

Department of Experimental and Clinical Medicine - DMSC

The Department of Experimental and Clinical Medicine (DMSC) is one of the largest in the University of Florence.

The DMSC is composed of the following 7 Specialty Sections:

Section of Anatomy and Histology

Specialist Surgery and Histopathological and Molecular Diagnostics

Health Services Research

Critical and Specialist Medicine

Internal Medicine

Physiological sciences

The Department is home to 109 university professors, 63 senior researchers, 79 research assistants and 43 fellows. Our competent teaching and administrative staff form a compact and supportive community and are easily approachable.

Its purposes are carrying out scientific research, teaching, training and third mission activities; most members also perform clinical activities in the Careggi University hospital. The Department includes full and associate professors and researchers belonging to various scientific-disciplinary sectors representing the majority of areas of biomedical education and research.

The Department's objectives are:

promote and coordinate research activity in the fields of Experimental and Clinical Medicine;

improve and promote relationships and collaborations with other universities, national and international cooperative groups, that are active in the biomedical research field;

undertake relationships and collaborations with public and private entities with respect to its mandate;

undertake and participate in initiatives for the dissemination of knowledge in the fields of pertinence for the purpose of cultural and professional training in both undergraduate and graduate education;

promote and protect welfare behaviour in the fields of teaching and research in the Department.

For above reasons, the DMSC likely represents a unique example in the Italian context, owing to the fact that the skills necessary to address different experimental and translational needs are all concurrently available, also with the skills to generate advanced diagnostic and therapeutic applications as well as offering new platforms and methodologies useful for translational research and clinical applications. The main features of the research is indeed a multidisciplinary approach to study metabolic, endocrine, cardiovascular, gastroenterological, rheumatologic, pneumological, neurological, oncologic, infectious and immunologic diseases. Such a multidisciplinaryity is strengthened and further qualified by the involvement of researchers and clinicians in cooperation projects in clinical medicine contexts, in order to provide answers to any novel request coming from the scientific community. The DMSC hosts a wide range of Laboratories equipped with classic and innovative technologies. Synergies have been consolidated in defined areas of cooperation among research groups. The Department coordinates the PhD course in Clinical Sciences whose main goal is to promote application of biotechnology and molecular technologies in medicine. Within the Department 14 research units are active (<https://www.dmsc.unifi.it/vp-32-centri-e-unita-di-ricerca.html>). Of note, DMSC has been appointed as Department of Excellence by the Ministry of Research and University, covering the five-year period 2018-2022.

ERC Main relevant Panels:

- *LS1 Molecules of Life: Biological Mechanisms, Structures and Functions*

For all organisms: Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling

- *LS2 Integrative Biology: from Genes and Genomes to Systems*

For all organisms: Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicine

- *LS4 Physiology in Health, Disease and Ageing*

Organ and tissue physiology, comparative physiology, physiology of ageing, pathophysiology, interorgan and tissue communication, endocrinology, nutrition, metabolism, interaction with the microbiome, non-communicable diseases including cancer (and except disorders of the nervous system and immunity-related diseases)

- *LS6 Immunity, Infection and Immunotherapy*

- *LS7 Prevention, Diagnosis and Treatment of Human Diseases*

Medical technologies and tools for prevention, diagnosis and treatment of human diseases, therapeutic approaches and interventions, pharmacology, preventative medicine, epidemiology and public health, digital medicine

Among other ERC:

- *PE6_11 Machine learning, statistical data processing and*

Key Research Activities

The main aim of DMSC is to integrate clinical and basic research with teaching of both undergraduates and post-graduates within the School of Medicine. Clinical and preclinical research lines are thus shared among the various units of the Department, which are routinely involved in diagnostic and therapeutic management of patients referred to the University Hospital of Florence.

The Department also has the following main research and teaching fields: surgery (oncology, abdominal transplants, geriatrics, endocrinology, urology, orthopaedics), anatomy and histology, infection diseases, Health Services Research, physiology, geriatric medicine, nephrology, hepatology, endocrinology and metabolism, gastroenterology, cardiology, atherothrombotic disease, immunology, oncology and hematology, rheumatology, and nutrition.

Key Research Facilities, Infrastructure and Equipment

The DMSC has many well equipped laboratories linked to the effervescent research activity at the university and Careggi University Hospital, also thanks to the Interdepartmental Centers and Research technological Platforms that are fully operational; many of these have been upgraded or de-novo activated in the last three years and now organized in a Departmental Multi-Technological Platform: A) Functional Sequencing Platform, B) Functional Imaging Platform, C) Cytofluorimetry Platform, and D) Tissue Engineering and Opto-Mechanical Functional Analysis Platform.

Throughout the years the collection grew thank to include the acquisition of new departmental technologies (e.g. Bio-Plex200 system Biorad, QX200 Droplet Digital PCR system Biorad, cryostatic microtome Leica, Sanger Sequencer CE-IVD 3500DX Thermo Fisher, NextSeq™ 2000 Sequencing System Illumina, Affymetrix GeneChip Scanner 3000 7G system with fluidics station, spectral and conventional flowcytometer BD FACSymphony™ A5 SE 9Blue/6Red/14Violet/9YG/10UV, Gridlon Nanopore e miseq illumine, flowcytometer BDFACSLyric™ System 3L12C instrument CE-IVD con BDFACS Universal Loader, laser scanning confocal microscope TCS-SP5 Leica)) that was also made possible thanks to additional funding deriving from the Department of Excellence, summing

applications using signal processing (e.g. speech, image, video)

- *PE6_13 Bioinformatics, bio-inspired computing, and natural computing*
- *SH6_15 History of science, medicine and technologies*

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up to €1,500,000. This effort has facilitated collaboration between researchers, and allowed strong research programs to be promoted by DMSC. The COMputational BlomediNE Laboratory - COMBINE, is part of our department, with the objective to helping scientists make sense of complex multi-dimensional data. COMBINE Laboratory is involved in basic and advanced research in the field of computational methods and their application in biomedicine. It is deeply committed in the implementation and development of computational methods and strategies for analysis and management of complex bioinformatic data (genomics, transcriptomics, proteomics, epigenetics, metabolomics, phenomics, imaging) aimed at enhancing biomedical research and diagnostics.

Previous Involvement in National and European Research Funding Programmes

DMSC has undertaken and has been funded in 7 Horizon 2020 projects, one under the Erasmus program and another founded from ERA-Net ERA-HDHL. During 2021 DMSC has been granted 58 national (i.e. from AIRC) and 5 international projects, most of which having members of the department as coordinator. In the same period DMSC obtained 10 regional funding and received 71 funding grants from third parties in the setting of investigational clinical studies or other forms of collaborations.

Department of Neuroscience, Psychology, Drug Research and Child Health - NEUROFARBA

The Department is composed of the administrative and scientific merging of six sections: Neurosciences, Pharmaceutical and Nutraceutical, Pharmacology and Toxicology, Psychology, Child Health, and Sensory Organs. The daily interaction of different preclinical and clinical skills gives rise to translational biomedical research. The research activity carried out in NEUROFARBA promotes the study of diseases pathophysiology, the identification of new drug targets, the study of the composition and properties of foods, and the setting of diagnostic and therapeutic strategies. Finally, the study of psychological constructs and their plasticity contributes to individual health.

The Department meets an extensive network of national and international collaborations, among which research institutions, charitable organizations, and scientific societies, that also take shape in three research centers (Cera, CeSAL, CIRIM).

NEUROFARBA is actively involved in Third Mission and Public Engagement as inferable from the Department Year Report and hosts public/private laboratories including Information Systems for pharmacology, pharmacovigilance and pharmacoepidemiology, Synthesis of peptides of pharmaceutical interest, NeuroGenetics in Rehabilitation and Perinatal Research. The department claims many collaborations with pharmaceutical companies to evolve knowledge produced by academic research into knowledge useful for productive purposes.

Researchers with a high scientific profile are enlisted in NEUROFARBA, among which is a gender balance with a woman/man ratio of 1.4 and important governance positions held by women. Recent results from the VQR3 exercise confirm the department high qualification with top H_{index} in the field of scientific research and a high-level scientific production. NEUROFARBA was classified as excellent by the Ministry of University and Research for the quality of research and scientific perspectives. It was funded with a dedicated grant to prompt research in the period 2023-2027 over the theme "New methodological strategies: challenges for the development of a personalized therapy for fragile patients".

ERC Main relevant Panels:

- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions**
For all organisms: Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling
- **LS3 Cellular, Developmental and Regenerative Biology**
For all organisms: Structure and function of the cell, cell-cell communication, embryogenesis, tissue differentiation,

Key Research Activities

NEUROSCIENCES

- Preclinical and clinical, epidemiological, biological, genetic, biochemical, immunological and translational study of neurological and psychiatric disorders.
- Study of cerebrovascular diseases, cognitive processes and related disorders (e.g. dementia and Alzheimer's disease), neurogenetics, neuroimmunology, multiple sclerosis, neurorehabilitation, neuroimaging, rare neurological diseases, psychic disorders.

PHARMACEUTICAL AND NUTRACEUTICAL SECTION

- Design in silico, synthesis, characterization, and optimization of compounds active toward biological targets such as enzymes, receptors and nucleic acids by using high throughput screening (HTS), fragment-based drug design (FBDD), structure-based drug

organogenesis, growth, development, evolution of development, organoids, stem cells, regeneration, therapeutic approaches

- *LS5 Neuroscience and Disorders of the Nervous System*

Nervous system development, homeostasis and ageing, nervous system function and dysfunction, systems neuroscience and modelling, biological basis of cognitive processes and of behaviour, neurological and mental disordersLS7 Prevention, Diagnosis and Treatment of Human Diseases

- *LS9 Biotechnology and Biosystems Engineering*

Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards

- *PE5_18 Medicinal chemistry*

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design (SBDD), ligand-based drug design (LBDD). Development of models for prediction of ADMET properties.

- Design, synthesis and characterization of peptides of immunologic, pharmaceutical and cosmetic interest.
- Identification and quantification of bioactive metabolites in plant-based food, medicinal plants; development of extraction and analytical methods for metabolomic studies.

PSYCHOLOGY

- Study of sleep and wakefulness as a function of age, and cognitive processes related to sleep.
- Study of cognitive processes (perception, categorization, recognition, memory and imagination and false memories) in normal and neuropsychological subjects.
- Study of human perceptual systems with attention to vision and neuronal mechanisms related to perception.
- Development, validation and adaptation of psychological and neuropsychological tests.
- Study of neural circuit plasticity in response to experience.

PHARMACOLOGY AND TOXICOLOGY

- Neuropharmacology: histaminergic, dopaminergic, serotonergic, purinergic, adrenergic, cholinergic, gabaergic and glutamatergic modulation in cognitive processes and in anxiety disorders, depression, stress, food consumption, and in both inflammatory and neuropathic pain.
- Cardiopharmacology: identification of new drugs with antiarrhythmic activity, electrophysiological remodeling in both physiological and pathological conditions. Pharmacology of cardiovascular risk factors.
- Experimental and Clinical Toxicology: study of intestinal carcinogenesis using in vivo and in vitro models, chemoprevention, intestinal inflammation, and genotoxic damage.
- Pharmacology of inflammation and immunopharmacology: study of inflammatory and immuno-allergic pathologies of the central nervous system and peripheral organs such as the respiratory and ocular systems; study of compounds active on the histaminergic system, nitric oxide donors, carbonic anhydrase inhibitors and PARP.
- Pharmacovigilance, phytovigilance and pharmacoepidemiology: search for adverse drug reactions (ADR) using regional and national databases to identify signal alarms due to drug-

related disorders; design and implementation of Pharmacoepidemiology studies.

CHILD HEALTH

- Study of drug treatment and neuroprotection in hypoxic-ischemic brain injury and neonatal– infantile seizures.
- Study of fetal programming, pediatric rare diseases, perinatal bioethics, solid organ transplantation and pregnancy.
- Study of the intestinal microbiota and yeasts in inflammatory intestinal diseases
- Study of juvenile idiopathic arthritis, Kawasaki disease, uveitis, pediatric connective tissue disease and auto-inflammatory syndromes
- Study of hemodynamics, respiratory insufficiency, hyperbilirubinemia, oxidative stress in the newborn.
- Study of congenital diseases from immunological dysregulation and hereditary metabolic diseases
- Study of infantile cerebral palsy, movement disorders, neuromotor rehabilitation.

Key Research Facilities, Infrastructure and Equipment

Dedicated centers for animal housing and preclinical imaging are available. Moreover, several instruments are currently running in the department:

- GC/MS – HPLC
- NMR spectrometer
- Microwave synthesizer
- Automated peptide synthesizer
- Plasmonic resonance optic biosensor
- Simoa for biomarker analysis
- Leica Thunder Imager 3D tissue
- Eyetracking system
- Software for behavioral analysis
- Vibratome
- Fluorescence microscope with spinning disk system (Nikon)
- N-SIM TIE microscope (Nikon)
- Cell counter

Previous Involvement in National and European Research Funding Programmes

Funder: European Commission

- Spatio-temporal mechanisms of generative perception.

- REACH: Russian European Alliance for research among women, Children and adolescents impacted by HIV, TB and HCV.
- Neurotoxicity De-Risking in Preclinical Drug Discovery.
- Faecal microbiome as determinant of the effect of diet on colorectal-cancer risk: comparison of meat based versus pesco-vegetarian diets.

Funder: Ministry of University and Research

- Bacterial carbonic anhydrase as drug targets: toward a new generation of antibiotics.
- Temporal context in perception: serial dependence and rhythmic oscillations.
- Deciphering the role of Carbonic Anhydrase isoforms in psychiatric disorders.
- Unraveling hidden culprits for the cardiac arrhythmia burden: modulation of immunoinflammation and inter-cellular signaling as targets for novel therapeutic approaches.
- Metabolic regulation of cortical visual processing in mice and humans.
- Glymphatic system: a new player in the gut-brain axis. Natural resources to maintain homeostasis.

PNRR projects

- Ecosistema dell'Innovazione "Tuscany Health Ecosystem - THE" (Advanced RADIOtherapies and diagnostics in oncology; Preventive and predictive medicine; Advanced technologies, methods and materials for human health and well-being; Biotechnologies and imaging in neuroscience);
- Partenariati Estesi (Age-IT e Brain-IT)
- Centri Nazionali (National Center for Gene Therapy and Drugs based on RNA Technology).

Department of Clinical and Experimental Biomedical Sciences "Mario Serio" - DSBSC

The Department of Experimental and Clinical Biomedical Sciences "Mario Serio" is made up of 102 professors and researchers, belonging to 15 scientific disciplinary sectors of the clinical and preclinical area who carry out teaching activities within the School of Human Health Sciences, of the School of Mathematical, Physical and Natural Sciences, of the School of Engineering, of the School of Psychology and of the School of Agriculture. The professors of the Department preside over 11 clinical units at AOU Careggi and AOU Meyer (Gynecology and Obstetrics, Endocrinology, Andrology and Gender Incongruence, Diabetology and Obesiology, Gastroenterology, Medical Physics, Diagnostic Imaging, Radiotherapy, Nephrology, Immune-mediated Kidney Diseases and 4 Regional Coordination Centers, 3 European reference Centers, 4 Regional Coordination Centers, 3 European reference Centers. The Department includes 12 Specialization Schools in the health area to which over 330 postgraduates, 6 1st and 2nd level Masters and 4 Degree Courses pertain. Furthermore, it is the administrative headquarters of the PhD in Biomedical Sciences, and participates to two Pegaso doctorates (in Biochemistry and Molecular Biology and in Genetics, Oncology and Clinical Medicine-GenOMeC), hosting about 25 PhD students for each cycle.

Over 15% of the Department's teachers (17 out of 102) are scientists of recognized authority and prestige, included in the list of Top Italian Scientists (TIS) (<https://topitalianscientists.org/>). Three ERC grants (a Starting, a Consolidator and an Advanced) have been won in the Department in the last eight years. In addition, professors of the Department are members of the European Evaluation Boards of the Starting Grant ERC and the Marie Curie Fellowships.

ERC Main relevant Panels:

- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions**
For all organisms: Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling
- **LS2 Integrative Biology: from Genes and Genomes to Systems**
For all organisms: Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicine
- **LS3 Cellular, Developmental and Regenerative Biology**
For all organisms: Structure and function of the cell, cell-cell communication, embryogenesis, tissue differentiation, organogenesis,

Key Research Activities

Research activities range from basic science to more clinical disciplines. Among the lines of research that have led to results of the greatest impact, the following should be mentioned:

the biology of stem cells
the pathogenesis of renal diseases
hepatocellular carcinoma
breast cancer
malignant melanoma
tumor metabolism
green models for the delivery of compounds to prevent tumors and inflammatory diseases
Crohn's disease
androgens and cardiovascular pathology
metabolic disease and male infertility
hormonal biomarkers in the pathogenesis of breast cancer in a longitudinal study

growth, development, evolution of development, organoids, stem cells, regeneration, therapeutic approaches

- **LS4 Physiology in Health, Disease and Ageing**

Organ and tissue physiology, comparative physiology, physiology of ageing, pathophysiology, interorgan and tissue communication, endocrinology, nutrition, metabolism, interaction with the microbiome, non-communicable diseases including cancer (and except disorders of the nervous system and immunity-related diseases) LS6 Immunity, Infection and Immunotherapy

- **LS7 Prevention, Diagnosis and Treatment of Human Diseases**

Medical technologies and tools for prevention, diagnosis and treatment of human diseases, therapeutic approaches and interventions, pharmacology, preventative medicine, epidemiology and public health, digital medicine

- **LS8 Environmental Biology, Ecology and Evolution**

For all organisms: Ecology, biodiversity, environmental change, evolutionary biology, behavioural ecology, microbial ecology, marine biology, ecophysiology, theoretical developments and modelling

Key Research Facilities, Infrastructure and Equipment

The Department has a transversal facility of Molecular Medicine and single cell transcriptomics including various advanced technological platforms (high-resolution microscopy, single cell RNAseq, metabolomics, multiparametric cytofluorimetry and cell sorting, digital histopathology) and specific technical-scientific skills (6 units of specialized technical personnel, all at the service of the Facility, including bioinformatics).

Previous Involvement in National and European Research Funding Programmes

Overall, projects funded on competitive calls for over €14M are currently active in the Department, including 6 European projects 1 ERC Advanced Grant, numerous MUR grants and prestigious international and national Associations, Foundations and Bodies (PRIN and AIRC). Research through contracts on behalf of third parties, particularly on the side of clinical trials are currently active for over €1.1 million. Added to these funding are €9.3M received as a Department of Excellence 2018-2022 and over €2.6M already assigned on PNRR tenders.

The constant activity of collaboration with third parties including companies has resulted in the filing of numerous patents, 8 of which are currently active. The department hosts 4 joint laboratories with industries and there are 2 spin-offs that have received international awards (UK Award from UK Trade & Investment and «Franci@Innovation» Award from French Embassy in Italy).

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Department of Health Sciences - DSS

The Department of Health Sciences builds and promotes a cooperative environment among researchers, aiming at reaching scientific achievements promoting knowledge on human health and disease therapy. These goals are achieved thanks to the active relationship among the members of the University and cooperation with students, patients and people, which are at the heart of the daily work of the Department. Research, teaching and health services are focalized on the recognition and valorization of scientific merit.

ERC Main relevant Panels:

- LS1_13 Early translational research and drug design
- LS2_14 Genetic diseases
- LS2_15 Integrative biology for personalised medicine
- LS3_1 Cell cycle, cell division and growth
- LS4_12 Cancer
- LS5_1 Neuronal cells
- LS5_2 Glial cells and neuronal-glia communication
- LS5_7 Sensory systems, sensation and perception, including pain
- LS5_9 Neural basis of cognition
- LS5_11 Neurological and neurodegenerative disorders
- LS5_12 Mental disorders
- LS6_4 Immune-related diseases
- LS6_10 Vaccine development
- LS7_2 Medical technologies and tools (including genetic tools and biomarkers) for prevention, diagnosis, monitoring and treatment of diseases

Key Research Activities

The Department of Health Sciences, since its foundation in 2013, is a well known research center focused on the health protection, which is defined in its broadest meaning, as "a full state of physical, psychical and social health, and not just as a disease free state". In doing so, the Department of Health Sciences builds its structural organization in a way to facilitate the interaction among the basic and clinical research, beyond the promotion interdisciplinary cooperation. Research activities' management is broadly founded on principles such as clearness, rightness and the contributions valorization, mainly of the young researchers. Thanks to this strategy and approach, the Department of Health Sciences was able to establish a wide range of cooperation with private and public partners, among which others prestigious universities both national and international such as those with the University of Siena, the Department of Public and Pediatric Health Sciences of the University of Turin, the Department of Health Sciences of the University of Genua, University of Verona and the University of Ferrara, the Chulalongkorn University (Thailand), Osaka University (Japan), University of Montana (U.S.A.) and University of Belgrade (Serbia). The Department of Health Sciences established since 2018-2020 cooperation agreements and joint ventures with the Careggi University-Hospital (Florence), Children University-Hospital Meyer (Florence), Sant'Andrea University-Hospital (Rome), ASL Toscana Centro (Tuscany), l'Azienda SOCIO SANITARIA TERRITORIALE DEGLI SPEDALI CIVILI DI BRESCIA (Brescia, Lombardy), ARS Toscana (Tuscany), ISPRO (Institute for the oncological study and prevention), Ministry of Health, ISS (Istituto Superiore di Sanità), INAIL and the civil protection, promoting altogether excellence programs. Among the private partners, there are ongoing joint ventures with companies such as AstraZeneca SpA, Pfizer, Chiesi farmaceutici, Sanofi, NOVARTIS FARMA SPA, Aboca SpA, ACRAF ANGELINI SpA, Baxter Healthcare Corporation and GlaxoSmithKline SpA.

- LS7_7 Pharmacology and toxicology
- LS7_9 Public health and epidemiology
- SH4_3 Clinical and health psychology
- SH4_4 Neuropsychology

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Moreover, we annoverate many other cooperation dealing in working progress with the Children-Hospital Foundation Anna Meyer onlus, Italian Technological Institute Foundation, Emilio Trabucchi Foundation, Brain Research Foundation Onlus, CNR/Tuscany Region for the clinical and public health research-Gabriele Monasterio Foundation, Consorzio Futuro in Ricerca (CFR), Italian Society of Pathological Anatomy and Diagnostic Cytopathology, Insitute of Pharmacological Reseach Mario Negri Foundation IRCCS, ORSA Study Center, Florence CR Bank, International Economic Study Center (C.E.I.S.) of the University of Rome Tor Vergata (Rome), Center of Neurology Psychiatry and Clinical Psychology SRL, Servier Research Institute Srl, Cooperative Society a.r.l., "Alas Psychological Sciences Center" and Florentine Institute of Care and Assistance – Casa di Cura Ulivella e Glicini – IFCA.

