ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DEPARTMENT
OF CHEMISTRY
"GIACOMO CIAMICIAN"

Research, Innovation, Teaching and Outreach

Department of Chemistry
"Giacomo Ciamician"

RESEARCH YEARBOOK

2024

Work group

Head of the Department (Maria Letizia Focarete)

Communication Committee (Giovanni Valenti)

Department Quality Assurance (Marco Bandini)

Research Committee

Teaching Committee

Knowledge Valorization Committee for Society and Enterprise (Third Mission)

Internationalization Committee

Infrastructures Commitee

Graphic design

Alma Mater Studiorum – Università di Bologna
APPC – Planning and Communication Division – Communication Unit – Graphic Design Office for Communication

Photos

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Courtesy of Eva Munter

The Department of Chemistry, established on January 1, 1987, originated from the Institute of Chemistry which was part of the long-standing chemical tradition of the University of Bologna, dating back to the oldest Italian Chair of Chemistry, founded in Bologna by Ferdinando Marsili in the year 1737. The Department is named after Giacomo Ciamician (1857-1922), an internationally renowned chemist, whose research covered a very broad range of fields, but he gave his most important contribution to the development of photochemistry. His contribution was so influential that today Ciamician is considered one of the founders of this branch of chemistry and a pioneer of solar energy conversion and "green chemistry".

The Department consists of 92 faculty members and approximately 200 PhD students, post-docs, and research fellows (end of 2024). This community, featuring high expertise in chemical disciplines, shares the global mission of fostering scientific culture in the field of chemistry through both basic and applied research, its promotion, and its dissemination through teaching activities, as well as through strong dialogue and exchange with society and the business world. The Department is a national reference point in the chemical field. This result is the outcome of a strong, continuous, and synergistic involvement of all the members of the structure, aimed at implementing cross-disciplinary "excellence" activities in teaching, research, and third mission areas. The "sense of belonging" that has always distinguished the members of the Ciamician Department is the foundation of this success.

Since 2017 the Department has been recognized among the Italian Departments of Excellence, and received an extraordinary funding from the Ministry of Education and the University for two five-year development projects (2018-2022 and 2023-2027). Thanks to these Excellence projects the Department could improve research outcomes compared to recognized international benchmarks, strengthen the quality of teaching, increase the ability to secure funding (both public and private), and enhance international visibility and technological transfer.

Currently, the Department is experiencing an unprecedented phase of growth, with its relocation to the new Navile scientific campus (Navile District), featuring state-of-the-art laboratories and equipment, and the development of campuses in Romagna (Rimini and Ravenna). This represents an extraordinary opportunity to strengthen our excellence at the national and international levels. From an organizational perspective, the Department is taking advantage of an efficient internal administrative management model and role organization, based on targeted training for individuals with specific responsibilities, the establishment of departmental committees and working groups, and an openness to dialogue with research bodies and institutions.

The "vision" and the related "mission" of the Department are closely linked to the highly socio-economic impact themes present in the current National Recovery and Resilience Plan (PNRR), the UN's 2030 Agenda and its Sustainable Development Goals (SDGs), and, lastly, the Strategic Plan 2022-2027 of our university.

The research themes of the Department are driven by strong interdisciplinarity with impact on strategic sectors. In particular, we are active in the study of: advanced materials for sustainable development (energy, catalysis, green chemistry, information technology); chemistry for life sciences (molecular diagnostics, structural biology, nanomedicine, biomaterials for tissue regeneration or local delivery of pharmaceuticals, cosmetics, nutraceuticals); synthesis and delivery of drugs; environment (sustainable chemistry for the circular economy, recovery of waste materials and use of biomass, climate-environment interactions, pollutant control); modeling of complex systems (computing, nanomaterials, structural analysis of biomolecules); cultural heritage (analysis of archaeological samples and 14C dating for the study of human evolution); astrochemistry and development of analytical tests for space missions.

The Department is committed to delivering high-quality education, continuously integrating scientific advancements from research into academic programs, and promoting the full employment of its graduates. The current educational offerings at the undergraduate, graduate, and doctoral levels are diverse, covering various areas of chemistry, such as the design, synthesis, and characterization of advanced materials; chemistry applied to health and quality of life; chemistry in the cosmetics sector; product regulation; optimization of chemical processes with a focus on sustainability; and chemistry applied to the conservation of environmental and cultural heritage. Additionally, we adopt a multi-campus approach, with courses offered in Bologna and at the campuses in Ravenna and Rimini. One of the most relevant Department's key missions is to make the Department an increasingly attractive destination for students, as well as for researchers, and industries worldwide.

Our scientific community strongly feels the need to intensify technological and cultural exchange programs with local, national, and international regions through targeted cross-cutting actions (teaching/research/society), aiming to translate our awareness into concrete actions that contribute to creating public value. We are strengthening relationships with industry through collaborations on high-profile projects and professional services, as well as with society in a broader sense through outreach activities, awareness-raising, and targeted interventions to address local or national issues.

As we evolve and grow in complexity, we are deeply committed to strengthen our position as a global leader in chemical education, scientific research, and societal impact guided by values that contribute to a fairer, more sustainable, and better world.

Prof. Maria Letizia Focarete

Head of the Department
of Chemistry «Giacomo Ciamician»

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01

TRADITION AND INNOVATION

A tour through
the old Department

THE HISTORICAL DEPARTMENT

The Department of Chemistry “Giacomo Ciamician,” established on January 1, 1987, traces its origins to the eponymous Institute, which stems from the ancient chemical tradition of the University of Bologna. In 1737, under the auspices of Ferdinando Marsili, a Chair of Chemistry was established—the first in Italy to include hands-on experiments—and was entrusted to Jacopo Bartolomeo Beccari.
The building at Via Selmi 2, completed in the late 1920s, was designed by Bolognese architect Edoardo Collamarini (1863–1928). The project incorporated technical requirements specified by Giacomo Ciamician (1857–1922), an internationally renowned chemist known for his research on pyrrole and its derivatives, plant chemistry, and the chemical action of light.
The building’s exterior showcases extraordinary attention to architectural details, while its interior features the monumental Aula Magna (1925) and the magnificent Art Nouveau library. Designed by Collamarini, the library, made of walnut wood with burl inlays, has remained perfectly preserved to this day.


OMNIA IN MENSURA ET NUMERO ET PONDERE

THE NEW DEPARTMENT

The University complex located in Bologna along the Navile Canal currently hosts all educational activities and, in the near future, will also accommodate the research activities of the Departments of Chemistry “Giacomo Ciamician,” Industrial Chemistry “Toso Montanari,” and Pharmacy and Biotechnology.

The complex (68,000 square meters) is designed to host approximately 3,700 students and about 500 faculty members, researchers, and technical-administrative staff. This hub will bring together a large and vibrant research community with more than 215 laboratories and cutting-edge equipment, making it one of the most advanced facilities in Europe.

Situated in the Navile District, the Chemical Teaching Laboratory Center (CILDIC) serves as a major hub for laboratory-based education in the chemical sciences. CILDIC is a building encompassing 52,000 square meters, inaugurated in 2021, and comprises eight floors, six of which are allocated to laboratory spaces. The Center coordinates the laboratory-based teaching activities of the Departments of Chemistry “Giacomo Ciamician,” Industrial Chemistry, and Pharmacy and Biotechnology. Laboratory activities are designed and supervised by academic staff to foster the acquisition of interdisciplinary competencies within a safe and technologically advanced environment equipped with the most sophisticated scientific instruments.

This new district represents a unique and recognized hub for research and education in the broader fields of chemistry, with practical applications encompassing all aspects of energy transition, chemistry for life sciences, pharmaceuticals, pharmacology, and biotechnology. It also addresses sustainable chemistry for the environment, circular economy, sustainable mobility, complex systems modeling, cultural heritage chemistry, catalysis, sensing technologies, and advanced materials.

The central hub of the new complex is the restoration of an industrial building constructed at the end of the 19th century, which was part of the larger historic industrial complex of the former Galotti Brickworks. Today, it hosts a series of study rooms on the ground floor and a café on the first floor.

The entire complex features a multi-service hub that connects the various utility networks. It is equipped with an internal road system differentiated by type of traffic and use, surface parking areas, and an extensive network of green spaces on both sides of the Navile Canal, with large pedestrian and cycling areas.

All the Navile Campus

(Departments of Chemistry “Giacomo Ciamician,” Industrial Chemistry “Toso Montanari,” and Pharmacy and Biotechnology)

