



## **Advanced Skills Course** ***Innovative Materials, Digital Transformation and Sustainability***

*Developing Shared Knowledge in Innovative Materials and Digital Transformation for Sustainable Economy and Green Transition*

**March 12–18, 2026**

 **First Session – Universidad Nacional de La Plata**

*Museo de La Plata–Paseo del Bosque s/n La Plata*

March 12–13 | 09:30 – 18:00

March 14 | 09:30 – 17.00

 **Second Session – Universidad Nacional de La Matanza**

*Moreno 1623, Ciudad Autonoma de BA*

March 16–17 | 09:30 – 18:00

 **Final Ceremony – Universidad de Buenos Aires**

*Facultad de Farmacia y Bioquímica | Junin 954 Ciudad Autonoma de BA*

March 18 | 09:30 – 13:00

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Lecture, March 12 – h11:00

# Living materials for advanced sustainable technologies

**GIANLUCA MARIA FARINOLA**

*Università degli Studi di Bari Aldo Moro, Bari, Italy*

Research on living materials has opened one of the most fascinating and promising frontiers in science and technology, positioned at the crossroads of synthetic biology, materials chemistry, and nanotechnology. “Living materials” refers to hybrid systems in which active biological components—cells, microorganisms, or engineered biomolecules—act as materials or are integrated, while maintaining their activity, into matrices and devices. They thus provide specific functionalities together with the self-regulation and adaptation capacities typical of living organisms.

Unlike traditional, static, and passive materials, living materials can respond to environmental stimuli, self-repair, grow, and change their structure and function over time. Their future use could help, in part, to address shortages of critical raw materials.

Relevant examples include self-regenerating materials based on biopolymers, hydrogels containing cells or active enzymes, and fungal mycelium structures used as living scaffolds for structural or biodegradable applications. A particularly interesting class comprises materials based on photosynthetic microorganisms, such as microalgae or photosynthetic bacteria, used in devices for converting solar energy into electricity, living photovoltaic panels, and systems for hydrogen production. These organisms are also employed in regenerative medicine, oxygen generation, and the design of bionic microrobots for biomedical and environmental applications.

Potential industrial applications range from sustainable construction—with mycelium-based materials or bioactive biopolymers for panels and eco-compatible components—to environmental sensing and remediation, with materials capable of capturing pollutants or producing energy.

Designing living materials poses crucial challenges related to the stability of biological systems, operational safety, and the ethical and environmental aspects of their regulation. In this context, living materials represent not only a new class of functional materials, but also a paradigm of “intelligent” and sustainable matter, able to evolve alongside the environment and human needs.

Lecture, March 12 – h12:00

# Sustainable Hybrid Biomaterials: Biofunctional Interfaces and Stimuli-Responsive Networks

**SIMONA CONCILIO**

*Università degli Studi di Salerno, Italy*

Multifunctionality in biomedical materials is frequently pursued by adding components and processing steps, increasing complexity and environmental burden. This lecture presents a “multifunctional-by-design” approach in which performance is encoded into material architecture and chemistry while keeping fabrication deliberately simple and compatible with green manufacturing. The focus will be on hybrid polymer networks and biofunctional interfaces that combine structural integrity with programmable responses, manufactured through solvent-minimized routes and benign chemistries. Emphasis will be placed on aqueous processing and low-toxicity crosslinking strategies (e.g., enzymatic and visible-light-initiated reactions) that preserve sensitive functional groups and support reproducible fabrication.

The lecture will draw on representative case studies of photoresponsive and thermoresponsive materials that enable spatiotemporal control of mechanics, permeability, and drug release, together with dynamic networks that offer reprocessability and reduced waste through design. In parallel with biomedical performance requirements (biocompatibility, sterilization compatibility, stability, and reproducibility), simple sustainability descriptors—such as material efficiency, solvent accounting, and mass intensity—will be introduced as practical tools to quantify trade-offs and guide selection. Overall, the lecture frames sustainability metrics as explicit design variables for advanced hybrid biomaterials, enabling scalable manufacturing without compromising function.

Lecture, March 12 – h14-30:00

# Smart Carbon Dots for Advanced Biomedical Application

**NICOLÒ MAURO**

*Università degli Studi di Palermo, Italy*

Smart carbon dots (CDs) have emerged as a fascinating class of optical nanomaterials owing to their unique physicochemical properties, tunable photoluminescence, biocompatibility, and versatile surface chemistry. The proposed lecture offers an introduction to the rapidly evolving world of carbon nanodots, highlighting their synthesis, optical behavior, and functional design. Particular emphasis will be placed on their role in biomedical applications, with selected examples in cancer nanomedicine, including imaging-guided therapy, theranostics, and targeted drug delivery. In addition, the potential of carbon dots as sensitive and selective platforms for biosensing will be discussed, illustrating how smart nanomaterial engineering can address current challenges in diagnosis and therapy.

Lecture, March 12 – h15:30

# Environmentally friendly design for electrical systems. Key aspects of the energy transition

**Mag. Ing. CARLOS WALL**

*Universidad Nacional de La Plata, Argentina*

Environmentally friendly design for electrical systems helps improve the durability, reliability, repairability, upgradeability, reusability, and recyclability of products. It allows for improved refurbishment and maintenance possibilities; addresses the presence of substances of concern in products; and increases the energy and resource efficiency of products.

Furthermore, it is important to include the possibility of recovering strategic and critical raw materials; reducing the anticipated waste generation and increasing the recycled content in products, while ensuring their performance and safety, enabling high-quality remanufacturing and recycling, and reducing the carbon and environmental footprint.

