

2019 ERC EVALUATION PANELS AND KEYWORDS

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, volcanology
- 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, crystal chemistry, isotope geochemistry, thermodynamics
- PE10_12 Sedimentology, soil science, palaeontology, earth evolution
- PE10_13 Physical geography
- PE10_14 Earth observations from space/remote sensing
- PE10_15 Geomagnetism, palaeomagnetism
- PE10_16 Ozone, upper atmosphere, ionosphere
- PE10_17 Hydrology, water and soil pollution
- PE10_18 Cryosphere, dynamics of snow and ice cover, sea ice, permafrosts and ice sheets

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, paleobiology
- 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_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

SH6 The Study of the Human Past

Archaeology and history

- SH6_1 Historiography, theory and methods in history, including the analysis of digital data
- SH6_2 Classical archaeology, history of archaeology
- 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