Key Research Facilities, Infrastructure and Equipment

- Development of innovative pharmacological approaches for the treatment of pain, autoimmune and brain ischemic disorders
- Epidemiology, biostatistic and public health
- Placental pathophysiology and microbiota
- Autologus and heterologus mammary surgical reconstruction. Surgery and microsurgery reconstruction techniques. Facial reinnervation techniques. Dermal matrix and adipose stem cell
- Morphological and molecular characterization of melanoma, mammary carcinoma, urological and hematopoietic malignancies
- Etiopathogenesis and psychopathology of mental disorders
- Medico-legal litigation; forensic pathology, toxicology, psychopathology and odontology; identification of livings and dead bodies.
- Skin tumor immunopathogenesis, Clinical immunodermatology, Molecular targets of inflammatory dermatosis.

- *Electroencephalography for anaesthesia and sedation depth monitoring in the operating room and critical care. Continuous Renal Replacement Therapies in Intensive Care Unit*
- *Musculoskeletal disorders and orthopedic techniques. Prosthesis and biomaterials.*

Previous Involvement in National and European Research Funding Programmes

Exploitation of the NAD rescue pathway as a toxification route of relevance to cancer therapy, with Scientific Responsible Prof. Alberto Chiarugi and a funding received by the A.I.R.C. under the Investigator Grant - IG 2017 of € 397,000.

Epigenetic modelling/remodelling of cancer metastases and tumor immune contexture to improve efficacy of immunotherapy, with Scientific Responsible Prof. Daniela Massi and a grant received from the A.I.R.C. under the Bando 5 per Mille 2018 of € 2,284,610

Exploitation of the NAD rescue pathway as a toxification route of relevance to cancer therapy, with Prof. Romina Nassini as Scientific Responsible and a funding received from the A.I.R.C. within the framework of the Investigator Grant - IG 2020 of € 640,000

Schwann Cell Options for chronic Pain Eradication (SCOPE) with scientific responsible Pierangelo Geppetti, under the European Research Council - Grant 2019-2024 and a funding of € 2,185,921.00.

Encompassing Training in fUnctional Disorders across Europe Horizon Europe project (SH4_5 - Social and clinical psychology), with Scientific Responsible Prof. Fiammetta Cosci and a funding of 261,499.68€.

BETTER UNDERSTANDING OF RISK FACTORS AND PROGRESSION OF MELANOMA IN CHILDREN, ADOLESCENTS AND YOUNG ADULTS TO IMPLEMENT HEALTH CARE STRATEGIES _ MELCAYA Horizon Europe project (LS7_1 - Medical imaging for prevention, diagnosis and monitoring of diseasescon) Scientific Coordinator Prof. Daniela Massi and a grant of 669.340,00 €.

Department of Biology - BIO

The Department of Biology includes laboratories and research groups which work on a wide range of biological disciplines, spanning from microbiology, genetics, physiology, botany in all its aspects, zoology with a particular contribution from ethology, ecology both marine and terrestrial environments, anthropology, cytology and histology, comparative anatomy and, as a common thread, the history of biology and natural sciences with evolutionary studies.

The Department is strongly oriented towards basic research, but considers applications with attention and increasing importance, responding to current needs for innovation and development.

Starting from the strong interest in basic scientific research and its applications, the teaching and technical staff of the Department is able to manage a good part of the teaching of the basic and applied biological and naturalistic disciplines of various educational paths: biology, science natural sciences, biotechnologies, at the level of bachelor's, master's and doctoral degree courses.

The rich and articulated history of the Department of Biology still emerges today in the structures in which its various components are located, which interact effectively with each other. On the one hand, the historic buildings in the center of Florence, in via La Pira, in via del Proconsolo and in via Romana, which are also home to the Museum of Natural History, represent the link with the more strictly naturalistic disciplines, while the offices at the Polo scientific center of Sesto Fiorentino welcome in particular the physiological and molecular disciplines.

ERC Main relevant Panels:

- *LS1 Molecules of Life: Biological Mechanisms, Structures and Functions*
For all organisms: Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling
 - *LS1_3 DNA and RNA biology*
 - *LS1_7 Molecular biophysics, biomechanics, bioenergetics*
 - *LS1_10 Synthetic biology*
 - *LS1_14 Innovative methods and modelling in molecular, structural and synthetic biology*

- *LS2 Integrative Biology: from Genes and Genomes to Systems*
For all organisms: Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicine
LS3 Cellular, Developmental and Regenerative Biology
 - *LS2_1 Genetics*
 - *LS2_2 Gene editing*

Key Research Activities

The Department is involved in projects involving ancient DNA and anthropological science, botany, zoology, ecology and nature conservation, plant and microbial genetics, microbiome studies and biophysics and physiological studies at the molecular level.

Key Research Facilities, Infrastructure and Equipment

The Department holds the largest facility for genomics present in Italy so far, including two short reads sequencers (Illumina NovaSeq6000, Illumina MiSeq), one long-read sequencer (Pacific Biosciences Sequel IIe) and a complete set of up-to-date instrumentation for library preparation. Electron and light microscopes with micromanipulator for chromosome dissection is present as well and facilities for in vitro plant cultures, laser-beam optical trapping and for ancient DNA manipulation.

Previous Involvement in National and European Research Funding Programmes

Ongoing research European projects include partnerships in Horizon Europe FishEUTrust, TetRRIS, BGE, Life URCA PROEMYS and coordination of the PRIMA

<ul style="list-style-type: none"> - <i>LS2_3 Epigenetics</i> - <i>LS2_4 Gene regulation</i> - <i>LS2_5 Genomics</i> - <i>LS2_6 Metagenomics</i> - <i>LS2_7 Transcriptomics</i> - <i>LS2_8 Proteomics</i> - <i>LS2_9 Metabolomics</i> - <i>LS2_11 Bioinformatics and computational biology</i> - <i>LS2_12 Biostatistics</i> - <i>LS2_13 Systems biology</i> - <i>LS2_14 Genetic diseases</i> - <i>LS2_15 Integrative biology for personalised medicine</i> - <i>LS2_16 Innovative methods and modelling in integrative biology</i> <p>- <i>LS3 Cellular, Developmental and Regenerative Biology</i> <i>For all organisms: Structure and function of the cell, cell-cell communication, embryogenesis, tissue differentiation, organogenesis, growth, development, evolution of development, organoids, stem cells, regeneration, therapeutic approaches</i></p> <ul style="list-style-type: none"> - <i>LS3_1 Cell cycle, cell division and growth</i> - <i>LS3_7 Mechanobiology of cells, tissues and organs</i> - <i>LS3_8 Embryogenesis, pattern formation, morphogenesis</i> - <i>LS3_9 Cell differentiation, formation of tissues and organs</i> - <i>LS3_10 Developmental genetics</i> - <i>LS3_14 Regeneration</i> - <i>LS3_15 Development of cell-based therapeutic approaches for tissue regeneration</i> - <i>LS3_16 Functional imaging of cells and tissues</i> <p>- <i>LS5 Neuroscience and Disorders of the Nervous System</i> <i>Nervous system development, homeostasis and ageing, nervous system function and dysfunction, systems neuroscience and modelling, biological basis of cognitive processes and of behaviour, neurological and mental disorders</i></p>	<p><i>project LEGU-MED and COST action EPI-CATCH, the Erasmus+ CONTAN and FEASR TRACKFISH. Among the national research projects the Department is coordinator and partners in several PRIN projects and other national grant programs from various Ministries and charity foundations.</i></p>
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Diagnosis and Treatment of Human Diseases

- *LS5_1 Neuronal cells*
- *LS5_2 Glial cells and neuronal-glial communication*
- *LS5_3 Neural development and related disorders*
- *LS5_5 Neural networks and plasticity*
- *LS5_7 Sensory systems, sensation and perception, including pain*
- *LS5_8 Neural basis of behaviour*
- *LS5_9 Neural basis of cognition*

- *LS8 Environmental Biology, Ecology and Evolution*

For all organisms: Ecology, biodiversity, environmental change, evolutionary biology, behavioural ecology, microbial ecology, marine biology, ecophysiology, theoretical developments and modelling

- *LS8_2 Biodiversity*
- *LS8_3 Conservation biology*
- *LS8_4 Population biology, population dynamics, population genetics*
- *LS8_5 Biological aspects of environmental change, including climate change*
- *LS8_6 Evolutionary ecology*
- *LS8_7 Evolutionary genetics*
- *LS8_8 Phylogenetics, systematics, comparative biology*
- *LS8_9 Macroevolution and paleobiology*
- *LS8_10 Ecology and evolution of species interactions*
- *LS8_11 Behavioural ecology and evolution*
- *LS8_12 Microbial ecology and evolution*
- *LS8_13 Marine biology and ecology*
- *LS8_14 Ecophysiology, from organisms to ecosystems*
- *LS8_15 Theoretical developments and modelling in environmental biology, ecology, and evolution*

- *LS9 Biotechnology and Biosystems Engineering Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards*
 - *LS9_2 Applied genetics, gene editing and transgenic organisms*
 - *LS9_4 Microbial biotechnology and bioengineering*
 - *LS9_6 Marine biotechnology and bioengineering*
 - *LS9_7 Environmental biotechnology and bioengineering*
 - *LS9_8 Applied plant sciences, plant breeding, agroecology and soil biology*
 - *LS9_12 Ecotoxicology, biohazards and biosafety*

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Department of Chemistry “Ugo Schiff” - DICUS

The Department of Chemistry “Ugo Schiff” (DICUS) was ranked #1 in Chemistry in the selection for the Italian Departments of Excellence 2018-2022 and it is again amongst the first classified for 2023-2027. DICUS has a total extension of about 20000 square meters, distributed between two adjacent buildings, at the Campus in Sesto Fiorentino (Firenze). In addition to DICUS, the Campus also hosts the Department of Physics and Astronomy, the Department of Biology, and sections of the Department of Neuroscience, Psychology, Pharmaceutical Area and Children Health (NEUROFARBA) and of the Department of Agricultural Science and Technology, Food, Environmental and Forestry (DAGRI), the European Lab of Non-Linear Spectroscopy (LENS), the University Service Center for the Enhancement of Research and Incubator Management (CsaVRI), the OpenLab dedicated to scientific dissemination for the public, and the Research Area of the National Research Council (CNR). This creates a very stimulating multi- and interdisciplinary scientific environment.

The Campus is located few kilometres far from Firenze and next to airport. Sport facilities, including a swimming pool, tennis and volleyball courts, are available, as well as canteens with special prices for the students. Students have free access to numerous cabled and equipped classrooms, computer workstations, full WiFi coverage, and the Animal Biology, Chemistry and Physics Library (part of the UNIFI Sciences Library). Transport services with connection to Firenze city center are also available. Presently, DICUS consists of 113 researchers and 51 technicians/administrative staff with an excellent gender balance.

DICUS is the reference Department for two 3-year bachelor degree (BS in Chemistry and BS in Diagnostics and Materials for Conservation and Restoration), one Single Cycle Master Degree in Chemistry and Pharmaceutical Technologies – with a total of 1050 regular enrolled students – and four Master Degrees: one in Chemical Sciences, one in Sciences and Materials for Conservation and Restoration, one in Molecular Biotechnologies, and one in Advanced Molecular Sciences fully in English – with a total of 170 regular enrolled students. In addition, DICUS holds two PhD Courses: PhD in Chemical Sciences and International Doctorate in Structural Biology hosting every year more than 70 PhD students.

In the period 2018-2022 DICUS participated in research projects funded for more than 26.5 M€ (international, national and regional projects). Many collaborations with industrial partners are also constantly ongoing.

In terms of scientific production, during the period 2018-22, more than 1500 articles have been published by DICUS researchers in international peer reviewed scientific journals. These articles are characterized by a strong interdisciplinarity and a high content of innovation. DICUS has also been able to put its skills at the service of research activities in the field of COVID-19, by participating in several projects funded on this topic and numerous publications.

Regarding the “Third Mission”, the impact of DICUS research activities on the productive value chain is demonstrated by the contribution to technology transfer, as well as the ability to patent the scientific results (7 patents in the 2018-22 period).

ERC Main relevant Panels:

- PE3 Condensed Matter Physics
Structure, electronic properties, fluids, nanosciences, biological physics
 - PE3_4 Electronic properties of materials, surfaces, interfaces, nanostructures
 - PE3_7 Spintronics
 - PE3_8 Magnetism and strongly correlated systems PE3_9

Key Research Activities

DICUS has well established excellences in the field of chemistry for the environment and life sciences, structural and biological chemistry, molecular magnetism, photovoltaics and molecular quantum computing, molecular spectroscopy, synthetic and formulation chemistry, smart drug delivery systems, and modeling of complex systems, peptide and glycan chemistry, structure and dynamics of high pressure

Condensed matter – beam interactions (photons, electrons, etc.)

- PE3_11 Mesoscopic quantum physics and solid-state quantum technologies
- PE3_13 Structure and dynamics of disordered systems, e.g. soft matter (gels, colloids, liquid crystals), granular matter, liquids, glasses, defects

- PE4 Physical and Analytical Chemical Sciences

Analytical chemistry, chemical theory, physical chemistry/chemical physics

- PE4_1 Physical chemistry PE4_2 Spectroscopic and spectrometric techniques, PE4_3 Molecular architecture and Structure
- PE4_4 Surface science and nanostructures
- PE4_5 Analytical chemistry, PE4_8 Electrochemistry, electrodialysis, microfluidics, sensors
- PE4_10 Heterogeneous catalysis
- PE4_13 Theoretical and computational chemistry, PE4_18 Environment chemistry

- PE5 Synthetic Chemistry and Materials

New materials and new synthetic approaches, structure-properties relations, solid state chemistry, molecular architecture, organic chemistry

- PE5_3 Surface modification, PE5_6 New materials: oxides, alloys, composite, organic-inorganic hybrid, nanoparticles
- PE5_8 Intelligent materials synthesis – self assembled materials
- PE5_9 Coordination chemistry, PE5_10 Colloid chemistry, PE5_11 Biological chemistry and chemical biology
- PE5_12 Chemistry of condensed matter
- PE5_13 Homogeneous catalysis

molecular systems, classical and *ab initio* molecular dynamics simulations, electrochemistry, sensors and biosensors, food chemistry, separation sciences and advanced materials for biomedical applications and for the preservation and restoration of the historical and artistic heritage.

In addition, the recent recruitment of internationally recognized experts and the acquisition of state-of-the-art equipment have allowed the development of new research lines based on the understanding of molecular, nanometric and micrometric phenomena, with an increased interest in issues related to green chemistry and sustainability, recycling and re-use of waste materials and biomass, clean energies, including hydrogen production and fuel cells, good health and well-being, climate action and environment including microplastics, bioremediation and pollution monitoring and control.

The DICUS personnel operates also in international large scale facilities (Synchrotrons, Neutron Sources, Muon sources) as well as in national and international institutions (EMBL, Artic and Antarctic Italian bases).

Key Research Facilities, Infrastructure and Equipment

The excellence of DICUS research in the field of chemical sciences is guaranteed by the availability of state-of-the-art equipment for structural, spectroscopic, analytical and functional studies, as well as the ability to design and produce new molecules and innovative materials.

Part of the DICUS staff is affiliated to CERM (European Centre for Magnetic Resonance; Italian headquarters of the INSTRUCT structural biology ERIC infrastructure), CRIST (University Service Centre for Structural Crystallography), LAMM (Laboratory for Molecular Magnetism), LENS (European Laboratory for Non Linear Spectroscopy), CETECS (Center for Scanning Probe Technologies) and CIRIB (Interdepartmental Research Center on Biomedical Imaging) that are reference centers for nuclear magnetic resonance, x-ray diffraction, magnetism, photonics and surface science, and molecular diagnostics, respectively.

Two inter-university consortia, CIRMMP, for Magnetic Resonances of Metal Proteins, and CSGI, Center for Colloid and Surface Science, are based in the DICUS; while INSTM (National Institute for Materials Science

<ul style="list-style-type: none"> - PE5_15 Polymer chemistry, PE5_16 Supramolecular chemistry - PE5_17 Organic chemistry, PE5_18 Medicinal chemistry - PE8 Products and Processes Engineering Product and process design, chemical, civil, environmental, mechanical, vehicle engineering, energy processes and relevant computational methods <ul style="list-style-type: none"> - PE8_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage - PE10 Earth System Science Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management <ul style="list-style-type: none"> - PE10_1 Atmospheric chemistry, atmospheric composition, air pollution, PE10_3 Climatology and climate change - PE10_6 Palaeoclimatology, palaeoecology - PE11 Materials Engineering Advanced materials development: performance enhancement, modelling, large-scale preparation, modification, tailoring, optimisation, novel and combined use of materials, etc. <ul style="list-style-type: none"> - PE11_1 Engineering of biomaterials, biomimetic, bioinspired and bio-enabled materials - PE11_9 Nanomaterials engineering, e.g. nanoparticles, nanoporous materials, 1D & 2D nanomaterials - PE11_10 Soft materials engineering, e.g. gels, foams, colloids 	<p>and Technology), has a reference center for the characterization of materials located at the Department.</p> <p>DICUS can also rely on a high pressure laboratory (LAP) with high safety standards for reactions in extreme conditions.</p> <p>DICUS participates with a leading role in the UNIFI Macronode of the ARTES 4.0 Competence Center (funded by the Ministry of Enterprises and Made in Italy) and is involved in three competence centers of UNIFI (CERM TT, RISE and VALORE), funded by the Tuscany Region, for business innovation. It also participates in National Technology Clusters (e.g. SPRING-Sustainable Processes and Resources for Innovation and National Growth) and in the Bio-Enable regional research infrastructure, which provides industries with innovative characterization and design services.</p> <p>Four interdepartmental research units are active at the DICUS: (1) PEPTLAB: Interdepartmental Laboratory of Chemistry and Biology of Peptides and Proteins; (2) MATCHLAB: Materials Characterization Laboratory; (3) PATOZYMES: Characterization of enzymes involved in pathological states; and (4) PROBIOCA: Processes and technologies for treatment of contaminated matrices with biocatalytic techniques.</p> <p>The following joint laboratories with external organizations and companies are currently active:</p> <ul style="list-style-type: none"> - JOYNLAB: Recombinant Proteins, in collaboration with Giotto Biotech S.r.l. - LABPUR: Water analysis and depuration processes, in collaboration with Gida Spa. - VALORE: Valorisation of algal masses and agro-industrial by-products and reduction of greenhouse gases in the atmosphere, in collaboration with DAGRI and Fotosintetica & Microbiologica SRL <p>Among the instrumentation present in the Department, the following cutting-edge instruments have been recently acquired:</p> <ul style="list-style-type: none"> - DICUS is equipped with a state-of-the-art cryo-electron microscope (cryo-EM) in its FloCEN Lab (Florence Center for Electron Nanoscopy) and recently promoted the establishment of a High-Performance Computing Center (HPC@UNIFI) in the Campus. - Xenocs Xeuss 3.0 HR: SAXS (Small Angle X-ray scattering), USAXS (Ultra SAXS), WAXS (Wide Angle X-ray scattering) and GISAXS (Grazing Incidence SAXS) - Spectrofluorimeter HORIBA FluoroMax Plus
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<ul style="list-style-type: none"> - <i>LS1 Molecules of Life: Biological Mechanisms, Structures and Functions</i> For all organisms: Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling <ul style="list-style-type: none"> - <i>LS1_1 Macromolecular complexes including interactions involving nucleic acids, proteins, lipids and carbohydrates</i> - <i>LS1_2 Biochemistry</i> - <i>LS1_7 Molecular biophysics, biomechanics, bioenergetics, LS1_8 Structural biology, LS1_13 Early translational research and drug design</i> - <i>LS2 Integrative Biology: from Genes and Genomes to Systems</i> For all organisms: Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicineLS3 Cellular, Developmental and Regenerative Biology <ul style="list-style-type: none"> - <i>LS2_8 Proteomics,</i> - <i>LS2_9 Metabolomics</i> - <i>LS4 Physiology in Health, Disease and Ageing</i> Organ and tissue physiology, comparative physiology, physiology of ageing, pathophysiology, interorgan and tissue communication, endocrinology, nutrition, metabolism, interaction with the microbiome, non-communicable diseases including cancer (and except disorders of the nervous system and immunity-related diseases) LS6 Immunity, Infection and Immunotherapy <ul style="list-style-type: none"> - <i>LS4_9 Metabolism and metabolic disorders</i> - <i>LS4_12 Cancer</i> 	<ul style="list-style-type: none"> - <i>Field emission Scanning Electron Microscope FEG-SEM Sigma Zeiss</i> - <i>Gasporosimeter 3FLEX Micromeritics</i> - <i>Raman confocal microscope InVia Qontor Renishaw</i> - <i>Confocal microscope Leica TCS SP8 with DMI8 microscope and FCS Picoquant module and microfluidics basic equipment</i> - <i>Zetasizer Malvern PRO Red Label</i> <p>Furthermore, DICUS is equipped with several NMR machines, GC/MS, direct inlet MS, ESI/MS, IR, HPLC, microwave reactors, ICP-AES, capillary electrophoresis, CHNS/O analysis, differential scanning calorimetry, light scattering and Z potential, atomic force microscopes, quartz crystal microbalance with dissipation monitoring for surface analysis and other standard instruments.</p> <p>A list of equipment acquired in the frame of Departments of Excellence 2018-2022 can be found at https://www.chim.unifi.it/p363.html</p> <p>In the frame of the Department of Excellence 2023-2027 project, three state-of-the-art technological platforms are being installed in DICUS premises:</p> <p>(1) <i>Green, Sustainable Chemistry and Scale Up Lab, which will include reactors for innovative sustainable synthesis techniques (photochemistry, electrochemistry, microwaves, mechanochemistry, microextrusion) and for scale-up (flow and pressure reactors). This new laboratory will contribute to the reduction of the environmental impact of synthetic processes (from materials to pharmaceuticals) with clear compliance with the DNSH principles;</i></p> <p>(2) <i>Materials, Processing, Characterization and Molecular Interactions Lab, which will include new instrumentation for the manufacture and manipulation of microfluidic devices, for the morphological and mechanical characterization of materials and surfaces and the study of the interaction between innovative (bio)materials and (bio)molecular targets at the solid-liquid and solid-gas interface;</i></p> <p>(3) <i>High-content Screening Lab, which will include a state-of-the-art automated system for high-content screening of drug candidates in cells and organoids.</i></p>
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- *LS5 Neuroscience and Disorders of the Nervous System*
Nervous system development, homeostasis and ageing, nervous system function and dysfunction, systems neuroscience and modelling, biological basis of cognitive processes and of behaviour, neurological and mental disorders
 - *LS5_11 Neurological and neurodegenerative disorders*

- *LS7 Prevention, Diagnosis and Treatment of Human Diseases*
Medical technologies and tools for prevention, diagnosis and treatment of human diseases, therapeutic approaches and interventions, pharmacology, preventative medicine, epidemiology and public health, digital medicine
 - *LS7_2 Medical technologies and tools (including genetic tools and biomarkers) for prevention, diagnosis, monitoring and treatment of diseases*
 - *LS7_3 Nanomedicine*
 - *LS7_10 Preventative and prognostic medicine*
 - *LS7_12 Health care, including care for the ageing population*

- *LS9 Biotechnology and Biosystems Engineering:*
Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards
 - *LS9_11 Biomass production and utilisation, biofuels,*
 - *LS9_12 Ecotoxicology, biohazards and biosafety*

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Previous Involvement in National and European Research Funding Programmes

The research activities carried out in DICUS have both a basic and an applied science orientation. For this reason, they have a strong impact on strategic sectors, as it can be inferred from the number and quality of funded research projects both at national (PRIN and other ministerial projects, AIRC, etc.) and international level (Horizon Europe, H2020, including ERC and FET).