Environmentally Conscious Design (ECD) is a similar methodology that systematically integrates environmental considerations into the design and development process of products, services, or systems. It seeks to minimize negative environmental impacts and promote sustainability throughout a product's life cycle, from raw material extraction to end-of-life management. This includes considering factors such as energy efficiency, resource use, waste reduction, and toxicity.

These issues become relevant when considering the role of the electrical system in the energy transition, as daily life is increasingly dependent on these systems.

Pannel Discussion, March 12 – h17:00

## Sustainability in bio-based polymeric nanocomposites for coating and adhesives design

**PABLO PERUZZO**

*Universidad Nacional de La Plata*

Sustainable Material Design (SMD) is a holistic approach to material selection and development minimizing environmental impact throughout its lifecycle. It integrates environmental, social, and economic aspects into product development, using Life Cycle Assessment to ensure materials are renewable, recyclable, or biodegradable: at its core, is about making mindful choices in material selection to lessen environmental burdens while maintaining or enhancing product performance and societal benefit. This dual focus, balancing performance and environmental impact, ensures that products are not only effective but also contribute to a more sustainable future.

A key strategy in SMD is the research on materials from renewable sources for the development of low impact products. However, in some cases, sustainable materials may not meet the performance standards of traditional options. Designers must navigate these trade-offs to ensure that materials are both environmentally friendly and functional. Innovations such as provided by nanotechnology or biotechnology have the potential to disrupt traditional materials industries and offer solutions for energy efficiency and performance optimization. Companies are increasingly recognizing the value of the SMD, will need to adapt to these changes and invest in sustainable practices to remain competitive. Consumers who are aware of the importance of

sustainability materials can promote market demand and drive more businesses to adopt eco-friendly practices, even more if the governments worldwide implement stricter regulations on environmental impact.

Based on examples of work in progress in our laboratory related to the design of biobased adhesives for cross-laminated timber (CLT) production, some aspects related to this subject will be aborded. The transition to a circular economy, where materials are reused and recycled, is gaining momentum. Probably it involves creative, forward-thinking approaches, often demanding research to doing things in a new way with a clear course of action to increase people recognizing the value of designing products for longevity and recyclability, leading to reduced waste and environmental impact. The challenge is how integrating these aspects in a synergic process to increase the demand for sustainable materials.

Lecture, March 13 – h9:30

# AI-Driven Materials Discovery: From Data Pipelines to Predictive Design

**Stefano Piotto Piotto**

*Università degli Studi di Salerno, Italy*

AI-driven materials discovery is reshaping how functional materials are conceived, prioritized, and translated into reproducible chemistries. This lecture introduces a pragmatic workflow that integrates experimental data, molecular and mesoscale simulation, and predictive modeling to accelerate discovery while maintaining mechanistic interpretability—an essential requirement in biomaterials and drug-delivery-adjacent platforms. The emphasis is on building quantitative structure–process–property relationships from heterogeneous sources: formulation and synthesis metadata, spectroscopy and rheology, microscopy, and functional readouts such as release kinetics and bioactivity proxies.

Key topics include data representation for soft and hybrid materials (descriptors for polymer networks, stimuli-responsive motifs, and interfacial biofunctionalization), uncertainty-aware learning to operate in low-data regimes, and closed-loop strategies that couple active learning with experimental design. Simulation will be positioned as a complementary source of priors and constraints—enabling physics-informed models that extrapolate more reliably than purely empirical fits. The lecture will also address validation and generalization, with attention to domain shift, batch effects, and the practical deployment of models for decision-making in the laboratory. By the end, participants will be able to map a materials problem to an AI-ready dataset, select an appropriate modeling strategy (from interpretable baselines to modern surrogate models), and define success criteria aligned with robustness and translational relevance.

Lecture, March 13 – h10:30

# Artificial Intelligence, Digital Transformation and Process Innovation for Sustainable Transitions in Manufacturing and Services Industries

**FRANCESCO SCHIAVONE**

*Università degli Studi di Napoli Parthenope, Italy*

Artificial Intelligence (AI) is emerging as a pivotal enabler of digital transformation and process innovation, profoundly reshaping manufacturing and service industries in the context of sustainable transitions. This academic-level lecture examines how AI-driven technologies—such as machine learning, advanced analytics, digital twins, and intelligent automation—are redefining organizational processes, decision-making architectures, and value creation models to address economic, environmental, and social sustainability challenges.

The lecture adopts a process-oriented and socio-technical perspective, emphasizing the integration of AI within broader digital transformation strategies rather than treating it as a standalone technological solution. It explores how AI supports process innovation across key organizational domains, including operations management, supply chain coordination, service delivery, and performance measurement. Particular attention is devoted to the role of AI in enabling resource efficiency, waste reduction, predictive maintenance, and demand-responsive systems, which are critical levers for reducing environmental impact while enhancing productivity and resilience.

Drawing on recent empirical studies and illustrative cases from manufacturing and service contexts, the lecture highlights the conditions under which AI-enabled process innovation contributes to sustainable transitions. These include data governance capabilities, organizational learning mechanisms, cross-functional collaboration, and alignment between technological investments and sustainability-oriented strategic objectives. The lecture also critically addresses key challenges and risks, such as algorithmic bias, energy consumption of AI systems, workforce reskilling, and the uneven distribution of digital capabilities across organizations and regions.

By integrating insights from digital innovation, operations management, and sustainability transitions literature, this lecture provides a conceptual framework for understanding AI as a catalyst for systemic change. It offers scholars and practitioners a structured lens to assess how AI-driven digital transformation can support long-term sustainable value creation in manufacturing and service industries.