29
LECTURE HALLS

4
COMPUTER LABS

14
STUDY ROOMS AND SPACES

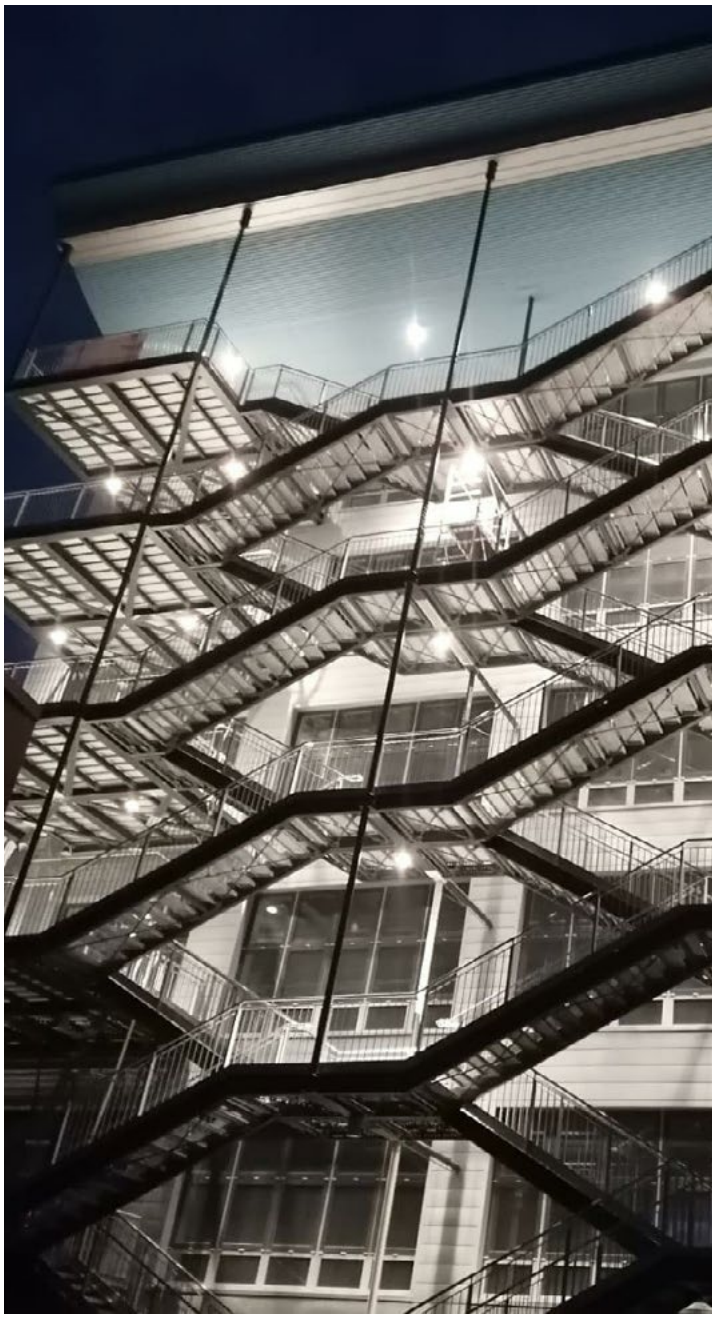
9
TEACHING LABORATORIES

215
RESEARCH LABORATORIES

1
NEW DISTRICT LIBRARY serving all the departments housed within

1
BABY PIT STOP


500 ml
Made in Germany

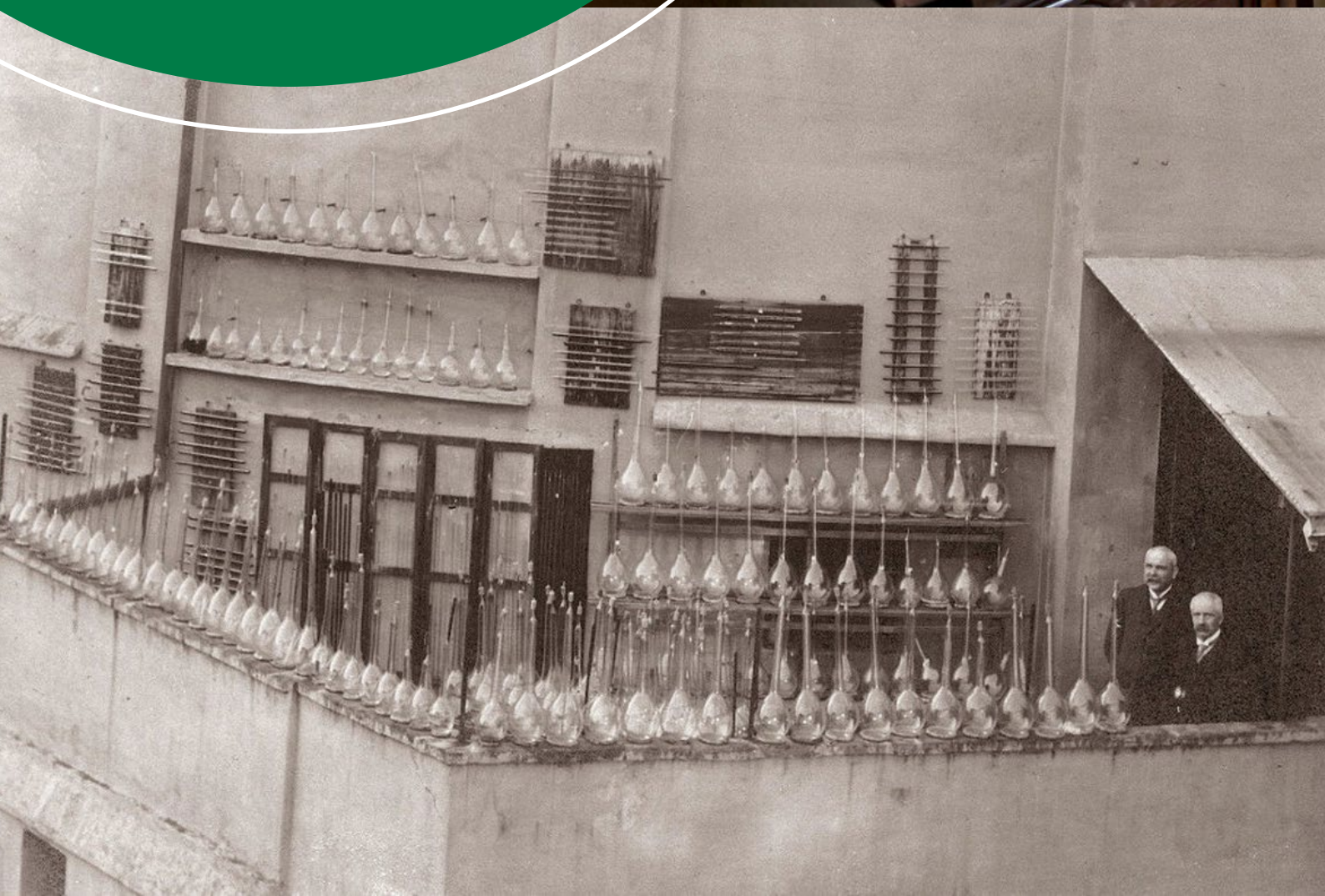


Giacomo Ciamician pioneer in Chemistry

Giacomo Luigi Ciamician (Trieste, 1857 – Bologna, 1922), a member of the Armenian community in Trieste, studied at the University of Vienna (Austria) and earned his doctorate at Giessen (Germany) in 1880. He spent eight years in Rome as an assistant to Professor Cannizzaro before becoming a professor of Chemistry at the University of Padua in 1887. Two years later, in 1889, he joined the University of Bologna, where he remained until his death.

Although his research spanned various fields of chemistry, Ciamician made a significant contribution to the development of photochemistry. Today, he is regarded as one of the founders of this discipline and a pioneer in solar energy conversion and green chemistry.

From 1900 to 1921, alongside his collaborator and friend Paul Silber, Ciamician published numerous articles on photochemical research. Much of his fame, however, is attributed to his lecture at the "VIII International Congress of Applied Chemistry" held in New York in September 1912. In his speech, titled "The Photochemistry of the Future" and published in four languages, Ciamician demonstrated remarkable foresight in addressing the energy challenges of his time. He proposed replacing coal-based energy with the free and inexhaustible energy provided by the sun.



02

MISSION AND ORGANIZZATION

OUR MISSION

In the medium/long-term, the ***Department*** aims to consolidate its reputation at National level and to project the Ciamician «centrality» internationally. Fields of main focus will be: chemical education, scientific research, and the socio-cultural dimension within a global context. Our policy will deal within a contxt in which 'differences' and 'sectoriality' between these areas will become increasingly blurred and imperceptible. This goal will be pursued through a collegial, shared, and synergistic vision of all the playes involved in these areas. The ***Department*** is ready to embrace this challenging ***MISSION*** through: the expertise of the individual, internal organization, a spirit of community, and a healthy dose of competitiveness.

The Department has been awarded the seal of the National Chemistry Italy, ranking 48th in Europe and 115th globally. Department of Excellence Program 2023-2027 (funded by the Italian Ministry of Universities and Research (MUR)- L. 232 del 01/12/2016), receiving a grant of 8.67 milion euros (only 11 Italian chemical departments 12 were selected as excellent in the program).

In the QS – World University Ranking 2024, ***Chemistry subject*** of the Alma Mater Studiorum continues to hold first place in Italy, ranking 48th in Europe and 115th globally.

2018-2022
Department of Excellence

2023-2027
Department of Excellence
Grant of 8.67 milion euros

1st in Italy
in QS World University Rankings by Subject 2024 – Chemistry

OUR ORGANIZZATION

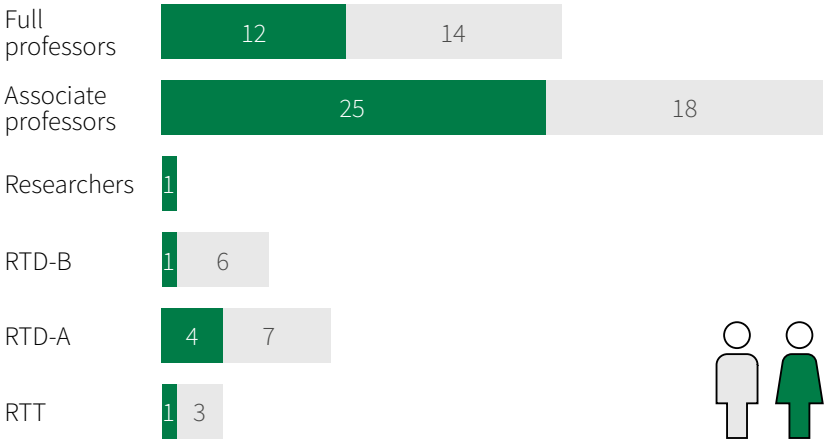
The Department of Chemistry is organised around three governing bodies in charge of the organisation and management of **research, teaching and third mission** activities:

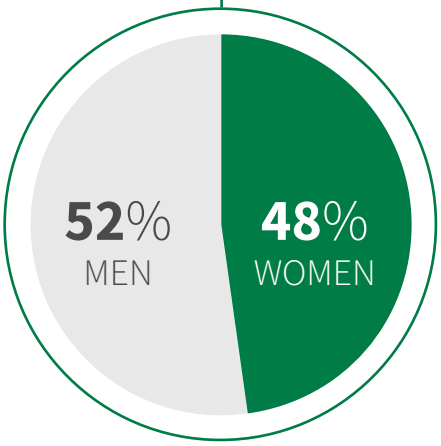
- The Director (Prof. Maria Letizia Focarete)
- The Department Council (It includes all full and associate professors, researchers, the administrative manager, representatives of the technical-administrative staff, research fellows representatives, and student representatives)
- The Department Board (It is composed of a representation of all figures in the Department)

Various **committees and working groups** operate within the department and support the Director and the Board in the Execution of Specific Functions on strategic issues for the department. Main committees are:

- Joint Committee of Faculty and Students
- Research Committee
- Teaching Committee
- Knowledge Valorization Committee for Society and Enterprise (Third Mission)
- Internationalization Committee
- Communication Committee
- Department Quality Assurance
- Infrastructures Commitee

The Department has **technical and administrative staff** to support research, and they report directly to the Director of the Department.





FACULTY

- Riccardo Amorati (PA)
- Catia Arbizzani (PO)
- Evangelos Bakalis (RTT)
- Vincenzo Balzani (Emeritus Professor)
- Marco Bandini (PO)
- Giacomo Bergamini (PO)
- Giulio Bertuzzi (RTT)
- Luca Bizzocchi (PA)
- Elisa Boanini (PA)
- Dario Braga (Emeritus Professor)
- Walter Cabri (PO)
- Maria Maddalena Calabretta (RTDB)
- Donato Calabria (RTT)
- Matteo Calvaresi (PA)
- Paola Ceroni (PO)
- Sabrina Conoci (Professor part-time from another university)
- Pier Giorgio Cozzi (PO)
- Simone D'Agostino (PA)
- Matteo Di Giosia (RTDA)
- Luca Dore (PA)
- Luca Evangelisti (PA)
- Daniele Fabbri (PO)
- Giuseppe Falini (PO)
- Daniele Fazzi (PA)
- Simona Fermani (PA)
- Andrea Fermi (RTDB)
- Lucia Ferrazzano (RTDA)
- Jessica Fiori (PA)
- Maria Letizia Focarete (PO)
- Paola Franchi (PA)
- Guido Galletti (PA)
- Paola Galletti (PO)
- Maria Teresa Gandolfi (Retired professor, responsible for the Giacomo Ciamician Chemistry Collection)
- Damiano Genovese (PA)
- Luca Gentilucci (PA)
- Daria Giacomini (PA)
- Demetra Giuri (RTT)
- Fabrizia Grepioni (PO)
- Andrea Gualandi (PA)
- Chiara Gualandi (PA)
- Massimo Guardigli (PA)
- Susanna Guernelli (PA)
- Anna Liguori (RTT)
- Marco Lombardo (PA)
- Marco Lucarini (PO)
- Lucia Maini (PO)
- Marco Malferrari (RTT)
- Valentina Marassi (RTT)
- Massimo Marcaccio (PO)
- Marianna Marchini (RTDA)
- Assimo Maris (PA)
- Stefano Masiero (PA)
- Rocco Mazzeo (PO)
- Sonia Melandri (PO)
- Mattia Melosso (RTDA)
- Dora Melucci (PA)
- Arianna Menichetti (RTDA)
- Elisabetta Mezzina (PA)
- Elisa Michelini (PA)
- Mara Mirasoli (PA)
- Magda Monari (PA)
- Marco Montalti (PO)
- Devis Montroni (RTDA)
- Fabrizia Negri (PO)
- Giorgio Orlandi (Emeritus Professor)
- Silvia Panzavolta (PA)
- Francesco Paolucci (PO)
- Emilio Parisini (RTDB)
- Andrea Picin (RTDB)
- Silvia Pieraccini (RC)
- Silvia Prati (PA)
- Luca Prodi (PO)
- Cristina Puzzarini (PO)
- Arianna Quintavalla (PA)
- Enrico Rampazzo (PA)
- Stefania Rapino (PA)
- Pierluigi Reschiglian (PO)
- Aldo Roda (Emeritus Professor)
- Barbara Roda (PO)
- Alessandro Girolamo Rombolà (RTDB)
- Chiara Samorì (PA)
- Giorgia Sciutto (PA)
- Serena Silvi (PA)
- Francesca Soavi (PA)
- Antunes Staffolani (RTDA)
- Emilio Tagliavini (PO)
- Sahra Talamo (PO)
- Cleo Thomas Gabriel Teixeira Pires (RTDA)
- Alessandra Tolomelli (PA)
- Claudia Tomasini (PO)
- Cristian Torri (PA)
- Laura Tositti (PA)
- Claudio Trombini (Alma Mater Professor, Adjunct Professor)
- Giovanni Valenti (PA)
- Luca Valgimigli (PO)
- Margherita Venturi (Alma Mater Professor, Adjunct Professor)
- Marco Villa (RTT)
- Nelsi Zaccheroni (PO)
- Martina Zangheri (PA)
- Alessandro Zappi (RTDA)
- Andrea Zattoni (PA)
- Francesco Zerbetto (PO)