Currently, DICUS is involved in several projects related to the “PNRR” (National Recovery and Resilience Plan) that is part of the Next Generation EU programme, including the Tuscany Health Ecosystem-THE; 3 “National Centers”: CN1 - HPC, Big Data and Quantum Computing, CN2 - Agricultural Technologies-Agritech, and CN3 - Gene Therapy and Drugs based on RNA Technology; 5 “Extended Partnerships”: PE3 on Environmental, natural and anthropic risks, PE4 on Quantum science and technology, PE5 on Humanistic culture and cultural heritage, PE8 on Ageing, PE11 on circular and sustainable Made in Italy, and PE12 on neurosciences and neuropharmacology. In addition, some DICUS members are participating to the project “Research Infrastructures” in the area ESFRI Health and Food-ITACA.

Among the EC-funded projects in the 2018-22 period, it is worth mentioning the Horizon Europe projects which include 3 ERC grants (1 Advanced, 1 Starting, 1 Synergy Grant) on molecular magnetism, molecular spintronics and quantum computing and 2 coordinated MSCA-Doctoral Networks (“GlycoNoVi” on the role of glycans in human Norovirus infection and “FC-RELAX” on NMR relaxometry for biomedicine). Regarding HORIZON 2020, DICUS participates in 2 FET (Future and Emerging Technologies), 2 projects on Research Infrastructures for digital and structural biology, 1 MSCA-International Training Networks (“GLYTUNES”), 1 BBI-JTI (Bio-based Industries Joint Technology Initiative) to develop innovative systems for olive leaf upcycling, and 2 MSCA-Research and Innovation Staff Exchange. Furthermore, DICUS is grant holder of the COST action INNOGLY on the role of glycans in health and disease. DICUS participates also in the LIFE project “MILCH” on the impact of endocrine disrupting chemicals in human milk.

Regarding National Funding Programmes, in 2018-22 period DICUS has participated in 11 PRIN (research projects of relevant national interest), of which 5 as

coordinator, funded by the Italian Ministry of University and Research (MIUR). The Department is also involved in more than 20 projects funded by different Ministries (Foreign Affairs, Health, Economic Development, Environment, Agricultural, Food and Forestry Policies, among others).

Furthermore, DICUS takes part in several Regional projects and leads more than 30 projects funded by private entities and foundations (Cassa di Risparmio di Firenze, Istituto San Paolo, Telethon, Cassa di Risparmio di Pistoia e Pescia, Banca d'Italia, etc.), among which 2 AIRC on cancer research with the role of coordinator.

Department of Physics and Astronomy

The research activity at the Department of Physics and Astronomy covers all the main areas of theoretical and experimental physics, among these: physics of matter, optics and photonics, quantum physics, nuclear physics, high-energy physics, biophysics, physics of fundamental interactions, physics of complex systems, astrophysics and space science. The Department is run by 90 Faculty members, working both in the headquarters in the University Campus of Sesto Fiorentino and in the former historical site in Arcetri (Firenze), and coordinates advanced high-education programs: 2 B.Sc Programs (Physics and Astronomy, Optics and Optometry), 1 M.Sc Program (Physical and Astrophysical Sciences), 2 PhD Programs (Physics and Astronomy, LENS International Doctorate in Atomic and Molecular Photonics). Strong collaboration and synergies with important research institutes in the Florence area (among these: LENS, CNR-INO, CNR-IFAC, CNR-ISC, INFN-Florence, and INAF-Osservatorio Astrofisico di Arcetri) make the Department a crucial hub for all physics-related research activities in the Florence area (about 600 practitioners qualified to access the facilities) and the center of an extremely vital, unique framework for research and advanced education.

ERC Main relevant Panels:

- PE2 Fundamental Constituents of Matter
Particle, nuclear, plasma, atomic, molecular, gas, and optical physics
PE3 Condensed Matter Physics
- PE6 Computer Science and Informatics
Informatics and information systems, computer science, scientific computing, intelligent systems
- PE7 Systems and Communication Engineering
Electrical, electronic, communication, optical and systems engineering
- PE9 Universe Sciences
Astro-physics/-chemistry/-biology;
solar system; planetary systems;
stellar, galactic and extragalactic astronomy; cosmology; space sciences; astronomical instrumentation and data

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Key Research Activities

The research activity, both theoretical and experimental, spans from fundamental physical research to multidisciplinary applications, i.e. in medicine, biology, neuroscience, information science, cultural heritage, earth science, atmosphere science. More in detail:

Theoretical Physics: theory of fundamental interactions, relativistic and nuclear matter, holographic methods, high-energy astrophysics, dark matter and dark energy, black holes and gravitational waves; statistical mechanics, complex systems, artificial intelligence and machine learning, modeling of multidisciplinary phenomena (biology, chemistry, neuroscience); quantum information theory, many-body quantum physics.

Physics of Matter: optics, photonics, spectroscopy, advanced microscopy, biophotonics, atomic physics, ultracold atoms, quantum technologies, quantum optics, quantum communications, optomechanics, smart materials, complex optical systems, nanostructures, semiconductors, molecular magnets, soft matter.

High-Energy Physics and Nuclear Physics: design and development of instrumentation and detectors for accelerators and space-based experiments, data analysis methods for particle physics, study of astroparticles and cosmic rays, detectors for gravitational waves, search for dark matter; study of nuclear structure with high-energy ions, development of nuclear-physics techniques for environment and cultural heritage.

Astrophysics: observational studies of astrophysical objects, quasars, black holes, early stars and galaxies, exoplanets, solar physics; design of instrumentation for

space missions, development of advanced optical and infrared equipment for ground telescopes; theoretical astrophysics, numerical methods for plasma physics, simulations of galaxy formation.

Key Research Facilities, Infrastructure and Equipment

Advanced electronic workshop for prototyping and custom solutions. Advanced mechanical workshop for design and realization of custom jobs. Advanced laser equipment. Instrumentation for characterization of light sources. Single-photon sources and detectors. Spectrometers. Laser-cooling facilities. Ultra-high vacuum technology. Clean Rooms. Microscopy setups. Clean room with wire bonding facility and probe station for solid state detector R&D. Climatic chambers for prototype validation. 3D printing facilities. LABEC: proton and nuclei source and accelerator (Tandem 6MeV) for cultural heritage applications, pollution monitoring, and detector testing and characterisation. Astronomical telescope with imaging and spectroscopic instrumentation at the Osservatorio Polifunzionale del Chianti.

Previous Involvement in National and European Research Funding Programmes

The research budget of the Department for the period 2017-2022 was about 17 million euros. Most important funding agencies and bodies: EU, ERC, MUR, MISE, MDS, ISS, ENEA, CNR, European Space Agency, Tuscany Region, Tuscan Cancer Institute, AOU Careggi, Fondazione Cassa di Risparmio di Firenze (CRF), AIRC and technology industries (among these: Nuovo Pignone, Leonardo, El.En., Sony). European funding includes numerous ERC projects: 4 Advanced, 2 Consolidator, 4 Starting, 1 Proof of Concept (in ERC areas PE2 and PE9 the Department hosts the largest number of ERC winners among all Italian universities). Other European projects: 9 FP7, 1 LIFE, 3 H2020, 4 Marie Skłodowska-Curie Fellowships, 2 ERDF, 2 Horizon Europe, 1 EU RFCS. National projects: 25 PRIN, 8 FIRB, 2 FARE, 4 ASI, 31 CRF Foundation, 2 BRIC INAIL, 1 Bank of Italy, 1 Region of Tuscany, 1 Human Frontier Science Program, 4 Rita Levi Montalcini contracts, 1 "Rientro dei cervelli" contract. Research initiatives of the Mission 4.2 of the PNRR (NextGeneration EU / Recovery Plan), 2 National Centers for Research and Innovation, 4 Extended Partnerships, 1 Regional ecosystem for Innovation, 5 Research Infrastructures.

Department of Mathematics and Computer Science "Ulisse Dini" - DIMAI

The department is formed by a staff of around 90 persons (professors and assistant professor). A number of post-doc students varying from 10 and 20, is present, as well as a group of about 40 PhD students. The research activity of the department covers the main areas of mathematics and computer science: Algebra, Analysis, Computer Science, Geometry, Mathematical Physics; Numerical Analysis. The department hosts some important research institutions like CIME, International Mathematics Summer School, and the journal *Annali di Matematica Pura e Applicata*.

ERC Main relevant Panels:

- PE1 Mathematics
All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics
 - PE1_1 Logic and foundations
 - PE1_2 Algebra
 - PE1_3 Number theory
 - PE1_4 Algebraic and complex geometry
 - PE1_7 Topology
 - PE1_8 Analysis
 - PE1_10 ODE and dynamical systems
 - PE1_11 Theoretical aspects of partial differential equations
 - PE1_12 Mathematical physics
 - PE1_13 Probability
 - PE1_16 Discrete mathematics and combinatorics
 - PE1_17 Mathematical aspects of computer science
 - PE1_18 Numerical analysis
 - PE1_19 Scientific computing and data processing
 - PE1_20 Control theory, optimisation and operational research
 - PE1_21 Application of mathematics in sciences
 - PE1_22 Application of mathematics in industry and society.

Key Research Activities

The research of the department is spread over all main topics of mathematics and computer science: Algebra; Complementary mathematics; Computer Science; Geometry; Mathematical Analysis; Mathematical Logic; Mathematical Physics; Numerical Analysis; Probability and statistics.

Key Research Facilities, Infrastructure and Equipment

The department is equipped with a library with a very rich catalogue of textbooks, monographs, journals and online resources; seminar rooms for talks and discussion; computer science laboratories.

Previous Involvement in National and European Research Funding Programmes

The members of the department have been and are currently involved in many research and funding projects, at national and international level. Here we mention only few of them.

HORIZON 2020: in the last years there have been at least two local coordinators in the department.

PRIN projects. In the last years there have been between five and ten principal or associated (local) investigators, in the department.

GNAMPA projects. These are programs funded by the Istituto Nazionale di Alta Matematica (INdAM), on specific research topics. In the last five years there have been between five and ten coordinators in the department.

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Special programmes funded by the University of Florence. In the last years there have been at least three of such programs involving members of the department.

We also mention:

Two European (non EC) programmes involving members of the department as local coordinator.

Three applicative programmes, in part co-funded by private companies, involving members of the department as principal or local coordinator,

One long term national program funded by the Ministero della Cultura.

Department of Earth Sciences - DST

The Department of Earth Sciences (DST) has been declared an Excellent place to do research for two consecutive five-years (2018-2022 and 2023-2027) as the result of a national competitive call. Research covers a wide spectrum of disciplines each one characterised by innovation, technology, sustainability and modeling by using high performance calculus. The aim is to understand the processes that governs the evolution and the dynamics of the Earth system at different spatial and temporal scales, the impact and mitigation of natural hazards, resource sustainability, biogeochemical cycles, past and present biodiversity evolution, climate changes, properties of terrestrial and extraterrestrial materials. Multidisciplinary is the challenge to deal with the major changes of our Planet in an holistic view. The research activity of the DST is organized in three sections. <https://www.dst.unifi.it/index.html?newlang=eng>

ERC Main relevant Panels:

- **PE1 Mathematics**
All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics
 - PE1_15 Generic statistical methodology and modelling
 - PE1_21 Application of mathematics in sciences
- **PE4 Physical and Analytical Chemical Sciences**
Analytical chemistry, chemical theory, physical chemistry/chemical physics
 - PE4_18 Environment chemistry
- **PE10 Earth System Science**
Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management
 - PE10_3 Climatology and climate change
 - PE10_4 Terrestrial ecology, land cover change
 - PE10_5 Geology, tectonics, volcanology
 - PE10_6 Palaeoclimatology, palaeoecology
 - PE10_7 Physics of Earth's interior, seismology, Geodynamics

Key Research Activities

Section 1

Characterisation of the crystallographic structure of specific natural and/or synthetic mineral phases for industrial applications also for their potential use as and their re-use as secondary raw materials.

Characterisation of stone material used in historic/prehistoric building and/or artifacts to evaluate their provenance and the response to chemical/mechanical alteration specifically related to pollution.

Chemical and isotopic characterisation of natural water, water/rock interaction, thermodynamic of hydrological cycle, climate changes, pollution.

Chemical and isotopic investigation of air and air particulate (e.g. PM10, organic components and so on) in urban areas to investigate and discriminate the sources of pollution

Definition and discrimination of natural vs anthropic sources of potentially toxic elements (PTE, e.g., heavy metals, thallium, mercury, and so on), their presence and mobility in both urban and extra-urban environment.

Determination of the morphological, mineral chemical and crystallographic, petrographic, geochemical and isotopic characteristics of natural matrices (rocks, fluids and gasses) of active and quiescent volcanoes worldwide.

<ul style="list-style-type: none"> - PE10_8 Oceanography (physical, chemical, biological, geological) - PE10_9 Biogeochemistry, biogeochemical cycles, environmental chemistry - PE10_11 Geochemistry, cosmochemistry, crystal chemistry, isotope geochemistry, thermodynamics - PE10_12 Sedimentology, soil science, palaeontology, earth evolution - PE10_14 Earth observations from space/remote sensing - PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution - PE10_19 Planetary geology and geophysics - PE10_20 Geohazards: earthquakes, landslides, tsunamis and other ground instabilities - PE10_21 Earth system modelling and interactions - LS8 Environmental Biology, Ecology and Evolution For all organisms: Ecology, biodiversity, environmental change, evolutionary biology, behavioural ecology, microbial ecology, marine biology, ecophysiology, theoretical developments and modelling - LS8_2 Biodiversity - LS8_9 Macroevolution and paleobiology - SH5 Cultures and Cultural Production Literary studies, cultural studies, study of the arts, philosophy - SH_5_8 Cultural studies, cultural identities and memories, cultural heritage - SH6 The Study of the Human Past Archaeology and history - SH6_4 Prehistory, palaeoanthropology, palaeodemography, protohistory, bioarchaeology 	<p><i>Dynamics of complex systems, methods to quantify reliance, identify regime shifts and tipping points by HPC, neural network, IA, machine learning.</i></p> <p><i>Eruptive scenarios to define and mitigate the volcanic hazard, and to investigate the natural cycle and budget of specific elements and/or compounds (e.g., REE, CO₂) to understand the anthropic impact on climate.</i></p> <p><i>Geological geochemical and isotopic fingerprint of food products (e.g. wine, olive oil) for tracing and potentially certifying their geographic provenance.</i></p> <p><i>Mineralogical, crystallographic, mineral chemical, petrographic, geochemical and isotopic characterisation of extra-terrestrial objects (e.g. meteorites) to define they conditions of formations and to constraint the evolution of the Solar system and its planetary bodies.</i></p> <p><i>Mineralogical and cosmochemical studies to characterize a new state of matter: quasicrystalline materials recovered in exotic extraterrestrial objects.</i></p> <p><i>Multi-disciplinary investigation of volcanic systems, including the processes responsible for magma genesis and evolution, to the eruptive dynamics and the geochemical monitoring (gas and water).</i></p> <p>Section 2</p> <p><i>Geoarchaeological analysis applied to define the interaction between humans and the environment throughout the Holocene; Environmental sedimentology for tracing geogenic vs anthropogenic dispersal of toxic elements in the sedimentary matrix.</i></p> <p><i>Geophysical volcanology, infrasound acoustics, seismic hazard and vulnerability, seismic and infrasound propagation modeling. Early-Warning system in volcano environment.</i></p> <p><i>Integration of geology, seismology, ground deformation, and numerical modelling to constrain geodynamic processes and fluid flow relevant for earthquake geohazards and geothermal resources.</i></p> <p><i>Paleoenvironmental, paleoclimatic and stratigraphic reconstructions using palynological analysis especially in terrestrial and marine deposits of the Neogene and Quaternary of the Mediterranean area. Global warming and biodiversity in Holocene wetlands with associated dissemination activities and citizen science projects.</i></p>
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- SH7 Human Mobility, Environment, and Space
Human geography, demography, health, sustainability science, territorial planning, spatial analysis
 - SH_7_9 Energy, transportation and mobility
 - SH_7_10 GIS, spatial analysis; big data in geographical studies

Contact Details:

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Paleontology and Paleobiology; Virtual Paleontology; Paleontological Heritage; Conservation Paleobiology; Paleoenvironmental reconstructions; Paleoecological reconstructions; Evolutionary history reconstructions; Taxonomy and Systematics; Vertebrate ichnology.

Regional Geology of the Mediterranean area. Geothermics and geothermal applications. Geology of the cultural heritages. Geology of the crystalline basements. Sedimentology of turbiditic successions.

Sedimentology and Stratigraphy of continental and shallow marine successions in different geodynamic settings; depositional processes in terrestrial silicoclastic and carbonate deposits; Reservoir Analogues in carbonates: characterization and modeling.

Structural analysis of deformations and reconstruction of geological evolution in different geodynamic settings (mainly rifting, subduction zones and mountain building), through field studies, seismic lines interpretation, analogue modeling, rock mechanics, remote sensing, and seismo-tectonics.

Section 3

Earth Observation data, and regional forecasting models to detect, map, monitor and forecast ground deformations as well as the development of regional and national quantitative landslide risk assessment procedures.

Natural and artificial stone materials characterization and study of physical, chemical and mechanical stone degradation phenomena. Investigation and monitoring process typically involves using non-destructive testing techniques such as ultrasound, infrared thermography, and laser scanning to detect any structural defects or changes that may occur over time.

Research and development on advanced technologies and new methodologies for the prevention and management of landslide risk to support policies and actions of risk reduction, focusing on landslide monitoring and early warning using innovative technologies.

Key Research Facilities, Infrastructure and Equipment

Laboratories (alphabetic order)

- Analogue structural modeling
- Analysis of Trace and Ultratrace Elements (LAETU)
- Archaeometry and environmental mineralogy
- Crystallography
- Experimental Mineralogy and Petrology
- Fluid Geochemistry
- Fluids And Rocks Geochemistry
- Geochemistry of Radiogenic Isotopes
- GIS and thematic mapping laboratory
- In-house and on-field Geophysical labs and network
- Micro Analysis (LaMA)
- Optical cold cathodoluminescence
- Palynology
- Petrography Applied to Cultural Heritage
- Petrophysic
- Remote Sensing laboratory specialized on SAR interferometry, optical multi- and hyperspectral remote sensing
- Rock and Soil mechanics laboratory
- Sedimentary Petrography
- Soil solution analysis
- Stable Isotopes Geochemistry
- Stone Materials, Engineering Geology, Environmental and Landscape
- Volcanology
- X-Ray Laboratory
- 3D-Digital and photogrammetry

Equipment (alphabetic order)

- Access to real-time meteorological services
- Advanced geotechnical and hydrogeological modelling software
- Advanced photogrammetric modelling software
- Atomic Absorption: Perkin Elmer AAnalyst 100, LUMEX mercury analyzer for liquide samples RA-915M/RP-92
- Atomic fluorescence: PSA Merlin, PSA Excalibur
- Cavity Ring-Down Spectroscopy CRDS analyzer for CO₂, CH₄ and related $\delta^{13}C$, PICARRO G2201-I
- Cavity Ring-Down Spectroscopy CRDS analyzer for H₂O isotopes H₂O, PICARRO L2130-I
- Chromatography: Metrohm 761 Compact IC, Metrohm 861 Advanced Compact IC
- Compact submarine remotely controlled (NEMO-ROV)
- Copahue infrasonic network: 1 infrasonic array, 1 seismic station
- Digitizers guralp EAM-DM24 4 bit 4-7 channels

- Direct mercury analyzer, Milestone DMA-80 evo
- Electrical resistivity, electromagnetic and seismic surveying instrumentation
- Electron Microprobe (EMPA), JEOL-JXA 8230, for in situ determination
- Etna multiparameter network: 2 infrasonic arrays, 1 seismic station, 2 visible camera, 1 thermal camera
- Fieldspec spectroradiometer
- Gas-Chromatography: Shimadzu GC-15°, Shimadzu GC-14° (2), Thermo Focus GC
- Gas-Mass: Thermo Trace GC Ultra – DSQ, DANI Master TD, Teledyne Tekmar Stratum Purge & Trap
- GBInSAR portable monitoring systems
- GPS and topographical survey instrumentation
- Ground Penetrating Radar (GPR)
- Guralp CMG-T40 seismometers
- Huber goniometer heads with adjustable X, Y, Z axes for single-crystal X-ray diffraction
- Inductively Coupled Plasma Mass Spectrometer (ICPMS), Agilent 7800
- Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) Perkin Elmer ICP-OES Optima 8000 Spectrometer + HG.
- Infrared thermal camera
- Infrasonic network Iceland: 5 infrasonic arrays
- Lennartz LE-3D/5s seismometers
- Lennartz LE-3Dlite seismometers
- Lunitek Atlas 24 bit 3-6 channel digitizers
- Microwave mineralizer Milestone CEM Mars-5
- Particle static analyser Malvern Morphologi 3Gs
- Portable instrument for airborne Hg analysis, Lumex 915M
- Portable analyzer: GA 2000 multigas, EDA Radon analyzer RD 200, LUMEX Hg analyzer (AAS) in air, Portable FID for CH4 CROWCON Gas Tec, Accumulation chamber WEST SYSTEM for CO2 fluxes
- Pulsed Fluorescence: Thermo Electron mod. 4501 H2S and SO2 analyzer in air
- Rock and soil mechanics field and laboratory equipment
- Robotized total stations
- Samplers TECORA Echo PM (2)
- Samples preparation and separation line for the isotopic analysis of $\delta^{18}O$ and δ^2H (water), $\delta^{13}C$ and $\delta^{18}O$ of CO2 (Gas, Carbonates)
- Soil solution analysis laboratory equipment
- Spectrometers, Thermofisher Triton-Ti and Triton-Plus
- Spectrophotometers: (HACH DR/2010, HACH DR/2000 Philips Pye Unicam SP6-350)
- Stone Materials laboratory equipment
- Stromboli multiparameter network: 2 andometric buoys, 2 FLIR cameras, 2 visible cameras, 5 seismic-

acoustic stations, 3 borehole tilt, 1 surface tilt, 1 infrasonic array

- TECORA AYRON 5 samplers of atmospheric gases with tri-phasic traps for Volatile Organic Compounds (VOCs) analysis
- Titration (Metrohm 794 Basic Titrino; Metrohm 645 Dosimat)
- Tuscany seismic network: 9 broadband seismic stations
- Two Multicollector Thermal Ionisation Mass.
- UAV (Uncrewed Aerial Vehicle), SATURN and SATURN mini
- UAV Near Infrared camera
- UAV High resolution digital camera
- UAV laser scanner
- UAV Infrared Thermal sensor
- UAV Ground Penetrating Radar (GPR)
- Ultra Clean Lab for the dissolution of samples and chemical separations for isotopic measurements, equipped with a microsampling systems, ESI Micromill 2.
- Wireless sensor networks
- X-ray diffractometers for powders Philips Model PW 1050/37, with a Panalytical X'Pert PRO data acquiring system, operating with a Cu anode, a graphite monochromator (limit of detection 4%).
- 3D laser scanners
- 3D printers

Previous Involvement in National and European Research Funding Programmes

- L.S.B. Leakey Foundation for Anthropological Research, San Francisco (U.S.A.) – Project “Geo-Paleontological investigation investigations at the Buia hominid site, Eritrea”, 2000-2005.
- CEE, European Commission 5th FP – “ERUPT – “Processes and Timescales of Magma Evolution in Volcanic Systems” (grant # EVG1-CT-2002-00058), 2002-2005.
- National Geographic Society, Committee for Research and Exploration, Washington D.C, (U.S.A.) – Project “Pleistocene Homo erectus (and other mammals) dispersal pathways along the western coasts of the Red sea (Eritrea and Sudan)”, 2005-2006.
- The Wenner-Gren Foundation for Anthropological Research, New York (U.S.A.) - Project “Early Pleistocene archeological sites of western Sudan”, 2006-2007.
- Marie Skłodowska-Curie Actions - Innovative Training Networks (ITN): “PUSHH”

Palaeoproteomics to Unleash Studies on Human History (Proposal 861389), 2010-2011.

