



DEPARTMENT OF EXPERIMENTAL AND CLINICAL MEDICINE

www.dmsc.unifi.it

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**
- **LS2 Integrative Biology: from Genes and Genomes to Systems**
- **LS4 Physiology in Health, Disease and Ageing**
- **LS7 Prevention, Diagnosis and Treatment of Human Diseases**
- **PE6 Computer Science and Informatics [PE6_11, PE6_13]**
- **SH6 The Study of the Human Past [SH6_14]**

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 up to €1,500,000. This effort has facilitated collaboration between researchers, and allowed strong research programs to be promoted by DMSC. The COMputational BlomediCINE 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.

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.

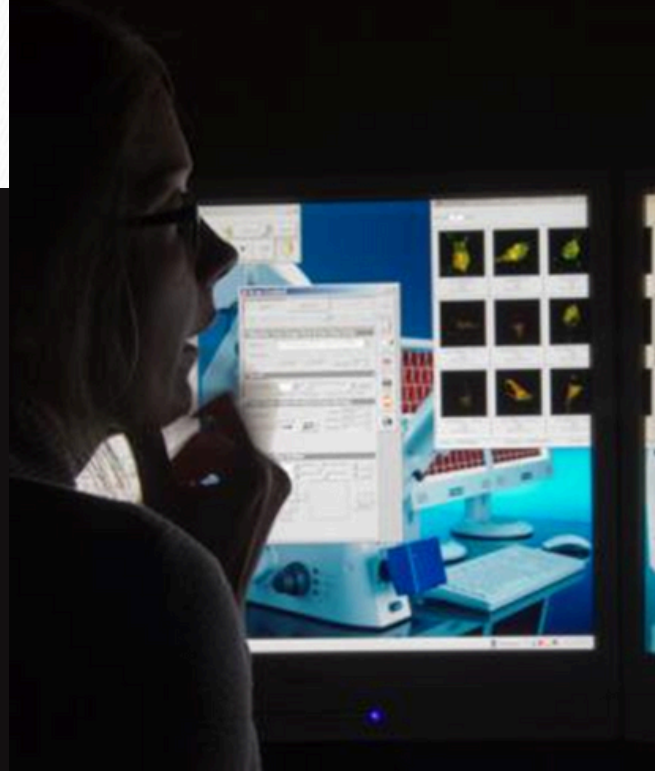
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DEPARTMENT OF NEUROSCIENCES, PSYCHOLOGY, DRUG RESEARCH AND CHILD HEALTH

www.neurofarba.unifi.it



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's high qualification with top Hindex 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".

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.

ERC MAIN RELEVANT PANELS

- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions**
- **LS3 Cell Biology, Development, Stem Cells and Regeneration**
- **LS5 Neuroscience and Disorders of the Nervous System**
- **LS9 Biotechnology and Biosystems Engineering**
- **PE5 Synthetic Chemistry and Materials [PE5_18]**

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 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

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

FUNDER: EUROPEAN COMMISSION

- **GenPercept** Spatio-temporal mechanisms of generative perception
- **REACH** Russian European Alliance for research among women, Children and adolescents impacted by HIV, TB and HCV
- **NeuroDeRisk** Neurotoxicity De-Risking in Preclinical Drug Discovery
- **MeaTlc** 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**
- **RHYTHM-INSIGHT** Unraveling hidden culprits for the cardiac arrhythmia burden: modulation of immunoinflammation and inter-cellular signaling as targets for novel therapeutic approaches
- **MISMatCH** 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**
- **Characterization of the pathophysiology of three lysosomal storage diseases (Pompe disease, Morquio disease and GM1 gangliosidosis) and identification of novel therapeutic targets**
- **Development of prediction models for seizure and cognitive outcome after epilepsy surgery in children and adults**
- **Clinical, imaging and serological biomarkers to distinguish inflammatory demyelinating diseases: multidimensional diagnostic algorithm and long-term management**
- **The CIPS-TER Study** Cognitive Impairment Post Stroke: a single-blinded randomized trial on the efficacy of TELeRehabilitation
- **How does the brain deal with stimuli of opposite emotional content? Understanding the role of hypothalamic histaminergic neurons and their interplay with the basolateral amygdala and the auditory cortex in processing appetitive and aversive stimuli**
- **STAT3-related inborn errors of immunity: unraveling disease mechanisms and potential targets**
- **Psoriasis and sleep: an integrated clinical and cognitive approach**
- **Targeting microglia CB2 Receptors with novel multisite ligands: a multidisciplinary and translational study for the identification of an innovative multiple sclerosis therapy**
- **miRNA 137 as a mediator of adolescent alcohol drinking and comorbid disorders caused by prenatal alcohol exposure**
- **Harnessing the potential of the THP: moving toward the development of a clinical-grade kit for a peptide-based PET imaging agent for real-time imaging and treatment of aberrant c-Met cancers for another giant step in cancer treatment**
- **Kv7 channels in pain: pathophysiological mechanisms, peripheral biomarkers, and treatment opportunities**
- **Multimomics and Machine Learning to predict response to drug therapies in pediatric Eosinophilic Esophagitis**
- **An integrated multimodal approach for an in vitro evaluation of the nutraceutical potential of botanical extracts (phytochemicals) from *Olea europaea* L. and *Punica granatum* fruit**
- **Targeting the protein kinase CK1delta as a strategy to enlarge the therapeutic toolbox against Amyotrophic Lateral Sclerosis (ALS)**
- **OPTO-19F-LUIDICS** Fluorinated hybrid photopolymers for the fabrication of robust diagnostic optofluidic devices
- **MuTaG4L** Multi-targeting G-quadruplex ligands as innovative chemotherapeutic agents to combat tumor drug resistance
- **RIGHTSTRESS** Tuning arousal for optimal perception
- **PROMETHEUS** 4D printing self-deploying bio-enabled polymer scaffolds for the non-invasive treatment of bleeding intestinal ulcers



PNRR PROJECTS

THE Tuscany Health Ecosystem 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

Age-It – Ageing well in an ageing society

Brain-it

National Center for Gene Therapy and Drugs based on RNA Technology

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DEPARTMENT OF EXPERIMENTAL AND CLINICAL BIOMEDICAL SCIENCES "MARIO SERIO"

www.sbosc.unifi.it



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 in 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.

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

ERC MAIN RELEVANT PANELS

- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions**
- **LS2 Integrative Biology: from Genes and Genomes to Systems**
- **LS3 Cell Biology, Development, Stem Cells and Regeneration**
- **LS4 Physiology in Health, Disease and Ageing**
- **LS7 Prevention, Diagnosis and Treatment of Human Diseases**
- **LS8 Environmental Biology, Ecology and Evolution**

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).

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

www.dss.unifi.it

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 focused on the recognition and valorization of scientific merit.

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 of 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 Genoa, 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. Moreover, we annoverate many other cooperation dealing in working progress with the



ERC MAIN RELEVANT PANELS

- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions** [LS1_13]
- **LS2 Integrative Biology: from Genes and Genomes to Systems** [LS2_14, LS2_15]
- **LS3 Cell Biology, Development, Stem Cells and Regeneration** [LS3_1]
- **LS4 Physiology in Health, Disease and Ageing** [LS4_12]
- **LS5 Neuroscience and Disorders of the Nervous System** [LS5_1, LS5_2, LS5_7, LS5_9, LS5_11, LS5_12]
- **LS6 Immunity, Infection and Immunotherapy** [LS6_4, LS6_10]
- **LS7 Prevention, Diagnosis and Treatment of Human Diseases** [LS7_2, LS7_7, LS7_9]
- **SH4 The Human Mind and Its Complexity** [SH4_3, SH4_4]

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, Institute of Pharmacological Research 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
- Autologous and heterologous 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. Prothesis and biomaterials.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

Exploitation of the NAD rescue pathway as a toxification route of relevance to cancer therapy, PI Prof. Alberto Chiarugi, A.I.R.C. Investigator Grant - IG 2017, € 397,000.

Epigenetic modelling/remodelling of cancer metastases and tumor immune contexture to improve efficacy of immunotherapy, PI Prof. Daniela Massi, A.I.R.C. Bando 5 per Mille 2018, € 2,284,610

Exploitation of the NAD rescue pathway as a toxification route of relevance to cancer therapy, PI Prof. Romina Nassini, A.I.R.C. Investigator Grant - IG 2020, € 640,000

SCOPE Schwann Cell Options for chronic Pain Eradication, PI Pierangelo Geppetti, ERC 2019-2024, € 2,185,921.00.

ETUDE Encompassing Training in fUnctional Disorders across Europe, PI Prof. Fiammetta Cosci, Horizon Europe € 261,499.68

MELCAYA Novel health care strategies for melanoma children, adolescents and young adults, PI Prof. Daniela Massi, Horizon Europe, € 669.340,00

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DEPARTMENT OF BIOLOGY

www.bio.unifi.it

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.

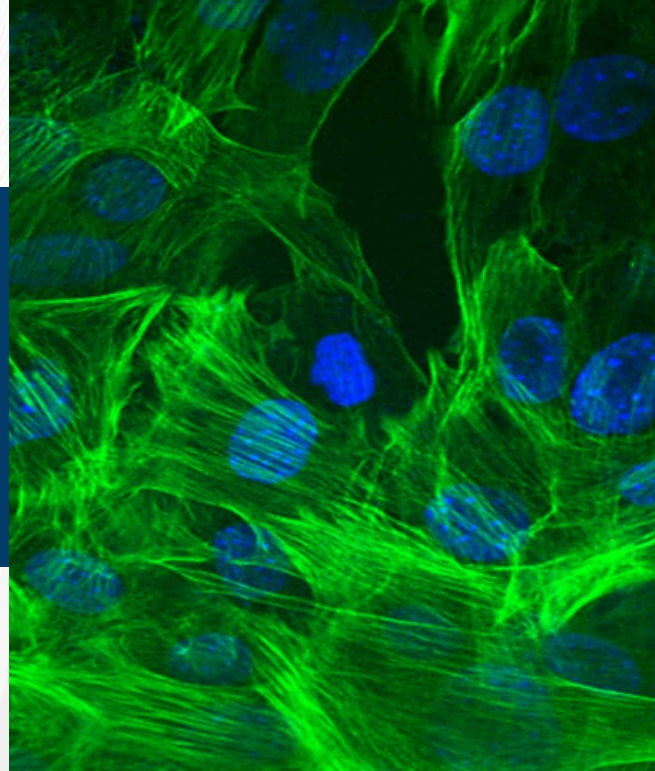
The Department is strongly oriented towards basic research, but considers applications with attention and increasing importance, responding to current needs for innovation and development.

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.

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.