PROFESSIONAL STAFF

- Carmen Auricchio
- Chiara Bernardi
- Maria Angela Canè
- Sonia Casolari
- Emilio Catelli
- Emanuele Cevenini
- Gianluca Chiapponi
- Marco Chiavari
- Valeria Contegno
- Chiara Covezzoli
- Savino Vincenzo D'Alessio
- Eros D'Amen
- Emanuela De Luca
- Luigia De Simone
- Marianna Fanti
- Alberto Filetti
- Valentina Fiorini
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- Marina Freddi
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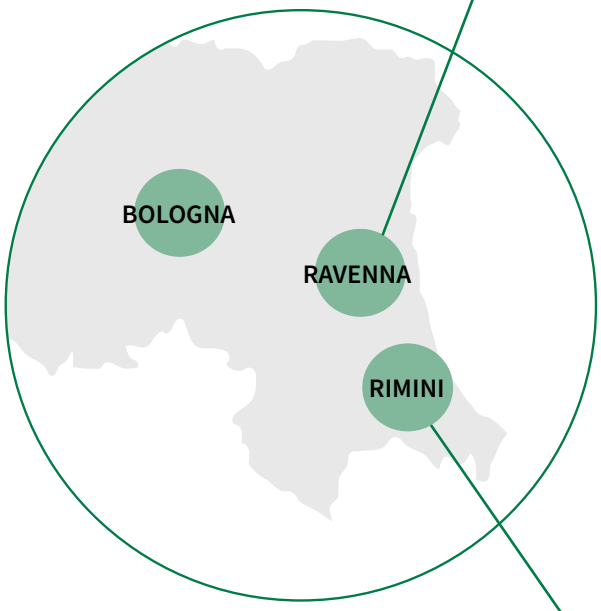
- Andrea Garelli
- Stefano Grilli
- Krishnadeo Hoolash
- Matteo Iurlo
- Viola Laura
- Lucrezia Liserre
- Alice Lolli
- Francesca Lugli
- Mirella Luppi
- Stefania Maiello
- Giuseppe Marascio
- Alessandra Marino
- Giuseppe Marino
- Letizia Masi
- Elia Matteucci
- Stefano Modelli
- Silvia Parmeggiani
- Roberta Pelacani
- Katia Rubini
- Marta Sanna
- Sergio Scorza
- Pietro Sergi
- Lorenzo Spada
- Carla Triunfo
- Manuela Trivigno

MULTICAMPUS EDUCATIONAL SITES

>3500

ENROLED STUDENTS
(A.A. 2024-2025)



03

RESEARCH

RESEARCH AREAS AND OUTPUTS

IN 2024

- ANALYTICAL SCIENCES
- CHEMISTRY FOR CULTURAL HERITAGE
- COMPUTATIONAL AND THEORETICAL CHEMISTRY
- ELECTROCHEMISTRY
- ENVIRONMENTAL CHEMISTRY
- MOLECULAR SPECTROSCOPY
- NANOSCIENCES
- ORGANIC SYNTHESIS
- PHOTOCHEMISTRY
- PHYSICAL ORGANIC CHEMISTRY
- POLYMERIC MATERIALS
- STRUCTURAL AND SOLID-STATE CHEMISTRY
- SUPRAMOLECULAR CHEMISTRY

62%
FACULTY
with at least
1 publication best
SJR 15 percentile

33%
FACULTY
with at least
1 publication best
SJR 5 percentile

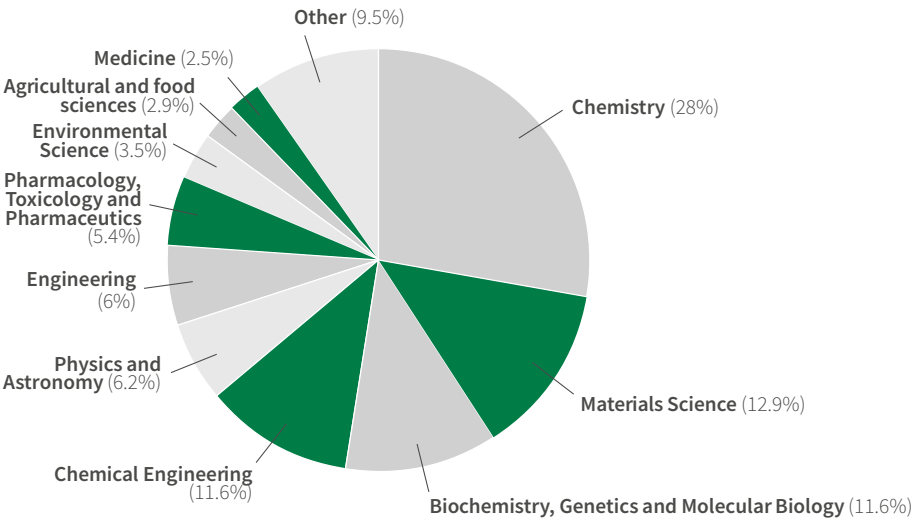
19%
FACULTY
with at least
2 publication
in the best
SJR 5 percentile

99.9%
PUBLICATIONS IN GREEN OR GOLD OPEN ACCESS

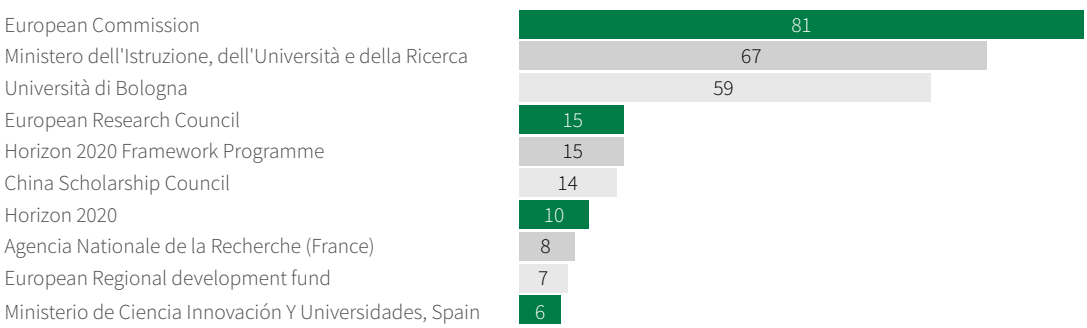
245
SCOPUS PUBLICATIONS

154
PUBLICATIONS IN THE BEST 15%
(Scopus)

Documents by subject area



Documents by funding sponsor



RESEARCH ADVANCED INSTRUMENTATION

The Department of Chemistry “Giacomo Ciamician” has a wide range of research facilities and instruments that are essential to achieve excellence in scientific research, covering various areas of chemistry, such as theoretical and computational investigations, design and synthesis of new compounds, including the fundamental characterization with NMR and mass spectroscopy; structural characterization of a variety of systems and materials by X-ray, as well as at the micrometric and nanometric level with different microscopy techniques, including scanning probe microscopy. A remarkable variety of chemical, biochemical systems and materials are also studied using spectroscopy techniques (rotational spectroscopy, ESR, luminescence, transient spectroscopy at fs) and electrochemistry in the field of energy conversion. The collection of instruments are key components of an integrated system for the research infrastructure at the modern chemical district of Navile.

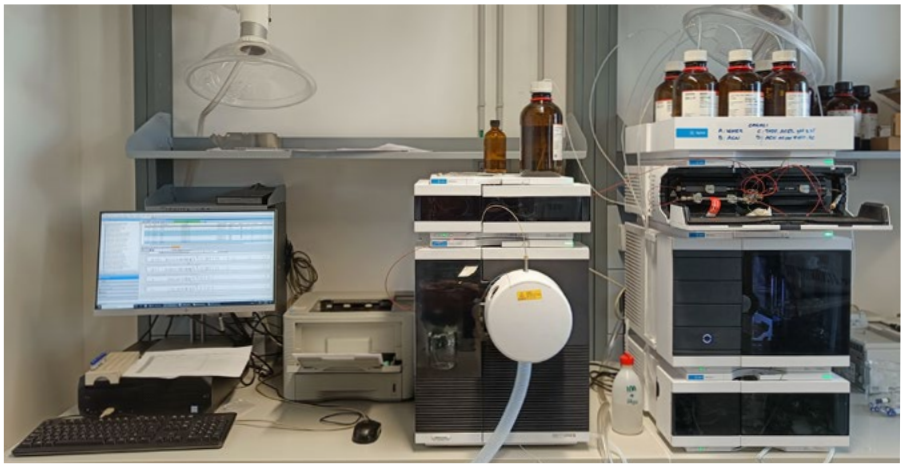
400 MHz NMR Spectrometer (Varian)

