ALLEGATO 1

ERC EVALUATION PANELS AND KEYWORDS

ERC panels cover all fields of research in three domains: Physical Sciences and Engineering (PE), Life Sciences (LS), and Social Sciences and Humanities (SH).

The list of keywords and descriptors associated to each panel is indicative and not exhaustive; applications are welcomed from all fields and disciplines even if not specifically mentioned under a given panel.

Physical Sciences and Engineering

**PE1 Mathematics**

All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics

- PE1_1 Logic and foundations
- PE1_2 Algebra
- PE1_3 Number theory
- PE1_4 Algebraic and complex geometry
- PE1_5 Lie groups, Lie algebras
- PE1_6 Geometry and Global Analysis
- PE1_7 Topology
- PE1_8 Analysis
- PE1_9 Operator algebras and functional analysis
- PE1_10 ODE and dynamical systems
- PE1_11 Theoretical aspects of partial differential equations
- PE1_12 Mathematical physics
- PE1_13 Probability
- PE1_14 Statistics
- PE1_15 Discrete mathematics and combinatorics
- PE1_16 Mathematical aspects of computer science
- PE1_17 Numerical analysis
- PE1_18 Scientific computing and data processing
- PE1_19 Control theory and optimisation
- PE1_20 Application of mathematics in sciences
- PE1_21 Application of mathematics in industry and society

**PE2 Fundamental Constituents of Matter**

Particle, nuclear, plasma, atomic, molecular, gas, and optical physics

- PE2_1 Fundamental interactions and fields
- PE2_2 Particle physics
- PE2_3 Nuclear physics
- PE2_4 Nuclear astrophysics
- PE2_5 Gas and plasma physics
- PE2_6 Electromagnetism
- PE2_7 Atomic, molecular physics
- PE2_8 Ultra-cold atoms and molecules
- PE2_9 Optics, non-linear optics and nano-optics
- PE2_10 Quantum optics and quantum information
- PE2_11 Lasers, ultra-short lasers and laser physics
- PE2_12 Relativity
- PE2_13 Thermodynamics
- PE2_14 Non-linear physics
- PE2_15 Metrology and measurement
PE3 **Condensed Matter Physics**  
Structure, electronic properties, fluids, nanosciences, biological physics

- PE3_1 Structure of solids, material growth and characterisation  
- PE3_2 Mechanical and acoustical properties of condensed matter, Lattice dynamics  
- PE3_3 Transport properties of condensed matter  
- PE3_4 Electronic properties of materials, surfaces, interfaces, nanostructures, etc.  
- PE3_5 Physical properties of semiconductors and insulators  
- PE3_6 Macroscopic quantum phenomena: superconductivity, superfluidity, etc.  
- PE3_7 Spintronics  
- PE3_8 Magnetism and strongly correlated systems  
- PE3_9 Condensed matter – beam interactions (photons, electrons, etc.)  
- PE3_10 Nanophysics: nanoelectronics, nanophotonics, nanomagnetism, nanoelectromechanics, etc.  
- PE3_11 Mesoscopic physics  
- PE3_12 Molecular electronics  
- PE3_13 Structure and dynamics of disordered systems: soft matter (gels, colloids, liquid crystals, etc.), liquids, glasses, defects, etc.  
- PE3_14 Fluid dynamics (physics)  
- PE3_15 Statistical physics: phase transitions, noise and fluctuations, models of complex systems, etc.  
- PE3_16 Physics of biological systems

PE4 **Physical and Analytical Chemical Sciences**  
Analytical chemistry, chemical theory, physical chemistry/chemical physics