ERC MAIN RELEVANT PANELS

- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions** [LS1_3, LS1_7, LS1_10, LS1_14]
- **LS2 Integrative Biology: from Genes and Genomes to Systems** [LS2_1, LS2_2, LS2_3, LS2_4, LS2_5, LS2_6, LS2_7, LS2_8, LS2_9, LS2_11, LS2_12, LS2_13, LS2_14, LS2_15, LS2_16]
- **LS3 Cell Biology, Development, Stem Cells and Regeneration** [LS3_1, LS3_7, LS3_8, LS3_9, LS3_10, LS3_14, LS3_15, LS3_16]
- **LS5 Neuroscience and Disorders of the Nervous System** [LS5_1, LS5_2, LS5_3, LS5_5, LS5_7, LS5_8, LS5_9]
- **LS8 Environmental Biology, Ecology and Evolution** [LS8_2, LS8_3, LS8_4, LS8_5, LS8_6, LS8_7, LS8_8, LS8_9, LS8_10, LS8_11, LS8_12, LS8_13, LS8_14, LS8_15]
- **LS9 Biotechnology and Biosystems Engineering** [LS9_2, LS9_4, LS9_6, LS9_7, LS9_8, LS9_12]

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.

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 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.

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DEPARTMENT OF CHEMISTRY "UGO SCHIFF"

www.chim.unifi.it

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 European Centre for Magnetic Resonance (CERM); 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 Wi-Fi 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 117 researchers and 47 technicians/administrative staff with an excellent gender balance. DICUS is the reference Department for three 3-year bachelor degree (BS in Chemistry, BS in Diagnostics and Materials for Conservation and Restoration and, since the aa 2023-24 also BS in Materials Science), 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 100 PhD students. In the period 2018-23 DICUS participated in research projects funded for more than 44 M€ (international, national and regional projects). Many collaborations with industrial partners are also constantly ongoing.



ERC MAIN RELEVANT PANELS

- **PE3 Condensed Matter Physics** [PE3_4, PE3_7, PE3_8, PE3_9, PE3_11, PE3_13]
- **PE4 Physical and Analytical Chemical Sciences** [PE4_1, PE4_2, PE4_3, PE4_4, PE4_5, PE4_8, PE4_10, PE4_13, PE4_18]
- **PE5 Synthetic Chemistry and Materials** [PE5_3, PE5_8, PE5_9, PE5_10, PE5_11, PE5_12, PE5_13, PE5_15, PE5_16, PE5_17, PE5_18]
- **PE8 Products and Processes Engineering** [PE8_11]
- **PE10 Earth System Science** [PE10_1, PE10_3, PE10_6]
- **PE11 Materials Engineering** [PE11_1, PE11_9, PE11_10]
- **LS1 Molecules of Life: Biological Mechanisms, Structures and Functions** [LS1_1, LS1_2, LS1_7, LS1_8, LS1_13]
- **LS2 Integrative Biology: from Genes and Genomes to Systems** [LS2_8, LS2_9]
- **LS4 Physiology in Health, Disease and Ageing** [LS4_9, LS4_12]
- **LS5 Neuroscience and Disorders of the Nervous System** [LS5_11]
- **LS7 Prevention, Diagnosis and Treatment of Human Diseases** [LS7_2, LS7_3, LS7_10, LS7_12]
- **LS9 Biotechnology and Biosystems Engineering** [LS9_11, LS9_12]

In terms of scientific production, during the period 2018-23, more than 2000 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 (11 patents in the 2018-23 period).

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 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.

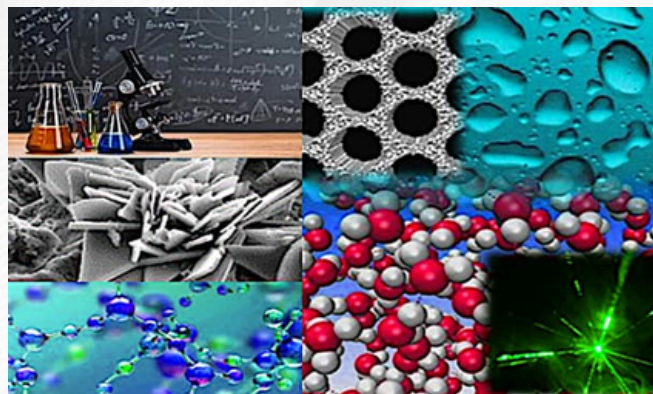
Part of the DICUS staff is affiliated to CERM (European Centre for Magnetic Resonance; Italian headquarters of the INSTRUCT structural biology ERIC infrastructure), CRIST (University Service Centre for Structural Crystallography), LAMM (Laboratory for Molecular Magnetism), LENS (European Laboratory for 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 and Technology), has a reference center for the characterization of materials located at the Department.

DICUS can also rely on a high pressure laboratory (LAP) with high safety standards for reactions in extreme conditions.

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.

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.

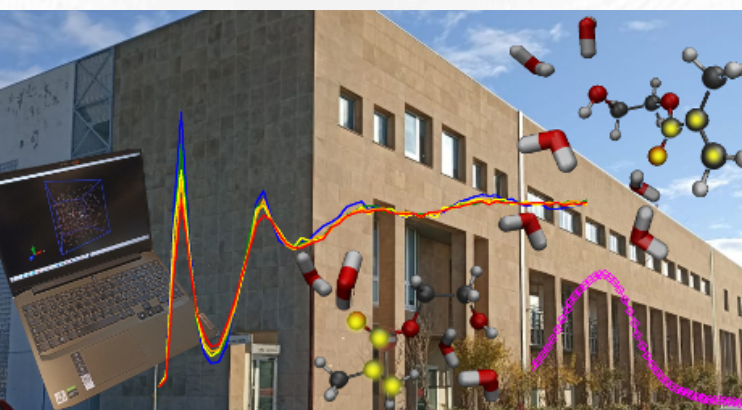


The following joint laboratories with external organizations and companies are currently active:

- 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

Among the instrumentation present in the Department, the following cutting-edge instruments have been recently acquired:

- 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
- Field emission Scanning Electron Microscope FEG-SEM Sigma Zeiss
- Gasporosimeter 3FLEX Micromeritics
- Raman confocal microscope InVia Qontor Renishaw
- Confocal microscope Leica TCS SP8 with DMI8 microscope and FCS Picoquant module and microfluidics basic equipment
- Zetasizer Malvern PRO Red Label



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.

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>.

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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>

In the frame of the Department of Excellence 2023-2027 project, three state-of-the-art technological platforms are being installed in DICUS premises:

- 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;
- 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;
- 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.

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 2018-23 period, it is worth mentioning the Horizon Europe projects which include 3 ERC grants (1 Consolidator, 1 Starting, 1 Synergy Grant) on molecular magnetism, molecular spintronics and quantum computing, one related to the Mission Oceans, Seas and Waters facing innovative solutions for Mediterranean ecosystem remediation, and 4 coordinated MSCA-Doctoral Networks (“GlycoNoVi” on the role of glycans in human Norovirus infection, “FC-RELAX” on NMR relaxometry for biomedicine, “GlyCanDrug” on precision therapeutics that target glycan motifs implicated in cancer, and “ENSCC” on the Supramolecular Chemistry of Carbohydrates).

Regarding HORIZON 2020, DICUS participates in 2 FET (Future and Emerging Technologies), 1 ERC Consolidator, 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 2023 DICUS has received funding for 36 PRIN (research projects of relevant national interest), funded by the Italian Ministry of University and Research (MUR): PRIN 2022 (27 total projects, 11 as coordinator) and PRIN 2022 PNRR (9 total projects, 3 as coordinator). These PRIN sum to the ones of 2018-22 period when DICUS has participated in 11 PRIN, of which 5 as coordinator. The Department is also involved in more than 35 projects funded by different national programmes (including Ministries of Foreign Affairs, Health, Economic Development, Environment, Agricultural, Food and Forestry Policies, among others) and more than 15 regional programmes (mainly FESR).

Furthermore, DICUS takes part in several Regional projects and leads more than 60 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.

CONTACTS

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DEPARTMENT OF PHYSICS AND ASTRONOMY

www.fisica.unifi.it

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:

- 3 B.Sc Programs (Physics and Astronomy, Optics and Optometry, Materials Science);
- 2 M.Sc Programs (Physical and Astrophysical Sciences, Data Science, Scientific Computing & Artificial Intelligence);
- 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.

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.



ERC MAIN RELEVANT PANELS

- **PE2 Fundamental Constituents of Matter**
- **PE3 Condensed Matter Physics**
- **PE6 Computer Science and Informatics**
- **PE7 Systems and Communication Engineering**
- **PE9 Universe Scientist**

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.

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: European Commission (EC), Ministry of University and Research (MUR), Ministry of Enterprises and Made In Italy (MIMIT), Ministry of Health (MDS), Istituto Superiore di Sanità (ISS), Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), National Research Council (CNR), European Space Agency (ESA), Tuscany Region, Tuscan Cancer Institute, Azienda Ospedaliera Universitaria Careggi, Fondazione Cassa di Risparmio di Firenze (CRF), Fondazione AIRC per la Ricerca sul Cancro (AIRC) and many private technology industries (among these: Nuovo Pignone, Leonardo, El.En., Sony). European funding includes numerous ERC projects: 4 Advanced grants, 2 Consolidator grants, 4 Starting grants, 1 Proof of Concept grant (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 Research Projects of National Relevance (PRIN), 8 FIRB Futuro in Ricerca, 2 FARE, 4 Italian Space Agency (ASI), 31 Fondazione Cassa di Risparmio di Firenze (CRF), 2 BRIC projects National Institute for Insurance against Accidents at Work, 1 Bank of Italy, 1 Tuscany Region, 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.

CONTACTS

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DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE "ULISSE DINI"

www.dimai.unifi.it

The department is formed by a staff of around 90 persons (professors and assistant professors). Moreover, 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*.

The department is involved in a large number of research projects, funded by the European Union, and by several national and international institutions. Among them: projects financed by MUR (Italian ministry for university and research), projects financed by the Istituto Nazionale di Alta Matematica (INdAM), by the Centro Nazionale per le Ricerche (CNR), co-financed by the Istituto Nazionale di Geofisica e Vulcanologia, and by many other institutions. For many of these projects, the principal investigator is a member of the department.

The department runs a joint PhD program in Mathematics, Computer Science and Statistics. It hosts research meetings and workshops, and regular series of seminars, as well as a Colloquium.

KEY RESEARCH ACTIVITIES

The research of the department is spread over all main topics of mathematics and computer science.