600 MHz NMR Spectrometer (Bruker) with automatic sampling

UPLC system coupled to ESI-QTOF Mass Spectrometer

Powder X-Ray diffractomer

Single crystal X-Ray diffractomer

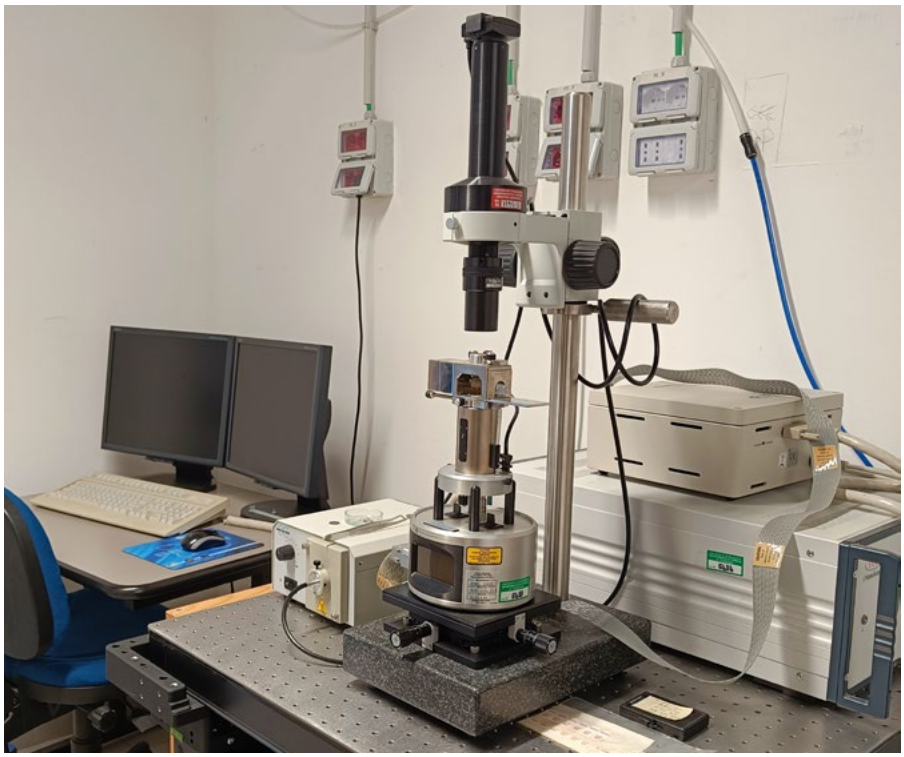


Integrated HPLC-Mass Analyzer

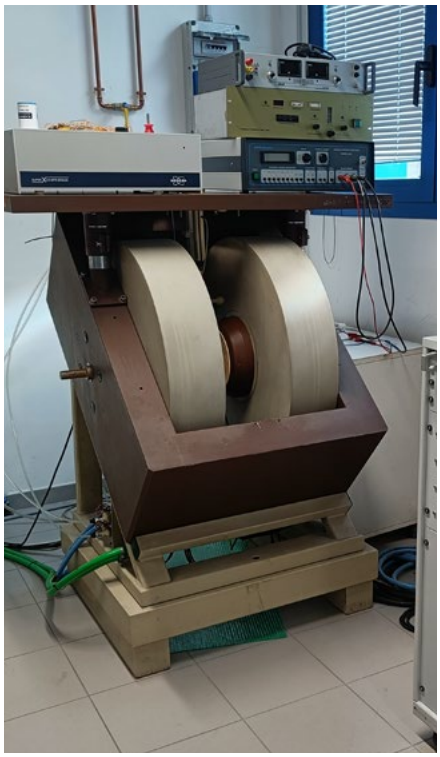
Automatic flash and preparative LC system and automatic solid-phase peptide synthesizer

Glove box system for experiments in a controlled atmosphere

Nano- and femtosecond transient spectroscopy instrument (Edinburgh Instr.)



AFM and STM Multimode scanning probe microscopy system equiped with optical microscopy-videocamera



X and Q band frequency ESR spectroscopy instrument

Computational Equipment

The Navile Data Center is located in the new U.E.4 building and is equipped with 36 rack cabinets hosting HPC and storage servers for several UNIBO Departments.

No. 1 rack cabinet hosting 9 multicore, high-memory and high-capacity servers.

No.2 rack cabinets equipped with a modular IT infrastructure for High Performance Computing (HPC computing) acquired with Departments of Excellence 2023-27 fundings and consisting of 10 dual socket AMD EPYC 9754 servers for a total of 2560 computing cores, 20 Tb RAM, 64 Tb disk space for fast I/O; 4 GPU rack servers for a total of 16 Nvidia L40S GPU cards, 8 Tb RAM, 16 Tb disk space for fast I/O; 1 All Flash Array storage system, with total 320 Tb disk space.

COMPETITIVE RESEARCH PROJECTS

SINCE 2014

118
COMPETITIVE RESEARCH PROJECTS

40 EUROPEAN PROJECTS
78 NATIONAL PROJECTS

5
EXTENDED PARTNERSHIPS

16.06 MLN EUROS
BUDGET FUNDED TO THE DEPARTMENT

34.96 MLN EUROS
BUDGET FUNDED TO THE UNIVERSITY

Department of Excellence Project

The Department of Chemistry “Giacomo Ciamician” has been recognized as a Department of Excellence for the 2023–2027 period, reflecting its outstanding research and educational performance.
Departments of Excellence are selected and funded by the Italian Ministry of University and Research (MUR) every five years, as the top 180 departments in Italian public universities. These departments stand out for the scientific quality of their research output and the strength of their proposed development plans.
Pioneering Chemistry and Sustainable Development, the Department of Chemistry “Giacomo Ciamician” conducts cutting-edge research in chemistry, ranging from the design and synthesis of novel molecules to their application in advanced materials, and resources that enhance quality of life. This is achieved through integrated teaching, research activities, and continuous interaction with industry and society at large. The strategic objective of the Excellence Project is to consolidate the Department’s national leadership in research and technology transfer related to new functional materials with a strong awareness of the central role that chemical knowledge plays in achieving environmentally sustainable development. This research has a significant impact across multiple sectors, including energy, biomass and waste reuse, health, advanced electronics, and the conservation and restoration of cultural heritage. Key strengths underpinning the project’s success include the Department’s relocation to the new scientific campus in the Navile District, the expansion of its specialized personnel, and the establishment of a multidisciplinary research center focused on advanced materials.

Merlin

The MERLIN project will increase the quality and rate of MultilayER packaging recycLINg waste, by putting together a partnership to design cradle-to-cradle solutions to recycle multi-layer packaging between sorting technology providers, a waste management company, industry and research experts on delamination and recycling, SMEs service providers, packaging industry for flexible and rigid and a European Packaging Association, offering expertise on standardization and policies.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003883

UNIBO PI: Prof Galletti Paola

https://x.com/MERLINProject21
https://www.linkedin.com/company/merlinproject/
https://merlinproject.eu/

BioGov

Foster the transition to an innovative and inclusive bioeconomy, by exploring innovative governance models in bioeconomy education and co-create guidelines for bioeconomy training and mentoring through a multistakeholder approach, and the integration of humanities, art, design and culture.

Governance & Upskilling for a Stronger Bioeconomy
Funded by @HorizonEU under GA 101060742

UNIBO PI: Prof Galletti Paola

https://x.com/BioGovNet
https://www.linkedin.com/company/biogovnet/
https://www.biogov.net/project-overview/

ECLipse

Coordinated by the University of Bologna, the new European project will develop portable devices with a level of sensitivity equal or higher than that of molecular PCR swabs, and with much faster results. Eclipse aims to design and produce a nanobiotechnological platform for the detection of pathogens that is both economical, usable even by non-expert personnel and with a high level of sensitivity and reliability.

ECLIPSE project has received funding from the European Union's Horizon Europe EIC Pathfinder Open programme under Grant Agreement N. 101046787

Coordinated by the Department contact person: Prof Luca Prodi

https://x.com/ECLipse_eic
https://www.linkedin.com/in/eclipse-eic-930199243/
https://eclipse-project.eu/

Resolution

RESOLUTION "Radiocarbon, tree rings, and solar variability provide the accurate time scale for human evolution and geoscience" is a European Research Council (ERC) starting grant project directed by Prof. Sahra Talamo, for a total of 5-years (2019-2024).The project will resolve the discrepancies caused by chronological and methodological differences between archives (terrestrial and marine), using the best-suited material to reconstruct the atmospheric 14C in the glacial period – tree rings. The results of this work will be crucial in solving some of the most interesting puzzles in European prehistory, i.e. chronological interaction between the two most fascinating species in Europe (Neanderthals and Homo sapiens). With tree-rings, the resolution will be an order of magnitude higher compared the all other archives, and using the most recent advances in the AMS technique, we will obtain confidence intervals of only a few centuries in glacial times. This project will be of pivotal importance for key periods in human evolution and it will provide information on solar variability on decadal to centennial time scales reconstructed from production changes of 14C in tree rings and 10Be in ice cores.Moreover, the multidisciplinary nature of the project promotes knowledge exchange between humanities and other scientific domains (e.g., archaeology, palaeoanthropology, paleogenetics geoscience, solar dynamo). It will generate an invaluable resource to the scientific community, and it will be an exciting opportunity for the development of the scientific careers of PhDs and Post-doctoral researchers at Bologna University. We will build a precise clock for archaeology, geo- and solar science, to accomplish the definitive high RESOLUTION of European human evolution.

RESOLUTION is an ERC Starting Grant project, under the European Union's Horizon 2020 Research and Innovation Programme (N. 803147)

Coordinated by the Department contact person: Prof Sahra Talamo

https://x.com/ERC_RESOLUTION
https://www.instagram.com/erc_resolution/
https://site.unibo.it/resolution-erc/en

CuBER

The CuBER project proposes the validation of a promising RFB technology, the all-copper redox flow battery (CuRFB), able to cover a wide range of the aforementioned market applications due to its simple, modular and scalable design, security and sustainability. Firstly, a 5kWDC CuRFB pilot will be designed for its integration in Smart Cities and residential self-consumption market segments within the CuBER action. Subsequently, the planning of further developments will allow its application at larger scales, both as back-up power system in isolated areas (i.e. copper mining) and for energy management and grid balancing in renewable power production.

Horizon 2020 research and innovation programme
Copper-Based Flow Battery for Energy storage Renewables Integration
H2020 - LC – BAT_2019
Grant agreement No. 875605

UNIBO PI: Prof Catia Arbizzani

https://cordis.europa.eu/project/id/875605

Condor

CONDOR targets a modular device for solar-driven production of energy carriers and added value chemicals from biomass valorisation. Reactants are simple molecules and waste chemicals such as water and carbon dioxide or biomass derived alcohols. The only energy source to drive the process is sunlight. This is the most convenient way to store an intrinsically intermittent primary energy source (sunlight) into high energy density products that can be used whenever needed(fuels). The latter are termed solar fuels.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101006839

Contact person: Prof Paola Ceroni

https://x.com/CONDOR_EU
https://condor-h2020.eu/

PhotoReAct

Photocatalysis harnesses the energy of light to accelerate a chemical reaction. It is a green chemistry alternative as it reduces the use or generation of hazardous substances in the design, manufacture and application of chemical products. Funded by the Marie Skłodowska-Curie Actions programme, the PhotoReAct project will offer 15 early-stage researchers (ESRs) the opportunity to undertake research in the field and overcome current limitations that prevent the applicability and scalability of photochemical transformations. Young researchers will focus on the rational design of photocatalysts, new photocatalytic methodologies, improved reactor technologies and the industrial implementation of photocatalytic transformations. All ESRs will complete secondments at an industrial partner and at an institute other than their host to broaden their knowledge and expertise in preparation for entering the job market.

Innovative Training Network (ITN) (2021-2024) as coordinator of the Bologna research unit of a project entitled: “Photocatalysis as a tool for synthetic organic chemistry” (PhotoReact).

Contact person: Prof Paola Ceroni

https://www.photoreact.eu/

BattValue

BattValue project provides courses with professional level knowledge of existing and future battery concepts to those working in the mining, metal refining, processing and battery end-user sector (energy sector, automotive industry), and gives an excellent basis to enhance their skills in the field.

