF5A and the first enzyme implicated in the post-traslation modification reaction: the DHS



DHS TETRAMER MODEL - Liao, et al



eIF5A with hypusine in N-domain – Melnikov, et al.



SDS-PAGE. Purification of complex between recombinant proteins IF5A and DHS

EXPLOITATION OF NON-CONVENTIONAL YEASTS IN FOOD AND BEVERAGES
TUTOR PROF. FRANCESCA COMITINI

Name: Edoardo Galli
Nationality: Italian
Previous University: Università Politecnica delle Marche – Ancona

The opportunity to do a PhD Course in Life and Environmental Sciences, in particular the SB curriculum, allowed me to deepen the knowledge and the laboratory techniques learned during the thesis period.
I think that the PhD is a great opportunity to enhance my applied research, allowing the students to meet highly qualified people and work with them.
I've decided to continue my academic experience here at the Polytechnic University of Marche since I had a good experience during my experimental thesis, due to the efficiency of structures and laboratories.
Furthermore, the UnivPM gives the chance to go to highly specialized facilities in foreign countries during the PhD period, allowing the students to know new different realities, expanding "their own horizons" and allowing them to further increase their training.

Summary: During my PhD study, the principal research topic will focus on yeasts involved in fermented products such as food and beverages. Indeed, the use of yeasts is strictly linked to their effect on the quality and safety of the final products. Generally fermented products, and in particular beverages, can contain viable yeasts, which after having played their technological role, also contribute to enhance the aromatic or organoleptic properties of final product. This trait is crucial to exploit the yeast not only for its fermentative properties but also for nutritional enhancement. In this context my research activities will be principally focused on the study and characterization of physiological traits of yeasts involved during fermentation. After a preliminary evaluation of non-conventional yeasts, it will evaluate their potential probiotic and functional features. At the same time their potential use as microbial starters to enhance the chemical and organoleptic characteristics of food and beverages will be evaluated.

Yeast biomass production

Evaluation of fermentation kinetics

DOTTORATO DAY - AULA MAGNA «G. BOSSI»
ANCONA, MAY 13° 2019

Phd Course in Life and Environmental Sciences

OVERVIEW

PhD programs represent the third level of University education in Italy, and are designed to provide participants with the specialized knowledge and skills necessary to carry out highly high quality research and executive activities both in public or private institutions.

Application for a PhD program at the UNIVPM requires a master degree (Laurea Magistrale or Specialistica). To be admitted candidates must pass a competitive selection based on qualifications and examinations.

The PhD Degree is awarded at the end of a three years program, after successful completion of various requirements, including the writing of a dissertation and its oral presentation and defense.

The Phd Course in Life and Environmental Sciences at the Università Politecnica delle Marche offers three specialized curricula:

Marine Biology and Ecology (BEM)
Civil and Environmental Protection (PCA)
Biomolecular Sciences (SB)

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