Lecture, March 13 – h12:00

# Cyber-security challenges in digital transformation: resilience and ethics

**DANILO CAIVANO**

*Università degli Studi di Bari Aldo Moro, Italy*

Digital transformation is reshaping organizations, industrial processes, and public services, while simultaneously expanding the attack surface of digital systems. This lecture addresses the main cybersecurity challenges emerging in highly interconnected and data-driven environments, focusing on the impact of cloud computing, Internet of Things, artificial intelligence, and distributed digital infrastructures on security and resilience.

The course provides an overview of contemporary cyber threats, including advanced persistent threats, ransomware, supply-chain attacks, and data breaches, highlighting how digital transformation amplifies systemic vulnerabilities. Particular attention is devoted to risk assessment methodologies, security-by-design principles, and the integration of cybersecurity into digital innovation processes.

Beyond the technical dimension, the lecture adopts a multidisciplinary perspective, discussing organizational, regulatory, and ethical aspects of cybersecurity, as well as the role of governance and human factors in building resilient digital systems. Case studies and real-world scenarios are used to illustrate how effective cybersecurity strategies can support trust, sustainability, and long-term value creation in digital transformation initiatives.

The lecture contributes to the development of advanced skills by equipping participants with conceptual tools and strategic awareness necessary to design, manage, and evaluate secure digital transformation pathways in complex socio-technical systems.

Lecture, March 13 – h14:30

# Legal Framework for the use of AI in Public Decision-Making

**FEDERICO LACAVA**

*Universidad de Concepción del Uruguay, Argentina*

The growing adoption of artificial intelligence in public administration is transforming the way governments design policies, manage public services, and support decision-making processes. While AI systems offer significant opportunities for improving efficiency, predictive capacity, and data-driven governance, their use also raises important legal and ethical challenges. This lecture examines the emerging legal framework governing the use of artificial intelligence in public decision-making, focusing on principles such as transparency, accountability, due process, and the protection of fundamental rights. Particular attention will be given to the risks associated with algorithmic decision-making in public administration, including issues related to bias, explainability, and the potential erosion of democratic oversight. The presentation will discuss current regulatory developments at the international and comparative level, including recent initiatives in the European Union and their possible implications for other jurisdictions. The analysis highlights the need for legal frameworks capable of ensuring that the integration of AI into public governance remains consistent with constitutional principles, democratic values, and the rule of law.

Lecture, March 13 – h15:30

# Digital Transition in Organizational Processes and Human Resource Management

**LUISA VARRIALE**

*Università degli Studi di Napoli Parthenope, Italy*

The digital transition represents a strategic transformation affecting organizational structures, processes, and the management and development of human resources. Otherwise also green transition, with an increasing attention paid to sustainable development, significantly affects organizations and their processes and activities at any level. This seminar explores the temporal dimensions of digital transformation, focusing on how organizations can plan, sequence, and govern change over time to ensure sustainable value creation. Attention is given to the impact of digital and smart technologies on organizational workflows, leadership models, workforce skills, and HR

practices such as recruitment, performance management, learning, and employee engagement.

Through theoretical frameworks, empirical evidence, and applied case studies, participants will develop a critical understanding of how timing, pacing, and alignment shape the success of digital transformation initiatives. In this direction, main fundamentals of digital HRM and sustainable HRM can be explored by adopting an integrated viewpoint.

Roundtable, March 13 – h17:00

## Ethics and technology in digital times

**JAVIER DIAZ**

*Universidad Nacional de La Plata, Argentina*

Where should the ethical limits of AI autonomy lie today, and in what types of decisions do you consider it essential to keep humans in the loop? .What should be the minimum ethical standards for using AI or automation in public, educational, or institutional decision-making without increasing inequalities, reproducing biases, or making processes less transparent? How should a technology be ethically evaluated when it promises efficiency or innovation, but at the same time increases energy consumption, technological dependence, or environmental impact?. Let s discuss about this and other topics.

Lecture, March 14 – h9:30

# Global Environmental Law, Regional Sustainability Governance, and International Climate Agreements

**MASSIMILIANO MONTINI**

*Università degli Studi di Siena, Italy*

The lecture will focus on the implementation of the European Green Deal with a particular focus on the internal and external dimensions. The analysis will look at the principle of sustainable development as the common thread for the legislation implementing the European Green Deal, as applicable both within the European internal market and in the trade relations of the European Union with third countries. Within this framework three case studies will be analyzed: the CBAM regulation on the carbon border adjustment mechanism, the EUDR regulation for the prevention of deforestation and biodiversity protection, the ESPR regulation on eco-design for sustainable products.

Lecture, March 14 – h10:30

# **Climate Security in Latin America and Argentina: International and local actions in mitigation and adaptation strategy**

**JULIANA GONZALEZ VARELA**

*Universidad Nacional de La Plata, Argentina*

Climate change is increasingly shaping the environmental, social and political dynamics of Latin America and the Caribbean. This presentation explores how climate change and environmental degradation interact with existing structural challenges in the region, including inequality, political instability, social conflict, insecurity and organized crime.

It highlights the strategic importance of the region for global environmental security due to its extraordinary biodiversity, its vast forest ecosystems with high mitigation potential, its role as a key food producer in the context of global food insecurity, and its relevance in the global energy transition. These features strengthen the position of LAC within international climate commitments.

The presentation also refers to international initiatives and agreements such as the Escazu Agreement and the Convention on the Protection of the Environment through Criminal Law. It argues that climate change acts as a threat multiplier, requiring integrated responses that promote climate action, peace, resilience and sustainable development.