BattValue: SKILLED LEARNERS FOR BATTERY VALUE CHAIN IN EUROPE
IC EIT Raw Materias Academy (KAVA 8) [2022 –2024]

Contact person: Prof Francesca Soavi

https://www.battvalue.com/

HyFlow

Modern energy grids are smart and rely on fluctuation of the renewable energies sources, e.g. solar power, and are characterized by higher fluctuations in both power generation and energy consumption. In order to absorb resulting power peaks and to cope with the increased demand for renewable energies, modern grids need more dynamic storage systems. Hybrid energy storage systems (HESS) with high-power redox flow batteries and supercapacitors working as a team are uniquely suited to provide multiple system services at low cost and without the use of critical resources. The EU-funded project HyFlow will focus on technological, economic and ecological improvements of the HESS components, their management systems and their interaction through the complete supply chain. Through the project, we enhance components for optimal hybridization, by improved material utilization and cell design, and develop high-level control algorithms. Redox flow batteries and supercapacitors – HyFlow brings the best of both worlds together. This way, our solution can unlock different applications in the grid, boosting the stability and a flexibility in saving energy.

HyFlow: Development of a sustainable hybrid storage system based on high power vanadium redox flow battery and supercapacitor – technology

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 963550

contact person: Prof Francesca Soavi

https://hyflow-h2020.eu/

Nano-ImmunoERA

Nano-ImmunoEra is a research and innovation staff exchange network aiming at the development of innovative biosensors and diagnostic tools for the detection of clinically relevant antibodies.

Nano-ImmunoEra will form the next generation of clinically-oriented analytical scientists capable of delivering innovative solutions that will improve the lives of patients, reduce the cost of healthcare and position Europe as a leader in biomedical devices.

Nano-ImmunoEra project has received funding from the European Union’s MSCA Staff exchange Horizon Europe programme Grant Agreement Number 101086341

Coordinated by the Department contact person:
Prof Francesco Paolucci;
Prof Giovanni Valenti

https://nanoimmunoera-project.eu/

ECLectic

The overall objectives of ECLectic are the training of 10 Doctoral Candidates (DCs) in the field of sensing, diagnostics and spectroscopy, aiming in particular to the development of highly performant biosensors for solving the infection problems. Our goals are based on five major objectives which will be enabled by inter- and multidisciplinary scientific exchange, international mobility and strong collaborative transfer of knowledge and training activities between Italy, Spain, France, The Netherlands, Germany, Ireland and also including a secondment in the USA and an advisory board from China, USA and South of Africa.

ECLectic project has received funding from the European Union’s MSCA Doctoral network Horizon Europe programme Grant Agreement Number 101119951

Coordinated by the Department contact person: Prof Giovanni Valenti

https://x.com/ECLectic_MSCADN
https://eclectic-dn.eu/
https://www.linkedin.com/in/eclectic-msca-dn-83b529300/

Alcyone

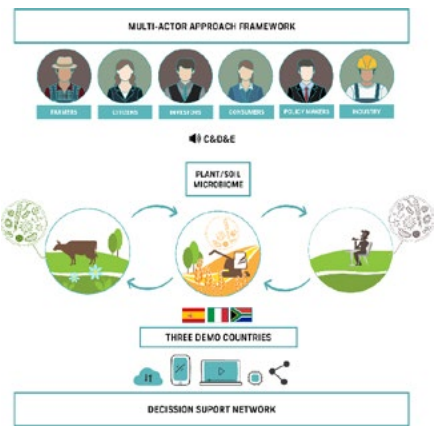
The EU-funded ALCYONE project aims to develop an innovative analytical platform for studying the effects of space environment on living cells. The project will design a lab-on-chip that will implement a micro-incubator to study cell cultures and radiation effects on them during space missions using bioluminescence. ALCYONE will allow for in situ evaluation of space environment effects on model biological systems and further contribute to the search for novel shielding solutions.

Contact person: Prof Mara Mirasoli

https://site.unibo.it/alcyone-project/en

Tribiome

TRIBIOME's vision is to develop and implement a systemic solution to transform current food production systems. To this end, TRIBIOME aims to advance alignment with the Green Deal and Farm2fork strategies, by deepening the knowledge of soil/ plant/animal and human microbiomes and their interconnections.
The project aims to drive agricultural systems by focusing on the relevance of the soil and plant microbiome and metabolome to produce more with less, through knowledge of microbial biodiversity and its interaction with the plant, developing novel technologies to influence its modulation in such a way as to generate an upgrade quality food and have a positive influence on the microbiomes of both animals and humans.



This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement n° 848158

Contact person Prof Jessica Fiori

https://www.tribiome.eu/
https://www.linkedin.com/company/tribiomeproject/

SENSOPAD: Sensing Endometriosis On Portable Auxiliary Devices

The SENSOPAD project represents a groundbreaking leap in addressing the challenges posed by endometriosis. The visionary approach of SENSOPAD involves empowering individuals through SENSOPAD’s sophisticated sensors designed for self-monitoring. These devices employ cutting-edge technology to efficiently detect relevant biomarkers, providing users with valuable insights during their menstrual cycles. If initial readings indicate potential concerns, a seamless transition occurs, guiding users to employ the SENSOPAD Microfluidic graphene transistor device at clinical entry points. The integration of the pad and the transistor with a mobile application and a cloud platform enhances diagnostic accuracy significantly.
This initiative not only enables early treatment, preventing the deterioration of debilitating symptoms and optimizing infertility care but also significantly enhances patients’ quality of life. SENSOPAD offers a simple, autonomous, and non-invasive form of screening, eliminating the need for expensive and time-consuming in-lab diagnosis. In essence, SENSOPAD represents a paradigm shift, forging a path towards more informed, proactive, and inclusive healthcare decisions for women worldwide.

Contact person: Prof Giovanni Valenti

https://www.linkedin.com/company/sensopad-sensing-endometriosis/posts/?feedView=all

Go Green

GoGreen’s core objective is to initiate green revolution by reinventing conservation practices towards environmentally friendly and human healthy solutions. GoGreen will spearhead this revolution by accomplishing the following objectives:
1)Define parameters for what constitutes green conservation to influence the creation of sector-wide standards.
2)Develop preventive conservation practices and a decision-making model that utilizes ‘green thinking’ in conservation.
3)Develop and introduce green innovative materials and methods inspired by historical recipes and methods, biological processes and green chemistry practices.
4)Create a prototype of a digital web-app that helps conservators evaluate the environmental impact of their actions and supports their search for greener alternatives.
5)Empower practitioners by creating a sector-wide paradigm shift, making green thinking the daily standard in conservation.

This project has received fundings from the Europen Union, grant agreement number: 101060768

Contact person: Prof Silvia Prati

https://gogreenconservation.eu/
https://www.linkedin.com/company/gogreen-conservation

Safewax

Sustainable Bioinspired Wax Coating for Multi-Functional Crop Protection

According to the FAO, plant diseases cost the global economy around 210€ billion per year, and fungal pathogens destroy at least a third of all food crops annually. Commercial agriculture relies on chemical fungicides for crop protection owing to their easy application and low cost; however, their overuse and misuse have devastating implications for all living systems and the entire ecosystem. Thus, establishing sustainable crop protection strategies is essential for global economic development, environmental protection, and food security. Inspired by superhydrophobic plants, such as lotus and broccoli which exhibit wax crystals on their cuticles, we propose a generic sustainable strategy for passive crop protection against fungal pathogens. Our biomimetic technology, termed SafeWax, relies on bio-derived non-toxic fatty acid-based sprayable formulations which self-assemble into a multifaceted protective coating with anti-adhesive, self-cleaning and antifungal properties. When applied on sensitive crops, which do not naturally exhibit wax crystals, SafeWax will synthetically render their foliage to passively resist pathogens. SafeWax concepts will initially be demonstrated on grapevine, as a relevant model crop of high importance to Europe's economy, environment and culture, which is highly susceptible to fungal diseases and is the most-frequently treated crop. SafeWax will then be expanded to other sensitive commodity crops. The biodegradable SafeWax coating will not only protect crops from fungal infections but will also be tuned to provide UV radiation filtering, prevent sun damage, as well as facilitate water collection from dew condensation, mitigating inevitable effects of climate change. SafeWax will revolutionize the global fungicides market (valued > 20 billion €), starting from the biofungicide market with a value of 3,2 billion € by 2025.

Progetto europeo HEU – PATHFINDER OPEN, Marzo 2023 – Febbraio 2027

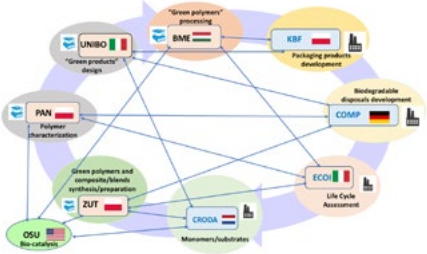
Contact person: Simona Fermani

https://safe-wax.eu/

GREEN-MAP

NOVEL GREEN POLYMERIC MATERIALS FOR MEDICAL PACKAGING AND DISPOSABLES TO IMPROVE HOSPITAL SUSTAINABILITY

The ultimate research goal of the GREEN-MAP project is to enable a circular economy within the disposable medical device industry. The project develops novel bio-based, biodegradable polymers that can be used in medical device packaging, as well as for disposable medical devices/components. By combining renewable, bio-based monomers with biodegradability via industrial composting and/or anaerobic digestion and bioconversion, we will enable a sustainable path for the disposable medical device market—expected to double by 2023—ultimately leading to a circular economy.

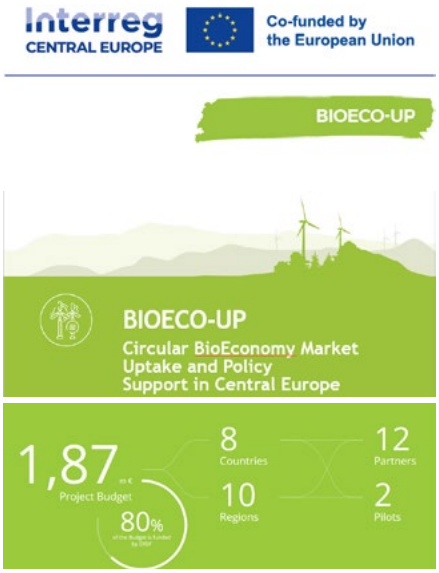


This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 872152

Contact person: Prof Maria Letizia Focarete

https://greenmap.zut.edu.pl/

BIOECO-UP interreg



The bioeconomy concept seeks to replace fossil resources with renewable raw materials in as many areas and applications as possible. The BIOECO-UP project widely establishes this concept across central Europe. The partners will design new circular value chains for the bioeconomy and change consumer behaviour. They will also support the policy level to push ahead with the transformation.