- **Algebra:** Group theory, Representation Theory, Character theory, Symmetric and Alternating groups, Character degree graph, Zeros of irreducible characters, Locally finite simple groups, Word problems in finite and profinite groups, Coverings and normal coverings of finite groups, Group generation, Subnormal subgroups in finite groups, Simplicial complexes in finite groups, Graph theory, Social theory
- **Complementary mathematics:** History of mathematics, Mathematics Education.
- **Computer Science:** Complex network analysis and algorithms for large graphs; Computer science education; Discrete tomography and graph theory; Enumerative and algebraic combinatorics; Formal languages and code theory; Neural network applications in neurobiology; Random and exhaustive generation algorithms for discrete structures; System design, validation and assessment.
- **Geometry:** Algebraic geometry, Derived geometry, Complex and hypercomplex analysis, Geometric theory of holomorphic functions. Complex, Symplectic, and Differential geometry, Riemannian and pseudo-Riemannian geometry, Riemannian manifolds with prescribed sectional curvature, Combinatorics, Weighted graphs, Linear and multilinear algebra, Matrix completion, Foundations, didactic, popularization in Geometry
- **Mathematical Analysis:** Calculus of Variations, Mathematical Control Theory, Partial differential equations, ODE's and Dynamical Systems.

ERC MAIN RELEVANT PANELS

- **PE1 Mathematics** [PE1_1, PE1_2, PE1_3, PE1_4, PE1_7, PE1_8, PE1_10, PE1_11, PE1_12, PE1_13, PE1_16, PE1_17, PE1_18, PE1_19, PE1_20, PE1_21, PE1_22]

- **Mathematical Logic:** Model Theory (Valuation theory, o-minimality and generalizations, Surreal numbers, differential algebra, Interactions with algebra). Logic for Computer Science (Computer formalization and theorem proving, Mathematics for abstract syntax and semantics, Univalent Foundation of Mathematics).
- **Mathematical Physics:** Quantum transport, applied quantum mechanics, nonlinear optics. Fluid dynamics, free-boundary problems and industrial mathematics.
- **General relativity and field theory.** Non-olonomous classical mechanics, coupled oscillations in mechanics and acoustics .
- **Numerical Analysis:** Numerical methods for differential problems (Geometric Integration, Energy-Preserving Methods, Isogeometric Analysis), Numerical approximation (Computer Aided Geometric Design, Geometric Modelling, Spline Functions: Theory and Applications, Spectrally Accurate Methods).
- **Probability and statistics:** Probability theory and statistical mechanics, Random Graphs and Complex Networks, Random walks, Markov processes, Queueing Theory

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.

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 a 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.

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.

CONTACTS

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DEPARTMENT OF EARTH SCIENCES

www.dst.unifi.it

The Department of Earth Sciences (DST) has been declared an Excellent centre to do research for two consecutive five-year periods (2018-2022 and 2023-2027) as the result of a national competitive call. Research covers a wide spectrum of disciplines with 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, and properties of terrestrial and extraterrestrial materials. Multidisciplinarity is the challenge required 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>.

KEY RESEARCH ACTIVITIES

Section 1

- Characterization of the crystallographic structure of specific natural and/or synthetic mineral phases for industrial applications and also for their potential use as and their re-use as secondary raw materials.
- Characterization 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.
- Mineral and chemical characterization of natural resources (reserves and subeconomic resources) for comprehensive evaluation of the genesis and potential extraction of critical raw materials (CRMs).
- Chemical and isotopic characterization 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.
- Dynamics of complex systems, methods to quantify reliance, identify regime shifts and tipping points by HPC, neural network, IA, machine learning.
- Investigations on natural cycles and budget of specific elements and/or compounds (e.g., REE, CO₂) to understand the anthropic impact on climate.



ERC MAIN RELEVANT PANELS

- **PE1 Mathematics** [PE1_15; PE1_21]
- **PE4 Physical and Analytical Chemical Sciences** [PE4_18]
- **PE10 Earth System Science** [PE10_3, PE10_4, PE10_5, PE10_6, PE10_7, PE10_8, PE10_9, PE10_10, PE10_11, PE10_12, PE10_13, PE10_14, PE10_17, PE10_19, PE10_20, PE10_21]
- **LS8 Environmental Biology, Ecology and Evolution** [LS8_2, LS8_9]
- **SH5 Texts and Concepts** [SH5_5]
- **SH6 The Study of the Human Past** [SH6_2, SH6_5]
- **SH7 Human Mobility, Environment, and Space** [SH7_9, SH7_10]

- Geological geochemical and isotopic fingerprinting of food products (e.g. wine, olive oil) for tracing and potentially certifying their geographic provenance.
- Mineralogical, crystallographic, mineral chemical, petrographic, geochemical and isotopic characterization of extra-terrestrial objects (e.g. meteorites) to define their conditions of formations and to constraint the evolution of the Solar system and its planetary bodies.
- Mineralogical and cosmochemical studies to characterize a new state of matter: quasicrystalline materials recovered in exotic extraterrestrial objects.
- 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).
- Physical volcanology of past and on-going eruptions through the geological, textural and compositional study of eruptive deposits and products. Mapping of volcanic terrains.
- Magmatic volatiles in melts and glasses and their role in explosive eruptive dynamics.
- Volcanic hazards assessment, eruptive scenarios definition and probabilistic hazard mapping at active volcanoes.

Section 2

- 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.
- Geophysical volcanology, infrasound acoustics, seismic hazard and vulnerability, seismic and infrasound propagation modeling. Early-Warning system in volcano environment.
- Integration of geology, seismology, ground deformation, and numerical modelling to constrain geodynamic processes and fluid flow relevant for earthquake geohazards and geothermal resources.
- 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.
- Paleontology and Paleobiology; Virtual Paleontology; Paleontological Heritage; Conservation Paleobiology; Paleoenvironmental reconstructions; Paleoecological reconstructions; Evolutionary history reconstructions; Taxonomy and Systematics; Vertebrate ichnology.
- Paleoecological and paleoclimatic reconstructions using the fossil record of marine invertebrates. Past extinction and turnover events, reconstruction of ecological baselines pre-Anthropogenic impact, sclerochronology.
- 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 siliciclastic and carbonate deposits; Reservoir analogues in carbonates: characterization and modeling.
- Palaeoceanography, palaeoclimatology, and stratigraphy of Mesozoic and Paleozoic marine sediments using sedimentology and sedimentary geochemistry. Depositional processes of organic facies from continental to deep marine settings. Source rock sedimentological 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.
- Prevention and Sustainable Management of Geo-Hydrological Hazards, threatening the human life, property, cultural heritage and the natural and built environment (UNESCO Chair established in 2016).

- Research on karst landforms and processes, with particular attention on underground systems. Investigations concern three major issues: Geomorphology and morphotectonic of karst areas, karst hydrogeology, impact of climate on groundwater dynamics.
- Investigations on soil genesis, paleo- and archeo-pedology; methodological problems in soil survey; applications of remote sensing and GIS technologies to soil survey; genesis and monitoring of forest soils.
- Fluvial dynamics, morphological variations and evolution of river beds and effects of anthropic interventions; monitoring, modeling and analysis of erosion processes and failure mechanisms of river banks.

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
- Experimental Geophysics Laboratory
- 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
- Paleontology (invertebrates and vertebrates) and 3D
- 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
- Structure and Tectonics: Experiments, Numerics, Observations (STENO Lab)
- Volcanology
- X-Ray Laboratory
- 3D Digital Geology
- 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 liquid samples RA-915M/RP-92
- Atomic fluorescence: PSA Merlin, PSA Excalibur
- Autonomous Underwater Vehicle with camera and sonar
- Cavity Ring-Down Spectroscopy CRDS analyzer for CO₂, CH₄ & 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.
- Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) Thermofischer iCAP PRO XP
- 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
- Meta QUEST 3 visors (10), software and hardware for augmented reality
- Microwave mineralizer Milestone CEM Mars-5. CEM MARS-6
- Particle static analyser Malvern Morphologi 3Gs
- Optical cold cathodoluminescence
- Poro-Permeameter (Gas)

- 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 $\delta^{18}\text{O}$ and $\delta^2\text{H}$ (water), $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ 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)
- Spot mobile robot for automatic sensing and inspection
- 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 til, 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 Fixed Wing
- UAV Near Infrared camera
- UAV High resolution digital camera
- UAV laser scanner
- UAV Infrared Thermal sensor
- UAV Ground Penetrating Radar (GPR)
- UAV VNIR hyperspectral camera (400-1000 nm)
- UAV NIR hyperspectral camera (900-1700 nm)
- 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%).
- X-ray fluorescence: ELIO-Portable Micro-XRF Spectrometer with Mapping Option
- 3D laser scanners
- 3D Structured light scanners
- 3D printers

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

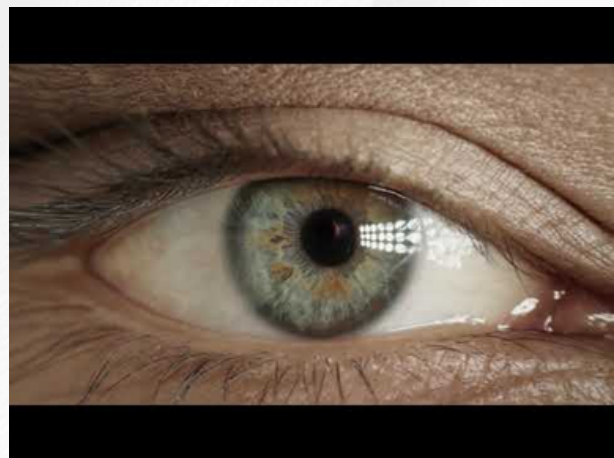
- L.S.B. Leakey Foundation for Anthropological Research, San Francisco (U.S.A.) – Project “**Geo-Paleontological investigation investigations at the Buia hominid site, Eritrea**”, 2000-2005.
- CEE, European Commission 5th FP – “**ERUPT – “Processes and Timescales of Magma Evolution in Volcanic Systems**”, 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** , 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.
- LIFE **SMART4Action “Sustainable Monitoring And Reporting To Inform Forest- and Environmental Awareness and Protection**”, 2014-2018.
- PNR 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**”, 2017.
- M.I.U.R.-P.R.I.N. “**Micro to Macro - How to unravel the nature of the Large Magmatic Events**”, 2017.
- M.I.U.R.-P.R.I.N., “**Distribution of strain and magmatism during rifting**”, 2017.
- M.I.U.R.-P.R.I.N., “**Detailing the Palaeogeography of Southern Palaeoeurope by means of biostratigraphic correlation and basin development in the Palaeozoic to early Mesozoic time-frame: case histories from the Italian record (DEEP PAST)**”, 2022.
- **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.
- CR Firenze Foundation “**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**”, 2019.
- CR Firenze Foundation **MiDAE - Micro Diffraction and Elemental Analysis**, 2019.
- European Environment Agency (EEA) **Copernicus European Ground Motion (EU-GMS)**, 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 “**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) “**Scientific activities of the Hayabusa2 space mission**”, 2020.
- Tuscany Region, Call for YOUNG RESEARCHERS FOR CULTURE, “**AirMuseum Air quality: environmental monitoring and technological solutions for the usability and preservation of museum collections**”, 2020.
- ESMERA (Boosting Robotics Innovation) European Consortium **ROMERO (Robots for Extreme Environments)**, 2020-2021.
- **EUSATfinder, a European SME Robotics Application**, 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 **MELODY - Moon multisensor and Laboratory Data Analysis**, 2021.
- Bank of Italy **Characterization of meteoroids through the spectroscopic observations and historical-scientific study of the Italian meteorites**, 2021.
- “**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.
- POR-FESR14-20 **ATLANT Development of high-technology laser instrument for remote monitoring building**, 2021-2022.
- European Space Agency (ESA) **PATHFINDER PNT as A Technology to support drones’ BVLOS scenarios for preventive monitoring and First responder missions**, 2021-2022.
- World Bank Strengthening **SFRARR Financial Resilience and Accelerating Risk Reduction in Central Asia**, 2021-2022.
- Horizon 2020 **GEOENVI “Tackling the environmental concerns for deploying geothermal energy in Europe”**, , 2021-2022.
- Horizon 2020 **LITRASV Life in travertine and sinter veins: a possible key to recognize extra-terrestrial life in tectonically-driven depositional system**, 2021-2022.