- *National Geographic Society, Committee for Research and Exploration, Washington D.C, (U.S.A.) – Project “Fossil mammals of Late Miocene Libyco-Chadian Province in southern Italy”, 2010-2011.*
- *ARISE (2012-2014 FP7) and ARISE2 (2015-2018), H2020, Atmospheric dynamics Research InfraStructure in Europe: Design studies for a research infrastructure for the dynamics of the upper atmosphere, 2012-2018.*
- *FUTUREVOLC (2012-2016 FP7): European supersite for development of new monitoring solutions of active volcanoes, 2012-2016.*
- *Air quality: specific geochemical markers of geothermal power plant input into atmosphere - Patos II - Tuscany Region, 2013.*
- *NERC Large Grant (UK), "Rift volcanism: past, present, future - RiftVolc", 2014-2017.*
- *LIFE13 ENV/IT/000813 SMART4Action 01/09/2014 – 31/03/2018. “Sustainable Monitoring And Reporting To Inform Forest- and Environmental Awareness and Protection”, 2014-2018.*
- *PNR Prot. 20203YX58R, Cultural Heritage: “The Times of Castles. Multidisciplinary researches for a new chronology of the building sites of incastellamento (XI-XI centuries), 2015-2020.*
- *M.I.U.R.-P.R.I.N., “TEOREM deciphering geological processes using Terrestrial and Extraterrestrial ORE Minerals”, prot. 2017AK8C32, 2017.*
- *M.I.U.R.-P.R.I.N. “Micro to Macro - How to unravel the nature of the Large Magmatic Events” prot. N. 20178LPCPW, 2017.*
- *EUROVOLC (H2020): European supersite for development of new monitoring solutions of active volcanoes, 2018-2022.*
- *ASI-INAF, “Olivine-bearing ungrouped achondrites and their parent bodies in the Solar System”, 2019.*
- *Research Project of National Relevance - National Institute of Astrophysics PACMAN - "3200 Phaethon Asteroid Composition by Multiple Analysis", 2019.*
- *Competitive project for temporary researchers of UNIFI “SENECA- Streams in the urban landscape: evaluating the chemical/ecological status for sustainable city Planning”, 2019.*
- *Fondazione Cassa di Risparmio di Firenze "Monitoring mercury concentrations and speciation in the botanical collections of the Museum of Natural History and the Center for Tropical Herbarium Studies at the University of Florence: impact on the usability of the collections and on the health of frequent visitors" (Contribute numbers 2018.1152 and 2019.07022), 2019.*

- CR Firenze Foundation Grant n. 2019.0360 - M.E.M. - MiDAE - Micro Diffraction and Elemental Analysis, 2019.
- Copernicus European Ground Motion (EU-GMS; <https://land.copernicus.eu/pan-european/european-ground-motion-service>), funded by the European Environment Agency (EEA), 2019-2021.
- POLlen et ARIdité, résilience de la végétation aux Sécheresses récurrentes - POLARISE" 2020.
- International Research Network (IRN). RTM. 2020-2023 - URBO–Urbi et Orb(etello). IMU 2020 (Géoarchéologie – Bathymétrie – Palynologie), 2020.
- ASI-INAF "Development of a pressure/temperature controlled chamber for the study of spectral properties of planetary analogues and meteorites, in support to the interpretation of data from current/future space missions to minor bodies and icy moons", 2020.
- Simons Foundation contribution (New York, USA) and private benefactors on "Natural quasicrystals", 2020.
- CR Firenze Foundation Grant n. 2020.1587 "A window on the Solar System: project on the spectroscopic characterization of bolides", 2020.
- Framework agreement Italian Space Agency-National Institute of Astrophysics (ASI-INAF) implementation agreement n. 2020-12-HH.0 "Scientific activities of the Hayabusa2 space mission", 2020.
- Tuscany Region (POR FSE 2014-2020, Call for YOUNG RESEARCHERS FOR CULTURE.) "Air quality: environmental monitoring and technological solutions for the usability and preservation of museum collections" (AirMusuem), 2020.
- ROMERO (Robots for Extreme Environments, ESMERA (Boosting Robotics Innovation) European Consortium-funded project, 2020-2021.
- EUSATfinder, a European SME Robotics Application-funded project, 2020-2023.
- PassPORT-Operational Platform managing a fleet of semi-autonomous drones exploiting GNSS high Accuracy and Authentication to improve Security & Safety in port areas, H2020, 2020-2023.
- UNIFI Infrastructures project, acquisition of a Microdrill equipment, 2021.
- Research Project of National Relevance - National Institute of Astrophysics PRA21INAF_MELODY - Moon multisensor and Laboratory Data Analysis, 2021.
- Bank of Italy Grant n. 421079/21, Characterization of meteoroids through the spectroscopic

observations and historical-scientific study of the Italian meteorites, 2021.

- *Sub-Project No. 2: "Susceptibility estimation for Landslides in the Hellenic Territory – Volcanic Hazard and Risk Assessment - GEOKA" - HSGME, Greece - Petrologic, geochemical and isotopic studies of selected volcanoes from the South Aegean Active Volcanic Arc, Greece", 2021.*
- *ATLANT, POR-FESR14-20): Development of high-technology laser instrument for remote monitoring building, 2021-2022.*
- *PATHFINDER (PNT as A TechNology to support drones' BVLOS scenarios for preventive monitoring and Flrst respoNDER missions) – European Space Agency (ESA), 2021-2022.*
- *Strengthening Financial Resilience and Accelerating Risk Reduction in Central Asia (SFRARR) – World Bank, 2021-2022.*
- *GEOENVI Project - European Union's Horizon 2020 research ("Tackling the environmental concerns for deploying geothermal energy in Europe"). Grant agreement No 818242, 2021-2022.*
- *LITRASV (Life in travertine and sinter veins: a possible key to recognize extra-terrestrial life in tectonically-driven depositional system) – European Union Horizon 2020 (agreement No. 871149), 2021-2022.*
- *LINKS (Strengthening Links between Technologies and Society for European Disaster Resilience, Horizon 2020 project, 2021-2022.*
- *PRIN INAF – "Project 3200 Phaethon Asteroid Composition by Multiple Analysis- PACMAN, 2021-2024.*
- *LIFE20 GIE/IT/000091 MODERn (NEC) 01/10/2021 – 30/09/2025 "new MOnitoring system to Detect the Effects of Reduced pollutants emissions resulting from NEC Directive adoption", 2021-2025.*
- *EVAMED - New evaporite records from the Eastern and Western Mediterranean: contributions to the evolution of the last saline giant and opportunities for the energy transition). RTM. Spanish government, 2021-2025.*
- *G-Class Hydroterra (an Earth Explorer mission for Water Cycle Science) - European Space Agency (ESA), 2019-2020.*
- *UNIFI Infrastructures project acquisition of a microtomography with high resolution, 2022.*
- *Framework agreement Italian Space Agency-University of Bologna (ASI-UniBO): implementation agreement n. 2022-8-HH.0 "Scientific activities for the HERA space mission", 2022.*
- *MUR-PNRR – National Biodiversity Future Centre – NBFC. Abiotic and biotic complex interaction*

dynamics and environmental stressors in riverine ecosystems: innovative multilevel data-driven modeling approaches, 2022.

- *MUR PNRR – National Centre for HPC, Big Data and Quantum Computing. Dynamics of complex Mediterranean river catchments, 2022.*
- *COLLECTION – Isolation and initial identification of microorganisms in extreme environments volcanoes, HSGME (Hellenic Survey of Geology and Mineral Exploration), 2022.*
- *IRGIE, Inventory of Geothermal Resources Aeolian Islands founded by Regione Sicilia and INGV, 2022.*
- *MUR PRIN HYDROX - HYDRous- vs OXo-components in minerals: adding new pieces to the Earth's H2O cycle puzzle (coordinator of RU), 2022.*
- *MUR-PNRR Cultural Heritage Active Innovation for Sustainable Society (CHANGES), Spoke 5, WP4, Development of advanced diagnostics and scientific methods for the analysis and valorization of organic materials in cultural heritage, 2022.*
- *EGMS RASTOOL (European ground motion risk assessment tool), an ECHO EU-funded project, 2022-2024.*
- *ARPAT-DST project. Mercury survey monitoring in the Mt. Amiata district for the portion related to the regional territory in the river courses of the Paglia River, 2022-2024.*
- *PNRR, CN5, National Biodiversity Future Centre, NBFC, spoke 7, 2022-2025.*
- *PNRR Infrastructure ITINERIS, PE3, RETURN, 2022-2025.*
- *PRIUS Premier Research Institute for Ultrahigh-pressure Sciences , project #2023-B43, on “Structural study of phase H, (MgSiH2O4), a potential high-pressure carrier for water to the deep lower mantle”, 2023.*
- *Galileo Program (French-Italy), CRUI. 2023-2024 – Which future for the Mediterranean biodiversity? Images from the past for a sustainable future (BIOMED), 2023-2024.*
- *EMOTION, Geochemical characterization of fluid manifestations in central-northern Italy for geothermal assessment and development of the geothermal fluid national web portal, Founded by Pianeta Dinamico 2023-2025.*
- *ERC Advanced Grant. Why late earliest occupation of Western Europe? LATEUROPE, 2023-2027.*
- *CARG 263 sheet, 2023-2027.*

Department of Statistics, Computer Science, Applications - DISIA

The Department of Statistics, Computer Science, Applications "Giuseppe Parenti" (DiSIA) of the University of Florence organises research, teaching and training activities, and transmission of knowledge and innovation, ensuring and improving the characteristics of universality and transversality specific to the professions and subjects it covers. DiSIA aims to be a point of reference and aggregation in the University for all subjects that revolve around the development of quantitative methods and the acquisition, processing and elaboration of data, however heterogeneous it may be, with the aim of extracting all the information contained in the data and transforming it into knowledge available to society.

The professors and researchers belong to a range of scientific-disciplinary sectors which, although belonging to different CUN areas (01 - Mathematical and Computer Sciences, 06 - Medical Sciences and 13 - Economics and Statistics), share a cultural-scientific approach in which attention to data and the information contained in it is combined with a strong interest in applied and experimental areas, in line with specific scientific sensitivities and skills.

The sectors in question are: INF/01 (Computer Science), MED/01 (Medical Statistics), SECS-P/05 (Econometrics), SECS-P/13 (Commodity Sciences), SECS-S/01 (Statistics), SECS-S/03 (Economic Statistics), SECS-S/04 (Demography), SECS-S/05 (Social Statistics).

The DiSIA offers its expertise in support of teaching and training activities in several Schools of the University, with the aim of training professional figures suited to the growing demand for skills in the field of information processing and analysis, also stimulating the necessary sensitivity to the problems of the various fields of application.

There are significant national and international research networks, which have always represented a particular dimension of the activities carried out.

DiSIA has been appointed the second time in a row as Department of Excellence of Italian universities by the Italian Ministry of Research and University (MUR). The award consists of a five-year (2023-2027) special funding to strengthen and enhance excellence in research and teaching. The first project covered the five years 2018-2022. It is an important recognition that confirms the excellence of the research produced by researchers of the DiSIA. The funding will enable the strategic development project to strengthen DiSIA's role as a national and international reference center for the disciplines involved in generating knowledge through the intensive use of data to support decision-making processes.

ERC Main relevant Panels:

- PE1 Mathematics
All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics
 - PE1_13 Probability
 - PE1_14 Mathematical statistics
 - PE1_15 Generic statistical methodology and modelling
 - PE1_17 Mathematical aspects of computer science
 - PE1_19 Scientific computing and data processing

Key Research Activities

DiSIA members are engaged in the following research topic areas:

- Statistical information systems for the analysis of complex contexts
- Causal inference
- Biostatistics
- Economics and Finance
- Population and Society
- Design of experiments, statistical quality control
- Computer Science: algorithms, languages, formal methods and security
- Quantitative analysis of tourism-related phenomena
- Sample surveys and inferential methods for finite populations

- *PE4 Physical and Analytical Chemical Sciences*
Analytical chemistry, chemical theory, physical chemistry/chemical physics
 - *PE4_2 Spectroscopic and spectrometric techniques*
 - *PE4_5 Analytical chemistry*

- *PE6 Computer Science and Informatics*
Informatics and information systems, computer science, scientific computing, intelligent systems
 - *PE6_2 Distributed systems, parallel computing, sensor networks, cyber-physical systems*
 - *PE6_3 Software engineering, programming languages and systems*
 - *PE6_4 Theoretical computer science, formal methods, automata*
 - *PE6_5 Security, privacy, cryptology, quantum cryptography*
 - *PE6_6 Algorithms and complexity, distributed, parallel and network algorithms, algorithmic game theory*
 - *PE6_7 Artificial intelligence, intelligent systems, natural language processing*
 - *PE6_11 Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)*

- *LS2 Integrative Biology: from Genes and Genomes to Systems*
For all organisms: Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicine
 - *LS2_12 Biostatistics*

- *Assessment of the quality and sustainability of production chains*
- *Statistical methods*

A full description of the research topics is available here: <https://www.disia.unifi.it/p344.html> Key Research Facilities, Infrastructure and Equipment

Key Research Facilities, Infrastructure and Equipment

DiSIA is involved in several Research Centres:

- *Florence Center for Data Science*
- *StEring: Statistics for Engineering: design, quality and reliability*
- *Camilo Dagum on Advanced Statistics for the Equitable and Sustainable Development*
- *CERA: centro interdipartimentale di ricerca per la valorizzazione degli alimenti.*

We also mention the research unit of DiSIA-Lab, which is the Laboratory of Statistics and Computer Science, a research unit of DiSIA established by resolution of the Department Council in July 2014.

The DiSIA-Lab was created to meet specific teaching and research needs, and to serve as a tool for conducting transfer and innovation projects and for developing the DiSIA's collaborative relationships with other organizations inside and outside the University.

The tasks of the DiSIA-Lab also include the operational management of IT resources, equipped classrooms and data collection systems within the DiSIA, including:

- *Three multimedial rooms, in total 98 stations with Thin Clients, aimed to teaching activity*
- *Infrastructural Server whose aim is to handle virtual servers (DELL PowerEdge R740xd, 2 CPU Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz 28 core, 1 TB RAM)*
- *HPC server for research activity (Lenovo ThinkSystem SR950, with 8 CPU Intel(R) Xeon(R) Platinum 8260 CPU @ 2.40GHz 24 core, 6 TB RAM)*
- *Storage Unit (NAS LENOVO DM5000H having 12 SSD disk with 894GB)*

The DiSIA-Lab is run by all the technical and teaching staff of the DiSIA, coordinated by Professor Bruno Bertaccini.

- *LS7 Prevention, Diagnosis and Treatment of Human Diseases*
Medical technologies and tools for prevention, diagnosis and treatment of human diseases, therapeutic approaches and interventions, pharmacology, preventative medicine, epidemiology and public health, digital medicine
 - *LS7_9 Public Health and epidemiology*
- *SH1 Individuals, Markets and Organisations*
Economics, finance, management
 - *SH1_6 Econometrics; operations research*
 - *SH1_12 Environmental economics; resource and energy economics; agricultural economics*
 - *SH1_13 Labour and demographic economics*
 - *SH1_14 Health economics; economics of education*
- *SH3 The Social World and Its Diversity;*
Sociology, social psychology, social anthropology, education sciences, communication studies
 - *SH3_7 Kinship; diversity and identities, gender, interethnic relations*
 - *SH3_8 Social policies, welfare, work and employment*
 - *SH3_11 Social aspects of teaching and learning, curriculum studies, education and educational policies*
- *SH7 Human Mobility, Environment, and Space*
Human geography, demography, health, sustainability science, territorial planning, spatial analysis
 - *SH7_2 Migration*
 - *SH7_3 Population dynamics: households, family and fertility*
 - *SH7_4 Social Aspects of health, ageing and Society*

Previous Involvement in National and European Research Funding Programmes

- *Department of Excellence 2018-2022*
- *Department of Excellence 2023-2027*
- *EU-FER project (PI: Prof. Daniele Vignoli) funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, grant agreement n° DLV-725961: <https://eu-fer.com/>*
- *PRESSPAD: Green agriculture products extraction process PSR 2014-2020 GAL F.A.R. Maremma, Regione Toscana*
- *Assessment cybersecurity readiness (2019-2021, PI: Rosario Pugliese), Prog. POR FESR 2014-2020, Regione Toscana*
- *GDR Great Demographic Recession, PRIN Project, Miur (2019-2021, PI: D. Vignoli)*
- *CREW Care, Retirement and Wellbeing, JPY Project, European Commission (2019-2021, PI: G. De Santis)*

A full description is available at:
<https://www.disia.unifi.it/>

- *SH7_5 Sustainability sciences, environment and resources*
- *SH7_5 Sustainability sciences, environment and resources*
- *SH7_6 Environmental and climate change, societal impact and Policy*
- *SH7_7 Cities; urban, regional and rural studies*

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Department of Economics and Management - DiSEI

The Department of Economics and Management (DiSEI) was established in 2013 as the natural successor to the Faculty of Economics and Business, which was founded in 1935 and was based in Villa Favard until 2004.

DiSEI is currently composed of more than 100 Professors and Researchers, supported in its various activities by technical-administrative staff and research personnel such as doctoral students, postdoctoral fellows, research fellows, and contract workers.

The main object of DiSEI's research concerns theoretical and empirical areas related to all areas of Economics and Business sciences, but with contributions from Agricultural, Mathematical, Geographical, Legal, and Historical sciences. DiSEI is referent for 13 different disciplinary science areas in the general area of Economic and Statistical sciences (MIUR AREA 13), representing the majority of the Department. Other disciplinary areas such as Area 7 (Agricultural and veterinary sciences), Area 11 (Historical, philosophical, pedagogical, and psychological sciences), and Area 12 (Legal sciences) are also represented.

Multidisciplinarity is also a teaching strength. DiSEI is a referent department for three bachelor's degrees in Italian and a fourth one completely taught in English and five master's degrees. Two master's degrees are in English with double degrees (and three are in Italian). All courses of study attract many international students, taking full advantage of the opportunity of Erasmus exchanges and using innovative teaching methods, with direct student involvement in lectures and laboratories. As an associate department, DiSEI also contributes to other courses in different Schools in the University of Florence.

At the higher education level, DiSEI is home to several first- and second-level master's programs. In addition, the Department contributes to three doctoral programs: it is the administrative headquarters for DELoS (Doctoral Program in Development Economics and Local Systems), and it is the referent for the Doctoral Program in Economics of the Tuscan universities and Doctoral Program in Business Economics and Management.

ERC Main relevant Panels:

- SH1 *Individuals, Markets and Organisations*
Economics, finance, management
- SH7 *Human Mobility, Environment, and Space*
Human geography, demography, health, sustainability science, territorial planning, spatial analysis

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Key Research Activities

DiSEI's key research activities concern theoretical and empirical areas related to all areas of Economics and Business sciences, but with contributions from Agricultural, Mathematical, Geographical, Legal, and Historical sciences.

Key Research Facilities, Infrastructure and Equipment

DiSEI has several economic area databases available including: AIDA, Amadeus, Bloomberg Professional Service, Datastream, FACTSET, etc.

There are several laboratories such as the Laboratory of experimental economics and management (Beelab+), Real Estate Workout e Data Life Lab.

Previous Involvement in National and European Research Funding Programmes

DiSEI participate to several research projects at regional level, national level and international level.