Lecture, March 14 – h12:00

# **Fiscal Policy, International law of Human Rights, and its impact on environmental law**

***HORACIO CORTI***

*Universidad de Buenos Aires, Argentina*

This lecture explores the relationship between fiscal policy, international human rights law, and the emerging legal frameworks of environmental protection. In contemporary constitutional and international law, public budgets and taxation policies are increasingly understood not merely as economic instruments, but as key mechanisms for implementing fundamental rights and collective goods. From this perspective, fiscal policy plays a crucial role in enabling states to fulfill their obligations under international human rights law, particularly in areas related to social rights, environmental protection, and sustainable development.

The lecture examines how principles derived from international human rights law—such as the obligation to use the “maximum available resources,” equality and non-discrimination, and intergenerational justice—can influence the design of fiscal policies and public expenditure. Particular attention will be given to the growing interaction between fiscal governance and environmental law, highlighting how taxation, public investment, and budgetary priorities can contribute to addressing climate change and supporting ecological transition policies. Through this interdisciplinary approach, the talk emphasizes the importance of integrating legal, economic, and environmental perspectives in contemporary public policy.

Lecture, March 14 – h14:30

# **The Fight Against Climate Change Between State Political Decision- Making and Judicial Protection of Citizens. The Case of the Judgment of the Rome Tribunal of 26 February 2024**

**ANTONELLO LO CALZO**

*Università di Pisa, Italy*

The phenomenon of anthropogenic climate change is increasingly evident and currently constitutes one of the greatest challenges that humanity is called upon to confront in the coming years. The characteristics of this phenomenon, induced by human behavior and, therefore, by the political choices underlying such behavior, qualify it as an emergency of a global nature, with respect to which the intervention of each State constitutes a necessary, but not sufficient, condition for its resolution.

It is no coincidence that these issues represent one of the crucial points of Luigi Ferrajoli's reflection in his volume "For a Constitution of the Earth", in which, in proposing a model of a global constitution, he emphasizes in the opening article that the Earth is the common home of all living beings, including future generations, and that the survival and health of humanity "depend on the vitality and health of the natural world."

The greatest difficulty in approaching the resolution of climate-related problems depends, as Ferrajoli further observes, on the persistence of the logic of sovereignty as the legitimizing condition of State decision-making. It is precisely in this context that differing climate policies depend in part on ideological reasons, but above all on divergent economic and development interests, which cut across the measures adopted by States. The search for a difficult balance between the "right to full development" and its sustainability, within a global context that is rapidly evolving toward multilateralism, today appears unavoidable.

Precisely because climate action cannot take place unless it is driven by political decisions that are the expression of coordination on a global scale, it is at this level that one must look in order to identify certain points of reference—above all, the 2015 Paris Agreement, which set the objective of containing global warming to well below 2°C above pre-industrial levels and of pursuing efforts to limit it to 1.5°C, providing for periodic reviews of the implementation of the commitments undertaken, as well as the objective of achieving climate neutrality by 2050.

Global objectives, however, could not be achieved without the action of States, since it is not currently conceivable to envisage a model such as that advocated by Ferrajoli, in which State sovereignty is overcome.

If States are the principal actors in the fight against climate change, and the instruments they employ are acts that are typically an expression of political power, ranging from legislative measures to governmental action, it becomes necessary to ask whether, in the face of alleged failures to comply (or unsatisfactory compliance) with climate-related obligations, citizens may obtain judicial protection against their own

Governments, including a judicial order requiring the achievement of specific objectives, as well as the adoption of measures suitable for the reduction of emissions.

This is what occurred in Italy in a case (known as the “Giudizio Universale” case) in which a group of citizens brought proceedings before the Rome Tribunal seeking an order compelling the Italian Government to adopt all measures necessary to reduce CO<sub>2</sub> emissions.

The court seised, by its judgment of 26 February 2024, declared the claim inadmissible on the grounds of an absolute lack of jurisdiction, on the basis that individuals are not entitled to obtain from the courts a review of decisions concerning the fight against climate change, as such decisions are the result of the political direction set by the Government and Parliament. In the words of the court, there was a lack of “a rule of law abstractly capable of protecting the interest asserted in the proceedings.”

Accordingly, citizens’ interest in the achievement of objectives relating to the containment of emissions and climate change appears difficult to realize due to the intrinsic limits of the Italian system of judicial protection of rights, and above all because its implementation remains entrusted to political choices and to the acts through which such choices are expressed. The substantive dynamics of citizens’ interest in preserving a healthy environment, including in the interest of future generations, must therefore be interpreted in harmony with the relevant theoretical and definitional issues (namely, whether such interest constitutes a genuine subjective right or rather a diffuse interest), as well as with the role primarily attributed to the bodies responsible for setting political direction in selecting the means and instruments—also in light of other constitutional requirements—through which to pursue the objectives established at the global level. This sphere of relevance, even today, appears to be scarcely amenable to judicial review.

Lecture, March 14 – h15:30

## Local Governance, science and water resource

**SILVIA SALA**

*Universidad Nacional de La Plata, Argentina*

This presentation is focussed on the experience of developing a long term cooperation project with the participation of FCNyM with the community Lof Mapuche Catalan. The community's territory (14.000 hectares) is located in Lonco –Luan, Neuquén Province,

Along provincial route N° 23 between Aluminé and Villa Pehuenia. The Community has the possession domain of use of 48 % of the territory. Their main activity is primary subsistence agricultural production based on family labor and with a strong self-consumption component.

Between 2016-2019 we developed projects in the framework of a Program called “Universitary Social Compromise”.

All projects were developed in 3 main levels, adults, primary school and high school. Although our first contact was in relation to a microalgae that was invading rivers and streams of Patagonia, we began to discuss different environmental problems that concerned the community (contamination of the rivers; loss of biodiversity, water supply and waste management. To treat these problems experts on different topics were included in the work group and all decisions were taken conjunctly with the community members.

