

SAPIENTOLOGY, METASCIENCE, OR UNISCIENCE: Federated Science, Technology, and Humanities [the European Research Area as a Core of Global Research Space]

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“All the sciences are conjoined with each other and interdependent”...” The sciences taken all together are identical with human wisdom...”

Descartes

“I would go so far as to say that the lack of a common frame of reference, the absence of any unifying set of concepts and principles, is now, if not the world's major disease, at least its most serious symptom.”

Julian Huxley, the first Director of UNESCO

ABSTRACT

The greatest achievement of science, technology, and humanities is to discover and identify the four distinct but interdependent parts of the world: the world of Nature (World I), the world of Mind (World II), the world of Society and Human Culture (World III), and the world of Technology and Engineering and Industry (World IV), interconnected via common reality, its fundamental entities, principles, rules and laws. Assuming such a federated architecture of the world, a federate union of all sciences and knowledge fields and subjects is developed. The conceptual union is identified as the “wisdom science”, SAPIENTOLOGY, METASCIENCE, or UNISCIENCE. The knowledge federation affords uniting the 21st Century Science, Technology and Humanities, converging and syncretizing the key provinces of knowledge and subject fields, with their basic concepts and principles, facts, definitions, axioms, hypothesis, laws, and theories. It is demonstrated that the Federated Science Architecture works as a guiding pattern for the Global Research Framework of Science and Technology, encompassing rising international knowledge areas, with the built-in frameworks, programs, organizations, platforms, and initiatives, as the European Research Area. The theory of federate sciences and technologies is created with the assumptions that the current unstable, shifting world is the product of experts, specialists and separated sciences and social and political paradigms, while the real world is the world of integrated sciences; and a scientific wisdom about the universe and human life is a necessary condition for a federated intelligent world, distinguished by a genuine social stability and global progression in all sphere of human life and culture.

Introduction: Towards a Unified Science and Research of the World

Science is designed to afford systematic knowledge and fundamental truths of the world, its properties, domains, levels, and parts, by the agency of scientific method, interplaying observation, experimentation, measurement, and theoretical reasoning. But an infinite complexity of the subject compelled the scientists to divide the whole universe of knowledge into many special divisions, fragments, pieces, portions, and components, encouraging special disciplines and particular worldviews and thence divisive doctrines, political ideologies, sociological models, particular beliefs, and prejudices.

The 20th century saw an explosion of special knowledge and skills and arts, marked by an unseen booming of diversity, specialization and professionalization of scientific research. Being historically rooted into three speculative activities, mathematics, physics, and ontology (metaphysics), the evolution of science has presently produced an enormous variety of special scientific disciplines and technological professions, thus greatly increasing an old gap between the sciences and the humanities, a liberal collection of liberal arts: philosophy, history, linguistics and language, literature studies, law, the fine arts, and religion.

Unlike the sciences, humanistic disciplines were long striving to provide scholarship, general learning and intellectual skills and broad, large-minded education to balance a narrow-minded expertise, specialism and professionalisation, dubbed as mass education. The educational institutes of interdisciplinary studies have been incorporated as elect colleges and schools, affording an elite learning for elite students, like the Paris Institute of Political Studies and its follower, the London School of Economics and Political Science (the alumni, the head of states and governments, policymakers, Nobel prize holders, 16 only from the LSE).

But domineering tendency has still been a technical diversification and fragmentation of knowledge reflected in enumerable numbers of scientists and engineers, academic disciplines, centers, and associations, educational establishments, colleges, schools, institutes, and universities, special research projects and programs. As a result, there have been spawned a never seen before number of specialists, specialties and professions, and there left only a small group of generalists, as humanists, balancing on the verge of extinction as an intelligent species.