- Horizon 2020 **LINKS Strengthening Links between Technologies and Society for European Disaster Resilience**, 2021-2022.
- PRIN INAF "**PACMAN 3200 Phaethon Asteroid Composition by Multiple Analysis**", 2021-2024.
- LIFE20 "**MODERn (NEC) new MOnitoring system to Detect the Effects of Reduced pollutants emissions resulting from NEC Directive adoption**", 2021-2025.
- RTM Spanish government **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**, 2021-2025.
- European Space Agency (ESA) **G-Class Hydroterra (an Earth Explorer mission for Water Cycle Science**, 2019-2020.
- UNIFI Infrastructures project acquisition of a **microtomography with high resolution**, 2022.
- Italian Space Agency- University of Bologna (ASI-UniBO) "**Scientific activities for the HERA space mission**", 2022.
- MUR PNRR **National Centre for HPC, Big Data and Quantum Computing. Dynamics of complex Mediterranean river catchments**, 2022.
- HSGME Hellenic Survey of Geology and Mineral Exploration "**COLLECTION Isolation and initial identification of microorganisms in extreme environments volcanoes**", 2022.
- Regione Sicilia and INGV "**IRGIE Inventory of Geothermal Resources Aeolian Islands**", 2022.
- MUR PRIN "**HYDROX - HYDRous- vs OXo-components in minerals: adding new pieces to the Earth's H2O cycle puzzle**", 2022.
- MUR-PNRR "**CHANGES Cultural Heritage Active Innovation for Sustainable Society**", 2022.
- ECHO EU **EGMS RASTOOL European ground motion risk assessment tool**, 2022-2024.
- ARPAT-DST "**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 "**Environmental monitoring and (paleo)biodiversity analysis through museum collections and field activities in protected areas**", 2022-2025.
- PNRR, **National Biodiversity Future Centre, spoke 7**, 2022-2025.
- PNRR Infrastructure **ITINERIS, PE3, RETURN**, 2022-2025.
- PRIUS Premier Research Institute for Ultrahigh-pressure Sciences, "**Structural study of phase H, (MgSiH₂O₄), a potential high-pressure carrier for water to the deep lower mantle**", 2023.
- UNIFI Infrastructures project, acquisition of a **analytical system DPIV – Digital Particle Image Velocimetry** 2023.
- Galileo Program (French-Italy) "**BIOMED Which future for the Mediterranean biodiversity? Images from the past for a sustainable future**", 2023-2024.
- Pianeta Dinamico **EMOTION Geochemical characterization of fluid manifestations in central-northern Italy for geothermal assessment and development of the geothermal fluid national web portal**, 2023-2025.
- ERC Advanced Grant "**LATEUROPE Why late earliest occupation of Western Europe?**", 2023-2027.
- MSCA Doctoral Network "**TALENTS The doctoral rift science network for the energy transition**", 2024-2027.
- MSCA Staff Exchanges "**LOC3G Localization in Geophysics, Geohazards and Geoengineering**", 2024-2027.
- UNIFI – INGV "**Volcanic Monitoring and Early warning system of tsunami and paroxysm explosion at Stromboli**", 2022-2024.
- MUR PRIN "**TEAMS Terrestrial And Marginal System in a hot world. The continental and marginal-marine Cenomanian environments of the Southern Morocco between climate extreme and regional tectonics**", 2022-2025.
- MUR PRIN "**HEATED - PHreatic Eruptions at AcTive volcanoEs: processes, source parameters and physical models of eruption Dynamics**", 2022.
- MUR PRIN "**OPENLIT Building An Open Access Lithotheque Of Italian Knappable Rocks Exploited During Prehistory**", 2022.
- MUR PRIN "**TRANSIENT. Time-integrATed melt-depletioN Signature in an Evolving sub-ridge maNTle**", 2022.
- MUR PRIN "**FORMATION Full coverage multiscale and multisensor geomorphological map: a practical tool for territorial planning**", 2023-2025.
- MUR PRIN PNRR "**Causes and consequences of deposit-derived pyroclastic density currents**", 2023-2025.
- MUR PRIN PNRR "**SMILE Statistical Machine Learning for Exposure development**", 2023-2025.



- MIUR PRIN PNRR “**MOLIERE The antimony resource in Italy: evaluation of environmental impact and ore exploration of a critical raw material**”, 2022.
- MUR PRIN-PNRR “**RESILIENCE - Refine Eruptive Scenarios and Impact reLated to phreatomagmatic EruptionS at Campi FlegrEi (Italy)**”, 2022.
- Competitive projects for Fixed Term Researchers (RTD) from the University of Florence “**COMBINE, COupling MicroBes and mINerals for treating heavy metal containing waters**”, 2024-2025.
- MUR Rita Levi Montalcini programme “**Marine benthic community response to climate change: the Mid Pliocene Climatic Optimum**”, 2018-2021.
- PRIN “**Ecological effects of species range-expansions driven by climate: insights from the Last Interglacial (MIS5e, Pleistocene) of the Mediterranean Sea**”, 2022.

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DEPARTMENT OF STATISTICS, COMPUTER SCIENCE, APPLICATIONS "G. PARENTI"

www.disia.unifi.it



DiSIA is the landmark of the University of Florence for all subjects concerning the development of quantitative methods and the acquisition, processing, and elaboration of data (however heterogeneous it may be) with the aim of extracting the information it contains and transforming it into available knowledge.

In this regard, the Department organizes research, teaching, and training activities, as well as transmission of knowledge and innovation, in line with the transverse nature of the subjects it covers. DiSIA aims to be a point of reference and aggregation in the University for all subjects that revolve around data science.

The DiSIA members belong to several scientific sectors (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), framed in different CUN areas (01 - Mathematical and Computer Sciences, 06 - Medical Sciences, 13 - Economics and Statistics). Despite this heterogeneity, the Department members share a common view in which attention to data (and the information contained in it) is combined with a strong focus in applied and experimental areas, in line with specific scientific sensitivities and skills.

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 specific characteristics of the specific field of application. DiSIA boasts a multitude of international collaborations, fostering robust partnerships with esteemed institutions and organizations worldwide.

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

ERC MAIN RELEVANT PANELS

- **PE1 Mathematics** [PE1_13, PE1_14, PE1_15, PE1_17, PE1_19, PE1_20]
- **PE4 Physical and Analytical Chemical Sciences** [PE4_2, PE4_5]
- **PE6 Computer Science and Informatics** [PE6_2, PE6_3, PE6_4, PE6_5, PE6_6, PE6_7, PE6_11]
- **LS2 Integrative Biology: from Genes and Genomes to Systems** [LS2_12]
- **LS7 Prevention, Diagnosis and Treatment of Human Diseases** [LS7_9]
- **SH1 Individuals, Markets and Organisations** [SH1_1, SH1_8]
- **SH3 The Social World and Its Interactions** [SH3_7, SH3_9]
- **SH7 Human Mobility, Environment, and Space** [SH7_2, SH7_3, SH7_4, SH7_5, SH7_6, SH7_7]
- **SH8 Studies of Cultures and Arts** [SH8_1]

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
- Inferential methods for finite populations
- Assessment of the quality and sustainability of production chains
- Methodological Statistics

A full description of the research topics is available at <https://www.disia.unifi.it/p344.html>

KEY RESEARCH FACILITIES, INFRASTRUCTURE AND EQUIPMENT

DiSIA is involved in the following Research Centers:

- **Florence Center for Data Science**
- **StEering**: 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 **DiSIA-Lab** (Laboratory of Statistics and Computer Science), a research unit of DiSIA established by resolution of the Department Council in July 2014.

DiSIA-Lab was created to meet specific teaching and research needs, to serve transfer and innovation projects, and to enhance 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)
- Servers for research activity (2x 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 prof. Bruno Bertaccini.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

- **Department of Excellence 2018-2022**
- **Department of Excellence 2023-2027**
- **EU-FER**, PI Prof. Daniele Vignoli, HORIZON 2020 ERC, <https://eu-fer.com/>
- **KinHealth** Beyond the nuclear family: Extended kinship and mental health in Italy, RU: V. Tocchioni, PRIN 2022 (2023-2025)
- **From high school to university: Assessing peers' influence in educational inequalities and performances**, RU: V. Tocchioni, PRIN (2023-2025)
- **Complex graphical models for biological network science**, RU: F.C. Stingo, PRIN 2022 (2023-2025)
- **NextGRAAL** Next-generation algorithms for constrained GRaph visuALization, RU: A. Marino, PRIN 2022 (2023-2025)
- **DLT-FRUIT** A user centered framework for facilitating DLTs FRUITion, RU: A. Marino, PRIN 2022, (2023-2025)
- **The pre-Covid-19 stall in life expectancy in Italy: looking for explanations**, PI: G. De Santis, PRIN 2022 (2023-2025)
- **WelFerPoli** Well-being and Fertility Policies, PI: R. Guetto, PRIN 2022, (2023-2025)
- **Age-It** Ageing Well in an Ageing Society, SC: D. Vignoli, PNRR

- **PRESSPAD** Green agriculture products extraction process PSR 2014-2020 Maremma, Regione Toscana
 - **Assessment cybersecurity readiness**, PI: Rosario Pugliese, POR FESR 2014-2020, Regione Toscana, (2019-2021)
 - **GDR** Great Demographic Recessione, PI: D. Vignoli, PRIN Project, (2019-2021)
 - **CREW** Care, Retirement and Wellbeing, PI: G. De Santis, JPI More Years Better Life (2019-2021)
- A full description is available at <https://www.disia.unifi.it/> (section Projects).

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DEPARTMENT OF ECONOMICS AND MANAGEMENT

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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 four doctoral programs: it is the administrative headquarters for two Doctoral Programs in Development Economics and Local Systems (DELOS) and Social Sciences for Sustainability and Wellbeing (S3W), and it is the referent for the Doctoral Program in Economics of the Tuscan universities and Doctoral Program in Business Economics and Management.

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.