With Community sanitary agents, environmental guards and members of the Directive Commission que delineated the project applied “Drinking water gives us life, becoming aware will give us water” for the International Prize CEMEX-TEC, 2018. Winning the prize allowed us to improve the supply of drinking water for the community.

Lecture, March 16 – h9:30

## Exploring Scenarios and Policy Tools for a Just Ecological Transition

**SIMONE D'ALESSANDRO**

*Università di Pisa, Italy*

The lecture will present results from practical applications of ecological macroeconomic methods to specific policy problems, drawing from the Eurogreen+ model. The lesson will analyze the macroeconomic effects of transition policies, including their feedback mechanisms and distributional consequences. This analysis illuminates potential social barriers to policy implementation and demonstrates how policy design can be refined to address these challenges while promoting more equitable outcomes. Students will learn about scenario analysis methodology, comparing different transition pathways and their implications across several indicators. Depending on resource availability, a practical exercise can be developed using the Ecohesion online simulator. After completing the lecture, students will have introductory knowledge of how to assess relationships between economic growth, environmental sustainability, and social equity within macroeconomic frameworks, and of how to implement scenario analysis with critical evaluation of results.

Lecture, March 16 – h10:30

# Hydrogen, ammonia, and urea as energy carriers, and the importance of energy efficiency

**LUIS FAUROUX**

*Universidad Nacional de La Matanza, Argentina*

The European Green Deal aims for climate neutrality by 2050 and establishes rules for importing products obtained with low or zero carbon dioxide emissions.

This opens a window of opportunity for countries with limited global impact due to their emissions, allowing for a balance between exporting "green" products and consuming "grey" ones, within the framework of the agreements signed and the standards accepted by importing countries.

These rules are based on the definition of Renewable Fuels of Non-Biological Origin (RFNBO), which establishes strict sustainability and emissions requirements for certifying hydrogen as "green." These requirements apply to both production within the EU and imports, and stipulate that the energy used must come from renewable sources.

In addition, there are regulations on the transport and use of hydrogen, as well as the requirement for importers to comply with carbon market rules and the 70% carbon intensity requirement compared to fossil fuels.

In the context of the H<sub>2</sub>/PtX (Hydrogen Power to X) scenario, this work analyzes the characteristics of the current situation in Argentina regarding ammonia and urea, and outlines the strengths, opportunities, weaknesses, and threats it possesses in this scenario with a view to exporting hydrogen and/or its derivatives, obtained by renewable energy.

Lecture, March 16 – h12:00

# The Human Right to Sustainability: Criminal Justice, Environment, and Food Security in the Argentine Republic

**FRANCO M. FIUMARA**

*Universidad Nacional de La Matanza, Argentina*

This class explores the concept of sustainability as a fundamental human right, analyzing the intrinsic connection between environmental protection, the right to food, and the role of criminal justice. Focusing on the Argentine perspective, the session traces the evolution of these rights from the 1948 Universal Declaration of Human Rights to their current status as constitutional mandates in Argentina (Articles 41, 42, and 75).

The presentation highlights how environmental degradation—such as deforestation, pollution, and arson—directly jeopardizes food security and public health. We will examine the current legal framework, noting that while criminal law is essential for punishing ecological crimes, it often faces challenges due to legislative fragmentation and procedural delays. Through the analysis of landmark Supreme Court rulings (such as the Mendoza, Kersich, and Majul cases), the class illustrates the application of the "precautionary principle" and the "in dubio pro natura" standard. Ultimately, the session argues that achieving true sustainability requires a holistic approach that combines effective judicial intervention with preventative education, economic incentives for green practices, and robust public policies to protect the welfare of future generations.

Lecture, March 16 – h14:30

# Impact of nectar-inhabiting microbes in conservation biological control

**STEFANO COLAZZA**

*Università degli Studi di Palermo, Italy*

Parasitoids are third-trophic-level insects whose larvae develop in or on the bodies of other arthropods, while the adults are free-living. In the framework of sustainable crop protection, parasitoids play a pivotal role in biological control since many species can be effective natural enemies of agricultural pests. Adult parasitoids are known to visit flowers in order to feed on nectar. Recent research carried out on parasitoids has shown that microbe-mediated changes in nectar traits can influence the foraging behavior and life history traits. The production of microbial volatile organic compounds can affect the attraction of parasitoids to nectar, while changes in sugar composition can impact their longevity. Future research should focus on understanding the effects of nectar microbial colonization on parasitoid reproduction, with a specific emphasis on the interactions among different microbial taxa known to co-occur in floral nectar. Overall, this talk highlights the importance of considering the role of nectar-inhabiting microbes in conservation biological control programs.

Lecture, March 16 – h15:30

## **Environmental Monitoring: Gregorio de Laferrere Arroyo- Susana-La Matanza Nature Reserve -CMR-**

**PATRICIA YNSFRAN**

*Universidad Nacional de La Matanza, Argentina*

This research project, led by the Institute of the Environment (IMA-UNLaM), focuses on environmental monitoring within the Gregorio de Laferrere Nature Reserve, specifically targeting the Susana stream in the middle Matanza-Riachuelo basin. Building on previous studies regarding watercourses in La Matanza, the initiative aims to investigate the activities of social, economic, and environmental stakeholders in the surrounding areas to understand their impact on the reserve.

The project has two main objectives: analyzing social implications through participatory management and reevaluating the local ecosystem, which includes monitoring native fish species such as tarariras and catfish. It addresses the socio-environmental tensions faced by the population residing near the reserve, a "green lung" often threatened by pollution and lack of intervention. By transferring academic knowledge to the community, the project seeks to empower residents to manage potential solutions, improve health outcomes related to environmental conditions, and protect the stream's biodiversity.