To avoid an existential risk of narrow-mindedness, harmful overspecialization lacking meaningful fusion and synthesis, the 21st century commenced with a remarkable tendency to unify scientific knowledge, research, and development. This crucial drift towards unifying science and technologies was recognized in the NSF report on [Converging Technologies](#): Nanotechnology, Biotechnology, Information Technology and Cognitive Science. Increasingly, there appears recognition that interdisciplinary knowledge is a natural progressing of disciplinary sciences, overflowing the artificial boundaries of disciplinary knowledge. Some international funding agencies declared a vital necessity of multidisciplinary projects for solving most complex problems facing humanity. Realizing the [Lisbon Process \(Strategy, Agenda\)](#) of knowledge-based economy, the multi-billion EU FP7

“[Cooperation](#)” programme was established, involving universities, research centers, public authorities, and industry, to promote collaborative research, projects and networks of excellence in such critical multidisciplinary subject areas as health, food, agriculture, and biotechnology, nanosciences, nanotechnologies, materials, new production technologies, information and communication technologies, energy, environment, transport, socio-economic sciences and the humanities, security and space.

Today, one can find more and more inter-sciences numbered as academic disciplines, http://en.wikipedia.org/wiki/Academic_disciplines. Multidisciplinary areas become progressively established as mature disciplines. On the negative side, interdisciplinarity and multidisciplinary are still about combination without real integration, mostly about distributed, collective, pooled knowledge of a learned community, using the old disciplinary division of sciences. For the final cause of human cognition is a whole and complete learning, achieved by a hard progression through unavoidable stages of generalization: subjective, intuitive, or personal knowledge > experimental and factual and scientific knowledge > collective knowledge and intelligence > commonsense knowledge (see [the CYC common sense knowledge base](#)) > unified knowledge of the World (see the Encyclopedia of Unified Knowledge, Ontopaedia).

This surely suggests that without unifying theories and schemes, just distributed knowledge of distributed agents is hardly capable to integrate separate scientific ideas from separate specialties into a single complex whole. Such an atomistic methodology, science is a medley of separate, individual disciplines, starts practicing in the newly organized [European Research Council](#) FP 7 “[Ideas](#)” specific programme, the engine of “the [European Research Area](#) ... , a cornerstone of a European knowledge society”. The project is supposed to fund ‘frontier research’ in all fields of science and engineering, promising ‘new and unpredictable scientific and technological discoveries’ but with an obsolete and mixed pastiche of scientific disciplines and subject matters, lacking a united organization and so newly coming converging and emerging fields. This makes much a worrying situation not only for the misguided researchers but also for the EU science and technology policy makers; for the misconception of the nature and structure and unity of science and technology is sure putting at risk the idea of one European Knowledge Area as well as the multibillion public funding.

A new avenue to scientific knowledge integration is promised by transdisciplinarity of art, science, and technology, suggesting a unity of knowledge above and beyond the subjects, founding on the ontological and methodological principles: 1. the existence of levels of reality, 2. the logic of the included middle, and 3. complexity. The enterprise was recorded as the 1st World Congress of Transdisciplinarity, publishing its Charter, <http://nicol.club.fr/ciret/english/charten.htm>.

But there is still a low awareness among scientists, developers, knowledge managers and other stakeholders that unity-in-diversity or variety-in-unity for the sciences, fundamental and applied, formal and empirical, theoretical and practical, is effective principle as in the works of art. It could be seen on the large scale social community-based knowledge forums as Wikipedia (see the [Wikipedia’s fundamental categories](#)) or well-established encyclopedias as Britannica (see Encyclopaedia Britannica’s [Propaedia, Outline of Knowledge](#)), now discarding its traditional hierarchical knowledge organization, though. It is plain that a large variety of sciences without unity is special meanings without their unifying sense and context, as data without information, information without knowledge and intelligence, intelligence without **wisdom, the power to apply knowledge (understanding, experience, common sense, insight, learning) with general consciousness and intellectual depth.**