- PE4_1 Physical chemistry  
- PE4_2 Spectroscopic and spectrometric techniques  
- PE4_3 Molecular architecture and Structure  
- PE4_4 Surface science and nanostructures  
- PE4_5 Analytical chemistry  
- PE4_6 Chemical physics  
- PE4_7 Chemical instrumentation  
- PE4_8 Electrochemistry, electrodialysis, microfluidics, sensors  
- PE4_9 Method development in chemistry  
- PE4_10 Heterogeneous catalysis  
- PE4_11 Physical chemistry of biological systems  
- PE4_12 Chemical reactions: mechanisms, dynamics, kinetics and catalytic reactions  
- PE4_13 Theoretical and computational chemistry  
- PE4_14 Radiation and Nuclear chemistry  
- PE4_15 Photochemistry  
- PE4_16 Corrosion  
- PE4_17 Characterisation methods of materials  
- PE4_18 Environment chemistry

PE5 **Synthetic Chemistry and Materials**  
Materials synthesis, structure-properties relations, functional and advanced materials, molecular architecture, organic chemistry

- PE5_1 Structural properties of materials  
- PE5_2 Solid state materials  
- PE5_3 Surface modification  
- PE5_4 Thin films  
- PE5_5 Ionic liquids  
- PE5_6 New materials: oxides, alloys, composite, organic-inorganic hybrid, nanoparticles
PE5_7 Biomaterials, biomaterials synthesis
PE5_8 Intelligent materials – self assembled materials
PE5_9 Coordination chemistry
PE5_10 Colloid chemistry
PE5_11 Biological chemistry
PE5_12 Chemistry of condensed matter
PE5_13 Homogeneous catalysis
PE5_14 Macromolecular chemistry
PE5_15 Polymer chemistry
PE5_16 Supramolecular chemistry
PE5_17 Organic chemistry
PE5_18 Medicinal chemistry

PE6 Computer Science and Informatics
Informatics and information systems, computer science, scientific computing, intelligent systems

PE6_1 Computer architecture, pervasive computing, ubiquitous computing
PE6_2 Computer systems, parallel/distributed systems, sensor networks, embedded systems, cyber-physical systems
PE6_3 Software engineering, operating systems, computer languages
PE6_4 Theoretical computer science, formal methods, and quantum computing
PE6_5 Cryptology, security, privacy, quantum cryptography
PE6_6 Algorithms, distributed, parallel and network algorithms, algorithmic game theory
PE6_7 Artificial intelligence, intelligent systems, multi agent systems
PE6_8 Computer graphics, computer vision, multimedia, computer games
PE6_9 Human computer interaction and interface, visualisation and natural language processing
PE6_10 Web and information systems, database systems, information retrieval and digital libraries, data fusion
PE6_11 Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)
PE6_12 Scientific computing, simulation and modelling tools
PE6_13 Bioinformatics, biocomputing, and DNA and molecular computation

PE7 Systems and Communication Engineering
Electrical, electronic, communication, optical and systems engineering

PE7_1 Control engineering
PE7_2 Electrical engineering: power components and/or systems
PE7_3 Simulation engineering and modelling
PE7_4 (Micro- and nano-) systems engineering
PE7_5 (Micro- and nano-) electronic, optoelectronic and photonic components
PE7_6 Communication technology, high-frequency technology
PE7_7 Signal processing
PE7_8 Networks (communication networks, sensor networks, networks of robots, etc.)
PE7_9 Man-machine interfaces
PE7_10 Robotics
PE7_11 Components and systems for applications (in e.g. medicine, biology, environment)
PE7_12 Electrical energy production, distribution, application

PE8 Products and Processes Engineering
Product design, process design and control, construction methods, civil engineering, energy processes, material engineering

PE8_1  Aerospace engineering
PE8_2  Chemical engineering, technical chemistry
PE8_3  Civil engineering, architecture, maritime/hydraulic engineering, geotechnics, waste treatment
PE8_4  Computational engineering
PE8_5  Fluid mechanics, hydraulic-, turbo-, and piston- engines
PE8_6  Energy processes engineering
PE8_7  Mechanical and manufacturing engineering (shaping, mounting, joining, separation)
PE8_8  Materials engineering (biomaterials, metals, ceramics, polymers, composites, etc.)
PE8_9  Production technology, process engineering
PE8_10  Industrial design (product design, ergonomics, man-machine interfaces, etc.)
PE8_11  Sustainable design (for recycling, for environment, eco-design)
PE8_12  Lightweight construction, textile technology
PE8_13  Industrial bioengineering