At the moment there are underway 3 Horizon2020 research projects and 2 Erasmus+ projects:

- *SPES – Sustainability Performances, Evidence and Scenarios, HORIZON-CL2-2022-TRANSFORMATIONS-01-01*
- *COACH - Collaborative Agri-food Chains: Driving Innovation in Territorial Food Systems and Improving Outcomes for Producers and Consumers, Horizon 2020 H2020-RUR-2018-2020 / H2020-RUR-2020-1*
- *EUROSHIP-Closing gaps in social citizenship. New tools to foster social resilience in Europe, H2020-SC6-GOVERNANCE-2018-2019-2020/H2020-SC6-GOVERNANCE-2019*
- *ORM - Online reputation management, Erasmus+ KA203 Strategic Partnership*
- *EOS - Economics of Sustainability, Erasmus+ KA203 Strategic Partnership*

For other national and regional project please visit:

<https://www.disei.unifi.it/vp-484-progetti-di-ricerca.html>

Department of Legal Sciences - DSG

The Department of Legal Sciences (DSG) brings together researchers from many disciplinary areas who carry out their activities in all the different fields of law.

The DSG is an expression of the Florentine legal and cultural tradition. In the recent years, having obtained specific funding with the approval of the 2018-22 Project of Excellence, it has consolidated its role as a centre for the training of jurists equipped to decipher the present complexity, through solid references to the past, the constant reference to comparisons with foreign experiences, the interdisciplinary approach. In this framework, the combination of theoretical and practical-application profiles constitutes a characteristic element of its activities, as the ability to translate research into the construction of tools with an impact on the legal system. The constant relationship with institutions and public and private bodies implement its attitude to be involved in decision-making processes and to contribute to the development of the country.

The DSG has been selected to propose a new Project of Excellence for the period 2023-2027. Even this project has been approved. This grants to the DSG an important financial support which enables it to consolidate and further develop its research activities. DGS has also been admitted as an implementer of several strategic measures under the PNRR, such as Extended Partnerships, National Centres and Ecosystems of Innovation

The Department's research also translates into a constant development of teaching, both in its five degree courses, in higher education (in particular, in the PhD programme) and the training of professionals working in the field of law.

Five A-range journals are housed at the DSG or its affiliated centres.

Key Research Activities

With the approval of the 2023-2028 Project of Excellence, the department's research will be developed in particular (but not only) on some department's key themes, namely:

(a) the third sector and public services, civil society, new welfare systems, demographic dynamics and the ageing population

b) new technologies, cybersecurity and cybersafety, equality and digital society

c) anti-discrimination protection; identity, gender equality and sexual orientation; migration policies, protection of minorities and religious pluralism

d) transformations of criminal and civil justice: access, efficiency, effectiveness, consensual and restorative justice (consistent with the reforms envisaged in the NRP)

e) intergenerational solidarity and future generations, environment, cultural heritage

f) enterprise and sustainability, support for SMEs, Industry 4.0, access to credit

There is also a great deal of other research that the department's members conduct, individually and in

ERC Main relevant Panels:

- *SH2 Institutions, Governance and Legal Systems
Political science, international relations, law*

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aggregate. This intense and vibrant research activity creates a very rich network of initiatives that cross all areas of law

Key Research Facilities, Infrastructure and Equipment

Research activities can benefit from a social science library with a holdings of around 900,000 and access to numerous collections and digital resources.

These activities are enhanced by 6 centres and laboratories:

- Study Centre for the History of Modern Legal Thought (PGM) (1971)
- Another way. Mediation Laboratory (2012)
- Joint research laboratory Rights, foreigners, anti-discrimination-DIR.S.A (2014)
- The other right. Inter-university research centre on prison, deviance, marginality and migration governance ADir (2015)
- MedICT (Medical and Health Information and Communication Technology) interdepartmental joint laboratory (2022)
- Interdepartmental service centre for research and advanced training on cadaver and forensic identification (TANATOCENTRUM) (2022)

Previous Involvement in National and European Research Funding Programmes

Horizon 2020:

- [D.RAD](#) (2020-2023) De-Radicalize, Detect, Integrate
- [SIRIUS](#) (2018-2020) Skills and Integration of Migrants, Refugees and Asylum Applicants in the European Labour Market
- [RESPOND](#) (2017-2020) Multilevel Governance of Mass Migration in Europe and Beyond Project
- [TRANSOL](#) (2015-2018) European paths to transnational solidarity at times of crisis: conditions, forms, role-models and policy responses TransSol

Horizon Europe

- [Care4Care](#) We care for those who care

Justice 2021-2027

- [TRIAL 2](#) *TRust, Independence, Impartiality and Accountability of Legal professionals under the EU Charter – Part 2*

Currently, there are also 9 Research Projects of National Interest (PRIN) being conducted in the department.

Further information can be found at the link

<https://www.dsg.unifi.it/vp-711-progetti-europei-e-progetti-di-rilevanza-nazionale.html>

Department of Political and Social Sciences - DSPS

The Department of Political and Social Sciences (DSPS) was founded in 2013 and now has 52 members engaged in research, teaching and third mission's activities. The DSPS focuses on contemporary social and political phenomena, and on the analysis of their historical roots and interdependencies.

The DSPS participates in 3 PhD programmes:

- *Social and Political Change, in agreement with the CPS Dept. of the University of Turin. The administrative seat from 2023 is in Florence.*
- *Historical Studies, in agreement with the DILEF and SAGAS Departments of the University of Florence; and the DSSBC and DSFUCI Departments of the University of Siena.*
- *Resources for the New Public Administration: People and Data, in cooperation with the Universities of Milano Bicocca, Milano Statale and Ca' Foscari of Venice. This PhD programme is funded by the PNRR and develops in coherence with its objectives.*

ERC Main relevant Panels:

- *SH2 Institutions, Governance and Legal Systems
Political science, international relations, law*
- *SH3 The Social World and Its Diversity
Sociology, social psychology, social anthropology, education sciences, communication studies*
- *SH6 The Study of the Human Past
Archaeology and history*

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Key Research Activities

Research over the last decade has been developed with reference to many themes, among which at the international level are: the connections between models of capitalism, welfare and the effectiveness of democracies; the transformations of inequalities and inclusion policies; the relations between scientific innovation and the development of local economies; humanitarian policies and practices in Mediterranean Europe; good social service practices in the Mediterranean area; communication, media and the circulation of anti-Semitism; political modernity, processes of globalisation and forms of political coexistence.

Research has also been developed on the political system and the transformations of political representation; on the policy coherence of local government; on the links between digital innovation and transformations of procedures in representative assemblies; on climate sustainability in public policies; on institutional training on new social media; on the relations between generative communication and the differentiation of publics; on anti-mafia policies and anti-mafia associations as political participation; on forms of migration, remissions and transnational care practices; on the practices of transnational care; on the construction of the identity of migrant minors; on practices of reception, visibility of the Other and public space; on the emotional dimension of politics; on the history of environmental transformations and policies; on subjectivity and institutional change.

Key Research Facilities, Infrastructure and Equipment

*Library of Social Sciences
Seminar rooms equipped for video-conferences*

Previous Involvement in National and European Research Funding Programmes

European Projects

Replan EU Jean Monnet Module "Implementing Resilience and Recovery Plans in Italy and beyond" which investigates how National Recovery and Resiliency Plans were designed, the extent they are implemented on the ground (Enrico Borghetto)

<https://www.dsps.unifi.it/p577.html>

HumanEuroMed. Humanitarianism and Mediterranean Europe: a Transnational and Comparative History (1945-1990), ERC Advanced Grant. It investigates the role played by Southern European countries in shaping the contemporary regime of international aid. (Silvia Salvatici)

<https://www.humaneuromed.unifi.it/index.html#>

GLOBAL ANSWER - Global social work and human mobility: comparative studies on local government and good Social Work practices in the Euro-mediterranean region, funded by the programme Horizon 2020 – Call: H2020-MSCA-RISE-2019 (Marie Skłodowska-Curie Research and Innovation Staff Exchange) Ivana Acocella

National Projects

Prin Migrant remittances and transnational ties: care, social change and development across borders (MIGREM) (Ivana Acocella)

Prin Republican Italy and International Aid (1945-1989) (Silvia Salvatici)

Prin Development Policies and Digitalization in Italy (Luigi Burroni)

Department of Architecture - DIDA

The research and educational activities of the Department of Architecture (DiDA) are organised into different disciplinary components: architectural design, representation, history of architecture, conservation and restoration, building science and technology, architectural technology, estimation and valuation, industrial design, fashion design, urban design and spatial planning, landscape design. DiDA's main mission is that of project culture and science, i.e. a clear project orientation in all its dimensions and transversality: architecture, design, fashion, city, planning and landscape. This dimension is called upon to confront the complexity of nowadays economic and social changes, the new scenarios opened up by the globalisation of production processes, and the innovations introduced in communication systems. This requires a cultural approach and research methodologies in which critical and interpretative abilities are integrated with a broad spectrum of technical and design skills, capable of directing the transformations of physical space and the related design and production processes towards forms of sustainable and conscious development, to improve the quality of life of all mankind and the environment.

ERC Main relevant Panels:

- SH5 Cultures and Cultural Production

Literary studies, cultural studies, study of the arts, philosophy

- SH5_4 Visual and performing arts, film, design and architecture
- SH5_6 History of art and architecture, arts-based research
- SH5_7 Museums, exhibitions, conservation and restoration
- SH5_8 Cultural studies, cultural identities and memories, cultural heritage

- SH7 Human Mobility, Environment, and Space

Human geography, demography, health, sustainability science, territorial planning, spatial analysis

- SH7_4 Social aspects of health, ageing and society
- SH7_5 Sustainability sciences, environment and resources
- SH7_6 Environmental and climate change, societal impact and policy
- SH7_7 Cities; urban, regional and rural studies
- SH7_8 Land use and planning

Key Research Activities

DiDA's research activities embrace all scales and declinations (cultural, creative, technical and technological) of spatial analysis and design, as well as the different declinations with specific attention to human activities' environmental, social and economic impacts. DiDA's activities intercept all 17 Sustainable Development Goals identified by the UN 2030 Agenda, some directly, and others as related themes. The following goals are central to DiDA activities: 3. Good health and well-being; 4. Quality education; 6. Clean water and sanitation; 7. Affordable and clean energy; 9. Industry, innovation and infrastructure; 10. Reduced inequalities; 11. Sustainable cities and communities; 12. Responsible consumption and production; 13. Climate action; 17. Partnerships for the Goals.

- *PE8 Products and Processes Engineering*

Product and process design, chemical, civil, environmental, mechanical, vehicle engineering, energy processes and relevant computational methods

- *PE8_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics*
- *PE8_10 Manufacturing engineering and industrial design*
- *PE8_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage*

- *PE10 Earth System Science*

Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management

- *PE10_4 Terrestrial ecology, land cover change*

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Key Research Facilities, Infrastructure and Equipment

DiDALabs constitute a support infrastructure for research to go beyond the sectorialisation of knowledge to embrace forms, even experimental ones, of transversality and intersectoriality, having as a common fulcrum the themes of the project at all scales. DiDALabs are divided into two groups: Service Laboratories (LASER) and Research Laboratories (LARI).

The LASERs are structures of the DiDA, they carry out activities and support research and offer direct and onerous services to users inside and outside the DiDA. LASERs are characterised by the presence of machines and/or machinery (including non-transportable) instruments, devices and special equipment designed to guarantee specialised services and high-performance scientific services "on demand" by students, professors, researchers or external users.

LASERs include: Communication; Informatics and Bim; Models for Architecture and Design; Self-construction; Extended Reality; Photo and Video; Building Technologies; Materials and Structures Testing; Architectural surveys; Restoration.

In LARIs is carried out and promoted scientific research and the transfer of knowledge from research to institutions, territories and society.

In addition to DiDALabs, DiDA implements research through ten Research Units and the two Inter-University Research Centres TESIS - Systems and Technologies for Social, Health and Education Facilities and ABITA - Bioecological Architecture and Technological Innovation for the Environment.

Previous Involvement in National and European Research Funding Programmes

Recently international funded projects include: PHOENIX - The rise of citizen voices for a green Europe (H2020); Search and Rescue (H2020); F-ATLAS Franciscan Landscapes (JPI); Practicing Universal Design Principles in Design Education through a CAD-based Game (ERASMUS+ KA2); Soft, Digital and Green Skills for smart Designers: designers as innovation TRiggers for SMEs Game (ERASMUS+ KA2); Traditional Craft Heritage training, design and marketing in Jordan and Syria (ERASMUS+ KA2); OD&M - A knowledge Alliance between HEIs, makers and manufacturers (ERASMUS+ KA3); ReD4EUA – Regional

	<p><i>Design methodologies for implementing the European Urban Agenda” (ERASMUS+ Jean Monnet Module) INTERCULTURAL CRAFT. A bridge between traditional knowings and cultures (ERASMUS+ Cooperation Partnerships); Digital twin, sustainable design, energy efficiency (ERASMUS+ Cooperation Partnerships); Auralisation of Acoustic Heritage Sites Using Augmented and Virtual Reality (CREATIVE EUROPE); Investigation on building materials, structural analysis and consolidation guidelines – Afghanistan (Aga Khan Trust for Culture, Afghanistan).</i></p> <p><i>Recently projects funded by the Italian Ministry of University include: Smart Monitoring for Safety of Existing Structures and infrastructures (PRIN-Research projects of national interest); BIM-to-Digital Twin (PNR-National Programme for Research); INERTIAL: INnovativE mateRial from TraditlonaL resources (PNR); Regenerating the cultural landscapes of inland areas in a people-centred perspective (PNR); Designing for Inclusive Attitude: a toolbox for developing inclusiveness (PNRR).</i></p>
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Department of Agriculture, Food, Environment and Forestry - DAGRI

The Department of Agriculture, Food, Environment and Forestry (DAGRI) promotes teaching, research and third mission activities in the field of plant and animal production, food quality and technology, environmental protection and recovery, management and enhancement of forest resources. The achievement of these objectives is based on the recognition that the positive relationship and collaboration between the members of the University and the students, companies, national and international territorial bodies and, in general, the Community, constitute the central element of engagement of the Department. The relationship with businesses and local authorities is fundamental, for which the DAGRI represents a point of reference for the transfer of innovations, essential in a context of growing competitiveness in the national and international scenarios. A commitment that takes the form of the study of chemical, physical, biological and genetic processes, the interactions of which characterize agricultural and forestry, natural and semi-natural ecosystems. The research activities are oriented towards integrated and multidisciplinary studies to determine sustainable management of agricultural, animal and forest resources, maintaining and recovering the environmental quality and the various components of life (soil, microorganisms, climate, plants, animals, biodiversity). DAGRI researchers conduct regional, national and international research projects in the fields of agriculture, forestry, hydrology, environmental engineering, genetic and microbial biotechnology, food science and food production, animal sciences, legislation and agricultural and environmental economics, study, management and monitoring of the landscape.

ERC Main relevant Panels:

- **PE10 Earth System Science**
Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management
- **LS2 Integrative Biology: from Genes and Genomes to Systems**
For all organisms: Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicine
- **LS4 Physiology in Health, Disease and Ageing**
Organ and tissue physiology, comparative physiology, physiology of ageing, pathophysiology, interorgan and tissue communication, endocrinology, nutrition, metabolism, interaction with the microbiome, non-

Key Research Activities

The main research lines of the Department are:

- *agriculture (agronomy and soil management, arboriculture, crop science, crop production, engineering, precision farming)*
- *environment and landscape (climate change, relations between urban areas and rural areas, pollution, ecosystem services, land use changes)*
- *forestry (forest ecology, silviculture, forest management, forest monitoring and inventory, biodiversity, wood science, forest operations, forest engineering)*
- *animal science and game management*
- *food science and technology (food quality, food and beverage production processes, food product tracing and certification, sensorial and preference analysis)*

communicable diseases including cancer (and except disorders of the nervous system and immunity-related diseases)

- **LS8 Environmental Biology, Ecology and Evolution**
For all organisms: Ecology, biodiversity, environmental change, evolutionary biology, behavioural ecology, microbial ecology, marine biology, ecophysiology, theoretical developments and modelling
- **LS9 Biotechnology and Biosystems Engineering**
Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards

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Key Research Facilities, Infrastructure and Equipment

The Department is organized into 10 sections:
Arboriculture
Economics, Assessment and Legislation
Forests, Environment, Wood and Landscape
Agricultural, Forest and Biosystem Engineering
Agricultural Microbiology
Forest pathology and Entomology
Agronomy, Genetics and Land Management
animal science
Soil and Plant Science
Food Science and Technology

The Sections have the facilities, infrastructure and equipment to carry out scientific and educational activities.

Previous Involvement in National and European Research Funding Programmes

Clim4Vitis's main objective is to strengthen and raise UTAD's – and more specifically its research group CITAB's – science and technology (S&T) capacity and performance in two main specific fields of research in viticulture & climate:

- Grapevine modelling;
- Methods and tools for assessing climate change impacts on European viticulture, in general, and on grapevine productivity, quality attributes and risk of diseases and pests in particular.
<https://clim4vitis.eu/>

Eduilia is a part of an ITN-ETN Marie Curie Training Network, funded by the EU through Horizon 2020. Mission: Bringing down barriers to children's Healthy eating. Eduilia responds to the urgent need of the EU society to find new ways to tackle the escalating issue of obesity, through promoting healthier eating from childhood, within the context of choice.
<https://edulia.eu/>

GEroNIMO will work on chicken and pig, the most used sources of animal protein worldwide, to provide breeders with new knowledge and tools to promote innovative genome- and epigenome enabled selection methods for traits related to production (quantity and quality), efficiency, productive longevity, fertility, resilience and welfare. <https://www.geronimo-h2020.eu/>.

NOMAD is a H2020 project aiming to develop a mobile solution for production of high-quality organic fertilisers and soil amenders from anaerobically digested organic waste. In line with the EU bio-

economic strategy, NOMAD's innovative mobile approach fosters a vibrant organic circular economy model that has the potential to be widely replicated across rural, peri-urban and urban areas. <https://www.projectnomad.eu/>.

LIFE SySTEMiC (LIFE del 2018 Environment and Resource Efficiency) Close-to-Nature forest sustainable management practices under climate changes LIFE SySTEMiC's principal aim is to develop a tool to be used for Sustainable Forest Management (SFM) facilitating the choose of the best silviculture practice to preserve forest resilience in relation to climate change. <https://www.lifesystemic.eu/it/>.

Department of Civil and Environmental Engineering - DICEA

The Department of Civil and Environmental Engineering (DICEA) carries out basic and applied research, teaching, cultural and technological transfer, and public engagement activities in the fields of water and environment management, including reuse and recovery of resources, geomatics and infrastructures, geotechnics, structures, and architectural and building engineering. The disciplines characterizing the Department are hydraulics, hydrology, hydraulic and maritime constructions, sanitary and environmental engineering, transport engineering, geomatics, geotechnics, solid and structural mechanics, structural analysis and design, construction technology, technical architecture, and urban planning. The integration of these disciplines is a key part of the Department's mission aimed at promoting the sustainable development of safe and resilient human communities and ecosystems. The Department is composed by 32 Professors (Full and Associate), 19 Assistant Professors, 20 Post docs, more than 50 PhD students enrolled in the Department's International Doctorate in Civil and Environmental Engineering program, and the administrative and technical staff.

The Department is organized in four main divisions: Water and Environment, Geomatics and Infrastructures, Geotechnics, and Structural, Architectural and Building Engineering.

Water and Environment

The Water and Environment research unit is actively involved in the fields of Fluid Mechanics, Hydrology, Marine and Coastal Dynamics, Water Engineering and Environmental Systems, Treatment Processes and Environmental Biotechnologies. The main research activities include the management of water and energy resources, the assessment and mitigation of hydraulic risk, the design and management of processes and systems for environmental protection, the reuse and recovery of resources, the field of hydraulic and maritime constructions and the protection of the coasts. The staff share an interdisciplinary approach to research and to teaching and a strong involvement into international research networks and projects and the unit is open to contributions from other disciplinary scientific sectors with the potential of synergistically contributing in the fields of the management of resources and urban systems, the protection of the environment, the monitoring and control of pollution phenomena, from planetary scale of climate change to the nano scale of biological processes.

Geomatics and Infrastructures

The Geomatics and Infrastructures unit deals with all the aspects of road safety, from the road design to the development of accident prediction models. Analysis of safety barriers behaviour with FEM tools and analysis of the influence of Human Factors in road safety by studying the driver behaviour through a dynamic driver simulator. Evaluation of the impact of autonomous vehicle in transportation and how to better improve their inclusion on the current road systems. Planning instruments to help citizens moving in cities. Several projects and activities in the Department are related to geospatial data acquisition, modelling and processing, by using static and dynamic platforms, terrestrial, aerial and marine, exploiting a wide range of sensors (RGB, multispectral and thermal cameras, laser scanners, radar, echo-sounder) and techniques (terrestrial and mobile laser scanning, photogrammetry). Spatial data processing, information extraction and data analysis is performed by using geographic information systems and ad hoc developed tools, based on artificial intelligence methods, e.g. deep learning-based analysis of 2D and 3D data. 3D modelling with BIMs, virtual reality and 3D printing are also exploited, in particular related to cultural heritage applications. Positioning and navigation in critical environments is also an active research field, mostly to support autonomous driving.

Geotechnics

The research activities of the geotechnical team are related mainly to: (1) analysis of the seismic behaviour of structures and infrastructures and mitigation of seismic geotechnical hazards; (2) environmental and sustainable geotechnics, with special emphasis on the analysis and climate-adaptive geotechnical mitigation of environmental risks from natural and anthropogenic hazards;

and (3) application of advanced non-deterministic methods in the management and analysis of geotechnical data and in the application of statistical, probabilistic, and machine learning algorithms to the multi risk zonation of geotechnical hazards. Starting in the fall of 2023, the geotechnical team will play a central role in a 4-year Horizon Europe project focusing on the sustainable remediation and restoration of soil in polluted and unstable sites, operating specifically in the quantitative modelling of soil resilience and on the risk mitigation effects of geotechnical nature-based solutions. Recently submitted National research proposals for which evaluation is pending focus on: (1) multi-hazard zonation for earthquake and rainfall-induced landslides using evolutionary probabilistic and machine learning methods; and (2) metamodelling of geotechnical design for offshore foundation structures.

Structural, Architectural and Building Engineering

The Structural, Architectural and Building Engineering group focuses on solid and structural mechanics, structural analysis and design, architectural and building engineering. The most active research areas in these fields are: analytical, computational and experimental methods for the linear and nonlinear analysis of traditional and innovative materials; structural analysis, identification and monitoring of historical buildings, Structural Health Monitoring of existing buildings and structures; earthquake engineering, structural rehabilitation and advanced seismic protection technologies; sustainable materials for structural use and engineering of natural materials; structural dynamics and fluid structure interaction problems with a focus on wind engineering and offshore wind energy structures; energy and environmental sustainability at both urban and building levels: identification of energy and environmental strategies and technological solutions to achieve low-carbon buildings in a life cycle perspective; analysis and redevelopment of the modern building heritage; critical analysis of representative case studies starting with the interpretation of design and construction processes. The unit is equipped with a Laboratory for Structural and Material Testing and a Boundary Layer Wind Tunnel (see descriptions below).