ERC MAIN RELEVANT PANELS

- **SH1 Individuals, Markets and Organisations**
- **SH2 Institutions, Governance and Legal Systems [SH2_4]**
- **SH7 Human Mobility, Environment, and Space**

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. It is also a partner in the joint Medical ICT - Medical and Health Information and Communication Technology Laboratory.

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 EUROPE;
- **COACH** Collaborative Agri-food Chains: Driving Innovation in Territorial Food Systems and Improving Outcomes for Producers and Consumers, HORIZON 2020;
- **EUROSHIP** Closing gaps in social citizenship. New tools to foster social resilience in Europe, HORIZON 2020;
- **ORM** Online reputation management, Erasmus+ Strategic Partnerships;
- **EOS** Economics of Sustainability, Erasmus+ Strategic Partnerships.

Currently, there are over 20 Research Projects of National Interest (PRIN) being conducted in the department.

DiSEI participate to several PNRR research project and in particular PE5 **CHANGES** cultural heritage active innovation for next-gen sustainable society.

For other national and regional project please visit:

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

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www.dsg.unifi.it

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, such 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

DDiSEI's key research activities 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.



ERC MAIN RELEVANT PANELS

- SH2 Institutions, Governance and Legal Systems

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)

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

Horizon 2020

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

Horizon Europe

- **Care4Care** We care for those who care

Justice 2021-2027

- **TRIIAL 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>

CONTACTS

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DEPARTMENT OF POLITICAL AND SOCIAL SCIENCES

www.dsps.unifi.it/

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:

1. Social and Political Change, in agreement with the Department of Cultures, Politics and Society of the University of Turin. The administrative seat from 2023 is in Florence;
2. Historical Studies, in agreement with the Department of Humanities and the Department of History, Archaeology, Geography, Fine and Performing Arts of the University of Florence and with the Department of History and Cultural Heritage and the Department of Education, Human Sciences and Intercultural Communication of the University of Siena.
3. 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 developed in coherence with its objectives.

KEY RESEARCH ACTIVITIES

Over the last decade, research has been conducted on various themes, including the connections between models of capitalism, welfare, and the effectiveness of democracies at the international level. Other themes include 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 globalization, and forms of political coexistence.

Research has been conducted on the political system and the transformations of political representation, policy coherence of local government, links between digital innovation and transformations of procedures in representative assemblies, climate sustainability in public policies, institutional training on new social media, and the relations between generative communication and the differentiation of publics. This text covers various topics including anti-mafia policies and associations as a form of political participation, migration and remittance practices, transnational care practices, the construction of migrant minor identities, reception practices, visibility of the Other in public spaces, the emotional dimension of politics, the history of environmental policies and transformations, and subjectivity in institutional change.

KEY RESEARCH FACILITIES, INFRASTRUCTURE AND EQUIPMENT

Library of Social Sciences
Seminar rooms equipped for video-conferences



ERC MAIN RELEVANT PANELS

- SH2 Institutions, Governance and Legal Systems
- SH3 The Social World and Its Diversity
- SH6 The Study of the Human Past

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

REPLAN EU *Implementing Resilience and Recovery Plans in Italy and beyond*

ERASMUS PLUS Jean Monnet module investigating how national recovery and resiliency plans were designed and the extent they are implemented on the ground - PI Prof. Enrico Borghetto.

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

HUMANEUROMED *Humanitarianism and Mediterranean Europe: a Transnational and Comparative History (1945-1990)*

H2020 ERC Advanced Grant project investigating the role played by Southern European countries in shaping the contemporary regime of international aid - PI Prof. 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*

H2020 MSCA RISE project promoting the exchange of knowledge and the transfer of skills and consolidating an international and inter-sectorial network of comparative and collaborative research with training on the identification, analysis and dissemination of good practices in the field of social work and human mobility in Europe - PI Prof. Ivana Acocella.

<https://cordis.europa.eu/project/id/872209>



MIGREM *Migrant remittances and transnational ties: care, social change and development across borders*

PRIN - Research Projects of National Relevance project aiming to highlight the implications, meanings and functions of migrant remittances in transnational social fields. - PI Prof. Ivana Acocella.

<https://www.dsps.unifi.it/vp-614-prin-2020-migrem.html>

Republican Italy and International Aid (1945-1989)

PRIN - Research Projects of National Relevance project aiming to explore the links between international humanitarianism and Republican Italy in the period between 1945 and 1989 - PI Prof. Silvia Salvatici

<https://www.dsps.unifi.it/vp-611-prin-2017.html>

Development Policies and Digitalization in Italy

PRIN - Research Projects of National Relevance project - PI Prof. Luigi Burroni

PROSOCIAL CLIMA *Prosocial motivations for climate mitigation behaviors*

PRIN - Research Projects of National Relevance project focusing on the analysis of low-carbon behaviors as expressions of prosocial conduct for the benefit of present and future generations. - PI Dr. Giacomo Bazzani

<https://www.dsps.unifi.it/vp-631-prosocial-clima.html>

GovREL *Urban Governance Of Religious Diversity*

PRIN - Research Projects of National Relevance - PI Prof. Marco Bontempi

Explaining the formulation and implementation of Recovery and Resilience Plans in Europe: a comparative approach

PRIN - Research Projects of National Relevance - PI Prof. Enrico Borghetto

Public policies and collective representation for creative work

PRIN - Research Projects of National Relevance - PI Prof. Luigi Burroni

Reframing Globalization in European Peripheries: Intellectual and Expert Networks Facing Political and Economic Transformations (1975-2022)

PRIN - Research Projects of National Relevance studying how globalization, democratization, and conflicts intersect in Central and Southeastern Europe since the late Cold War, analyzing transitions shaped by global value chains and liberal-democratic institutions, focusing on intellectual conversations, political cultures, economic strategies, and entrepreneurial networks amidst financial crises and geopolitical shifts driven by Russia and China. - PI Prof. Marco Bresciani
<https://dsps.unifi.it/p625.html>

NEWCOMING New Conflicts' Mapping in the age of Globalization

PRIN - Research Projects of National Relevance - Recent comparative politics research focuses on cleavages' politicization, noting Rokkianian cleavage decline and the rise of globalization winners and losers. This project aims to understand the political impacts of these shifts, utilizing longitudinal analysis and original data collection methods - PI Prof. Alessandro Chiaramonte

Conflict management and resolution in the wider Mediterranean: comparing practices between Western and non-Western actors

PRIN - Research Projects of National Relevance project analyzing how non-Western actors influence conflict management strategies of Western countries in crisis, particularly in the extended Mediterranean region with actors like Russia, China, and Turkey - PI Prof. Stefano Costalli

A Gender-Sensitive Inquiry into "Workism" and the Discourses on Professional Duties. Rethinking the Vocabulary of Social and Political Inclusion

PRIN - Research Projects of National Relevance - PI Prof. Dimitri D'Andrea

Covid-19 as Cultural Trauma. Transformations in Social Solidarity, in Italian Public Opinion and Public Sphere, following the pandemic

PRIN - Research Projects of National Relevance project exploring how the Covid-19 crisis has reshaped social solidarity boundaries in Italy and examining how the pandemic has fostered inclusive solidarity, transforming disruptive events into resources for strengthening societal unity - PI Prof. Laura Leonardi
<https://dsps.unifi.it/p625.html>

KEYS Knowledge and Experts in the policY of Sustainable development

PRIN - Research Projects of National Relevance - PI Prof. Andrea Lippi

Loyalty Allegiance Consensus. Europe and Spanish Colonies in 18th century

PRIN - Research Projects of National Relevance analyzing 18th-century succession crises, focusing on new loyalty, obedience and political partnership practices, and administrative models - PI Prof. Luca Mannori
<https://dsps.unifi.it/p625.html>

Politics under commission. How special procedures change democracy

PRIN - Research Projects of National Relevance - PI Prof. Vittorio Mete

The legislation on psychotropic substances, especially 'soft drugs': an interdisciplinary analysis from a criminal law, criminological, statistic and economic point of view and reform perspectives

PRIN - Research Projects of National Relevance project examining cannabis legalization and its potential benefits starting with an analysis of the costs of prohibitionism on the criminal and social systems. - PI Prof. Vincenzo Scalia
<https://dsps.unifi.it/p625.html>

Social Transformations and the Crisis of Expertise

PRIN - Research Projects of National Relevance project investigating the crisis of expertise in advanced societies, focusing on the Covid-19 pandemic, examining the challenges in communicating medical knowledge to the public and aiming to revise expert mediation practices in healthcare while exploring broader issues of credibility and expert knowledge mediation - PI Prof. Laura Solito
<https://dsps.unifi.it/p625.html>

CONTACTS

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DEPARTMENT OF ARCHITECTURE

www.dida.unifi.it

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.

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.

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



ERC MAIN RELEVANT PANELS

- **SH5 Cultures and Cultural Production** [SH5_4, SH5_6, SH5_7, SH5_8]
- **SH7 Human Mobility, Environment, and Space** [SH7_4, SH7_5, SH7_6, SH7_7, SH7_8]
- **PE8 Products and Processes Engineering** [PE8_3, PE8_10, PE8_11]
- **PE10 Earth System Science** [PE10_4]

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; Technologies for Mediterranean Living.

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.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

Recently international funded projects include:

- **Venice's Nissology Reframing the Lagoon City as an Archipelago: A Model for Spatial and Temporal Urban Analysis** (HE-ERC);
- **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 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);
- **AURA** 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).

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 Traditional 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).

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DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

www.dicea.unifi.it

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, soil mechanics and geotechnical engineering, 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 33 Professors (Full and Associate), 20 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.

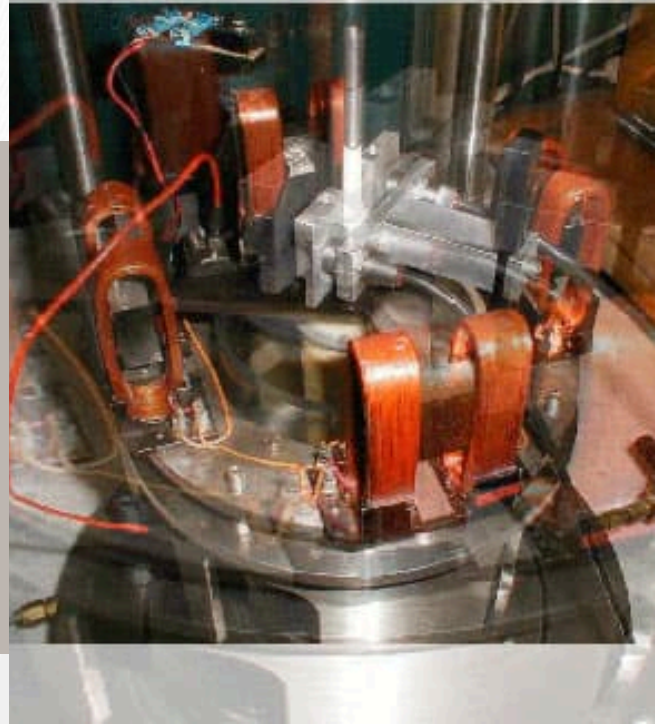
Water and Environment

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.