PE9  Universe Sciences
Astro-physics/chemistry/biology; solar system; stellar, galactic and extragalactic astronomy, planetary systems, cosmology, space science, instrumentation

PE9_1  Solar and interplanetary physics
PE9_2  Planetary systems sciences
PE9_3  Interstellar medium
PE9_4  Formation of stars and planets
PE9_5  Astrobiology
PE9_6  Stars and stellar systems
PE9_7  The Galaxy
PE9_8  Formation and evolution of galaxies
PE9_9  Clusters of galaxies and large scale structures
PE9_10  High energy and particles astronomy – X-rays, cosmic rays, gamma rays, neutrinos
PE9_11  Relativistic astrophysics
PE9_12  Dark matter, dark energy
PE9_13  Gravitational astronomy
PE9_14  Cosmology
PE9_15  Space Sciences
PE9_16  Very large data bases: archiving, handling and analysis
PE9_17  Instrumentation - telescopes, detectors and techniques

PE10  Earth System Science
Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management

PE10_1  Atmospheric chemistry, atmospheric composition, air pollution
PE10_2  Meteorology, atmospheric physics and dynamics
PE10_3  Climatology and climate change
PE10_4  Terrestrial ecology, land cover change
PE10_5  Geology, tectonics, volcanology
PE10_6  Palaeoclimatology, palaeoecology
PE10_7  Physics of earth’s interior, seismology, geodynamics
PE10_8  Oceanography (physical, chemical, biological, geological)
PE10_9  Biogeochemistry, biogeochemical cycles, environmental chemistry
PE10_10  Mineralogy, petrology, igneous petrology, metamorphic petrology
PE10_11 Geochemistry, cosmochemistry, crystal chemistry, isotope geochemistry, thermodynamics
PE10_12 Sedimentology, soil science, palaeontology, earth evolution
PE10_13 Physical geography, geomorphology
PE10_14 Earth observations from space/remote sensing
PE10_15 Geomagnetism, palaeomagnetism
PE10_16 Ozone, upper atmosphere, ionosphere
PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution
PE10_18 Cryosphere, dynamics of snow and ice cover, sea ice, permafrosts and ice sheets
PE10_19 Planetary geology and geophysics
PE10_20 Geohazards: earthquakes, landslides, tsunamis and other ground instabilities

Life Sciences

LS1 Molecular Biology, Biochemistry, Structural Biology and Molecular Biophysics
Molecular synthesis, modification, mechanisms and interactions, biochemistry, structural biology, molecular biophysics, signalling pathways

LS1_1 Macromolecular complexes including interactions involving nucleic acids, proteins, lipids and carbohydrates
LS1_2 Biochemistry
LS1_3 DNA synthesis, modification, repair, recombination, degradation
LS1_4 RNA synthesis, processing, modification, degradation
LS1_5 Protein synthesis, modification, turnover
LS1_6 Lipid biology
LS1_7 Glycobiology
LS1_8 Molecular biophysics (e.g. single-molecule approaches, bioenergetics, fluorescence)
LS1_9 Structural biology and its methodologies (e.g. crystallography, cryo-EM, NMR and new technologies)
LS1_10 Molecular mechanisms of signalling pathways
LS1_11 Fundamental aspects of synthetic biology and chemical biology

LS2 Genetics, 'Omics', Bioinformatics and Systems Biology
Molecular genetics, quantitative genetics, genetic epidemiology, epigenetics, genomics, metagenomics, transcriptomics, proteomics, metabolomics, glycomics, bioinformatics, computational biology, biostatistics, systems biology

