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
PE2_16 Statistical physics (gases)

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, multi media, 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** 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**

**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)

**Immunological mechanisms in disease** (e.g. autoimmunity, allergy, transplantation immunology, tumour immunology)

**Biology of pathogens** (e.g. bacteria, viruses, parasites, fungi)

**Mechanisms of infection** (e.g. transmission, virulence factors, host defences, immunity to pathogens, molecular pathogenesis)

**Biological basis of prevention and treatment of infection** (e.g. infection natural cycle, reservoirs, vectors, vaccines, antimicrobials)

**Infectious diseases in animals and plants**

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**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

**Imaging for medical diagnosis**

**Genetic tools for medical diagnosis**

**Other medical technologies for diagnosis and monitoring of diseases**

**Pharmacology and pharmacogenomics** (including drug discovery and design, drug delivery and therapy, toxicology)

**Applied gene and cell therapies, regenerative medicine**

**Radiation therapy**

**Analgesia and surgery**

**Epidemiology and public health**

**Environmental health, occupational medicine**

**Health services, health care research, medical ethics**

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**LS8**

**Ecology, Evolution and Environmental Biology**

Population, community and ecosystem ecology, evolutionary biology, behavioural ecology, microbial ecology

**Ecosystem and community ecology, macroecology**

**Biodiversity, conservation biology, conservation genetics**

**Population biology, population dynamics, population genetics**

**Evolutionary ecology**

**Evolutionary genetics**

**Phylogenetics, systematics, comparative biology**

**Macroevolution, palaeobiology**

**Coevolution, biological mechanisms and ecology of species interactions** (e.g. symbiosis, parasitism, mutualism, food-webs)

**Behavioural ecology and evolution**

**Microbial ecology and evolution**

**Marine biology and ecology**

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**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

**Applied biotechnology** (including transgenic organisms, applied genetics and genomics, biosensors, bioreactors, microbiology, bioactive compounds)

**Applied bioengineering, synthetic biology, chemical biology, nanobiotechnology, metabolic engineering, protein and glyco-engineering, tissue engineering, biocatalysis, biomimetics**
LS9_3  Applied animal sciences (including animal breeding, veterinary sciences, animal husbandry, animal welfare, aquaculture, fisheries, insect gene drive)
LS9_4  Applied plant sciences (including crop production, plant breeding, agroecology, forestry, soil biology)
LS9_5  Food sciences (including food technology, food safety, nutrition)
LS9_6  Biomass production and utilisation, biofuels
LS9_7  Environmental biotechnology (including bioindicators, bioremediation, biodegradation)
LS9_8  Biohazards (including biological containment, biosafety, biosecurity)
LS9_9  Marine biotechnology (including marine bioproducts, feed resources, genome mining)

Social Sciences and Humanities

SH1  Individuals, Markets and Organisations
Economics, finance and management
SH1_1  Macroeconomics; monetary economics; economic growth
SH1_2  International management; international trade; international business; spatial economics
SH1_3  Development economics, health economics, education economics
SH1_4  Financial economics; banking; corporate finance; international finance; accounting; auditing; insurance
SH1_5  Labour and demographic economics; human resource management
SH1_6  Econometrics; operations research
SH1_7  Behavioural economics; experimental economics; neuro-economics
SH1_8  Microeconomics; game theory
SH1_9  Industrial organisation; strategy; entrepreneurship
SH1_10  Management; marketing; organisational behaviour; operations management
SH1_11  Technological change, innovation, research & development
SH1_12  Agricultural economics; energy economics; environmental economics
SH1_13  Public economics; political economics; law and economics
SH1_14  Competition law, contract law, trade law, Intellectual Property Rights
SH1_15  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_1  Political systems, governance
SH2_2  Democratisation and social movements
SH2_3  Conflict resolution, war, peace building
SH2_4  Constitutions, human rights, comparative law, humanitarian law, anti-discrimination law
SH2_5  International relations, global and transnational governance
SH2_6  Sustainability sciences, environment and resources
SH2_7  Environmental and climate change, societal impact and policy
SH2_8  Energy, transportation and mobility
SH2_9  Urban, regional and rural studies
SH2_10  Land use and regional planning
SH2_11  Human, economic and social geography
SH2_12  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
Archeology 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