Lecture, March 16 – h17:00

# Ensuring the Quality of Drinking Water in Acquedotto Pugliese through the Digitalization of the Water Safety Plan

**PIER PAOLO ABIS**

*Acquedotto Pugliese srl*

This lecture focuses on how digital transformation is being applied to guarantee safer drinking water in a large utility, highlighting the example of Acquedotto Pugliese (AQP) in Italy. AQP, one of the biggest water companies in Europe, has embraced an innovative, digital Water Safety Plan (WSP) to proactively manage water quality risks across its vast supply network. We start by outlining what a Water Safety Plan entails: a comprehensive risk assessment and management approach covering every step from source watershed to consumers' taps, as recommended by WHO and Italian Regulation. Traditionally, WSPs could be paper-based checklists too; due to the enormous quantity of data to be managed and recorded, AQP instead developed a real-time digital platform that integrates data from thousands of sensors (monitoring chlorine levels, turbidity, flow rates, reservoir levels, etc.) and analyzes it using algorithms against established safety thresholds. This “digital twin” of the water network allows operators to detect anomalies or contamination threats immediately and respond swiftly. For instance, if a sensor flags a drop in chlorine residuals in part of the network, the system automatically alerts staff and models the affected zone so that targeted flushing or dosing can be done before water quality is compromised. The lecture describes how AQP's digital WSP incorporates GIS mapping of infrastructure, hydraulic models, and a central control room – dubbed the “digital brain” of AQP – that consolidates all signals of possible water safety issues and coordinates action. We explain the preventive maintenance schedules optimized by this system (valves and pipes are serviced based on condition data rather than fixed intervals, reducing failures and water loss) and how it facilitates compliance with new EU drinking water directives that require advanced risk management. AQP's approach also involves stakeholders: local health authorities have access to the platform for transparency, and the public can be quickly informed of any preventive boil notices through integrated communication tools. On the innovation side, AQP piloted new disinfection technology (like ultra-violet and chloramine dosing controlled by the digital system) to minimize harmful by-products while ensuring microbial safety. The results are impressive: since deploying the digital WSP, AQP reports significant improvements in water quality indicators and incident response time. We compare this with experiences in Latin America – for example, how digital monitoring is being adopted in Bogotá's water utility and the creation of an inter-city network for water safety innovation. We discuss challenges faced, including cybersecurity (protecting the water SCADA system is paramount, as highlighted in Lecture 3), data integration from legacy equipment, and training personnel to trust and effectively use the digital tools. Yet, the case study demonstrates clear benefits of digitalizing water management: greater resilience to contamination events (which are intercepted before becoming public health issues), optimized use of treatment chemicals, reduced water losses through early leak detection, and ultimately enhanced trust from consumers and regulators. AQP's digital WSP exemplifies how marrying operational technology with sustainability goals yields safer, more efficient services. It serves as a blueprint for utilities worldwide striving for excellence in water quality under the imperatives of the green transition and climate adaptation.

Lecture, March 17 – h9:30

## City and climate change: learning from the European context

**IGNAZIO VINCI**

*Università degli Studi di Palermo, Italy*

The seminar seeks to explore the different ways the climate change emergency has entered into city planning and urban policies in the European context, with a focus on the role played by EU policy framework. After an outline of the main steps that have marked the emergence of the climate issue in the urban agenda, the seminar offers an in-depth analysis of the approaches and instruments employed by cities to deal with the climate change effects on urban areas. These include (a) climate mitigation/adaptation plans, with a prevailing strategic, large-scale, and holistic approach to planning and implementation; (b) urban regeneration policies, with a prevailing integrated and multi-stakeholder approach; and (c) the emergence of nature-based solutions within urban design for the regeneration of the built environment.

Lecture, March 17 – h10:30

# Energy Poverty and the Just Energy Transition: Evidence-Based Policies for Inclusive Sustainability

**GIUSEPPE SCANDURRA**

*Università degli Studi di Napoli Parthenope, Italy*

Energy poverty (EP) has emerged as one of the most critical social challenges of the green transition, intensified by recent shocks such as the COVID-19 pandemic, energy price volatility, and geopolitical tensions. Far from being a purely technological issue, the energy transition represents a profound social and economic transformation, raising crucial questions about equity, vulnerability, and policy effectiveness.

This lecture conceptualizes EP as a multidimensional phenomenon located at the intersection of income inequality, housing energy efficiency, energy prices, and institutional design. Building on recent European empirical evidence, it illustrates how energy transition policies, including renewable energy diffusion, energy efficiency measures, and fiscal incentives, shape EP dynamics over time, sometimes alleviating vulnerability but, in other cases, unintentionally reinforcing social inequalities.

The lecture introduces, at a conceptual level, advanced quantitative tools used in policy analysis, such as composite indicators, dynamic factor models, and counterfactual policy evaluation, to show how policymakers can assess the distributive impacts of energy policies *ex ante* and *ex post*. Attention is devoted to policy targeting failures, explaining why poorly designed incentives may disproportionately benefit higher-income households while excluding energy-vulnerable groups.

Framing EP as a core benchmark for assessing progress toward Sustainable Development Goal 7 (Affordable and Clean Energy), the lecture argues that the green transition can be considered truly sustainable only if it ensures universal access to affordable, reliable, and modern energy services. The lecture concludes by outlining evidence-based policy principles for a just and inclusive energy transition that advance climate objectives, social cohesion, and SDG 7. While grounded in European experience, the discussion offers insights transferable to emerging and developing economies.