Contact person: Prof.ssa Paola Galletti

https://www.interreg-central.eu/projects/bioeco-up/

Biomass4Synthons

The global objective of the project is to increase the scientific excellence of two Institutions – Faculty of Pharmacy, University of Lisbon (FFUL), Lisbon, Portugal and Institute of Organic Chemistry with Centre of Phytochemistry Bulgarian Academy of Sciences (IOCCP-BAS) Sofia, Bulgaria and two non-academic partners: Spartax Chemicals (SPARTAX CHEM) and Science and Technology Park (BLC3).
The other Consortium Institutions partners: Sorbonne Université (France), Alma Mater Studiorum - Università di Bologna (Italy), Technische Universiteit Eindhoven (Netherlands) and Universitat Wien (Austria) are experts in key areas of synthetic organic chemistry and will transfer their knowlegde to FFUL, IOCCP-BAS and non-academic partners from Widening Countries.
The use of more modern and environmentally friendly tools to achieve the efficient transformation of bio-renewable based starting materials leading to valuable synthetic building blocks is one of the priorities of this networking. The success of this collaboration formed the basis for a joint Twinning application, which will aim to consolidate it, support its sustainability and foster its growth. The Consortium will enhance the scientific and technological capacity of linked academic institutions FFUL and IOCCP-BAS in key areas of synthetic organic chemistry such as process intensification by flow chemistry, photochemical and photocatalytic reactions, efficient metal catalysed C-H, C-C and C-heteroatom activation and domino reactions.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under Grant Agreement n° 951996

Contact person: Prof. Pier Giorgio Cozzi and Prof. Andrea Gualandi

https://sites.google.com/view/biomass4synthons/home?authuser=0

UseFool

Knowledge and manipulation of nature between usefulness and deception in the Arabo-Islamic tradition (9th-15th century)

UseFool brings together a corpus of previously unexplored Arabic technical sources that illustrate how to exploit the properties of natural substances in order to entertain and deceive. The project considers for the first time the technical knowledge of nature as applied by merchants, charlatans, craftsmen, and entertainers in the streets, markets, and other public and private urban spaces ofthe Arabo-Islamic Mediaeval and early modern world. Erudite scholars and street performers alike were engaged with the knowledge of nature and its numerous applications. UseFool investigates the parallel development of this interest in the different social and intellectual groups engaged in the transmission ofthis knowledge and involved in its practice. UseFool adopts the practitioner’s point of view and studies how both nature and humans are being manipulated, and the kinds of knowledge that develop around and in response to these practices.

ERC Consolidator Grant (g.a.101043939)

Contact person: Prof Lucia Maini

https://www.usefool.eu/

CROSS-LIFE

«CRotonic acid from Sewage Sludge»

The CROSS-LIFE project proposes an integrated technology for sludge management oriented to the dual aim of decreasing the volume of sludge to be treated at the end of life by ~ 70% and exploiting sludge as a feedstock to produce crotonic acid (i.e. a drop-in chemical) and its co-polymer poly(vinyl acetate-co-crotonic acid) from renewable sources to achieve a reduction of the carbon footprint of crotonic acid production.

The technology proposed is a combination of thermal, chemical, and biological processes, whose integration will unlock the potential of sludge as a source of chemicals and polymers. The companies involved in the project as sludge suppliers (Herambiente and Aqa) will benefit from sludge reduction and will play a novel role in the circular economy scenario. The company involved in the project as a bio-based crotonic acid end-user (Vinavil) will benefit from the introduction of a novel bio-based monomer into its polymer and from the novel synergies that will be created through such industrial symbiosis.

The project CROSS-LIFE «CRotonic acid from Sewage Sludge» is co-funded by the European Union within the LIFE program (LIFE21-ENV-IT-CROSS-LIFE Grant Agreement No. 101074164).

Contact person: Chiara Samorì

https://www.b-plas.it/progetto-cross-life/

PATAFEST

Potato crop effective management strategies to tackle future pest threats

Potato is a key crop in Europe (€12.4 billion, 2020). However, it is considered vulnerable to a variety of pests and soil-borne pathogen diseases. One of the most important pests is caused by bacteria Candidatus Liberibacter solanacearum (CLso), causing a disease known as zebra chip (ZC). The introduction of CLso bacterium on potato is mainly linked to the presence of the vector psyllid Bactericera cockerelli (BC) causing severe damage, both in terms of yield losses and quality. Main potato postharvest diseases as dry rot, black dot and silver scurf, are caused by soil-borne pathogens that have incidence in both field and storage. All these potential threats may result in significant economic losses in the potato industry and food losses. The European regulatory framework for potato's imports and production is very strict. However, globalisation, climate change, economical drivers, as well as the political context (EU Green Deal target of 50% pesticides reduction) are threatening the entrance of emerging potato pests and the incidence of soil-borne pathogen disease in postharvest storage. PataFEST and its 18 complementary partners, including the international cooperation with Ecuador, aims: 1) to characterise at molecular level the ecological pest spread pathway and identify potato disease resistance varieties against CLso and postharvest pathogens, 2) provide effective preharvest plant and soil treatments against CLso vector and soil-borne pathogens combined with other cutting-edge digital technologies such as image analysis tools (mobile app) and artificial intelligence predictive models; 3) develop postharvest technologies (biocontrol coating solution, controlled atmosphere storage and volatile organic compounds (VOCs sensors) to control the incidence of soil pathogens and maintain the quality of potato tubers stored. These strategies and technologies will be incorporated into an Integrated Pest Management approach to evaluate their performance at final TRL5.

Progetto europeo HEU – Farm to fork, Communities Development and Climate Action, Giugno 2023 – Maggio 2027

Contat person: Fermani Simona

https://www.patafest.eu/

FARMWISE

FARMWISE transforms the EU agricultural sector by empowering farmers and decision-makers with a state-of-the-art decision support system, combining precision agriculture, Artificial Intelligence (AI), and remote sensing. FARMWISE provides new insights into water quality, quantity, soil health, and nutrient management FARMWISE's state-of-the-art framework fosters knowledge sharing between scientists, farmers, and policymakers in a co-creation environment. The FARMWISE project will develop improved tools based on AI for more efficient European water policy and decision-making founded on research-based technologies to solve the most burning water pollution and climate change problems.

This project has received funding from the European Union's Horizon Europe research and innovation programme under GA N° 101135533

Contact person: Prof Elisa Michelini

https://www.farmwise-project.eu/

PARTICIPATION IN THE NATIONAL RECOVERY AND RESILIENCE PLAN (PNRR)

Finanziato dall'Unione europea NextGenerationEU

Ministero dell'Università e della Ricerca

Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

CHANGES: Cultural Heritage Active Innovation for Sustainable Society	Technological and multidisciplinary development for training, research, and technology transfer for cultural heritage
HEAL ITALIA: Health Extended Alliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision Medicine	Technological and multidisciplinary development for training, research, and technology transfer for cultural heritage
IN-FACT: One Health basic and translational actions addressing unmet needs on emerging infectious diseases	Monitoring, forecasting, diagnostic, and therapeutic research on viruses, resistant bacteria, vector insects, and animal reservoirs
RNA: National Centre for Gene Therapy and Drugs Based on RNA Technology	Sharing knowledge and resources in the field of genetic therapies and RNA technology drugs
MOST: National Center for Sustainable Mobility	Towards a more sustainable and digital mobility system
NBFC: National Biodiversity Future Center	Preserving Italian and Mediterranean biodiversity in marine, terrestrial, wetland, and urban areas
ICSC: National Research Centre for High Performance Computing, Big Data and Quantum Computing	High-performance data simulations, calculations, and analysis
AGRITECH: National Center for Technology in Agriculture	Sustainable development of agri-food production, adaptation to climate change, reduction of environmental impact
MICS: Made in Italy Circolare e Sostenibile	Promoting circular Made in Italy production in the clothing, furniture, and mechanical technology sectors

NEST: Network for Energy Sustainable Technologies

Supporting technologies for the energy transition towards renewable resources and overcoming dependence on fossil fuels

CHANGES: Cultural Heritage Active Innovation for Sustainable Society

Technological and multidisciplinary development for training, research, and technology transfer for cultural heritage

HEAL ITALIA: Health Extended Alliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision Medicine

Technological and multidisciplinary development for training, research, and technology transfer for cultural heritage

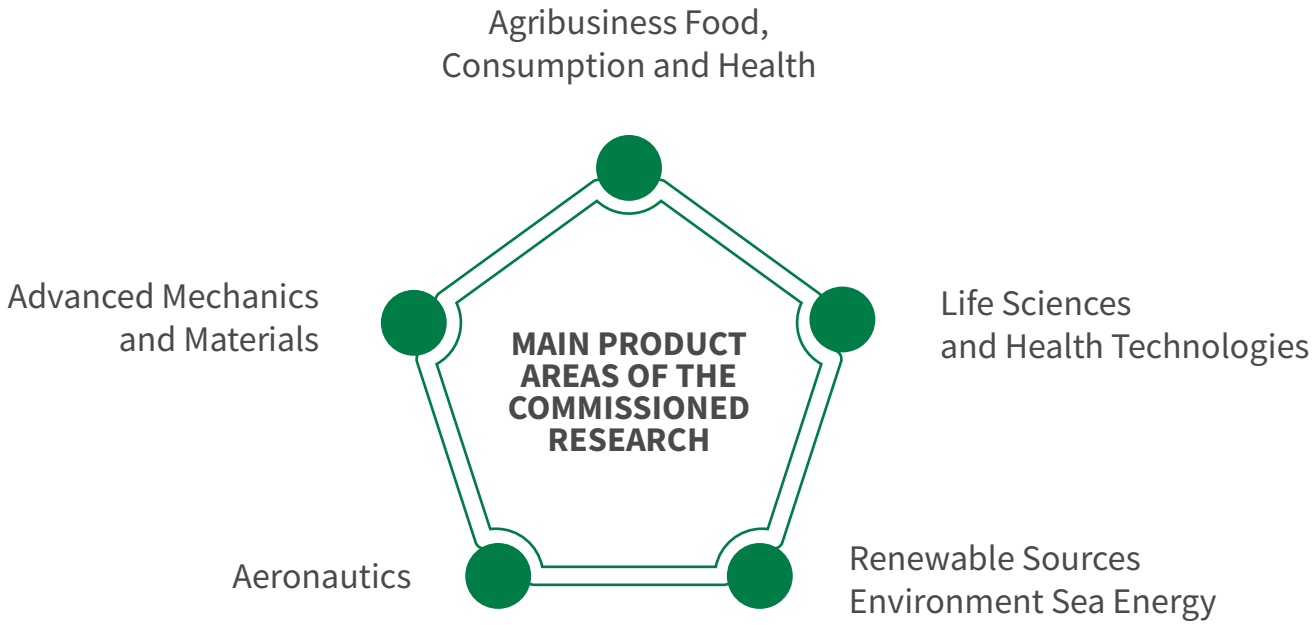
COMMISSIONED, CONTRACT RESEARCH AND PATENTS

90
PROJECTS (SINCE 2019)

3,8 MLN EUROS
FUNDED BUDGET

80
ACTIVE PATENTS

6
SPIN-OFFS STARTED AT THE UNIVERSITY



SPIN-OFF

Insimili Srl

The vision: InSimili recreates the real human body microenvironment in vitro, enabling better decisions in pre-clinical studies and reducing in vivo testing. Helping develop new therapies more efficiently and safely.