LS2_1 Molecular genetics, reverse genetics, forward genetics, genome editing
LS2_2 Non-coding RNAs
LS2_3 Quantitative genetics
LS2_4 Genetic epidemiology
LS2_5 Epigenetics and gene regulation
LS2_6 Genomics (e.g. comparative genomics, functional genomics)
LS2_7 Metagenomics
LS2_8 Transcriptomics
LS2_9 Proteomics
LS2_10 Metabolomics
LS2_11 Glycomics/Lipidomics
LS2_12 Bioinformatics
LS2_13 Computational biology
LS2_14 Biostatistics
LS2_15 Systems biology

LS3 Cellular and Developmental Biology
Cell biology, cell physiology, signal transduction, organogenesis, developmental genetics, pattern formation and stem cell biology, in plants and animals, or, where appropriate, in microorganisms

LS3_1 Morphology and functional imaging of cells and tissues
LS3_2 Cytoskeleton and cell behaviour (e.g. control of cell shape, cell migration and cellular mechanosensing)
LS3_3 Organelle biology and trafficking
LS3_4 Cell junctions, cell adhesion, cell communication and the extracellular matrix
LS3_5 Cell signalling and signal transduction
LS3_6 Cell cycle, division and growth
LS3_7 Cell death (including senescence) and autophagy
LS3_8 Cell differentiation, physiology and dynamics
LS3_9 Developmental genetics in animals and plants
LS3_10 Embryology and pattern formation in animals and plants
LS3_11 Tissue organisation and morphogenesis in animals and plants (including biophysical approaches)
LS3_12 Stem cell biology in development, tissue regeneration and ageing, and fundamental aspects of stem cell-based therapies

LS4 Physiology, Pathophysiology and Endocrinology
Organ physiology, pathophysiology, endocrinology, metabolism, ageing, tumorigenesis, cardiovascular diseases, metabolic syndromes

LS4_1 Organ physiology and pathophysiology
LS4_2 Comparative physiology and pathophysiology
LS4_3 Molecular aspects of endocrinology
LS4_4 Fundamental mechanisms underlying ageing
LS4_5 Metabolism, biological basis of metabolism-related disorders
LS4_6 Fundamental mechanisms underlying cancer
LS4_7 Fundamental mechanisms underlying cardiovascular diseases
LS4_8 Non-communicable diseases (except for neural/psychiatric and immunity-related diseases)

LS5 Neuroscience and Neural Disorders
Neural cell function and signalling, systems neuroscience, neural bases of cognitive and behavioural processes, neurological and psychiatric disorders

LS5_1 Neural cell function, communication and signalling, neurotransmission in neuronal and/or glial cells
LS5_2 Systems neuroscience and computational neuroscience (e.g. neural networks, neural modelling)
LS5_3 Neuronal development, plasticity and regeneration
LS5_4 Sensation and perception (e.g. sensory systems, sensory processing, pain)
LS5_5 Neural bases of cognitive processes (e.g. memory, learning, attention)
LS5_6 Neural bases of behaviour (e.g. sleep, consciousness, addiction)
LS5_7 Neurological disorders (e.g. neurodegenerative diseases, seizures)
LS5_8 Psychiatric disorders (e.g. affective and anxiety disorders, autism, psychotic disorders)
LS5_9 Neurotrauma and neurovascular conditions (including injury, blood-brain barrier, stroke, neurorehabilitation)

LS6 Immunity and Infection
The immune system and related disorders, biology of infectious agents and infection, biological basis of prevention and treatment of infectious diseases

LS6_1 Innate immunity in animals and plants
LS6_2 Adaptive immunity
LS6_3 Regulation and effector functions of the immune response (e.g. cytokines, interferons and chemokines, inflammation, immune signalling, helper T cells, immunological memory, immunological tolerance, cell-mediated cytotoxicity, complement)
LS6_4 Immunological mechanisms in disease (e.g. autoimmunity, allergy, transplantation immunology, tumour immunology)
LS6_5 Biology of pathogens (e.g. bacteria, viruses, parasites, fungi)
LS6_6 Mechanisms of infection (e.g. transmission, virulence factors, host defences, immunity to pathogens, molecular pathogenesis)
LS6_7 Biological basis of prevention and treatment of infection (e.g. infection natural cycle, reservoirs, vectors, vaccines, antimicrobials)
LS6_8 Infectious diseases in animals and plants