Lecture, March 17 – h12:00

# Comparative analysis of wind potential in the Río de La Plata area bordering the AMBA and Buenos Aires coast

**PABLO PROVENZANO**

*Universidad Nacional de La Matanza, Argentina*

This presentation details the current work of the research team focused on wind energy, specifically analyzing wind conditions over the extensive geographical sector of the Río de La Plata. The primary objective is to determine the suitability of this fluvial area as a provider of wind power and to propose its inclusion in the energy map of the Province of Buenos Aires.

The study examines the unique conditions of the river combined with the dominant South Atlantic wind patterns. It involves an analysis of variables at higher altitudes to assess the quality of the resource for powering large-scale wind turbines. A significant advantage highlighted is the proximity to the Buenos Aires Metropolitan Area (AMBA), a conglomerate of over 15 million inhabitants. Generating clean energy near this major consumption and emission center offers substantial savings in transmission logistics. The findings indicate that the wind resource in the Río de La Plata is comparable to the conditions in the Baltic Sea, a region successfully exploited by Germany, which ranks third globally in installed wind power capacity.

Lecture, March 17 – h14:30

## **Environmental protection and trade agreements: exploring the trade-off**

***DARIO MARTIN PEREYRA***

*Universidad Nacional de La Matanza, Argentina*

According to WP6, I propose a Seminar focus on the relationship (and possible conflicts) between the protection of the environment and international trade, by taking into account the countries' trade policy, the World Trade Organization (WTO) negotiations and the environmental protection agreements. My experience as full professor and researcher in the field of international economic relations provides me a solid academic background to address how international trade and environmental protection can coexist without becoming a barrier between their promotion and development.

In this regard, I have directed various research projects related to international negotiations, regional integration and international trade. Environmental protection and its international discussion appear in the countries' international trade agenda, which makes necessary to take into account a pragmatic approach on the relation between this topic and international trade. Linking the concepts of international trade and the environmental protection in a globalized world, leads us to consider a sphere in which both elements coexist. Moreover, environmental protection has become significant in this sphere that countries have used it to strengthen their positions in defense of their own commercial interests.

The Seminar is entitled “Environmental protection and international trade: exploring the trade-off” and will include lessons, presentations and the discussion of academic papers regarding the topic, and it is intended to last a week. The objective is to address how these two topics determine the countries' trade policy and their consequences in international trade negotiations, not only at the WTO level, but also in regional agreements like the MERCOSUR – EU free trade agreement.

Lecture, March 17 – h15:30

# Foundations for Ecological Macroeconomics

**GUILHERME SPINATO MORLIN**

*Università di Pisa, Italy*

Ecological Macroeconomics is an emerging discipline that addresses the critical intersection of economic systems and environmental constraints. This lecture provides an introductory overview of ecological macroeconomics, offering a concise exploration of the relationship between ecological economics and macroeconomic theory. The macroeconomic foundations of ecological macroeconomics include a brief consideration of theoretical elements of Post-Keynesian economics, followed by a discussion of the main criticisms of traditional (neoclassical) macroeconomic theory and its shortcomings in addressing ecological problems. The lecture will establish key foundations for understanding the explicit consideration of ecological boundaries on economic activity and the interplay of climate policy with economic and ecological systems. By explicitly considering the distributional implications of climate policy, we are able to discuss the social barriers that impede green transition efforts.

Emerging Voices, March 17 – h17:00

## From Microencapsulation to 3D Scaffolds: Biomaterial Strategies for Cannabis-Derived Therapeutics

**PABLO ANTEZANA**

*Universidad de Buenos Aires, Argentina*

The development of advanced biomaterials for tissue engineering and drug delivery has gained increasing attention in recent years. In this context, this work explores different strategies for the incorporation and stabilization of bioactive compounds derived from *Cannabis sativa* within biopolymeric matrices. Collagen hydrogels loaded with silver nanoparticles and *Cannabis sativa* oil were developed to obtain multifunctional systems with antimicrobial and anti-inflammatory properties for potential wound healing applications. In addition, a three-dimensional gelatin–alginate scaffold containing *Cannabis sativa* oil was designed to mimic the extracellular matrix and provide structural support for tissue regeneration. Finally, alginate-based microencapsulation was investigated as a strategy to enhance the stability and therapeutic potential of cannabidiolic acid (CBDA), a bioactive cannabinoid with promising pharmacological properties. Overall, these approaches highlight the potential of natural polymer-based systems combined with cannabis-derived compounds for the development of innovative biomaterials with applications in regenerative medicine and advanced therapeutic delivery.

Emerging Voices, March 17 – h17:20

## Safety-by-design and nanomedicine innovation for lung inflammatory conditions

**MARIANA GARCES**

*Universidad de Buenos Aires, Argentina*

It has been reported that the exposure to indoor particulate matter (PM) impairs redox metabolism and promotes inflammation, which might aggravate respiratory diseases. Lung epithelial cells are suggested to play a central role in this scenario, since they produce inflammatory and oxidative stress mediators following PM uptake. In the present work we aimed to explore a nano-pharmaceutical approach to enhance the efficacy of anti-inflammatory and antioxidant drugs, using curcumin (Cur) and ibuprofen (Ibu). When A549 cells and Epialveolar 3D tissue were exposed to ID, intracellular redox status and oxidative damage to lipids were observed. Additionally, dose-and time-dependent NFkB nuclear translocation, NLRP3-inflammasome activation and IL-1 $\beta$  levels were increased after ID exposure. When nanomicelles pretreatment was performed, A549 cells showed intracellular redox status values and IL-1 $\beta$  levels similar to control group. The protective pathway seems to be involved with Nrf2 nuclear translocation and further HO-1 increase. On *in vivo* studies, lung redox metabolism and inflammatory alterations due to ID were reverted with a previous inhalation of nanomicelles. Finally, biodistribution studies with radiolabeled nanomicelles using  $^{99m}\text{Tc}$ , demonstrated the successful delivery of micelles into the lungs by intranasal instillation. Our findings contribute to the understanding of the mechanisms by which ID promotes inflammation and oxidative stress in lung tissues and, overall, our nanoformulations stand as promising nanotechnological platforms to optimize lung therapy.