ERC Main relevant Panels:

- *PE3 Condensed Matter Physics*
Structure, electronic properties, fluids, nanosciences, biological physics
 - *PE3_14 Fluid dynamics*
(physics)
- *PE5 Synthetic Chemistry and Materials*
New materials and new synthetic approaches, structure-properties relations, solid state chemistry, molecular architecture, organic chemistry
 - *PE5_1 Structural properties of materials*
- *PE6 Computer Science and Informatics*
Informatics and information systems, computer science, scientific computing, intelligent systems
 - *PE6_11 Machine learning, statistical data processing and applications using*

Key Research Activities

Water and Environment

- *Fluvial and lagoon hydro-morphodynamics; sediment transport; river engineering.*
- *Fluid-dynamical modeling. Physically-based stochastic models of rainfall. Distributed hydrologic modeling for real time flood forecasting. Use of Quantitative Precipitation Forecast in flood risk management. Management and design of multi-sensor hydro-meteorologic data networks. Watershed planning. Sustainable water supply in arid regions. Climate change impact on eco-hydrology and water resources.*
- *Costal Dynamics, Marine Renewable Energies.*
- *Water-energy-food nexus and water related ecosystems services. Hydraulic structures and hydraulic risk analyses.*
- *Characterisation and treatment of waste, wastewater and gaseous streams, bioeconomy and resource recovery from wastewater and waste, modelling and control of engineered microbial communities for wastewater treatment and resources recovery. Wastewater reclamation and reuse for agricultural and industrial purposes,*

<p>signal processing (e.g. speech, image, video)</p> <ul style="list-style-type: none"> - PE6_12 Scientific computing, simulation and modelling tools <p>- PE8 Products and Processes Engineering Product and process design, chemical, civil, environmental, mechanical, vehicle engineering, energy processes and relevant computational methods</p> <ul style="list-style-type: none"> - PE8_3 Civil engineering, architecture, offshore construction, lightweight construction, geotechnics - PE8_4 Computational engineering - PE8_5 Fluid mechanics - PE8_6 Energy processes engineering - PE8_11 Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage - PE8_14 Automotive and rail engineering; multi-/inter modal transport engineering <p>- LS9 Biotechnology and Biosystems Engineering Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards</p> <ul style="list-style-type: none"> - LS9_7 Environmental biotechnology and bioengineering <p>- PE10 Earth System Science Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management</p> <ul style="list-style-type: none"> - PE10_2 Meteorology, atmospheric physics and dynamics 	<p>carbon footprint analysis and energy optimisation of wastewater treatment plants.</p> <p>Geomatics and Infrastructures</p> <ul style="list-style-type: none"> - Risk analysis. - Development of crash prediction models. - FEM evaluations for safety barriers. - Definition of procedures for the evaluation of road safety on existing roads. - Infrastructure digitalization to improve road safety. - Conception and management of new modes of transport (HS and I2V communications) for the safety and fluidity of circulation. - Cultural heritage documentation and modelling. - Digital and physical twins. - Plastic/litter detection in the fluvial/marine environment. - Semantic segmentation and modelling of point clouds. - Landslide monitoring. - Road traffic monitoring. - Precision agriculture, advantages and risks related to terraced vineyards. - Remote sensing based environmental monitoring. - Remote sensing and drone-based bathymetry. - Remote sensing satellite-based RADAR SAR images analysis. - Collaborative positioning and navigation. <p>Geotechnics</p> <ul style="list-style-type: none"> - Soil dynamics. - Seismic ground response. - Seismic liquefaction. - Seismic microzonation. - Slope stability. - Soil-structure interaction. - Programming of software for geotechnical numerical analyses. - Non-deterministic methods for geotechnical characterization and design. - Geotechnical mitigation of environmental risks. - Analysis and design of geotechnical nature-based solutions. - Geotechnical multi-risk analysis and zonation. <p>Structural, Architectural and Building Engineering</p> <ul style="list-style-type: none"> - Methods in Computational Mechanics for linear and nonlinear problems. - Nonlinear constitutive equations and models for existing and innovative materials, including masonry-like materials.
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- PE10_3 Climatology and climate change
- PE10_12 Sedimentology, soil science, palaeontology, earth evolution
- PE10_14 Earth observations from space/remote sensing
- PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution
- PE10_20 Geohazards

- SH4 The Human Mind and Its Complexity
Cognitive science, psychology, linguistics, theoretical philosophy
 - SH4_5 Attention, perception, action, consciousness

- SH7 Human Mobility, Environment, and Space
Human geography, demography, health, sustainability science, territorial planning, spatial analysis
 - SH7_6 Environmental and climate change, societal impact and policy
 - SH7_9 Energy, transportation and mobility
 - SH7_10 GIS, spatial analysis; big data in geographical studies

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- Static and dynamic behavior, identification and reinforcement of masonry structures and wooden elements.
- Earthquake engineering, seismic risk analysis and vulnerability of masonry historical buildings.
- Modeling and design of advanced seismic protection technologies.
- Data-driven methods, structural monitoring and damage detection.
- 3D printing of earth based materials.
- Mechanical performances of non-standardized structural materials.
- Bridge and Bluff-body aerodynamics.
- Wind loads on large structures and wind-induced vibrations of slender structures.
- Experimental aerodynamics.
- Offshore fixed-bottom and floating wind energy structures.
- Waves-structure interaction.
- Energy and environmental sustainability at urban and building levels.
- Green infrastructures in urban districts to tackle climate change.
- GIS and BIM tools to perform multidisciplinary analysis.
- Methodologies for preservation and sustainable retrofitting of modern building heritage.

Key Research Facilities, Infrastructure and Equipment

Water and Environment

- LABIMA (Maritime Engineering Laboratory)
- LDT (Geographical and Environmental Information System integration lab)
- Spatial Data Laboratory: reference lab for spatial and environmental data processing with Geographic Information Systems (GIS)
- River Hydraulics, lagoon and biofluidodinamics laboratory
- Sanitary and Environmental Engineering Lab

The following laboratories are managed jointly with industrial partners and external institutions, including other departments of the University of Florence:

- Water, sea, environment energy – (A-MARE)
- Research center for tannery wastewater (Cer2co)
- UNALAB (wastewater treatment processes)
- LIROMAN (monitoring of environmental pollution)
- WASTEREC (recovery of resources from industrial wastewater)

Geomatics and Infrastructures

- *Dynamic driving simulator to evaluate driver behaviour;*
- *Eye-tracker device that allows the analysis of the most attractive elements in the driver and pedestrian field of view;*
- *Automated bus to improve transportation efficiency and evaluate the integration of automated vehicle in the current road network.*
- *Fleet of Unmanned Aerial Vehicles (UAV), ranging from mini UAV to quite large ones, enabled to mount different types of sensors, such as RGB, multi-spectral and thermal cameras, LiDAR.*
- *Terrestrial topographic survey equipment: Terrestrial/mobile laser scanners, GNSS receivers, total stations.*
- *Digital cameras and workstations for aerial and close range photogrammetry.*
- *Virtual reality headsets.*
- *Geotechnics*
- *Standard and advanced equipment for carrying out laboratory testing on soils under static and dynamic loading conditions, and for performing in-situ static and dynamic tests.*
- *An extensive database containing the results of in situ and laboratory tests performed by the Geotechnical Laboratory of DICEA to measure the dynamic properties of soils from several areas in central Italy is available.*
- *Equipment for performing laboratory tests under static conditions includes: tools for soil classification and compaction tests, oedometer devices, Casagrande shear box, triaxial devices equipped for external and internal strain measures, standard and modified Proctor test equipment, in situ density measurement device. Equipment for measurement of soil dynamic properties includes: resonant column and cyclic torsional shear device, cyclic triaxial test apparatus. The Geotechnical Laboratory is also equipped to perform in situ static and dynamic tests, i.e.: density tests, static plate load tests and down-hole tests.*
- *Further equipment for laboratory and in situ test will be made available by a REsearch Center for GEOtechnical characterization and modelling (RECGEO) leaded jointly by DICEA-UNIFI and DST-UNIFI.*
- *Two 30 m deep boreholes, arranged for geophysical tests, are available in the park of the Engineering School.*

Structural, Architectural and Building Engineering

- *Laboratory for Structural and Material Testing: The laboratory has all instruments needed to measure forces, displacements, strains, accelerations, and is equipped with the following main testing machines:*
 - *Static loading system: A combination of steel frames (one horizontal frame and two vertical frames) and hydraulic actuators enables loading tests to reproduce the state of stress and deformation in structural elements and connections, under both vertical and horizontal load (monotonic or cyclic).*
 - *500 kN Structural Testing Machine (MTS 321-21): This machine can apply both compression and tension load up to a maximum of 500 kN. Differently from the static loading system, this machine allows for tests to be performed directly without assembling loading frames.*
 - *Universal testing machine (INSTRON 4486): Electromechanical system to perform static testing, including tensile, compression, bend, peel, tear, shear, friction, puncture, and other mechanical tests. Capacity: 300 kN.*
 - *Compression Testing Machine (CONTROLS): This machine can apply compression load for uniaxial compression tests (concrete, bricks, or stone specimens).*
 - *Vibrodyne: Electro-mechanical excitation machine (used in dynamic tests of existing structures) that can generate vibrations, with known frequency and amplitude; it produces unidirectional harmonic forces with variable intensity sinusoidal laws.*
 - *Boundary Layer Wind Tunnel:*
 - *Open-circuit (Eiffel-type) wind tunnel with a 10 m-long closed test chamber.*
 - *Test section 2.4 x 1.6 m²*
 - *Wind velocity continuously variable between 0 and 31 m/s.*
 - *Residual turbulence (in the absence of turbulence generating device)*
 - *Two main test section for Boundary Layer (with remotely controlled turntable) and Aerodynamic/Aeroelastic test typologies.*
 - *Anemometric dynamical measurements of flow velocity: Pitot tubes + Setra pressure transducers for mean flow velocity; single and multi-components (2*

and 3 wires) hot wire anemometers for 3D turbulence characteristics.

- Robotic arm constituting the traversing system for flow mapping in different sections of the chamber.
- Piezoelectric and extensimetric 6-components (3 shear forces + 3 moments / X-Y-Z) force measurements.
- Displacements and Accelerations by means of laser sensors and miniaturized accelerometers.
- Dynamical pressure fields measurements with miniaturized pressure scanners (190 simultaneous taps up to 650 Hz). - Automatically controlled test-rig for aerodynamic forces, varying angle of attack.
- 2-DoF Aeroelastic setup, for small and large displacements/rotations of sectional models.

Previous Involvement in National and European Research Funding Programmes

A list of the projects the Department was/is involved in can be found here:

<https://www.dicea.unifi.it/vp-629-catalogo-progetti-di-ricerca.html>

Department of Information Engineering - DINFO

The Department of Information Engineering (DINFO), one of the 21 departments of the University of Florence, is the reference Department for ICT (Information and Communications Technology), where it carries out advanced research in control systems, computer science and engineering, electronics systems, electromagnetism, telecommunications, operation research, bioengineering and electrical engineering.

Traditional and advanced researches, designs and implementations are digital signal processing, fixed and wireless telecommunications systems, radar, sensors and electronic devices, advanced software, ultrasound systems, satellite telecommunication/localization/sensing, media content processing and interpretation, decision support, security and protection of information and telematics, ICT for eHealth systems and electrical networks efficiency, measurement, reliability and safety.

DINFO is member of several inter-university centres and consortia, among which CNIT (National Inter-University Consortium for Telecommunications), MECSA (Microwave Engineering Centre for Space Applications), MIDRA (Multidisciplinary Institute for Development Research and Applications) and TICOM (Consortium for Technologies of Information and Telecommunications), which play an important role in the national high-level scientific cooperation between universities and industries.

DINFO also includes MICC (Media Integration and Communication Centre), a centre of excellence established by the Ministry of University and Research in 2001.

DINFO employs a workforce of more than 200 units (including professors, researchers, technical and administrative people, post-doc fellows and PhD students) with success in the acquisition of important public and private research funding. DINFO is in charge of two first-level three-year degree courses (Electronic Engineering and Telecommunications, Computer Engineering), five Master-of-Science two-year courses (Biomedical Engineering, Computer Engineering, Electronics Engineering, Electrical and Automation Engineering, Telecommunications Engineering) and a PhD course in Information Engineering for a total of about 1,400 students.

The main public research funding comes from European Community, the European Space Agency, the Ministry of University and Research, national research programs and the Tuscany Region. More than a quarter of the research budget of the DINFO comes from contracts with private companies that generate a fruitful technological transfer to industry.

ERC Main relevant Panels:

- **PE6 Computer Science and Informatics**
Informatics and information systems, computer science, scientific computing, intelligent systems
- **PE7 Systems and Communication Engineering**
Electrical, electronic, communication, optical and systems engineering

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Key Research Activities

Electronics and Electromagnetism

Microelectronics, analog and digital electronics, sensors, high-frequency electronics, programmable digital devices, real-time ultrasound systems, radar and wireless systems, advanced analytical and numerical models for electromagnetic engineering, antenna systems, micro- and millimetre-wave systems, fast methods for electromagnetic simulation of complex problems, antenna measurements, antennas for automotive applications and MIMO radar.

Electrical Engineering, Measurement, Reliability and Safety

Power Converters. Electric Machines and Drives. E-mobility. Renewables, RECs and Power Storage. Circuit modeling. Electricity management. Machine learning for predictive diagnosis of devices and systems. Power

quality. Monitoring of overhead and cable electrical infrastructures. Reliability. Metrology. Electromagnetic compatibility measurements. Smart-grids. Electrical and electronic measurements and uncertainty. Fault diagnosis. Risk analysis and functional safety. Maintenance, testing methods, qualification, and certification.

Telecommunications Engineering

Signal and image processing, information theory, radar systems and signals, remote sensing, communication systems, signals of opportunity, localization and navigation, multimedia content and communication security, communication networks, energy efficient communications, Internet of things, satellite communications, optical communications, vehicular communications and networks, body area networks, quantum networks, software-defined networks.

Automation, Control and Optimization

Automatic control; optimal, predictive and robust control; nonlinear systems; cyber-physical systems; sensor networks; data fusion; adaptive and learning systems; autonomous systems; operations research; problem solving; decision-making; continuous and discrete optimization; large-scale systems; big data and analytics.

Computer Engineering, Software and Network Architectures, and Security

Software engineering, performance and dependability evaluation, stochastic models, model checking, model driven engineering, Cyber Physical Systems, big data, cloud computing, serverless computing, distributed systems, microservices, Internet of Things, cybersecurity, decision support systems, digital twins, intelligent networks, 5G/6G networks.

Artificial Intelligence, Machine learning, Knowledge Engineering, and Computer Vision

Smart data models, semantic computing, GDPR, natural language processing, data privacy, document understanding, data mining, predictive models, trustworthy and ethical AI, explainable AI, physically inspired AI, deep learning, deep reinforcement learning, generative adversarial models, computer and robot vision, pattern recognition, biometrics, multimedia, image and video analysis, human computer interaction, virtual and augmented reality, 3D graphics.

Biomedical Engineering

Bioimaging, bioinformatics, biomedical signal processing, artificial intelligence, pattern recognition and machine learning, biostatistics, computational genomics, biosystem modeling, clinical decision support systems.

Key Research Facilities, Infrastructure and Equipment

The Department of Information Engineering consists of a network of laboratories which works on a specific research topic. All laboratories can support research activities with specific instrumentation.

Automation and Control

- *Systems & Control Laboratory – SysCon*

Biomedical Engineering

- *Biomedical Engineering Laboratory – BEL*

Electromagnetic Engineering and High-Frequency Systems

- *Radar and Millimeter Waves - RADOME*
- *RF, Microwaves and Electromagnetics Laboratory – RMEME*

Electronics and bioengineering

- *Microelectronics Systems Design Laboratory - MSDLab*
- *Ultrasound and non Destructive Tesing Laboratory - USCNDLab*
- *Electronic Systems for Environment and Cultural Heritage Laboratory – ESECH*

Informatics Engineering and Optimization

- *Artificial Intelligence Laboratory - AiLab*
- *Distributed Systems and Internet Tecnologies Laboratory - DISIT*
- *Global Optimization Laboratory "Gerardo Poggiali" - GOL*
- *Software Technologies Laboratory - STLab*
- *MICC Media Integration and Communication Center*

Reliability, Measurement, and Power Systems

- *Measurements, Reliability and Safety Lab*
- *Electrical Engineering, Power Converters, Electrical machines and Drivers Lab*
- *Electromagnetic Compatibility Lab*

Telecommunications and Networks

- *Data Communications Networks and Systems Laboratory - DaCoNetS*
- *Signal Processing & Communications Laboratory – LESC*

Previous Involvement in National and European Research Funding Programmes

A brief list of the most recent projects (2019-2023) are summarized below.

European Research Projects

- *Redefining the future of cultural heritage, through a disruptive model of sustainability - ReInHerit*
- *A European Excellence Centre for Media, Society and Democracy - AI4Media*
- *RELIABLE TECHNOLOGIES AND MODELS FOR VERIFIED WIRELESS BODY-CENTRIC TRANSMISSION AND LOCALIZATION - ROVER*
- *Leveraging AI based technology to transform the future of health care delivery in Leading Hospitals in Europe - ODIN*
- *sAfe Urban aiR mObility for euRopeAn citizens - AURORA*
- *Open Technology Platforms for Medical Devices - Moore4Medical*
- *Tuscany EU Digital Innovation Hub - Tuscany X.0*

National Research Projects

- *Remote Inspection for Industrial and Manufacturing Companies – ReInspect (Regione Toscana)*
- *Rethinking Over tomographic acquisition – ROVERTAC (Regione Toscana)*
- *INStruments for Intelligent Detection and Estimation of Rain forAgricultural Innovation – INSIDERAIN (Regione Toscana)*
- *Pattern and Anomaly Discovery - PAD (Regione Toscana)*
- *Sustainable Heritage Management towards Mass Tourism Impact thanks to a holistic use of Big and Open Data - HERIT-DATA (Regione Toscana)*
- *Artificial Intelligence for the Management of Shifts - AIMS (Regione Toscana)*
- *Remote Wildlife Monitoring in Real-Time REWIRE (Regione Toscana)*

	<ul style="list-style-type: none">- <i>CONUS: Conic Open scanNEr for UltraSound research advancement - CONUS (MIUR)</i>- <i>QUantitative Analysis for Services and Assets Reliability - QUASAR (Regione Toscana)</i>- <i>AdvaNceD micROservices for supply chain manageMEnt Digital trAnsition - ANDROMEDA (Regione Toscana)</i>- <i>Supply CHain Evaluation with Model-based & data driven Approaches - SCHEMA (Regione Toscana)</i>- <i>Development of innovative devices and systems for energy management, conversion and storage (MIUR PRIN)</i>
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Department of Industrial Engineering - DIEF

The Department of Industrial Engineering (DIEF) is distinguished by research in an international context with participation in competitive projects (particularly EU) in different areas of engineering and in partnerships including high-level industrial and research realities. The vocation to support the industrial environment through technology transfer is also relevant, as demonstrated by DIEF's annual budget, which, despite its small size (only 60 staff faculty/researchers), counts about 8 M€ of revenue in 2021/2022, (45% from EU funding and more than 30% from industrial research contracts)

Research topics range from Industry 4.0, integrated with design sustainability, to standard industrial design processes, production and management. Particularly relevant are the research in the different fields of sustainable mobility, the development of renewable energy and hydrogen production and use, the development of methodologies and devices for marine or biomedical applications up to the study of innovative materials. Common to all the cited topics is the development of mathematical/numerical engineering models for the simulation of machines and engineering systems.

DIEF is highly committed to multidisciplinary activities, with the engineering area being supported by the mathematics, addressed to the study of numerical tools for simulation and of data-driven models, and by chemistry, for the research on innovative materials and their treatments.

One of DIEF's greatest strengths, is the large number of research and technology transfer projects that have involved its staff. With reference to the last 10 years, DIEF has coordinated or was a partner in:

- *Over 50 EU Projects (Horizon Europe, H2020, FP7, Life and others);*
- *More than 15 National Projects (PRIN, FIRB, MISE, MUR);*
- *Over 45 Regional Projects (POR-FESR and others);*

In addition, over the past 5 years, there have been about 100 research agreements with leading Italian and European companies such as Enel Energia, GE Aviation, Avio Aero, Ferrari, Yanmar, Toyota, INAIL, Magneti Marelli, FCA, Baker Hughes, Ducati, Hitachi Rail, Ansaldo Energia, Meyer Children's Hospital, ADLER PEZLER, McPhy, Piaggio, SOL.

ERC Main relevant Panels:

- **PE1 Mathematics**
All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics
 - PE1_17 Numerical analysis
 - PE1_18 Scientific computing and data processing
 - PE1_21 Application of mathematics in industry

- **PE8 Products and Processes Engineering**
Product and process design, chemical, civil, environmental, mechanical, vehicle engineering, energy processes and relevant computational methods
 - PE8_5 Fluid mechanics, hydraulic-, turbo-, and piston engines
 - PE8_7 Mechanical and manufacturing engineering
 - PE8_8 Materials engineering
 - PE8_1 Aerospace Engineering
 - PE8_9 Process Engineering
 - PE8_10 industrial design

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Key Research Activities

Eco-sustainable design and management and circular economy.

Circular Economy in typical Made in Italy production sectors ; Ecodesign and Life Cycle Assessment; Eco-sustainable treatments for pharmaceuticals, textiles and fashion; Optimization and efficiency methods for industrial and hospital processes; Lean Manufacturing.

Product and process design and optimization.

Methods and tools for product and process optimization and control; Product certification, real-time diagnostics and blockchain; Systematic design methods and design for Additive Manufacturing (A.M.)/usability/assembly/disassembly/recycling; Predictive models for smart and sustainable design and manufacturing. Robotics

Manufacturing and demanufacturing using robotic systems; Social robotics for rehabilitation and surgery; Robotics for marine monitoring and intervention.

- *Microstructural evolution of the WAAM process*
- *The use of WAAM technology for cladding and repair of ferrous and non-ferrous alloys*
- *Study of deposition strategies and arc oscillation to improve the microstructure and deposition accuracy*
- *Modeling and optimization of machining processes (turning, milling)*
- *Smart devices for monitoring and control of machining operations*
- *Sustainability assessment and optimization of machining processes*
- *Advanced manufacturing approaches for aerospace components*

Enabling Technologies Industry 4.0

Optimization of production lines using Industry 4.0; Innovative A.M. technologies; Digital Twin, Augmented Reality and process and product simulations; Information generation, storage and synthesis of data obtained from primary sources.