LS7 Applied Medical Technologies, Diagnostics, Therapies and Public Health
Development of tools for diagnosis, monitoring and treatment of diseases, pharmacology, clinical medicine, regenerative medicine, epidemiology and public health
LS7_1 Imaging for medical diagnosis
LS7_2 Genetic tools for medical diagnosis
LS7_3 Other medical technologies for diagnosis and monitoring of diseases
LS7_4 Pharmacology and pharmacogenomics (including drug discovery and design, drug delivery and therapy, toxicology)
LS7_5 Applied gene and cell therapies, regenerative medicine
LS7_6 Radiation therapy
LS7_7 Analgesia and surgery
LS7_8 Epidemiology and public health
LS7_9 Environmental health, occupational medicine
LS7_10 Health services, health care research, medical ethics

LS8 Ecology, Evolution and Environmental Biology
Population, community and ecosystem ecology, evolutionary biology, behavioural ecology, microbial ecology
LS8_1 Ecosystem and community ecology, macroecology
LS8_2 Biodiversity, conservation biology, conservation genetics
LS8_3 Population biology, population dynamics, population genetics
LS8_4 Evolutionary ecology
LS8_5 Evolutionary genetics
LS8_6 Phylogenetics, systematics, comparative biology
LS8_7 Macroevolution, palaeobiology
LS8_8 Coevolution, biological mechanisms and ecology of species interactions (e.g. symbiosis, parasitism, mutualism, food-webs)
LS8_9 Behavioural ecology and evolution
LS8_10 Microbial ecology and evolution
LS8_11 Marine biology and ecology

LS9 Applied Life Sciences, Biotechnology, and Molecular and Biosystems Engineering
Applied plant and animal sciences, forestry, food sciences, applied biotechnology, environmental and marine biotechnology, applied bioengineering, biomass and biofuels, biohazards
LS9_1 Applied biotechnology (including transgenic organisms, applied genetics and genomics, biosensors, bioreactors, microbiology, bioactive compounds)
LS9_2 Applied bioengineering, synthetic biology, chemical biology, nanobiotechnology, metabolic engineering, protein and glyco-engineering, tissue engineering, biocatalysis, biomimetics
LS9  Applied animal sciences (including animal breeding, veterinary sciences, animal husbandry, animal welfare, aquaculture, fisheries, insect gene drive)
LS9  Applied plant sciences (including crop production, plant breeding, agroecology, forestry, soil biology)
LS9  Food sciences (including food technology, food safety, nutrition)
LS9  Biomass production and utilisation, biofuels
LS9  Environmental biotechnology (including bioindicators, bioremediation, biodegradation)
LS9  Biohazards (including biological containment, biosafety, biosecurity)
LS9  Marine biotechnology (including marine bioproducts, feed resources, genome mining)

Social Sciences and Humanities

SH1  Individuals, Markets and Organisations
Economics, finance and management
SH1  Macroeconomics; monetary economics; economic growth
SH1  International management; international trade; international business; spatial economics
SH1  Development economics, health economics, education economics
SH1  Financial economics; banking; corporate finance; international finance; accounting; auditing; insurance
SH1  Labour and demographic economics; human resource management
SH1  Econometrics; operations research
SH1  Behavioural economics; experimental economics; neuro-economics
SH1  Microeconomics; game theory
SH1  Industrial organisation; strategy; entrepreneurship
SH1  Management; marketing; organisational behaviour; operations management
SH1  Technological change, innovation, research & development
SH1  Agricultural economics; energy economics; environmental economics
SH1  Public economics; political economics; law and economics
SH1  Competition law, contract law, trade law, Intellectual Property Rights
SH1  Quantitative economic history and history of economics; institutional economics; economic systems