ERC MAIN RELEVANT PANELS

- **PE3 Condensed Matter Physics** [PE3_14]
- **PE5 Synthetic Chemistry and Materials** [PE5_1]
- **PE6 Computer Science and Informatics** [PE6_11, PE6_12]
- **PE8 Products and Processes Engineering** [PE8_3, PE8_4, PE8_5, PE8_6, PE8_11, PE8_14]
- **LS9 Biotechnology and Biosystems Engineering** [LS9_7]
- **PE10 Earth System Science** [PE10_2, PE10_3, PE10_12, PE10_14, PE10_17, PE10_20]
- **SH4 The Human Mind and Its Complexity** [SH4_5]
- **SH7 Human Mobility, Environment, and Space** [SH7_6, SH7_9, SH7_10]

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) analytical, computational and experimental methods for the linear and nonlinear analysis of soil behaviour; (2) evaluation of seismic ground motion for structural design purposes and seismic site stability analysis; (3) analysis of the static and seismic behaviour of building foundations, and artificial and natural slopes; (4) assessment and mitigation of seismic geotechnical hazards such as local amplification of ground motion; soil liquefaction, soil settlements, and landslides; (5) environmental and sustainable geotechnics, with special emphasis to energy micropiles and on the analysis and climate-adaptive geotechnical mitigation of environmental risks from natural and anthropogenic hazards; and sustainable geotechnics, with special emphasis to energy micropiles and 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. The unit is equipped with a Laboratory for soil testing under both static and dynamic loading conditions.

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).



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;
- Coastal 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, carbon footprint analysis and energy optimisation of wastewater treatment plants.

GEOTECHNICS

- Characterization of soils under static and dynamic loading conditions;
- Seismic ground response;
- Seismic liquefaction;
- Slope stability;
- Seismic microzonation;
- Soil-structure interaction;
- Programming of software for geotechnical 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.

STRUCTURAL, ARCHITECTURAL AND BUILDING ENGINEERING

- Methods in Computational Mechanics for linear and nonlinear problems;
- Nonlinear constitutive equations and models for existing and innovative materials, including masonry-like materials;
- Theoretical, experimental and computational methods for smart materials and structures;
- Responsive and environment-sensitive materials, morphing devices and structures;
- 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. Specifically, equipment for performing laboratory tests under static conditions including: 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 including: resonant column and cyclic torsional shear device; cyclic triaxial test apparatus; equipment to perform in situ static and dynamic tests, i.e. density tests, static plate load tests and down-hole tests.
- 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;
- Further equipment for laboratory and in situ test will be made available by a REsearch Center for GEOtechnical characterization and modelling (RECCEO) led 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);
- S500 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 estensimetric 6-components (3 shear forces + 3 moments | X-Y-Z) force measurements;
- Displacements and Accelerations by means of leaser 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.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

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

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

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DEPARTMENT OF INFORMATION ENGINEERING

www.dinfo.unifi.it

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.

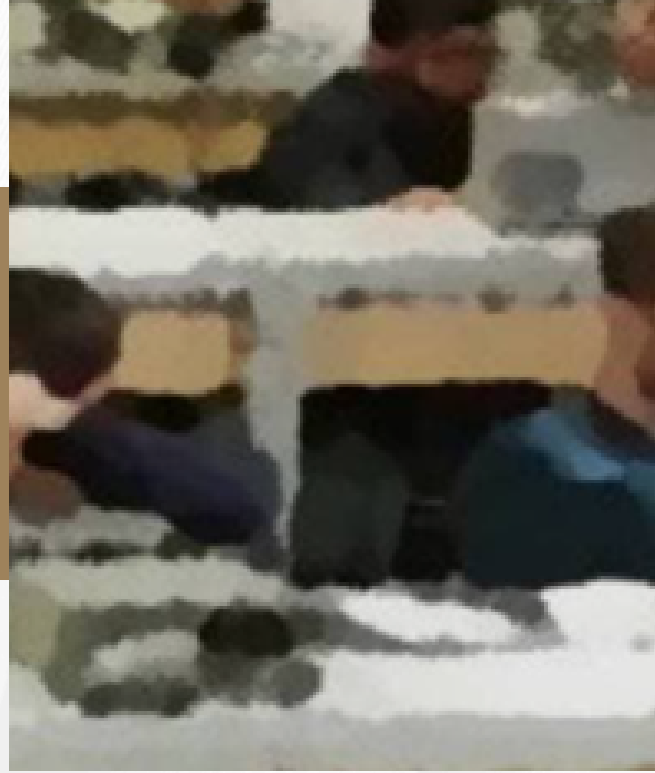
DINFO employs a workforce of more than 200 units (including professors, researchers, technical and administrative people, post-doc fellows and PhD students) with success in the acquisition of important public and private research funding. DINFO is in charge of two first-level three-year degree courses (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.

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.



ERC MAIN RELEVANT PANELS

- **PE6 Computer Science and Informatics**
- **PE7 Systems and Communication Engineering**

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 Testing Laboratory - USCNDLab
- Electronic Systems for Environment and Cultural Heritage Laboratory – ESECH

Informatics Engineering and Optimization

- Artificial Intelligence Laboratory - AiLab
- Distributed Systems and Internet Technologies 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
- Electromagnetic Compatibility Lab

Telecommunications and Networks

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

INVOLVEMENT IN NATIONAL RESEARCH FUNDING PROGRAMS

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

European Research Projects

- **ReInHerit** Redefining the future of cultural heritage, through a digital
- **AI4Media** A European Excellence Centre for Media, Society and Digital
- **ROVER** Reliable technologies and models for verified wireless body
- **ODIN** Leveraging AI based technology to transform the future of h
- **AURORA** sAfe Urban aiR mObility for euROpeAn citizens
- **Moore4Medical** Open Technology Platforms for Medical Devices
- **Tuscany X.0** Tuscany EU Digital Innovation Hub -

National Research Projects

- **ReInspect** Remote Inspection for Industrial and Manufacturing Companies (Regione Toscana)
- **ROVERTAC** Rethinking Over tomographic acquisition (Regione Toscana)
- **INSIDERAIN** INStruments for Intelligent Detection and Estimation of Rain for Agricultural Innovation (Regione Toscana)
- **PAD** Pattern and Anomaly eXpLOry (Regione Toscana)
- **HERIT-DATA** Sustainable Heritage Management towards Mass Tourism Impact thanks to a holistic use of Big and Open Data (Regione Toscana)
- **AIMS** Artificial Intelligence for the Management of Shifts (Regione Toscana)
- **REWIRE** Remote Wildlife Monitoring in Real-Time (Regione Toscana)
- **CONUS** Conic Open scanNEr for UltraSound research advancement (MIUR)
- **QUASAR** QUAntitative Analysis for Services and Assets Reliability (Regione Toscana)
- **ANDROMEDA** AdvaNceD micROservices for supply chain manageMEnt Digital trAnsition (Regione Toscana)
- **SCHEMA** Supply CHain Evaluation with Model-based & data driven Approaches (Regione Toscana)
- **Development of innovative devices and systems for energy management, conversion and storage** (MIUR PRIN)



UNIVERSITA
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FIRENZE

DIEF
DIPARTIMENTO DI
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DEPARTMENT OF INDUSTRIAL ENGINEERING

www.dief.unifi.it

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.

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;



ERC MAIN RELEVANT PANELS

- **PE1 Mathematics** [PE1_18, PE1_19, PE1_22]
- **PE8 Products and Processes Engineering** [PE8_1, PE8_5, PE8_7, PE8_8, PE8_9, PE8_10]
- **PE11 Materials Engineering**

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/electrical/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 opto-electronic 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 software for technology and engineering applications;
- Centrifugal compressor test rig, able to test industrial-scale impellers up to a peripheral Mach number of 0.7;
- Reciprocating engine test cells (1 dynamic, 2 eddy-currents), including the possibility of hydrogen feeding and innovative measurement systems;
- Five Axis milling center DMG Mori DMU 75 , five 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 robacta)
- Kistler force measurement devices;
- Thermocouples and thermocamera (optris 640i);
- CMM euro APEX from Mitutoyo;
- THT lab (Calenzano site): 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), Single Crystal X-ray diffractometer XcaliburPX Ultra (Oxford Diffraction), Single Crystal X-ray diffractometer Xcalibur3 (Oxford Diffraction);
- Powder X-ray diffractometer D8 “Da Vinci” (Bruker), - Powder X-ray diffractometer D8 Advance (Bruker) equipped with a hot chamber (T max = 1600°C), X-ray fluorescence spectrometer X ZSX Primus II (Rigaku), X-ray fluorescence spectrometer EDX 7000 (Shimadzu);
- Hot-stage microscopy LTS420 (Linkam);
- X-ray micro-CT Skyscan 1172 (Skyscan);
- Laboratory-scale plasma treatment equipment;
- RF sputtering and EB-PVD thin film deposition equipment;
- Metallography laboratory, Light and Scanning Electron Microscopy, Electrochemical corrosion evaluation equipment, 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 equipment;

- 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.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