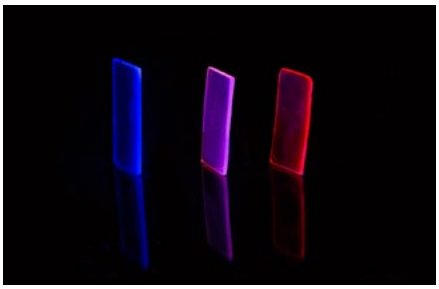
https://www.linkedin.com/company/insimili/posts/?feedView=all
https://www.insimili.com/

B-Plas Srl

The vision: Through an innovative process, B-Plas converts waste sludge into bioplastics, offering a concrete and sustainable solution to the problem of disposing of sludge of civil, industrial or agro-industrial origin.

https://www.linkedin.com/company/b-plas/
https://www.b-plas.it/

SINBIOSYS SRL



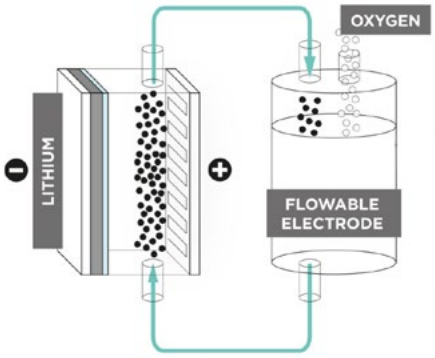
The vision: SINBIOSYS is an advanced materials company powering product innovations in different industrial applications like plastic sorting and security. Our exclusive know-how enables our partners to develop unique solutions based on our technology platform SiQD Tech®.
Our patented quantum dots hold the key to unlock low-waste, high-efficiency solutions for society’s most pressing problems. By developing dots that are safe, reliable, and, affordable, SINBIOSYS’ solutions will enable a new wave of revolutionary technologies.

https://www.sinbiosys.com/

BETTERY SRL

The vision: BETTERY aims at bringing a green liquid battery into the market, with the highest specific energy and safety associated with the lowest cost ever reported. Our battery, called NESSOX (NEw Semi-Solid flow lithium OXygen battery), is a patented technology based on lithium metal as anode and O2-rich flowable electrode as cathode.

https://www.bettery.eu/



Stem Sel

The vision: Celector® is a patented instrumentation for the separation, imaging and harvesting of living human cells. In many cases, adult stem cells lack effective markers and functional tests: labeling cannot guarantee correct cell selection. Celector® uses the principles of chromatography to obtain a label-free cell selection, based only on their native physical characteristics: size, morphology and density.

https://www.linkedin.com/company/stem-sel-srl/about/
https://www.stemsel.it/

PERSONAL GENOMICS SRL

https://www.personalgenomics.it/

byFlow Srl

The vision: Originating from the Separation Science Group at the Department of Chemistry “G. Ciamician”, focused on separation techniques of nano- and micro-sized analytes, byFlow was born as a spin-off with the aim of developing miniaturized field-flow fractionation (AF4) technology. Subsequently, byFlow has evolved to develop technologies and methods in collaboration with third parties. The services offered include product characterization, applications in proteomics and pre-proteomics, stability and aggregation studies for pre-trial samples, morphology studies (size/shape) and pre-marketing formulation studies of pharmaceuticals. Although FlFFF is the core of byFlow’s expertise, we offer many other technical solutions.

https://www.byflow.it/company/

Bionys Srl

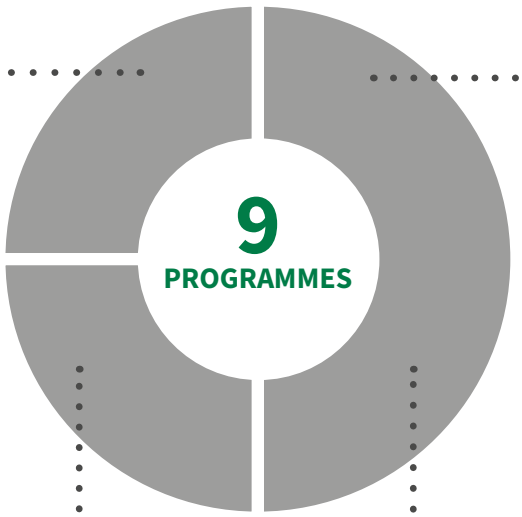
We advanced the ECL luminescence-based detection, increasing its sensitivity, portability, versatility and developing bio-sensors which are fast and cheap.

https://www.bionys.eu/

04

EDUCATION

PROGRAMMES



FIRST CYCLE DEGREE PROGRAMME

- Chemistry and Materials Chemistry

PROFESSIONAL MASTER'S PROGRAMME

- Materials and Manufacturing Processes for Medical Devices in the Healthcare Sector

SECOND CYCLE DEGREE PROGRAMMES

- Chemistry
- Advanced Cosmetic Sciences
- Chemical Innovation and Regulation
- Photochemistry and Molecular Materials
- Science for the Conservation-Restoration of Cultural Heritage

PHD PROGRAMME

- Nanoscience for Medicine and the Environment
- Chemistry

L27 CHEMISTRY AND MATERIALS CHEMISTRY (ITA)

The course focuses on the knowledge of the structure and properties of matter, the scientific method, the application of innovative methodologies and the use of complex instruments. The main feature is the theoretical-experimental approach that integrates the teachings with a strong laboratory activity.

Study and apply chemistry to address future challenges in the fields of new materials, health, energy, environment and cultural heritage.

Students
2023/2024

130
Availability

162
Number of applicants

Graduate satisfaction
2023

92.3%
with this programme

92.3%
with programmes in the same Class (Italy)

Students
2023/2024

115
1st year

89
2nd year

70
3rd year

274
All

Programme attractiveness
2023/2024

50%
Residents in other Italian regions

Programme attractiveness
2022/2023

9.5%
Students leaving university

THE COURSE IN NUMBERS

Is the teacher able to arouse students' interest in the course's subject?

81.9%
Positive feedback (%)

Are the teacher’s explanations clear?

86%
Positive feedback (%)

Are you interested in the subject matter of this course unit?

82%
Positive feedback (%)

On the whole, are you satisfied with the way this course has been taught?

82.6%
Positive feedback (%)

LM54 CHEMISTRY (ITA)

The Course offers an advanced study program of chemistry, characterized in the areas of synthesis and analysis and characterization. It combines the learning of the disciplinary foundations with laboratory practice; with the internship it gives access to cutting-edge research laboratories. The title allows entry into laboratories, public bodies and private companies with highly specialized roles.

From molecules to applied chemistry

Advanced skills in synthesis, analysis and characterization, for the search for scientific and technological solutions, innovative and sustainable.

Students
2023/2024

59
1st year

78
2nd year

127
All

Programme attractiveness
2023/2024

71.2%
Residents in other Italian regions

1.7%
Residents abroad

Graduates
2021/2023

73.7%
In course

THE COURSE IN NUMBERS

Is the teacher able to arouse students' interest in the course's subject?

92.8%
Positive feedback (%)

Are the teacher’s explanations clear?

91.5%
Positive feedback (%)

Are you interested in the subject matter of this course unit?

92.3%
Positive feedback (%)

On the whole, are you satisfied with the way this course has been taught?

91.7%
Positive feedback (%)

LM54 PHOTOCHEMISTRY AND MOLECULAR MATERIALS

This international programme provides you with sound skills in the fields of photochemistry and materials science. It prepares you to design, simulate, synthesise and characterise new materials, and to investigate, understand and exploit the effects of the interaction of electromagnetic radiation with natural and synthetic materials.

From light to materials: An advanced path between photochemistry and materials chemistry to develop innovative technologies in the energy, environmental and healthcare sectors.

Students
2023/2024

42
1st year

28
2nd year

70
All

Programme attractiveness
2023/2024

52.4%
Residents in other Italian regions

16.7%
Residents abroad

Graduate satisfaction
2023

90.9%
with this programme

92.4%
with programmes in the same Class (Italy)

Programme attractiveness
2022/2023

3.4%
Students leaving university

Work
Graduation year 2022

93.3%
with this programme

83.7%
with programmes in the same Class (Italy)

THE COURSE IN NUMBERS

Is the teacher able to arouse students' interest in the course's subject?

90.5%
Positive feedback (%)

Are the teacher’s explanations clear?

83.2%
Positive feedback (%)

Are you interested in the subject matter of this course unit?

85.5%
Positive feedback (%)

On the whole, are you satisfied with the way this course has been taught?

85%
Positive feedback (%)

LM54 CHEMICAL INNOVATION AND REGULATION

An international program in innovation, safety, regulation, and sustainability of chemical processes and products.

ERASMUS MUNDUS

Professional profile

Chemist in charge of regulatory issues Chemist working in research, development and analysis

Students

29 (23 Scholarships)
1st year

33 (23 Scholarships)
2nd year

62
All

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA
UNIVERSITAT DE BARCELONA
UNIVERSIDADE DO ALGARVE

Programme structure

1ST YEAR

Classes and curricular activities (66 ECTS) in the host university

2ND YEAR

Internship, research project and thesis (54 ECTS) in one/ two other countries of the consortium.

Programme attractiveness

2023/2024

11.3%
Residents in other Italian regions

83.8%
Residents abroad

LM54 ADVANCED COSMETIC SCIENCE (ENG)

The programme provides you with theoretical and practical training in the scientific and technological aspects of cosmetic products. This degree enables you to work in cosmetic companies in the field of design, production, analysis and certification of cosmetic products.

Innovate in cosmetic sciences
Apply advanced chemistry and technologies for the formulation and production of safe, innovative and sustainable cosmetic products.

Students
2023/2024

49
1st year

47
2nd year

96
All

Programme attractiveness
2023/2024

42.9%
Residents in other Italian regions

51%
Residents abroad

Students moving on
2022/2023

2.1%
Students leaving university

Graduates
2021/2022

90.9%
Graduates aligned to the exam schedule

Graduate satisfaction
2023

100%
with this programme

92.4%
with programmes in the same Class (Italy)

THE COURSE IN NUMBERS

Is the teacher able to arouse students' interest in the course's subject?
88.3%
Positive feedback (%)

Are the teacher’s explanations clear?
87.9%
Positive feedback (%)

Are you interested in the subject matter of this course unit?
88.5%
Positive feedback (%)

On the whole, are you satisfied with the way this course has been taught?
87%
Positive feedback (%)

LM11 SCIENCE FOR THE CONSERVATION - RESTORATION OF CULTURAL HERITAGE (ENG)

The programme, delivered entirely in English, is designed to train conservation scientists with sound technical and scientific knowledge of conservation, enabling them to contribute to the study, diagnostics and conservation of cultural heritage as part of an interdisciplinary team.

Studying and preserving cultural heritage Advanced scientific expertise to contribute to the study, diagnostics and conservation of cultural heritage within an interdisciplinary team.

Students
2023/2024

20
1st year

16
2nd year

36
All

Programme attractiveness
2023/2024

80%
International students

Graduate satisfaction
2023

95%
with this programme

83%
with programmes in the same Class (Italy)

Work
Graduation year 2021

71.4%
with this programme

60.4%
with programmes in the same Class (Italy)

THE COURSE IN NUMBERS

Is the teacher able to arouse students' interest in the course's subject?
93.2%
% risposte positive

Are the teacher’s explanations clear?
93.2%
% risposte positive

Are you interested in the subject matter of this course unit?
93.9%
% risposte positive

On the whole, are you satisfied with the way this course has been taught?
93.6%
% risposte positive

PHD CHEMISTRY

High scientific qualification, research activity in the chemical and nanotechnology fields, a multidisciplinary training path to stimulate creative thinking and originality: the PhD in Chemistry aims to develop a broader view, necessary to solve the important challenges that chemical research must face, from energy to health, from environmental protection to food sustainability.

The PhD in Chemistry trains professionals for public and private research structures, aimed to highly competitive positions in the job market.