Humans acquire skill, experience, erudition, enlightenment, learning, information, and knowledge to deepen human judgment, sagacity, insight, intuition, common sense, reason, and understanding. But still the top mental feature, demanding cooperation of all the mental powers, is wisdom, sapience, depth, profundity, a unique power to see the integrity of world’s things and relations and wholeness of representation. The real scientific wisdom emerges as the highest synthesis of knowledge, scientific know-what, humanitarian know-why, and technical know-how, comprehending all the basic aspects of any complexity, all the key risks in a strategy, or all the significant relations of parts. The fullest comprehensive learning, real wisdom or scientifically wise encyclopedism, affording general consciousness and intellectual breadth and profundity, is a sure way to the best solutions of the most complex problems with the most effective means and algorithms. Wise scientific knowledge is a secure proofing against experts’ errors, misuses, follies, miscalculation, misjudgment, silliness, nonsense, or stupidity, like a toxic \$531 trillion US market of speculative financial instruments, called derivatives, created by the financial experts just to harm the world’s financial system.

There is currently an urgent necessity of integrated world knowledge, where analysis is complemented with synthesis, disciplinarian differences of knowledge fields with unification of world learning. An integrated knowledge of reality, matching the way the world works, focuses on a holistic organization of learning with the organic and functional interrelationships between constituent parts and the whole. All is aimed to unify, converge, and syncretize the key provinces of knowledge and subject fields, with their key concepts and principles, facts, definitions, axioms, hypothesis, laws, and unifying theories, as the WISDOM SCIENCE, SAPIENTOLOGY, OR METASCIENCE, integrating science, technology, the liberal arts together with the “love of wisdom”, philosophy. Such a holistic attitude, that real science is an integrated whole, promises to open new avenues to understanding the world’s nature, parts, mechanisms, order and structure, as a vast single evolving metasystem of Nature (World I), Mind (World II), Society (World III), and Technology (World IV) (see [Encyclopedia of Unified Knowledge or Reality, Universal Ontology and Knowledge Systems](#)).

So, if modern science affords to know the world, natural, mental or social; technology affords to change the world, favoring human development and societal progress. Then SAPIENTOLOGY, **the scientific wisdom about reality, nature, mind, society, and technology of unified world knowledge**, will afford to wisely know and change reality by the agency of unifying scientific principles, theories, techniques, methods and advanced knowledge technologies. As the synthesis of the scientific, philosophical and technological knowledge, for SAPIENTOLOGY to study some significant issue, like new human cultures as knowledge society, global risks as [global warming](#), or singularity technologies like web intelligence, as something separated or nonintegrated from its whole context, structure or environment, is a sign of defective knowledge, research, and cognition, with unexpected results and unforeseeable social consequences. By its scope, the Wisdom Science emerges as the world view of wisdom merging the special paradigms of science, technology and arts and thus viewing each entity as a part of the grand scheme of things, a member of the global ontology of the world, where any thing is interconnected to everything else in the universe, an infinite web of meaningful interrelations and interactions structuring reality. The integrity of science, arts and technology is required to effectively and efficiently master global changes and to develop a consistent strategy for a possible knowledge-based world-society.

SAPIENTOLOGY, the integrality of the 21st Century Science, Technology and Humanities, is also a guiding pattern for a world-wide research and innovation space, or the Global Research Framework of Science and Technology, encompassing rising international knowledge areas, with the frameworks, programs, organizations, platforms, and initiatives. The World Research and Innovation System is virtually to be networked as the World-Wide Virtual Research Communities of world-class networks of excellence in all the interrelated domains of human knowledge. A well-known case of the world-wide research space is the mentioned European Research Area with its [Framework Programs for Research and Technical Development of the European Community](#). Classifying its broad targets as [Ideas](#), [People](#), [Capacities](#), and [Cooperation](#), its leading programme on ‘Cooperation’ has been focused its more than EUR 32 billion public finances on the complex themes and global challenges, environmental, public health, social, economic, and technological, which are hardly resolvable without being based on the integrated science and technology.