- **FACTOR** (2010-2017) Full Aero-thermal Combustor-Turbine interaction Research, EU FP7;
- **FIRST** (2011-2014) Fuel Injector Research for Sustainable Transport, EU FP7;
- **IMPACT-AE** (2011-2016) Intelligent design Methodologies for low Pollutant Combustors for Aero-Engine, EU FP7;
- **LEMCOTEC** (2011-2017) Low Emissions Core-Engine Technologies, EU FP7;
- **UNPLUGGED** (2012-2015) Wireless charging for Electric Vehicles, EU FP7;
- **ENLIGHT** (2012-2016) Innovative advanced lightweight materials for the next generation of environmentally-friendly electric vehicles, EU FP7;
- **ROBOBUILD** (2013) Progettazione di un nuovo sistema articolato, Regione Toscana and Romania (Executive Unit for Financing Higher Education R&D and Innovation);
- **RECORD** (2013-2015) Research on Core Noise Reduction, EU FP7;
- **INTEFIX** (2013-2016) INTElligent FIXtures for the manufacturing of low rigidity components, EU FP7;
- **MOREDE** (2013-2016) PhotoVoltaic panels MObile Recycling DEvice, EU CIP-EIP;
- **ENOVAL** (2013-2018) Engine Module Validators, EU FP7;
- **FACTS4WORKERS** (2014-2018) Worker-Centric Workplaces in Smart Factories, EU H2020;
- **RESOLVE** (2015-2018) Range of Electric SOLutions for L-category Vehicles, EU H2020;
- **FLEXTURBINE** (2016-2019) Flexible Fossil Power Plants for the Future Energy Market through new and advanced Turbine Technologies, EU H2020;
- **ALLIANCE** (2016-2019) AffordabLe Lightweight Automobiles AlliaNCE, EU H2020;
- **SOPRANO** (2016-2020) Investigations on Soot and Radiation in aeroengines, EU H2020;
- **AQUA** (2017) Assemblaggio Quadri Automatizzato, POR FESR 2014 - 2020;
- **TURBO-REFLEX** (2017-2020) TURBOmachinery RETrofits enabling FLEXible back-up capacity for the transition of the European energy system, EU H2020;
- **OBELICS** (2017-2020) Optimization of scalaBle rEaltime modeLs and functional testing for e-drive ConceptS; EU H2020;
- **NEOHIRE** (2017-2020) 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, EU H2020;
- **MeBeSafe** (2017-2020) Measures for Behaving Safely in Traffic, EU H2020;
- **RETROFIX** (2018-2020) Retrofit System for Repairing through Additive Manufacturing, EU MANUNET III;
- **FLOATECH** (2018-2020) Optimization of floating wind turbines using innovative control techniques and fully coupled open source engineering tool EU H2020;
- **START** (2018-2021), Numerical and experimental investigations on an innovative additive manufactured combustor, EU H2020 CleanSky 2;
- **PIONEERS** (2018-2021) Protective Innovations of new Equipment for Enhanced Rider Safety, EUH2020;
- **ARIAS** (2018-2022) Advanced Research Into Aeromechanical Solutions, EU H2020;
- **LEXIS** (2019-2021) Large-scale EXecution for Industry & Society, EU H2020;
- **CHAIRLIFT** (2019-2022), Compact helical arranged combustors with lean lifted flames, EU H2020 CleanSky 2;
- **ACCENTO** (2019-2022), Experimental investigations of Active Clearance Control systems for aeroengines, EU H2020 CleanSky 2
- **METRICS** (2019-2023) Metrological evaluation and testing of robots in international competitions; EU H2020;
- **PHARAON** (2019-2024) Pilots for Healthy and Active Aging, EU H2020;

- **Sviluppo e caratterizzazione di nanocompositi magnetici ibridi per la separazione di miscele gassose** (2020-2022), Ministry of Ecological Transition;
- **FATMOLS** (2020-2023) Fault-tolerant molecular spin quantum processor, EU H2020;
- **SAFE-UP** (2020-2023) proactive SAFETy systems and tools for a constantly UPgrading road environment, EU H2020;
- **INSPIRE** (2021-2024) Inspiring Pressure Gain Combustion Integration, Research and Education, EU H2020 MSCA-ETN;
- **LEONARDO** (2021-2024) MicrovehicLE fOr staNd-Alone and shaReD mObility, EU H2020;
- **MAGNUM** (2022) Macchinario per l'ispezione Automatizzata di assili ferroviari basata sulla Generazione Non Convenzionale di Ultrasuoni tramite Metodologie laser, POR FESR 2014- 2020;
- **ADREANCE** 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, PRIN PNRR 2022;
- **ECOBAM** Dense Eutectic Ceramic Oxide By Additive Manufacturing: sustainable-by-design materials and technologies, PRIN PNRR 2022;
- **MAVAM** Molecular assisted atom vacancies arrangement to modulate magnetism in 2D transition metal dichalcogenides; PRIN 2022;
- **RISORSA** (2022-2023) Riciclo SOstenibile di magneti di terre rare da Raae per Sistemi elettromagnetici ad Alta efficienza, Ministry of Ecological Transition;
- **Italian Research Center on High Performance Computing, Big Data and Quantum Computing** – Spoke 6 - "Multiscale modeling & Engineering applications", 2022-2025;
- **Italian Sustainable Mobility Center** - Spoke 12 "Innovative Propulsion", 2022-2025;
- **TRANSITION** (2022-2026) Future hydrogen assisted gas turbine for carbon capture process, EU Horizon Europe;
- **HESTIA** (2022-2026) Hydrogen combustion in aeroengines, EU Horizon Europe;
- **NEUMANN** (2022-2026) Innovative aeroengine technologies, EU EDF;
- **TRANS-SAFE** (2022-2026) Transforming Road Safety in Africa, EU HORIZON EUROPE;
- **LIFE2M** (2022-2023) Long LIFE to Micromobility, EU LIFE;
- **IN-MOB** (2023) Innovative Products For Sustainable Micromobility, EU ERDF i3;
- **MOST Centro Nazionale per la Mobilità** - Spoke 5 – Light vehicle and active mobility, MUR PNRR;
- **MOST Centro Nazionale per la Mobilità** - Spoke 9 – Urban mobility, MUR PNRR;
- **DESTINI** (2023-2024) An adapted behavioral robot model with advanced cognitive/physical interaction capabilities for assessment and rehabilitation of neurodegenerative diseases, bando RTD UNIFI;
- **AGE-IT** (2023-2025), MIUR PNRR;
- **THE** Tuscany Health Ecosystem (2022-2025), MIUR PNRR;
- **MICS** Made in Italy Circolare e Sostenibile, MIUR PNRR;
- **Fit4MedRob** (2023-2026) Fit for Medical Robot, MIUR PNRR;
- **ERMES** (2023-2026) Ecosistema uRbano per l'invecchiaMento attivo e in Salute, POS Salute traiettoria 1;
- **SMARTCARE** (2023-2026), POS Salute traiettoria 2;
- **XL-Connect** (2023-2026) Large scale system approach for advanced charging solutions, EU HORIZON EUROPE;
- **ACCCELLBAT** (2023-2026) Accelerated cell and battery testing, EU HORIZON EUROPE;
- **HYDEA** (2023-2027) Hydrogen combustion engine demonstrator, EU Horizon Clean Aviation;
- **ROSEMARIE** Recupero e riutilizzO di scarti dell'eStrazione e lavorazione del marmo nell'ottica di una EconoMiA circolare a Rifiuti zEro; Italian Ministry of Economic Development;

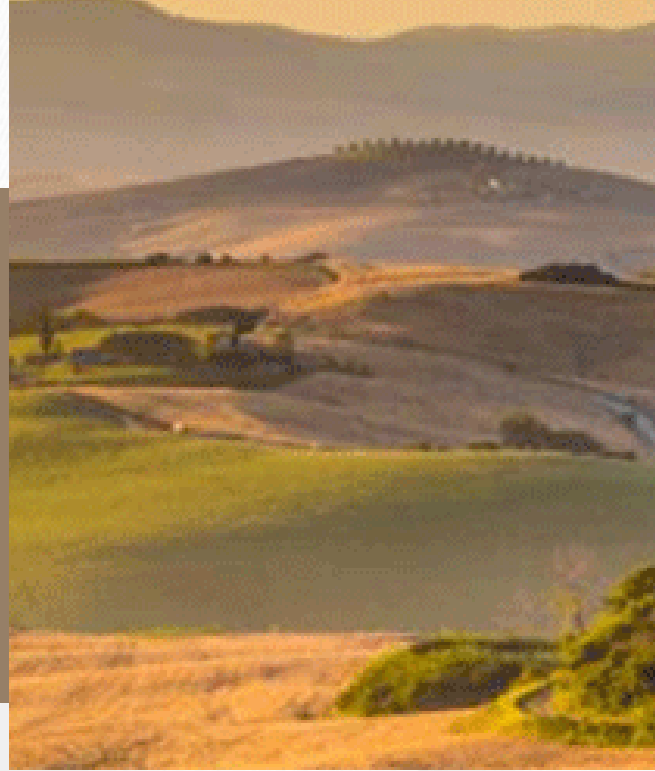
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DEPARTMENT OF AGRICULTURE, FOOD, ENVIRONMENT AND FORESTRY

www.dagri.unifi.it



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.

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)

ERC MAIN RELEVANT PANELS

- **PE10 Earth System Science**
- **LS2 Integrative Biology: from Genes and Genomes to Systems**
- **LS4 Physiology in Health, Disease and Ageing**
- **LS8 Environmental Biology, Ecology and Evolution**
- **LS9 Biotechnology and Biosystems Engineering**

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.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

Clim4Vitis - Climate change impact mitigation for European Viticulture

Clim4Vitis Horizon Europe's project 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/>

EDULIA Bringing down barriers to children's healthy eating

Edulia, part of an H2020 ITN-ETN Marie Curie Training Network, 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 - Genome and Epigenome eNabled breeding in MOnogastrics

GERONIMO H2020 project 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 Novel Organic recovery using Mobile ADvanced technology

NOMAD H2020 project aims 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 - 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 choice of the best silviculture practice to preserve forest resilience in relation to climate change

<https://www.lifesystemic.eu/it/>

CONTACTS

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DEPARTMENT OF HUMANITIES

www.dilef.unifi.it

The Department of Humanities 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

KEY RESEARCH ACTIVITIES

Research Units

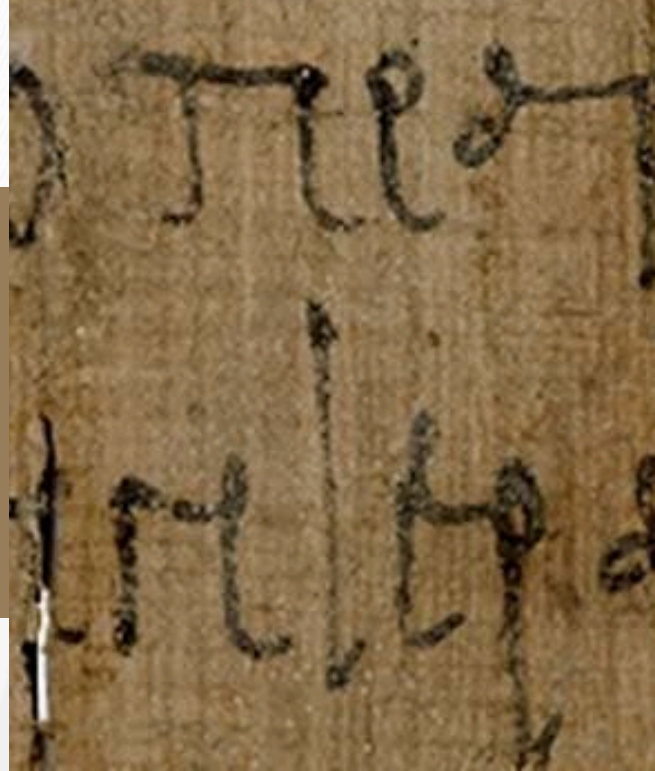
- FESVEM Foundations and Ethics of Life Science and Science of Mind
- GEIST Genealogy, hermeneutics, historical investigation of the texts
- LABLITA (building, studying and processing of Italian and multilanguage linguistic resources, with particular regard to spoken corpora and lexical databases)
-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

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

ERC MAIN RELEVANT PANELS

- **SH4 The Human Mind and Its Complexity** [SH4_8; SH4_9; SH4_10, SH4_11]
- **SH5 Texts and Concepts** [SH5_1, SH5_2, SH5_4, SH5_6, SH5_7, SH5_8, SH5_9, SH5_10, SH5_11]
- **SH6 The Study of the Human Past** [SH6_8, SH6_13]



KEY RESEARCH FACILITIES, INFRASTRUCTURE AND EQUIPMENT

Papyrological Institute "Girolamo Vitelli"

The Papyrological Institute 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.