Students
2024/2025

26
40th cycle

24
39th cycle

33
38th cycle

83
All

Scholarships by funding source

40th cycle	85.71% from external agreements	14.29% from UniBo
39th cycle	66.67% from external agreements	33.33% from UniBo
38th cycle	71.88% from external agreements	28.13% from UniBo

THE PHD IN CHEMISTRY OFFERS:

- High-quality and productive research
- International experiences for PhD students
- Full employment for Chemistry PhD graduates (>50% in the private sector)

PHD IN NANOSCIENCE FOR MEDICINE AND THE ENVIRONMENT

The PhD course Nanoscience for Medicine and the Environment aims to build a large area of advanced teaching and research centered on nanosciences and on their applications in medicine and the environment.The doctorate has its fundamental objective in the development of a multidisciplinary approach to the nanosciences, at the interface between chemistry, physics, biology, medicine and environmental science.
This PhD has, as its primary objective, that of crossing the “jargon” barriers in order to construct cultural connections between the various disciplines, integrating scientific communities with very different methodologies and approaches, with the awareness that innovations in this area can only take place in a fully interdisciplinary context.
The integration of the diverse scientific areas will thus provide the opportunity to design and develop common research projects thanks to multidisciplinary / interdisciplinary approaches.

Students
2024/2025

14
40th cycle

12
39th cycle

15
38th cycle

41
All

THE PHD IN NANOSCIENCE OFFERS:

- High-quality, high-impact research
- Strong international exposure
- High multidisciplinarity
- Full employment for Nanoscience PhD graduates, with 100% utilizing the skills acquired during their doctorate (AlmaLaurea data)

05

THIRD MISSION

LAUREA AD HONOREM

Paul Thomas Anastas is an American scientist considered the founder of Green Chemistry.
Born in Quincy, Massachusetts, on May 16, 1962, Anastas developed a passion for science from an early age. He earned his bachelor's degree from Boston University and later obtained his Master's and Ph.D. in Chemistry with a specialization in organic synthesis from Brandeis University.
His fundamental contribution to the field was formulating the **12 Principles of Green Chemistry**, which laid the foundation for a science more attentive to the environment and human health. These principles provide tools for designing the proper production and handling of chemical substances.
In addition to his significant scientific contributions as the head of the Center for Green Chemistry and Green Engineering at Yale University, Paul Anastas helped establish and directed the Institute for Green Chemistry of the American Chemical Society, the leading scientific organization promoting sustainable innovation in chemistry.
Paul Anastas has also played a key role within U.S. governmental institutions. Thanks to his efforts, green chemistry and sustainability became major priorities and achievements of the Environmental Protection Agency (EPA), where he worked from the late 1980s to the early 2000s, and again between 2009 and 2012. It was during his tenure at the EPA in 1991 that Anastas coined and popularized the term **Green Chemistry**, now a globally recognized concept. In his role at the EPA, Anastas also spearheaded the establishment of the **Presidential Green Chemistry Challenge Award** in 1995, an academic and industrial recognition that has since set a standard and provided vital encouragement for the promotion of sustainable chemical innovation.
Paul Anastas also served as the White House science advisor for environmental issues under Presidents Clinton and George W. Bush, and he held prominent positions during the Obama administration. In these roles, he contributed to addressing major environmental crises, including the aftermath of the 9/11 terrorist attacks, the BP Oil Spill, and the Fukushima disaster.
Over the past 25 years, Paul Anastas has been an ambassador for Sustainable Chemistry worldwide. In 2023, he launched the **Global Green Chem Accelerator Network** on behalf of the United Nations. His teaching and example have inspired all major scientific societies in chemistry, starting with EuCheMS, to establish sections and groups dedicated to advancing Green Chemistry. He has also helped create collaborative initiatives and networks in Green Chemistry across African nations and between Africa, China, India, South America, and Eastern Europe.


GREEN CHEMISTRY COMMITMENT
beyondbenign.org

CERTIFICATE

OF LEADERSHIP, GREEN CHEMISTRY COMMITMENT

THIS CERTIFICATE IS PRESENTED TO:

University of Bologna

in recognition of being a signer of the Green Chemistry Commitment and preparing scientists and citizens to address sustainability challenges through chemistry.

This certificate was awarded on 05/27/2024.

Dr. Amy Cannon
Co-founder,
Beyond Benign

Dr. John Warner
Co-founder,
Beyond Benign

beyondbenign

Laurea ad honorem video

Alumni video

ALMAE MATRIS ALUMNI ASSOCIATION

The Almae Matris Alumni Association (AMA Association) was established at the end of 2020 and already counts over 9,000 members. It was created with the aim of valuing the skills of Alumni as valuable resources in shaping the future of the University of Bologna.
At the same time, it serves as a network for the professional and personal development of the Alumni themselves—a global community that bridges generations, disciplines, and professional fields. It is a space where Alumni can maintain and renew their bond with Alma Mater, continue to grow by participating in exclusive activities, and share their expertise and creativity.

Within the community the department has a dedicated chapter. The Chapter was created to provide a meeting place for former and current students of the Ciamician Department. Its purpose is to foster moments of connection, training, and stimulating interaction between Alumni and students, offering them a practical and diverse perspective on the opportunities the professional world can offer now and in the future.

CENTER FOR CHEMICAL CATALYSIS

CENTER FOR
CHEMICAL CATALYSIS

The **Center for Chemical Catalysis – C³** –is and interdepartimental center created in the 2021.

The Department of Chemistry “Giacomo Ciamician” is one of the two co-founders, together with the Department of Industrial Chemistry “Toso Montanari”. Currently the C3 counts more that 120 junior and senior researchers that express scientific interests towards **chemical catalysis**.

As a general and ambitios ***VISION***, C³ aims to become a national and international "**hub**" for the development and investigation of chemical catalytic processes.

To pursue this objective, the center adopted an inter-area ***MISSION*** that can be declinated as follows:

- Promote the creation of profitable **scientific networks** (Academy & Industry)
- Consolidate **technology transfer** from Academia to chemical Industry;
- Pursue **high educational trainings** of early-stage chemists in the field of chemical catalysis;
- Foster **scientific dissemination** and public engagement.

PUBLIC ENGAGEMENT

The group has been active within the Department for over 20 years (since 1998) through various types of scientific dissemination initiatives, in particular aimed at elementary and middle schools with more than 100 creative workshops organized. In addition to these activities, the group regularly participates in the "European Researchers' Night", in the “Pint of Science” and in the national science festival in Genoa.

Active in Promoting Scientific Culture and Knowledge: since 1998, the department has been dedicated to advancing scientific culture and knowledge through a wide range of initiatives.

EUROPEAN RESEARCHERS’ NIGHT

+100 CREATIVE WORKSHOPS FOR ELEMENTARY AND MIDDLE SCHOOLS

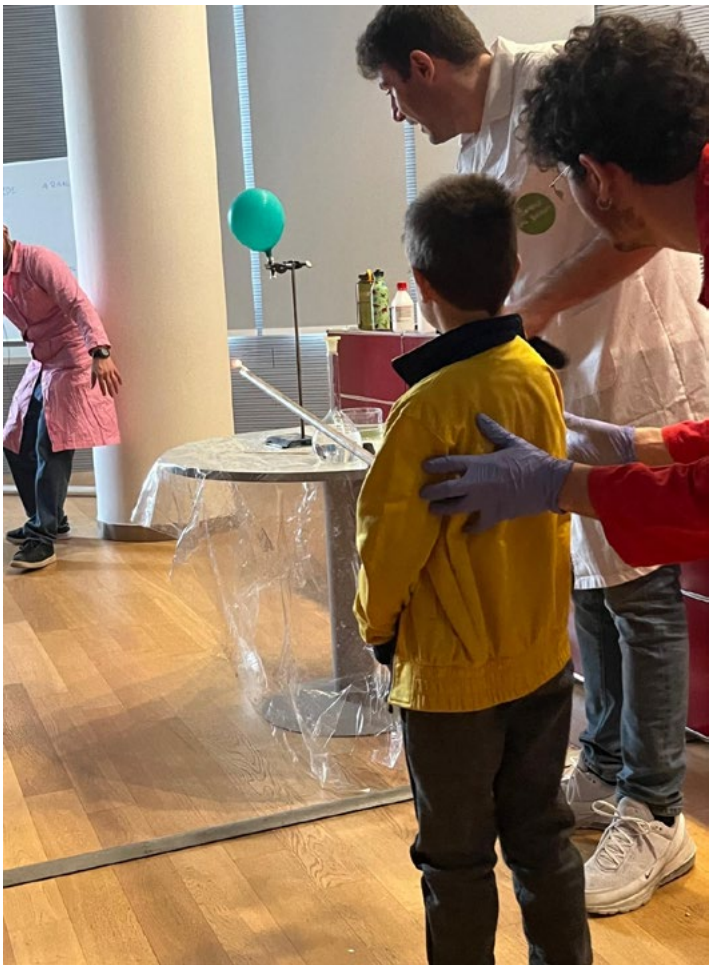
MORE THAN 700 STUDENTS ATTENDING TO THOSE WORKSHOP IN 2024

GENOA SCIENCE FESTIVAL

PINT OF SCIENCE

@CIAMICIAN_UNIBO


OMNIA IN MENSURA ET NUMERO ET PONDERE



PLS

The PLS is a MIUR project that has an orientation objective for high school students. The PLS-Chemistry welcomes entire high school classes in the two Chemistry departments of UniBo to carry out participatory lessons and exercises, and also individual students to carry out internships valid as PCTO.

https://www.pls.unibo.it/chimica

Navile Day

The "Navile Day" event was organized into two parallel initiatives: the presentation of the District's Departments, aimed at faculty members, researchers, and companies in the chemistry sector, and a Recruiting Day focused on connecting chemical-pharmaceutical companies with students and graduates in these fields.

In 2024, the event saw the participation of 9 companies (including Chiesi, Hera, and Coloplast) and over 300 students. Additionally, more than 150 university staff members and 37 representatives from 25 different companies attended the departmental presentations.
During the event, the directors of the three departments had the opportunity to showcase their activities, and the departments introduced themselves through 12 pitch presentations. The day also featured the presentation of projects, patents, and research activities related to high-technology transfer projects from the three departments.
This was achieved through 15 demonstration booths and over 100 posters, where PhD students and postdoctoral researchers explained their research work.

Article about Navile Day

Ciam-in-talk event

Ciam-in-talk event is organized annually and features presentations on the research activities of newly appointed faculty members affiliated with the Department.
The Ciam-in-talk, first held in 2021, was designed to foster new collaborations between recent arrivals to our Department and the existing research groups.

2021: Giulio Bertuzzi, Andrea Fermi, Demetra Giuri, Valentina Marassi, Daniele Fazzi.

2022: Luca Bizzochi, Devis Montroni, Emilio Parisini, Andrea Piccin, Alessandro Rombolà, Marco Villa.

2023: Matteo Di Giosia, Lucia Ferrazzano, Marianna Marchini, Mattia Melosso, Arianna Menichetti, Atunes Staffolani, Alessandro Zappi.

2024: Maria Maddalena Calabretta, Marco Malferrari, Cleo Thomas Gabriel Teixeira Pires, Anna Liguori, Donato Calabria.

Social media activities

@CIAMICIAN_UNIBO

LINKEDIN

UNIBOPER: #CIAMICIANSTORIES

"How has the world of chemistry changed over the past century? What are the current research areas and the latest discoveries? Who are the key figures behind these studies? Let's find out together through the #Ciamician-Stories series on Uniboper"


OMNIA IN MENSURA ET NUMERO ET PONDERE
PERIODIC TABLE
OF THE ELEMENTS

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DEPARTMENT
OF CHEMISTRY
"GIACOMO CIAMICIAN"