Emerging Voices, March 17 – h17:40

## Bacterial genomics for antimicrobial resistance surveillance in the era of artificial intelligence

**DANIELA CEJAS**

*Universidad de Buenos Aires, Argentina*

Antimicrobial resistance (AMR) is one of the most pressing global public health challenges, threatening the effective treatment of bacterial infections and the safety of complex medical procedures. The misuse and overuse of antimicrobials, together with the limited development of new antibiotics, have accelerated the emergence and dissemination of resistant pathogens worldwide.

Surveillance and research are essential to detect emerging resistance trends and guide effective interventions. In this context, genomic approaches have become key tools for monitoring antimicrobial resistance determinants and understanding the dissemination of resistant clones and mechanisms of resistance. Advances in whole-genome sequencing (WGS), accelerated during the COVID-19 pandemic, have increased the accessibility of genomic technologies and enabled the integration of classical microbiological data with bioinformatic analyses.

Comparative genomic analyses allow the identification of acquired resistance genes, chromosomal mutations, and mobile genetic elements such as plasmids, integrons, and transposons that contribute to the spread of resistance. WGS-based approaches can complement traditional phenotypic susceptibility testing while enabling high-resolution investigation of bacterial population structure, transmission events, and the emergence of high-risk clones.

At the same time, the rapid expansion of genomic datasets has created new analytical challenges related to the integration and interpretation of large and complex data. In this context, artificial intelligence and data-driven analytical approaches are increasingly being incorporated into genomic research. These methods facilitate the exploration of complex genomic patterns, support the classification of bacterial strains based on relevant genetic features, and contribute to the identification of relationships among resistance determinants, virulence factors, and bacterial lineages.

Our experience in the genomic characterization of hospital-associated Enterobacterales has revealed extended-spectrum  $\beta$ -lactamases, carbapenemases, and emerging resistance mechanisms, as well as mutations associated with resistance to last-line antimicrobials. Genomic analyses have also identified resistance genes located on plasmids circulating within epidemic high-risk clones of *Klebsiella pneumoniae*. In addition, single nucleotide polymorphism (SNP) analyses have proven useful for investigating outbreaks and studying the evolution of resistance under antimicrobial pressure.

Overall, the integration of microbiological, genomic, and epidemiological data provides a powerful framework for AMR surveillance. In the era of expanding genomic data and artificial intelligence, these approaches offer new opportunities to improve the detection, monitoring, and understanding of antimicrobial resistance.

Emerging Voices, March 17 – h18:00

## **3D Printing oral formulations for pediatric: improving acceptability and administration**

**ORIANA BOSCOLO & CAMILA OLIVERA**

*Universidad de Buenos Aires, Argentina*

The development of oral medicines for pediatric patients remains challenging due to metabolic and pharmacokinetic variability. Pediatric patients cannot simply be categorized as “small adults”, as they represent a highly complex and heterogeneous population. Additionally, the need for flexible dosing and the limited availability of age-appropriate formulations further complicate pediatric drug therapy. Emerging pharmaceutical technologies are increasingly focused on improving acceptability, palatability, and ease of administration in children.

Three-dimensional printing (3DP) has gained attention as an innovative approach for the personalized manufacturing of oral dosage forms, enabling precise adjustment of dose and geometry according to individual patient needs. Among the potential applications, tablets and orodispersible films represent promising platforms.

Advances in 3DP technologies, particularly Direct Powder Extrusion (DPE), open new possibilities for the fabrication of tailored pediatric formulations, contributing to improved treatment adherence and more patient-centered pharmaceutical design.

Lecture, March 18 – h9:30

# The silent killer: Underlying mechanisms of the adverse health effects caused by urban air pollution

**PABLO EVELSON**

*Universidad de Buenos Aires, Argentina*

The World Health Organization in its last report estimates that environmental pollution is responsible for approximately 7 million deaths worldwide each year, largely due to respiratory diseases—such as chronic obstructive pulmonary disease, lung cancer, and lower respiratory tract infections—and cardiovascular conditions including stroke and ischemic heart disease. Although environmental pollution consists of a complex mixture of gases—such as carbon monoxide, sulfur dioxide, nitrogen oxides, and ozone—together with suspended particulate matter (PM), epidemiological evidence consistently identifies PM as a major contributor to increased cardiopulmonary morbidity and mortality.

Following both acute and chronic exposure, inhaled particles are taken up by alveolar macrophages, triggering local cellular activation, cytokine release, and pulmonary inflammation. These responses can extend beyond the lung, as inflammatory mediators enter the systemic circulation and affect metabolic and inflammatory processes in distant organs. The toxicity of particulate pollutants is largely associated with the activation of inflammatory pathways and the generation of reactive oxygen species (ROS), leading to oxidative stress and tissue dysfunction.

This talk will discuss the systemic consequences of particulate matter exposure, focusing on its capacity to induce oxidative damage, inflammation, and functional impairment across multiple organs, thereby contributing to the development or exacerbation of pro-inflammatory disorders. Understanding the molecular and cellular mechanisms underlying these effects is essential for the development of targeted strategies to mitigate the health impacts of particulate pollution and to reduce individual susceptibility to its harmful effects.

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