SH2  Institutions, Values, Environment and Space
Political science, law, sustainability science, geography, regional studies and planning
SH2  Political systems, governance
SH2  Democratisation and social movements
SH2  Conflict resolution, war, peace building
SH2  Constitutions, human rights, comparative law, humanitarian law, anti-discrimination law
SH2  International relations, global and transnational governance
SH2  Sustainability sciences, environment and resources
SH2  Environmental and climate change, societal impact and policy
SH2  Energy, transportation and mobility
SH2  Urban, regional and rural studies
SH2  Land use and regional planning
SH2  Human, economic and social geography
SH2  GIS, spatial analysis; big data in political, geographical and legal studies
SH3  The Social World, Diversity, Population
Sociology, social psychology, social anthropology, demography, education, communication

SH3_1  Social structure, social mobility
SH3_2  Inequalities, discrimination, prejudice, aggression and violence, antisocial behaviour
SH3_3  Social integration, exclusion, prosocial behaviour
SH3_4  Attitudes and beliefs
SH3_5  Social influence; power and group behaviour
SH3_6  Kinship; diversity and identities, gender, interethnic relations
SH3_7  Social policies, welfare
SH3_8  Population dynamics; households, family and fertility
SH3_9  Health, ageing and society
SH3_10 Religious studies, ritual; symbolic representation
SH3_11 Social aspects of learning, curriculum studies, educational policies
SH3_12 Communication and information, networks, media
SH3_13 Digital social research
SH3_14 Science and technology studies

SH4  The Human Mind and Its Complexity
Cognitive science, psychology, linguistics, philosophy of mind

SH4_1  Cognitive basis of human development and education, developmental disorders; comparative cognition
SH4_2  Personality and social cognition; emotion
SH4_3  Clinical and health psychology
SH4_4  Neuropsychology
SH4_5  Attention, perception, action, consciousness
SH4_6  Learning, memory; cognition in ageing
SH4_7  Reasoning, decision-making; intelligence
SH4_8  Language learning and processing (first and second languages)
SH4_9  Theoretical linguistics; computational linguistics
SH4_10  Language typology; historical linguistics
SH4_11 Pragmatics, sociolinguistics, linguistic anthropology, discourse analysis
SH4_12 Philosophy of mind, philosophy of language
SH4_13 Philosophy of science, epistemology, logic

SH5  Cultures and Cultural Production
Literature, philology, cultural studies, study of the arts, philosophy

SH5_1  Classics, ancient literature and art
SH5_2  Theory and history of literature, comparative literature
SH5_3  Philology and palaeography
SH5_4  Visual and performing arts, film, design
SH5_5  Music and musicology; history of music
SH5_6  History of art and architecture, arts-based research
SH5_7  Museums, exhibitions, conservation and restoration
SH5_8  Cultural studies, cultural identities and memories, cultural heritage
SH5_9  Metaphysics, philosophical anthropology; aesthetics
SH5_10 Ethics; social and political philosophy
SH5_11 History of philosophy
SH5_12 Computational modelling and digitisation in the cultural sphere
The Study of the Human Past

Archaeology and history

SH6_1 Historiography, theory and methods in history, including the analysis of digital data
SH6_2 Classical archaeology, history of archaeology
SH6_3 General archaeology, archaeometry, landscape archaeology
SH6_4 Prehistory, palaeoanthropology, palaeodemography, protohistory
SH6_5 Ancient history
SH6_6 Medieval history
SH6_7 Early modern history
SH6_8 Modern and contemporary history
SH6_9 Colonial and post-colonial history
SH6_10 Global history, transnational history, comparative history, entangled histories
SH6_11 Social and economic history
SH6_12 Gender history; cultural history; history of collective identities and memories
SH6_13 History of ideas, intellectual history, history of economic thought
SH6_14 History of science, medicine and technologies