Safety and improvement of the environment, workplaces and mobility.

Noise mitigation including through active control methods; Human-machine interfaces for production, safety and worker involvement; Traffic accident reconstruction and analysis; Development of personal protective and safety devices for two-wheeled vehicles.

Innovative Materials

Innovative materials of natural origin; Supramolecular and nanostructured systems for the analysis of pollutants; Design of materials for catalytic applications; Sensors for the determination of chemical and microbiological contamination; Innovative materials for the textile, fashion, and agri-food sectors.

- *Solid state research focused on structural/electronic/morphological/ thermal properties aiming at understanding connections between structure and physicochemical properties (including stability) in materials (often organics). A joint experimental and in silico approach is used for their characterization, analysis, and study including crystallography, thermoanalytical and thermomicroscopic techniques.*
- *Development and characterization of nanostructured magnetic materials and oxides.*
- *Development of magnets without Rare Earth elements*
- *Production of coatings with metals, alloys, and oxides by PVD technique, magneto-sputtering and their analysis.*
- *Engineering and characterization of materials for photovoltaic applications, e.g. organic and kesterite solar cells.*
- *Development and characterization of CISS-based materials and devices for spin- and optoelectronic applications.*
- *Development of thin films of molecular magnets and investigation of their chemical and physical properties for spintronics and quantum computing.*
- *Synthesis of new materials*
- *Materials for additive manufacturing technologies*
- *Materials for the green building sector and waste recycling*
- *Coatings and surface modification*
- *Surface engineering*
- *Chemical, physical, and mechanical surface characterization*
- *Corrosion and wear resistance characterization*

Healthcare Engineering

Technologies, methods, and devices for personalized medicine; Wearable/implantable systems; Development of technologies based on Reverse Engineering and A.M. for personalized medicine; Virtual, Augmented and Mixed reality in biomedical field.

- *Development of a bio-cooperative platform for post-stroke and neurocognitive rehabilitation and assessment*
- *Social robot for physical coaching in pre-habilitation and rehabilitation tasks.*
- *Development of integrated platform as a decision support for diagnosis and treatment of patients with neurocognitive Diseases.*
- *Development of advanced and modular sensors system for the measuring of physiological and movement parameters*
- *Study of bio-markers for assessing and monitoring the progression of neurodegenerative diseases.*
- *Test and validation of integrated solutions for promoting active ageing in private home and residential facilities.*

Turbomachinery

Methods, numerical tools and experimental investigations to support turbomachinery design and innovation in terms of aerodynamics, aeromechanics, heat transfer and cooling. Applications are gas turbines for power generation, aeroengines, steam turbines, compressors, fans and pumps.

- *Compression technologies, including design, optimization and testing of centrifugal compressors and reciprocating compressors for industrial gases and hydrogen*
- *Numerical and experimental investigation of aerothermal behaviour (heat transfer, cooling, losses) of turbomachinery main flowpath and secondary systems*
- *Aerodynamics of turbomachinery for industrial and propulsion applications. CFD analysis of turbomachinery (e.g.: gas turbines, steam turbines, centrifugal compressors, pumps, turbo expanders, propellers). Design and optimization of turbomachinery components based on artificial intelligence. Machine-learning techniques applied to turbulence/transition modeling for RANS/URANS methods. High Fidelity CFD simulations.*
- *Aeromechanics of turbomachinery components, forced response, and flutter.*
- *Aeroacoustics of turbomachinery components, acoustic liners.*

Innovative combustion technologies and alternative fuels

Numerical models and experimental methods for the investigation and design support of innovative combustion technologies for propulsion and power

generation with particular focus on the use of alternative carbon-neutral fuels such as hydrogen and hydrogen carriers.

- High-fidelity CFD modelling (LES) of turbulent combustion processes in gas turbine and aeroengines to support low-emissions design and fuel flexibility
- High temperature, intermediate pressure testing capability with liquid fuels, natural gas and hydrogen

Energy systems for a sustainable transition

Renewable energy: solar, gasification from biomass, geothermal, wind; Technologies for non-programmable renewable sources including collaborative; Smart Grids/Smart Energy systems; Technologies for energy storage and production of green Hydrogen. Innovative cycle configurations with high efficiency gas turbines

- Wind energy, including turbine aero-servo-elastic design, multi-fidelity simulation methods, floating wind, and wind energy power management.
- Modelling of smart energy systems including renewable and storage systems. Development of smart-user, smart-grid control algorithms
- Sustainable HVAC Systems
- Refrigeration with natural fluids

Sustainable Mobility.

Technologies for mobility with electric and hybrid engines; Energy storage efficiency (batteries/supercapacitors) and charging systems; Development of management strategies, converters and innovative powertrains in electric and hybrid vehicles.

- Innovative propulsion systems for aviation/aerospace (details here) and road vehicles, including hybridization, electrification, innovative combustion technologies and fuels.

Development of predictive mathematical models and data analysis.

Numerical continuous optimization. Development of prediction models via machine learning and of neural networks, stochastic optimization methods for training the networks, missing data imputation and completion of data in matrices.

Key Research Facilities, Infrastructure and Equipment

- DIEF is equipped with three HPC scientific computing-oriented data centers with potential for 2500 equivalent cores with the main softwares for technology and engineering applications
- Centrifugal compressor test rig, able to test industrial-scale impellers up to a peripheral Mach number of 0.7
- Three reciprocating engine test cells (1 dynamic, 2 eddy-currents), including the possibility of hydrogen feeding and innovative measurement systems
- 5 axis milling center DMG Mori DMU 75, 5 axis milling center Mori Seiki NMV 1500DGC, NC Lathe DMG CTX450
- Vibration sensors and signal conditioners for modal analysis
- NI PXI real time control module
- CMT sources by Fronius (TPS320i and TPS320 robotctta)
- Kistler force measurement devices
- Termocouples and thermocamera (optris 640i)
- CMM euro APEX from Mitutoyox
- THT lab (Calenzano site)
 - o Air flow delivery systems: Compressed air network 1kg/s @10bar, Large blower 2.5kg/s, 600 kW air preheating up to 450°C
- Fuel skids: Liquid fuels like JET-A or equivalent stored in 3 x 500 liters tanks and pumped up to 40bar, Natural gas by dedicated compression system, Hydrogen electrolyzer
- Non reactive warm test cell: 3 different air lines with dedicated valves and orifices
- Reactive test cell: Maximum exhaust temperature 2000°C, T=450°C, P=10 bara, Exhaust emissions, optical flame detection
- Rotating rigs - GearBox test section: Experimental measure of losses due by shaft and gear rotation in an air oil mixture environment, high speed up to 18000 rpm multi purpose test section, 4000 rpm 1 stage stator rotor disk cavity rig, Large rotating rig for scaled up internal cooling system 150rpm
- Measurements techniques: Transient technique with narrow band TLC or Temperature Sensitive Paint, TLC, TSP and InfraRed camera for detailed 2D maps with time resolved resolution, Pressure Sensitive Paint technique (heat and mass transfer analogy), 2D PIV (steady and time resolved), Turbulence with 2 wire probes, High Speed camera 200kHz, DANTEC Phantom, Endoscopic PIV with camera, and laser

boroscopes, High temperature water cooled boroscope for reactive test rig, OH chemiluminescence*

Advanced materials testing

- *Platform for morphological and analytic characterization of surfaces such as scanning probe microscopies (AFM and STM operating in air or UHV down to 30 K), X-ray photoelectron spectroscopy (XPS), Ultraviolet photoelectron spectroscopy (UPS), Low energy ion scattering (LEIS).*
- *Several instruments for the magnetic characterization of hard and soft magnetic materials (SQUID, VSM, DC susceptometer, magnetometers, AC susceptometers, Cantilever, MOKE, MCD) operating between -12 T and +12 T and between 0,3 – 450 K and different frequencies.*
- *Electronic Paramagnetic Spectrometers (EPR) operating at X, Q, and W band frequencies, between 2 and 300 K.*
- *Possibility to use the above-described techniques under irradiation of light of different wavelengths (laser/diodes/lamps).*
- *Differential scanning calorimeter DSC-1 (Mettler Toledo)*
- *Single Crystal X-ray diffractometer D8 venture (Bruker) (CRIST, UNIFI), Single Crystal X-ray diffractometer XcaliburPX Ultra (Oxford Diffraction) (CRIST, UNIFI), Single Crystal X-ray diffractometer Xcalibur3 (Oxford Diffraction) (CRIST, UNIFI)*
- *Powder X-ray diffractometer D8 "Da Vinci" (Bruker) (CRIST, UNIFI), - Powder X-ray diffractometer D8 Advance (Bruker) equipped with a hot chamber (T max = 1600°C) (CRIST, UNIFI), X-ray fluorescence spectrometer X ZSX Primus II (Rigaku) (CRIST, UNIFI), X-ray fluorescence spectrometer EDX 7000 (Shimadzu) (CRIST, UNIFI)*
- *Hot-stage microscopy LTS420 (Linkam) (CRIST, UNIFI)*
- *X-ray micro-CT Skyscan 1172 (Skyscan) (CRIST, UNIFI)*
- *Laboratory-scale plasma treatment equipments*
- *RF sputtering and EB-PVD thin film deposition equipments*
- *Metallography laboratory, Light and Scanning Electron Microscopy, Electrochemical corrosion evaluation equipments, x Pin on disk and block on disk tribometers*
- *Pin on disk and block on disk tribometers*

Bioengineering

- *Custom social robot platforms (ASTRO, CloudIA)*
- *Humanoid robots (Pepper, Nao)*
- *Telepresence robot (Ohmni)*
- *Robot arm (Panda, UR5)*

- Wearable sensors for measuring physiological parameters such as ECG, EMG, EEG, and GSR (BioHarness, Shimmer, Mindwave), and motion parameters (XSens, SensHand, SensFoot, Tap), including level of activity and sleep parameters (FitBit, Oura ring)
- Virtual Reality sensors (Oculus)
- 3D Printers for custom prints with plastic and polymeric (including biocompatible) material

Moving Lab

- Universal testing machine
- Test bench for electric motors
- Non destructive ultrasonic testing equipments
- Pulsed and continuous wave Laser
- Climate chamber
- Driving simulator
- Software and environmental datasets (GaBi, SimaPro)
- Simulation software (Altair Hyperworks, Ls-Dyna, Siemens AMESim, Siemens Prescan, Siemens Madymo, Matlab)

Infrastructure

- test vehicles
- data acquisition systems and sensors
- drop tower
- motorcycle simulator
- test rig for battery cells
- computing cluster
-

Previous Involvement in National and European Research Funding Programmes

- FIRST (2011-2014) Fuel Injector Research for Sustainable Transport, EU FP7 project
- IMPACT-AE (2011-2016) Intelligent design Methodologies for low Pollutant Combustors for Aero-Engine, EU FP7 project
- FACTOR (2010-2017) Full Aero-thermal Combustor-Turbine interaction Research, EU FP7 project
- LEMCOTEC (2011-2017) Low Emissions Core-Engine Technologies, EU FP7 Project
- MAESTRO Experimental and numerical investigation to support reverse flow combustor, EU H2020 CleanSky 2 project
- SOPRANO (2016-2020) Investigations on Soot and Radiation in aeroengines, EU H2020 project
- START (2018-2021), Numerical and experimental investigations on an innovative additive manufactured combustor, EU H2020 CleanSky2, Coordinator

- CHAIRLIFT (2019-2022), Compact helical arranged combustors with lean lifted flames, EU H2020 CleanSky2, Coordinator
- ACCENTO (2019-2022), Experimental investigations of Active Clearance Control systems for aeroengines, EU H2020 CleanSky2 project
- INSPIRE (2021-2024) Inspiring Pressure Gain Combustion Integration, Research and Education, EU H2020 MSCA-ETN, Coordinator
- TRANSITION (2022-2026) Future hydrogen assisted gas turbine for carbon capture process, EU Horizon, Coordinator
- HESTIA (2022-2026) Hydrogen combustion in aeroplanes, EU Horizon
- HYDEA (2023-2027) Hydrogen combustion engine demonstrator, EU Horizon CleanAviation
- NEUMANN (2022-2026) Innovative aeroengine technologies, EU EDF
- FLOATECH - "Optimization of floating wind turbines using innovative control techniques and fully coupled open source engineering tool" H2020-LC-SC3-2018-2019-2020
- Italian Research Center on High Performance Computing, Big Data and Quantum Computing – CN1 - Spoke 6 - "Multiscale modeling & Engineering applications", 2022-2025
- Italian Sustainable Mobility Center CN4 - Spoke 12 "Innovative Propulsion", 2022-2025.
- LEXIS (Large-scale EXecution for Industry & Society) H2020, GA 825532, 2019-2021.
- ARIAS (Advanced Research Into Aeromechanical Solutions) H2020, GA 769346, 2018-2022.
- TURBO-REFLEX (TURBOMachinery RETrofits enabling FLEXible back-up capacity for the transition of the European energy system) H2020, GA 764545, 2017-2020.
- FLEXTURBINE (Flexible Fossil Power Plants for the Future Energy Market through new and advanced Turbine Technologies) H2020, GA 653941, 2016-2019.
- ENOVAL (Engine Module Validators), FP7, GA 604999, 2013-2018.
- RECORD (Research on Core Noise Reduction), FP7, GA 312444, 2013-2015.
- EU H2020 project Pilots for Healthy and Active Aging (Pharaon) Project (2019 – 2024)
- EU H2020 Project Metrological evaluation and testing of robots in international competitions (Metrics) Project (2019 -2023)
- POS Salute traiettoria 1 Ecosistema urbano per l'invecchiamento attivo e in Salute (ERMES) (2023 - 2026)
- POS Salute traiettoria 2 SmartCare (2023 - 2026)

- *RTD UNIFI An adapted behavioral robot model with advanced cognitive/physical interaction capabilities for assessment and rehabilitation of neurodegenerative diseases (DESTINI) (2023 - 2024)*
- *MIUR PNRR Fit for Medical Robot (Fit4MedRob) (2023 - 2026)*
- *MIUR PNRR AGE-IT (2023 - 2025)*
- *MIUR PNRR Tuscany Health Ecosystem (THE) (2022 - 2025)*
- *PE11 MICS*
- *RETROFIX, EC call MANUNET III.*
- *FACTS4WORKERS (H2020, FACTories for WORKERS - www.facts4workers.eu).*
- *INTEFIX (FP7, INTEligent FIXture - www.intefix.eu).*
- *UNPLUGGED (FP7, www.unplugged-project.eu).*
- *Several successful applications to beamtimes at synchrotron facilities (2016-2023).*
- *Individual research grant Marie Curie Global "MAGnetic sensitive photo-chemical REactions at Surfaces" (2018-2019).*
- *Fault-tolerant molecular spin quantum processor, H2020-FET program, (2020 -2023). Role: Participant.*
- *Refurbishing di un sistema da sputtering e di annesso sorgenti per la deposizione di film spessi su substrati di geometria non convenzionale. (2017-2018). Role: Co-PI.*
- *Short-term scientific mission (STSM) fellowship for participation in synchrotron experiments, European Cooperation in Science&Technology (COST), Synchrotron Soleil, Gif-Sur-Yvette, France (2018).*
- *Accordo di programma 2015-2017 MISE-ENEA per la ricerca del sistema elettrico. Sotto-progetto: Individuazione delle proprietà magnetiche e design dei materiali per applicazioni catalitiche ad elevata efficienza.*
- *Ministry of Ecological Transition: project Rlculo SOstenibile di magneti di terre rare da Raee per Sistemi elettromagnetici ad Alta efficienza" – RISORSA. (2022-2023)*
- *ENEA: Sviluppo e caratterizzazione di nanocompositi magnetici ibridi per la separazione di miscele gassose. (2020-2022)*
- *PRIN PNRR 2022: Development of an ADvanced fully REcyclable thermoplastic composite material reinforced by UHMWPE fibers, for the decarbonisation in Automotive, Nautical and construction fields, in the frame of Circular Economy (ADREANCE).*
- *PRIN PNRR 2022: Dense Eutectic Ceramic Oxide By Additive Manufacturing: sustainable-by-design materials and technologies (ECOBAM)*
- *bando PRIN 2022: Molecular assisted atom vacancies arrangement to modulate magnetism in 2D transition metal dichalcogenides (MAVAM)*

- *Bando MISE: Recupero e riutilizzo di scarti dell'estrazione e lavorazione del marmo nell'ottica di una Economia circolare a Rifiuti zero (ROSEMARIE). (sviluppo di processi e di prodotti ceramici per il recupero dello scarto del marmo).*
- *LIFE- 2021-SAP-ENV, progetto LIFE2M - Long LIFE to Micromobility, 2022 (<https://www.life2m.eu/project/>).*
- *H2020-LC-GV-2020, progetto LEONARDO - Vehicle for micro&Nano interface mobility, 2021 (<https://leonardoproject.eu/>).*
- *I3-2021-INV2a, progetto IN-MOB - Innovative Products For Sustainable Micromobility - 2023..*
- *POR FESR 2014- 2020 progetto MAGNUM - Macchinario per l'ispezione Automatizzata di assili ferroviari basata sulla Generazione Non Convenzionale di Ultrasuoni tramite Metodologie laser, 2022.*
- *POR FESR 2014 - 2020 - Regione Toscana, Progetto AQUA - "Assemblaggio Quadri Automatizzato, 2017 .*
- *Progetto H2020 MG-2014 SENIORS - Safety Enhanced Innovations for Older Road users, 2016;*
- *progetto ROBOBUILD, finanziato dalla Regione Toscana e dalla Romania (Executive Unit for Financing Higher Education R&D and Innovation), "Progettazione di un nuovo sistema articolato ", 2013. Finanziamento ricevuto € 27.000,00.*
- *progetto PNRR-CN4 MOST- Centro Nazionale per la Mobilità - Spoke 5 – Light vehicle and active mobility, 2023*
- *progetto PNRR-CN4 MOST- Centro Nazionale per la Mobilità - Spoke 9 – Urban mobility, 2023*
- *H2020-2014 TRANSPORT: Range of Electric SOLUTIONS for L-category Vehicles: RESOLVE*
- *H2020-2016 TRANSPORT: Optimization of scalable realtime models and functional testing for e-drive Concepts: OBELICS*
- *"PIONEERS - Protective Innovations of new Equipment for Enhanced Rider Safety" (H2020-MG-2017)*
- *"ENLIGHT - Innovative advanced lightweight materials for the next generation of environmentally-friendly electric vehicles" (FP7 - GC.NMP2012-2*
- *"PV MOREDE - PhotoVoltaic panels MOBILE Recycling DEvice" (CIP-EIP-Ecoinnovation-2012)*
- *"NEODYMIUM-IRON-BORON base materials, fabrication techniques and recycling solutions to HIGHLY REDUCE the consumption of Rare Earths in Permanent Magnets for Wind Energy Application - NEOHIRE" (H2020-NMBP-2016-two-stage)*
- *"ALLIANCE-Affordable Lightweight Automobiles ALLIANCE" (H2020-NMBP-GV-2016)*
- *"MeBeSafe – Measures for Behaving Safely in Traffic" (call: H2020-MG-2016-2017; topic: MG-3.5-2016)*

- *"SAFE-UP – proactive SAFETy systems and tools for a constantly UPgrading road environment" (call: H2020-MG-2018-2019-2020,topic: MG-2-7-2019)*
- *"TRANS-SAFE – Transforming Road Safety in Africa" (HORIZON-CL5-2021-D6-01-11)*
- *"XL-Connect - Large scale system approach for advanced charging solutions" (HORIZON-CL5-2021-D5-01-03)*
- *"ACCCELLBAT - Accelerated cell and battery testing" (Call: HORIZON-CL5-2022-D2-01-07)*

Department of Literature and Philosophy - DILEF

The Department of Literature and Philosophy hosts and coordinates a number of disciplines, including philology, philosophy, classical languages and cultures, linguistics, Italian literature, French, Spanish and Portuguese literature. Though they involve distinct research domains and orientations, they are all connected by a common tradition of studies at the University of Florence. This has proven its fecundity for scientific research as well as for cultural transmission more generally and for higher education and teaching. The Department carries out its humanistic research activities on a national and international level, also in relation to the image and centrality, both historical and symbolic, of Florence as the propulsive centre of humanistic culture in its crucial hubs.

ERC Main relevant Panels:

- **SH4 The Human Mind and Its Complexity**
Cognitive science, psychology, linguistics, theoretical philosophy
 - SH4_8 Language learning and processing (first and second languages)
 - SH4_9 Theoretical linguistics; computational linguistics
 - SH4_10 Language typology; historical linguistics
 - SH4_11 Pragmatics, sociolinguistics, linguistic anthropology, discourse analysis
 - SH4_12 Philosophy of mind, philosophy of language
 - SH4_13 Philosophy of science, epistemology, logic

- **SH5 Cultures and Cultural Production**
Literary studies, cultural studies, study of the arts, philosophy
 - SH5_1 Classics, ancient literature and art
 - SH5_2 Theory and history of literature, comparative literature
 - SH5_3 Philology; text and image studies
 - SH5_9 Metaphysics, philosophical anthropology; aesthetics
 - SH5_10 Ethics and its applications; social philosophy
 - SH5_11 History of philosophy

Key Research Activities

Research Fields

- Epigraphy
- Classical, Italian, Romance, Medieval and humanistic philology
- Ancient Christian Literature
- Greek and Latin Languages and Literatures
- Papyrology
- Greek and Roman History
- Historical Geography of the Ancient World
- The general Theory of textual Criticism
- Italian literature (historiography, interpretation and critical theory, archival research)
- Romance languages and literatures
- French, Spanish, Portuguese Literatures from the 16th century to the contemporary
- Italian linguistics
- Glottology
- Glottodidactics
- Aesthetics
- Philosophy of science
- Moral philosophy and bioethics
- Political philosophy, theoretical philosophy and epistemology
- Logic and philosophy of logic
- The history of philosophy

Research Units

- [FESVEM](#) - Foundations and Ethics of Life Science and Science of Mind
- [GEIST](#) - Genealogy, hermeneutics, historical investigation of the texts
- LABLITA (building, studying and processing of Italian and multilanguage linguistic resources, with particular regard to spoken corpora and lexical databases)
- Literature, medicine and science

- SH5_12 Computational modelling and digitisation in the cultural sphere
- SH6 The Study of the Human Past Archaeology and history
 - SH6_6 Ancient history
 - SH6_15 History of science, medicine and technologies

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- Log-Lab (logic and computational thinking, as mainly referred to the structure of language, computation and communication)
- Per Dante (Dante's oeuvre from a linguistic, philological and interpretative point of view)
- [PTS](#) - Aesthetic practices, anthropological transformations, contemporary scenarios (aesthetics, philosophical anthropology, genealogy of concepts)
- Qua-Onto-Tech - Qualitative Ontology and Technology (philosophy of mind, philosophy of language, phenomenology, hermeneutics, philosophy of medicine, bioethics, philosophy of psychology and cognitive sciences)
- Texts and Forms of Transmission (interaction between history of the manuscript tradition, textual criticism, paleography, papyrology and codicology)
- UniPare (Italian paremiological heritage considered diatopically, so with a particular focus on dialectal and regional heritage)

Key Research Facilities, Infrastructure and Equipment

Papyrological Institute "Girolamo Vitelli"

The Papyrological Institute ([website](#)) draws its origins from the "Italian Society for the Search of Greek and Latin Papyri in Egypt". It organizes excavations on the site of the ancient Antinoopolis and owns one of the biggest collections of papyri, mostly written in Greek, but also in Latin, in the Egyptian language (hieroglyphic, hieratic, demotic, coptic), in Arabic, including also one rare example in Syriac.