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

- ERC Advanced Grant 2017 **ArsNova Multilingual Poetry and Polyphonic Song in the Late Middle Ages**, Principal Investigator Maria Sofia Lannutti, 2019-2024.
- PRIN 2017 **Regenerating the OVI Corpus: Renewal and Optimization of Methods, Contents and Tools**, Principal Investigator Lino Leonardi, Unit Coordinator Maria Sofia Lannutti, 2020-2023.
- 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, Unit Coordinator Francesca Maltomini, 2020-2023.
- PRIN 2017 **Languages and Cultures of Ancient Italy. Historical Linguistics and Digital Models**, Principal Investigator Anna Marinetti, Unit Coordinator Francesca Murano, 2020-2023.
- PRIN 2017 **IMPAQTS: Implicit Manipulation in Politics - Quantitatively Assessing the Tendentiousness of Speech**, Principal Investigator Edoardo Lombardi Vallauri, Unit Coordinator Alessandro Panunzi, 2019-2022.
- PRIN 2017 **Models of language variation and change: new evidence from language contact**, Principal Investigator Maria Rita Manzini, 2019-2022.
- PRIN 2017 **The Manifest Image and The Scientific Image**, Principal Investigator: Elena Castellani, 2019-2022.
- PRIN 2022 **Instruments of digital lexicography in support of the OIM (Osservatorio degli Italianismi nel Mondo)**, Principal Investigator: Marco Biffi, 2023-2025.
- PRIN 2022 **ProDEM A Pilot Project in the Digitisation of Epigraphic Manuscripts: Senator Filippo Buonarroti's Papers and Antiquarian Culture under the Last Medicis**, Principal Investigator Giovanni Alberto Cecconi, 2023-2025.
- PRIN 2022 **ALON Archive of the Lexicography of the Nineteenth-Twentieth Century**, Principal Investigator Massimo Fanfani, 2023-2025.
- PRIN 2022 **A Question of Honor: Duels in Italian Culture from the Risorgimento to the Fascist Period, between Imaginary, Representation, and Reality**, Principal Investigator: Irene Gambacorti, 2023-2025.
- PRIN 2022 **Tommaseo Papers Online**, Principal Investigator: Simone Magherini, 2023-2025.
- PRIN 2022 **INTEGRATION INTELlectual miGRATION: circulation of philosophical books and ideas around the ancient Mediterranean through the evidence of Graeco-Roman papyri**, Principal Investigator: Valeria Piano, 2023-2025.
- PRIN 2022 **Petronius and Apuleius: new critical editions and related studies**, Principal Investigator: Giulio Vannini, 2023-2025.
- PRIN 2022 **the ASAP Project Ancient Science, Ancient Philosophy. The Philosophical Foundation of Sciences**, Unit Coordinator Francesco Ademollo, 2023-2025.

- PRIN 2022 **HERB Human Explanation of Robotic Behaviour**, Unit Coordinator Riccardo Bruni, 2023-2025.
- PRIN 2022 **Letters on the net: Eugenio Montale's correspondence (1915-1981). Study and database**, Unit Coordinator Francesca Pia Castellano, 2023-2025.
- PRIN 2022 **Ariosto's library. For a new commentary on 1532 Orlando furioso**, Unit Coordinator Luca Degl'Innocenti, 2023-2025.
- PRIN 2022 **A New Open Access Critical Edition of Dante's "Commedia" Fostering Digital Humanities Projects. Collation of 580 Mss, Provisional Texts and Apparatuses, and Lexical Updatings to the "Vocabolario Dantesco"** (Accademia Della Crusca / Cnr), Unit Coordinator Paola Manni, 2023-2025.
- PRIN 2022 **Corpus SIM (Senectus Ipsa Morbus) Spontaneous speech in healthy ageing**, Unit Coordinator Alessandro Panunzi, 2023-2025.
- PRIN 2022 **Itineraries of Philosophy and Science from Baghdad to Florence: Albert the Great, his Sources and his Legacies**, Unit Coordinator Anna Rodolfi, 2023-2025.
- PRIN 2022 **Early Modern Spanish Theater (1570 - 1700): textual transmission, european circulation, new digital resources**, Unit Coordinator Salomé Vuelta Garcia, 2023-2025.

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DEPARTMENT OF EDUCATION, LANGUAGES, INTERCULTURES, LITERATURES AND PSYCHOLOGY

www.forlilpsi.unifi.it/



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, 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;

ERC MAIN RELEVANT PANELS

- SH1 Individuals, Markets and Organisations
- SH3 The Social World and Its Interactions
- SH4 The Human Mind and Its Complexity
- SH5 Texts and Concepts

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.

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, as well as the spatial and temporal dimensions, 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. It also emphasizes interculturality, the integration of theoretical, empirical, and practical perspectives related to training, teaching, and language and literary learning, understood as an area of research regarding the role of teaching. Furthermore, the department emphasizes the promotion of well-being and education in a global perspective, as well as 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)
- **ARCHEU** 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)
- **CO-VALIS** Sviluppo e sostenibilità delle competenze valutative degli insegnanti a scuola
- **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
- **NA.SVI.** Ricerche Narrative e Processi di Sviluppo
- **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**
- **SHRMxI** 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)
- **LTE** Tecnologie Educative (Educational Technologies laboratory)
- **Valutazione dei Processi di Sviluppo** (Evaluation of Development Processes laboratory)
- **VirtHuLab** Virtual Human Dynamics Laboratory
- **Winckelmann Laboratory**

INVOLVEMENT IN NATIONAL AND EUROPEAN RESEARCH FUNDING PROGRAMMES

EUROPEAN PROJECTS

Erasmus+ "**DREAM**" [Development and run-test of an educational affective model](#)

Erasmus+ "**I-ECEC**" [Intercultural early childhood education and care curriculum design for professionals](#)

Erasmus+ "**MECEC+**" [Multicultural early childhood education](#)

Erasmus+ "**MEET**" [Media education for equity and tolerance](#)

Erasmus+ "**QUAMMELOT**" [Qualification for minor migrants education and learning open access - on line teacher-training](#)

Erasmus+ "**EAR**" [Forming active European citizens through the dialectical method and theater](#)

Erasmus+ "**EU-MADE4ALL**" [European multimodal and digital education for language learning](#)

Europe for Citizens "**FREASCO**" [Free from sexism and sexual harassment at school](#)

EUniWell Research Incubator "**GENDER WB**" [Design and validation of a questionnaire to measure traditional gender norms and their impact on health and well-being](#)

Erasmus+ "**IHES**" [Inclusive higher education systems for students with intellectual disabilities](#)

Erasmus+ "**JOBLAND**" [Teaching skill and resources for improving career learning at school](#)

CERV "**PROPEGE**" [A drone to promote equality on political and economic decision making](#)

Creative Europe "**Q-THEATRE**" [Theatrical Recreations of Don Quixote in Europe](#)

Horizon 2020 "**REFUGE-ED**" [Effective practices in education, mental health and psychosocial support for the integration of refugee children](#)

Erasmus+ "**REGALE**" [Regional capacity for adult learning and education](#)

Erasmus+ "**Super RED**" [Supporting Self Regulated Learning in Digital and Remote Education](#)

Erasmus+ "**VIW**" [Voices of immigrant women](#)

EUniWell Seed Funding Call "**UNIMATTER**" [University students matter! improving students' wellbeing and academic success through increased mattering](#)

OTHER PROJECTS

Mapping Social Emotional Learning and School Climate in Italian Lower Secondary Schools: Advancing Understanding and Participation to inform Intervention

YOU-FUTURE YOUths'FUTURE Orientation in Times of Social Changes

SU! Project [Let's Speak Up! Understanding the impact of Online-Hate Speech on adolescents' daily life](#)

PHOENIX [A new kind of 'rebirth' for women and children living in conditions of marginalization](#)

AGER Continuing Education and Prevention for Active Aging. Fostering success stories in the transition from work to retirement

[Ecco-Italy: Education of children of Chinese origin in Italy](#)

[UPHER Othering ourselves. Conceptualizing and Representing Otherness in Hebrew, Ukrainian, and Polish cultural fields. Metaphors, similitudes, symbols, paths of exclusion/inclusion](#)

[NBI Look at the bright \(nature\) side: Improving body image and associated protective factors and reducing body image threats with the Nature for Body Image](#)

[COoperation and BRAin-Synchrony: a multiscale and translatable approach](#)

[Financial Literacy for Reflective Citizenship. Development and evaluation of the efficacy of a Financial Education program for primary school children](#)

[TAB-VR Targeting Bullying and probullying behaviors using Virtual Reality: indicated actions within a multi-tiered approach](#)

[The Mediterranean through Chinese Eyes: An Analysis Based on Geographical and Travel Sources from the Song to Qing Dynasties \(960–1911\)](#)

[Fostering compassion abilities: potential benefits on body image and health related outcomes](#)

[Indoor and outdoor school environment impact on students' cognition, affect, socialization, and well-being](#)

[Claudio Magris, intellettuale europeo. Ricognizione d'archivio, studio critico e valorizzazione del Fondo all'Archivio Bonsanti di Firenze](#)

[Promoting Social Inclusion and Psychological Well-being through Prosocial Functioning: From an Ecological-Causal Perspective to Intervention Design](#)

[GAMEFUL Videogame-based Assessment of Executive Functions through machine Learning](#)

[Di.Co.Each. Digital Competence in Early Childhood](#)

[THE Tuscany Health Ecosystem](#)

[RETURN Multi-Risk sciEnce for resilienT commUnities undeR a changiNg climate](#)

[REMPLOY Reconsidering Graduate Employability: Educational Pathways for Transitions to Work](#)

[The Wheel of Time: An Inquiry into New Sources of Late Indian Buddhism \(X-XIII cent.\)](#)

[WBE Discourses and Contexts of Well-being in the History of English](#)

[RevLib Reviving "The Liberal": Literature and Politics between Britain and Italy, 1821-23](#)

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DEPARTMENT OF HISTORY, ARCHAEOLOGY, GEOGRAPHY, FINE AND PERFORMING ARTS

www.sagas.unifi.it/



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

- **SH5 Texts and Concepts** [SH5_2, SH5_5]
- **SH6 The Study of the Human Past**
- **SH7 Human Mobility, Environment, and Space** [SH7_1, SH7_7, SH7_10]
- **SH8 Studies of Cultures and Arts** [SH8_3, SH8_4, SH8_5, SH8_6, SH8_7, SH8_8]

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, INFRASTRUCTURES 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.

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 Actions** (2019 and 2020), **JPICH Conservation and Protection Call** (2020), participation in the Horizon 2020 Strengthening links Project (2020-23);
- 1 **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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