Center for Historical and Theoretical Linguistics: Italian, European Languages, Oriental Languages (CLIEO)

CLIEO is based on the aggregation of various Florentine linguistics institutions into a single centre of research and advanced training: [Accademia della Crusca](#), Opera del Vocabolario Italiano ([OVI](#), CNR Institute) and Institute of Theory and Techniques of Legal Information ([ITTIG](#), CNR Institute).

"Aldo Palazzeschi" Study Centre

Created to preserve and enhance the archival materials left by Aldo Palazzeschi to the University of Florence in his will, to promote knowledge of his work in Italy and abroad and encourage research and critical reflection on Italian literature.

Digital Humanities Laboratory

The DILEF's Digital Humanities Laboratory, namely information technology applied to the study of the humanities, is a center of expertise and services that will enhance research in all the scientific areas of DILEF having common ground in the study and computation/elaboration of texts.

Previous Involvement in National and European Research Funding Programmes

- *ERC Advanced Grant 2017
Multilingual Poetry and Polyphonic Song in the Late Middle Ages (ArsNova)
Principal Investigator: Maria Sofia Lannutti
01/01/2019 – 31/12/ 2024*
- *PRIN 2017
Regenerating the OVI Corpus: Renewal and Optimization of Methods, Contents and Tools
Principal Investigator: Lino Leonardi
20/01/2020 - 20/01/2023
Responsabile Unità UNIFI: Maria Sofia Lannutti*
- *PRIN 2017
Greek and Latin Literary Papyri from Graeco-Roman and Late Antique Fayum (4th BC – 7th AD): Texts, Contexts, Readers
Principal Investigator: Lucio Del Corso
20/01/2020 - 20/01/2023
Responsabile Unità UNIFI: Francesca Maltomini*
- *PRIN 2017
Languages and Cultures of Ancient Italy. Historical Linguistics and Digital Models
Principal Investigator: Anna Marinetti
20/01/2020 - 20/01/2023
Responsabile Unità UNIFI: Francesca Murano*
- *PRIN 2017
IMPAQTS: Implicit Manipulation in Politics - Quantitatively Assessing the Tendentiousness of Speec
29/12/2019 - 29/12/2022
Principal Investigator Edoardo Lombardi Vallauri
Responsabile Unità UNIFI: Alessandro Panunzi*
- *PRIN 2017
Models of language variation and change: new evidence from language contact
29/12/2019 - 29/12/2022
Principal Investigator: Maria Rita Manzini*
- *PRIN 2017
The Manifest Image and The Scientific Image
29/12/2019 - 29/12/2022
Principal Investigator: Elena Castellani*

Department of History, Archaeology, Geography, Fine and Performing Arts - SAGAS

The SAGAS Department was established in 2013 by uniting most of the disciplines in the fields of history, geography, archaeology, history of fine and performing arts, previously active in various departments, and currently consists of 77 professors and researchers. The department's research and teaching interests extend from prehistory, classical and Near Eastern archaeology, physical and social geography, medieval, modern, and contemporary history, and the history of fine and performing arts from the medieval age to the contemporary world. The disciplines cultivated in the department are linked to the tradition of humanistic studies of the University of Florence and the former Institute of Advanced Studies, seeking an extension that corresponds to the new directions of research, with particular reference to the field of digital humanities, global history studies, environmental history, and public history. In the Department, various research units have been set up, which coordinate the activities of scholars in specific fields. In recent years, particular attention has been paid to public engagement activities. There are numerous research activities in collaboration with public and private institutions, in Italy and abroad. The Department has been qualified as a Department of Excellence for 2018-2022 and 2023-2027.

ERC Main relevant Panels:

- SH6 The Study of the Human Past
Archaeology and history
 - SH6_1 Historiography, theory and methods in history, including the analysis of digital data
 - SH6_2 Classical archaeology, history of archaeology, social archaeology
 - SH6_3 General archaeology, archaeometry, landscape archaeology
 - SH6_4 Prehistory, palaeoanthropology, palaeodemography, protohistory, bioarchaeology
 - SH6_5 Palaeography and codicology
 - SH6_6 Ancient history
 - SH6_7 Medieval history
 - SH6_8 Early modern history
 - SH6_9 Modern and contemporary history
 - SH6_10 Colonial and post-colonial history
 - SH6_11 Global history, transnational history, comparative history, entangled histories
 - SH6_12 Social and economic history

Key Research Activities

- Archaeological investigation from prehistory to the classical world, the Near East, and the Middle Ages;
- Political, economic, social, religious, cultural history from ancient times to the contemporary world;
- Physical and social geography.
- History of fine and performing arts;
- Library science, archiving and palaeography;
- Cultural anthropology.

Key Research Facilities, Infrastructure and Equipment

In 2018 the Interdisciplinary Laboratory on Cultural Heritage (LiEC) was established (with its own regulations and a steering committee); a unit staff recruited in 2019 on the Excellence Plan was destined to its technical coordination. The LiEC has well-equipped spaces for research activities and doctoral studies including photo laboratory, photo archive, media library, computer equipment, 3D laser scanner, three total stations, planetary scanner, drone for low-altitude filming. The Project of Excellence 2023-2027 will reinforce already established lines of development of the Laboratory

Previous Involvement in National and European Research Funding Programmes

- Horizon 2020 programme: 2 ERCs (2019: as partner; 2020: as PI); COST Action (2018); 2 Individual Fellowships Marie Skłodowska-Curie

<ul style="list-style-type: none"> - SH6_13 Gender history, cultural history, history of collective identities and memories, history of religions - SH6_14 History of ideas, intellectual history, history of economic thought - SH6_15 History of science, medicine and technologies <p>- SH5 Cultures and Cultural Production Literary studies, cultural studies, study of the arts, philosophy</p> <ul style="list-style-type: none"> - SH5_4 Visual and performing arts, film, design and architecture - SH5_5 Music and musicology; history of music - SH5_6 History of art and architecture, arts-based research - SH5_7 Museums, exhibitions, conservation and restoration - SH5_8 Cultural studies, cultural identities and memories, cultural heritage <p>- SH7 Human Mobility, Environment, and Space Human geography, demography, health, sustainability science, territorial planning, spatial analysis</p> <ul style="list-style-type: none"> - SH7_1 Human, economic and social geography - SH7_7 Cities; urban, regional and rural studies - SH7_10 GIS, spatial analysis; big data in geographical studies <p>Contact Details:</p> <p>Rolando MINUTI rolando.minuti@unifi.it</p> <p>Paolo LIVERANI paolo.liverani@unifi.it</p>	<p>Actions (2019 and 2020), JPICH Conservation and Protection Call (2020), participation in the Horizon 2020 Strengthening links Project (2020-23 ID 883490);</p> <ul style="list-style-type: none"> - one FARE project; - Unesco programme: Partnership on training activities - Afghanistan (2019); - programmes of the Italian Development Cooperation Agency (AICS): 3 projects (2019, 2020, 2021); - international cooperation projects financed by MAECI for the cataloguing (through georeferenced databases), management and valorisation of tangible and intangible cultural heritage functional design and spatial planning in the contexts of Mandalay (Myanmar), Herat and Bamiyan (Afghanistan); - MUR programs: 7 PRIN 2017; 5 PRIN 2020 (the largest number of PRINs funded in the Florentine University); FISR (2020); FIRE (2022); - Tuscany Region programs: 3 Regional Operational Programmes co-financed by the European Social Fund (2020); Regional Strategic Plan (2020); 2 projects on the “Bando Memoria” (2018, 2019) and 6 others on other regional funds (2020-21); - memorandums of understanding with 110 private and public bodies, research centers and institutions, universities, and private companies and financed by the Ministry of Foreign Affairs; 21 archaeological missions. - The Department acquired resources amounting to 9.2 million in the four-year period 2018-21.
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Department of Education, Languages, Interculture, Literatures and Psychology (FORLILPSI)

Department's general description The Department of Education, Languages, Interculture, Literatures and Psychology (identified with the acronym FORLILPSI) was established on 1 January 2019 with the aim of improving the overall efficiency of the departmental organization, resulting from the fusion of two humanistic departments: Education Science and Psychology (SCIFOPSI) and Languages, Literatures and Intercultural Studies (LILSI).

Approved by the respective Department Councils on June 6, 2018, the FORLILPSI cultural project accommodates and merges the scientific and educational experience of the two pre-existing departments. The Department of Education Science and Psychology (SCIFOPSI), established in January 2013 by Law number 240 of December 30, 2010 (with regard to the reorganization of the public university system in Italy), emerged as a new institutional reality, born of the merger between the Department of Education Science and Cultural and Educational Processes, and the Department of Psychology (italian version). The Department of Languages, Literature and Cross-cultural Studies (LILSI), also established in January 2013, was born as an evolution of the Department of Languages, Literature and Comparative Cultures (italian version), in turn a previous unification of the Department of Modern Philology and the Department of Romance Languages and Literature.

Thus, FORLILPSI is an interdisciplinary department that embraces research areas ranging from educational science and psychology to languages, philology and literature. The aim of the department is to conduct research and promote learning in the area of relationships between languages, cultures, minds, behaviors, and education through the investigation of texts and contexts and spatial and temporal dimensions.

Given its composition, as a result of the merger between Italian National University Council (CUN) Areas 10 (LILSI) and 11 (SCIFOPSI), the department also has a strong vocation towards internationalization in terms of research, didactics and the third mission, favoring activation, promotion and acquisition of "cultural agreements", development cooperation, international funding, and support of double degrees for students.

The four pillars of the new department:

Integrated Didactics: Attention to integration between theoretical, empirical and practical perspectives of education, teaching and learning of language and literature also as a research area on the theme of the teacher's role. Specific areas of focus concern profiles of 0-6 teachers and educators, preschool and elementary school teachers, teachers for students with special needs, and of teachers of disciplines with particular attention to didactic, linguistic and psychopedagogical disciplines in secondary schools.

Cross-culturality is intended as: a) A relational, construction dimension regarding the self, others, and gender from a social, historical, theoretical, and literary perspective, an interdisciplinary complex to interpret the phenomena of change that characterize our time; b) A design dimension for the creation of spaces where comparison and dialogue between different languages, literatures and cultures are possible, within a democratic and inclusive society attentive to giving value to the contributions of minorities.

Interdisciplinarity: Interdisciplinary collaboration among disciplines within the department and those of different scientific areas within the university, to foster in particular research relationships between pedagogical, psychological, linguistic, philological and literary sciences according to different theoretical, historical, methodological and operational approaches in a comparative key.

Promotion of well-being and education: This area of study and research transcends the boundaries of local context and adopts a global perspective to give value to existing differences. This approach enhances the understanding of connections between local and global realities, promotes the understanding of cultural, social-historical, psychological, pedagogical and linguistic factors that influence people's lives, orients professional declination, and develops skills and aptitudes aimed at change and collaboration.

ERC Main relevant Panels:

- *SH1 Individuals, Markets and Organisations*
Economics, finance, management
- *SH3 The Social World and Its Diversity;*
Sociology, social psychology, social anthropology, education sciences, communication studies
- *SH4 The Human Mind and Its Complexity*
Cognitive science, psychology, linguistics, theoretical philosophy
- *SH5 Cultures and Cultural Production*
Literary studies, cultural studies, study of the arts, philosophy

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Key Research Activities

The research activity of the department focuses on the area of relationships between languages, cultures, minds, behaviors, and training and education investigated in relation to texts and contexts and the spatial and temporal dimension, with a strong vocation towards internationalization.

In particular, the research activity promotes: interdisciplinary collaboration both among the disciplines present in the department and with those of different scientific areas of the university; interculturality; the integration of theoretical, empirical and practical perspectives related to training, teaching and language and literary learning also understood as an area of research regarding the role of teaching; the promotion of well-being and education in a global perspective and the promotion of differences as an area of study and research that transcends the boundaries of the local context.

Research Units

- *All Japan*
- *APSo Applicazioni in Psicologia Sociale (Applications in Social Psychology)*
- *ARCEU Immagini d'Europa attraverso archivi pubblici e privati (Images of Europe through public and private archives)*
- *CHER The Corpora and Historical English Research Group*
- *CISUECO Centro Interuniversitario di Studi ungheresi e sull'Europa centro-orientale (Inter-University Center for Hungarian and East Central European Studies)*
- *EuTradOR Culture, Testi e Tradizioni dell'Oriente cristiano in dialogo con l'Europa e l'Islam (Cultures, Texts and Traditions of the Christian East in Dialogue with Europe and Islam)*
- *Genere e educazione (Gender and education)*
- *Genitorialità, infanzia e intercultura (Parenting, childhood and interculturalism)*
- *I'm in Immagine di sé e inclusione sociale (Self-image and social inclusion)*
- *I-QUAL Inclusion and quality of educational processes*
- *L2L Second Language Learning in the lifespan*
- *LBC Lessico dei Beni Culturali (Cultural Heritage Lexicon)*
- *LeNEU Letteratura nazionale, europea, universale (National, European, universal literature)*

- *LILAH Lifelong Learning e Alta Formazione (Lifelong Learning and Higher Education)*
- *LMT Learning Media & Technology for Educational Research and Innovation in Education and Training*
- *PAS-PAS Psicologia a Scuola: Promuovere Apprendimento e Socializzazione (Psychology in School: Promoting Learning and Socialization)*
- *PSIA Pedagogia e Storia dell'infanzia e dell'adolescenza (Pedagogy and History of Childhood and Adolescence)*
- *PsicoBioSynergetics Engineering and Physic Synergetic approach to Psychology and Clinical Sciences*
- *PUSH-D Pedagogical approach for Sustainable development and Heritage valorization*
- *RESILIENT Dispersione scolastica Metodologie Narrative e Memorie Migranti e Learning Cities (School Dispersion Narrative Methodologies and Migrant Memories and Learning Cities)*
- *Romanticismo e dintorni (Romanticism and surroundings)*
- *SED-LS Sviluppo socio-emozionale nel ciclo di vita (Social-emotional development in the life cycle)*
- *SILC Sinoltalian Links and Connections*
- *SSEF Studi storici sull'educazione e sulla formazione (Historical studies on education and training)*
- *WOProHO Psicologia del Lavoro e delle Organizzazioni per organizzazioni sane (Work and Organizational Psychology for Healthy Organizations)*

Key Research Facilities, Infrastructure and Equipment

LabOA: Laboratorio Open Access

LabOA, in collaboration with editorial coordination of the Department of Education, Languages, Intercultures, Literatures and Psychology (FORLILPSI), promotes the open access to scientific literature movement, carries out research activities related to digital literacy, and offers guidance and training services principally within the context of 'curricular internships'.

In addition, it promotes experimentation in the field of scientific and cultural communication, carries out editing and layout of books and journals, and provides for the creation and management of scientific and scientific-didactic environments and sites.

The Open Access Project provides for systematic testing of new media, tools and environments of humanistic communication in digital format, and directs constant attention to the training of students and teachers.

LabOA collaborates with the department's Research Observatory.

VIRALab (Valutazione Interventi, Rilevazione e Analisi dati)

The Intervention Evaluation, Data Collection and Analysis laboratory of the Department of Education, Languages, Intercultures, Literatures and Psychology (FORLILPSI) was created to provide methodological support to teachers and PhD and undergraduate students with regard to research and data analysis.

The mission of the laboratory is to provide support to research activities of the department in phases of development and during studies as well as in the analysis and management of data, whether it's qualitative or quantitative.

The objectives of the laboratory are:

- To enable rapid updating with regard to the most innovative research methodologies presented in international literature and the most modern data analysis techniques.*
- To boost the quality of the department's scientific production through the use of the most innovative research methodologies and data analysis.*
- To increase the competitiveness of the department in national, European and international arenas, making VIRALab an added value as a center of excellence in scientific research in psychology, education and linguistics.*
- To make possible the creation of a departmental data repository in compliance with the privacy law and new European GDPR 2016/679, providing support to faculty and researchers regarding the best ways to store data collected in their research.*
- To provide technological support relative to software used to conduct research and analyze data.*
- To foster the transfer of skills and knowledge about covered topics by organizing courses and workshops at various levels based on previous experiences in order to make the activities offered by the laboratory accessible to the greatest number of people possible*

Joint Laboratories

- FAI-RICERCA "ENZO CATARSI" Famiglia, Adolescenza e Infanzia (Joint Laboratory of Family, Adolescence and Childhood)*
- LAB-E.R. Laboratory of Educational Research for Social Innovation and Cooperation*

- *MetaES Metodi e Tecniche di Analisi delle Esperienze di Malattia (Joint Laboratory of Analytical Methods and Techniques of Disease Experiences)*
- *Modelli educativi per la prevenzione del bullismo e del cyberbullismo (Educational models to prevent bullying and cyberbullying)*
- *Multisetting Community Action Research: from real to virtual*
- *SHRMxl "Strategic Human Resource Management for Innovation"*

International Research and Intervention Laboratories

- *Metodologie narrative e Memorie migranti (International laboratory of Narrative methodologies and Migrant memories)*
- *WOProCCareerT&HO Psicologia del Lavoro e delle Organizzazioni per l'orientamento professionale, il career counseling, il career development, i talenti e le organizzazioni in salute (International research and intervention laboratory in Psychology of Work and Organizations for professional orientation, career counseling, career development, aptitudes and healthy organizations)*
- *La.Psi.R.I3 Psicologia per la Ricerca sull'Imprenditorialità, Innovazione e Integrazione (Laboratory of Psychology for Research on Entrepreneurship, Innovation and Integration)*
- *CCrossPoPP&S Psicologia Positiva Cross-Culturale, Prevenzione e Sostenibilità (International laboratory for research and intervention on Positive Cross-Cultural, Prevention and Sustainability Psychology)*
- *Psicologia Scolastica (Laboratory of School Psychology)*
- *Psicologia Sociale (Social Psychology laboratory)*
- *Public History of Education Laboratorio di ricerca, formazione e didattica (Research, training and didactic laboratory)*
- *Education and Consumption research laboratory*
- *"SRI-Studi e Ricerche sull'Infanzia" (Study and research laboratory on Childhood)*
- *Studi Longitudinali in Psicologia dello Sviluppo (Longitudinal Studies in Psychology of Development laboratory)*
- *Tecnologie Educative (LTE) (Educational Technologies laboratory)*
- *Valutazione dei Processi di Sviluppo (Evaluation of Development Processes laboratory)*
- *VirtHuLab Virtual Human Dynamics Laboratory*
- *Winckelmann Laboratory*

Previous Involvement in National and European Research Funding Programmes

- Project Elisa Platform 2021/2023 (PI: MENESINI ERSILIA). Funded by MIUR 162.260,40 euros
- Inclusive and Creative Media Education (PI: RANIERI MARIA). Funded by European Commission – Common Research Centre (Creative Europe) 160.074,03 euros
- Teaching Places, Building Communities: A multidimensional model for the education to territory and its heritage through a cross-medial approach and immersive environment (PI: RANIERI MARIA) Funded by University of Florence 131.316,30 euros
- Empowering schools in self-regulation of Media and Information Literacy processes (PI: TARCHI CHRISTIAN) Funded by CALOUSTE GULBENKIAN FOUNDATION 119.837,97 euros
- Pedagogical Digital Competences as a key element for the digital transformation (PI: RANIERI MARIA). Funded by European Union - ERASMUS+ - Forward-Looking Projects 2022 110.250,00 euros
- SUSTAINING THE PROFESSIONAL DEVELOPMENT OF TEACHERS WITHIN SCHOOLS AS PROFESSIONAL LEARNING ENVIRONMENTSRESPOND (PI: CAPPERUCCI DAVIDE). Funded by European Union ERASMUS+ - Cooperation Partnerships 2021 108.508,00 euros
- REGENERATING THE CULTURAL LANDSCAPES OF INLAND AREAS IN A PEOPLE-CENTRED PERSPECTIVE. CASENTINO'S HISTORICAL VILLAGES AND RURAL TERRITORIES AS CREATIVITY AND INNOVATION LAB (PI: DEL GOBBO GIOVANNA). Funded by MUR 106.000,00 euros
- Ethnic Bullying - Understanding for Prevention (PI: PALLADINO BENEDETTA EMANUELA). Funded by University of Florence 87.940,00 euros
- *Gender narratives and other identities. Building inclusive communities* (PI: BRAVI LUCA). Funded by University of Florence 85.940,00 euros
- *Open Arms' Initiative With Children* (PI: MANCANELLO MARIA RITA). Funded by AIRONE 48 CON I BAMBINI 81.390,00 euros
- Effective Communication for Healthcare: Theory and Evidence (PI: TARCHI CHRISTIAN). Funded by University of Florence 80.922,05 euros
- *Meine Brücke führt in beide Richtungen: Alexander Langer's Writing as a cultural bridge between Germany, South Tyrol and Italy, towards wartime Yugoslavia* (PI: MELI MARCO). Funded by Istituto Italiano di Studi Germanici 78.000,00 euros
- Online Reflective Writing in higher Education and Lifelong Learning (PI: TARCHI CHRISTIAN). Funded by

	<p>European Union - ERASMUS+ - Cooperation Partnerships 2022) 77.000,00 euros</p> <ul style="list-style-type: none">– Supporting Self Regulated Learning in Digital and Remote Education (PI: RANIERI MARIA). Funded by European Union - ERASMUS+ - Cooperation Partnerships 2021), 66.133,00 euros– Navigating ambiguity when reading from multiple sources: The interplay between the reader and the text (PI: TARCHI CHRISTIAN). Funded by University of Florence, 64.589,00 euros
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