I. THE FEDERATION OF SCIENCE AND TECHNOLOGY

..... (SEE THE FULL VERSION)

II. CONVERGING SCIENCES AND EMERGENT TECHNOLOGIES

.....(SEE THE FULL VERSION)

III. FEDERATING LARGE KNOWLEDGE RESOURCES

1. Britannica’s Outline of Knowledge

The content of the universal knowledge base can be sourced from the world’s collective knowledge resources, such as online [Wikipedia](#), the [New Encyclopaedia Britannica](#), and the [Great Ideas of the Western World](#), which knowledge organization systems afford rational reclassification and smooth incorporation. A troubling situation is with the [European Research Council’s](#) confusion of science and technology and humanities, needing restructuring anew, as its confusing governing board of reconstitution.

The online free encyclopedia follows the [Wikipedia Category](#) lacking the general structure of knowledge. There are traditional fields of study as mathematics and logics, natural sciences, social sciences, philosophy and thinking and belief systems, the arts, history, applied sciences, with cross-references. The Britannica is reorganized according to novel principles of knowledge organization. The first one is to refine a classic hierarchical division of knowledge by suggesting *the circle of learning* as the whole circle of human learning with no absolute beginning or ending (see Encyclopaedia Britannica’s [Propaedia, Outline of Knowledge](#).) The second principle is that ‘the whole world of knowledge is a single universe of discourse’. To organize the world’s learning as a total structure, one need to arrange both huge resources according to the unifying structure of sciences, specifically, postulating that there are no principal differences between the humanities or arts and the sciences regardless of their dissimilarities in methodology and criteria of validity.

Altogether, the Encyclopedia covers both all what is known about the universe (*‘what we know about the knowable universe’*) and the means and tools by which we get the world knowledge (*‘whereby we know which we know’*). The latter comprises the branches of knowledge such as logic; mathematics; the sciences (physics, biology, the social sciences with psychology, linguistics, technological sciences, medical science with its associate

disciplines); history and the humanities; philosophy; knowledge processing subjects, or information sciences. The former includes all what we know about matter and energy, Earth, life, human life, human society, art, technology, religion, and the history of mankind:

- ✚ **Matter and Energy:** *atoms* (atomic nuclei and elementary particles, structure and properties, nucleus and elementary particles); *energy, radiation, and matter* (chemical elements, compounds, and reactions; heat, thermodynamics, and the nonsolid states of matter; the solid state of matter; mechanics of particles, rigid bodies and deformable bodies - elasticity, vibrations, and flow; electricity and magnetism; waves and wave motion - water, sound, electromagnetic waves); *the universe: galaxies, stars, the solar system* (the cosmos, galaxies, stars, and the solar system); (Part two, 4 Divisions, 13 Sections)
- ✚ **Earth:** *the Earth's properties, structure, and composition* (the planet Earth, physical properties, structure and composition, minerals and rocks); *envelope* (the atmosphere, the hydrosphere, weather and climate); *surface feature* (physical features, geomorphic features); *history* (origin and development, the geological record, the geological time); (Part One, 3 Divisions, 11 Sections)
- ✚ **Life:** *living things, nature and diversity* (properties, origin and evolution, division); *vital processes, molecular basis* (chemicals, photosynthesis, metabolism, the nitrogen cycle, molecular mechanisms); *organisms, structures and functions* (cells, form and function, regulation and integration, support and covering, nutrition, exchange, transport and elimination, reproduction and sex, development and heredity); *organisms, behavioral responses* (nature and regularities, development and capacities); the biosphere (features, populations and communities, disease and death, ecosystems); (Part Three, 3 Divisions, 15 Sections)
- ✚ **Human Life:** *stages in the human life development* (evolution, heredity, races); *the human organism* (the body, health, diseases, medicine and care); *human behavior and experience* (human nature and experience, attention, sensation, and perception, internal states, capacities and dispositions, learning and thinking, the self and personality); (Part Four, 3 Divisions, 12 Sections)
- ✚ **Human Society:** *social groups: peoples and cultures* (peoples and cultures of the World, cultural development, cultural components and institutions, language and communication); *social organization and social change* (structure, change, status, populations); *the production, distribution, and utilization of wealth* (economic concepts and systems, the consumer, the market, and pricing, organization, income, macroeconomics, growth and planning); *politics and governments* (theory, institutions, processes, international relations); *law* (philosophies, systems, and practices, public law, private law); *education* (aims, organization); (Part Five, 6 Divisions, 25 Sections)
- ✚ **Art:** *art in general* (theories and classification, experience and criticism of works of art, characteristics of the arts in particular cultures); *the particular arts* (literature, theatre, motion pictures, music, dance, architecture, garden and landscape design, and urban design, sculpture, drawing, painting, printmaking and photography, arts of decoration and functional design); (Part Six, 3 Divisions, 12 Sections)
- ✚ **Technology:** *nature and development* (scope and history, organization of human work) *elements* (energy conversion and utilization, tools and machines, measurement, observation, and control, extraction and conversion of industrial raw materials, industrial production processes), *major fields* (agriculture and food production, construction, transportation, information processing and communication systems, the major industries technology, the urban community technology, military technology, earth and space exploration technology); (Part Seven, 3 Divisions, 15 Sections)
- ✚ **Religion:** *religion in general* (knowledge, understanding, institutions and practices), *the particular religions* (primitive religion, ancient peoples, Hinduism, Buddhism, East Asia Religions, Judaism, Christianity, Islam, the Modern World religions and movements) [see also Wikipedia's category: [Religion and belief systems](#)]; (Part Eight, 2 Divisions, 11 Sections)
- ✚ **The History of Mankind:** *peoples and civilizations of ancient Southwest Asia, North Africa, and Europe; of medieval Europe, North Africa, and Southwest Asia; of East, Central, South, and Southeast Asia; of Sub-Saharan Africa to 1885; of Pre-Columbian America; the modern world to 1920; the world since 1920*; (Part Nine, 7 Divisions, 37 Sections)
- ✚ **Knowledge Fields and Subjects and Branches:** *Logic, Mathematics, Science* (philosophy of science, the physical sciences, the Earth sciences, the biological sciences, the medical sciences, the social sciences and psychology and linguistics, the technological sciences), *History and the Humanities, Philosophy* (history, nature, scope, methods, and divisions, metaphysics, natural philosophy, epistemology, the philosophy of mind, philosophical anthropology, ethics, political philosophy, aesthetics, the philosophy of domains, logic, mathematics, art, science, religion, law, education, history); *Preservation of Knowledge*, (institutions and techniques for knowledge processing, collection, storage, retrieval, dissemination, preservation, including cultural objects and artefacts); (Part Ten, 3 Divisions, 18 Sections)

In all, the whole universe of the world's knowledge is arranged in ten levels (10 parts), 41 divisions (*italic*), and 177 sections, the key knowledge categories in the hierarchy, each having a three part numerical code, Part x, Division y, Section w, to indicate a place in the whole schema.

The Great Ideas of The Western World

The Unified Knowledge Base also covers a rich compendium of the great ideas found in the 'Synopsis of the Great Ideas', the two-volume subject-matter index of the resources systematically collected in the Great Books of the Western World. What numbers a hundred of generic concepts making the basic terms of any general universe of discourse. Adapted to the Ontopaedia's hierarchy, the basic ideas are organized as a hierarchy of categories with their subordinates, as in:

The Properties of Reality: Being, Cause, Chance, Change, Element, Eternity, Form, Infinity, Matter, Mind, Nature, Necessity and Contingency, One and Many, Opposition, Quality, Quantity, Relation, Same and Other, Space, Time, Universal and Particular, World

The Forms of Nature: Animal, Experience, Evolution, Fate, History, Immortality, Law, Life and Death, Man, Progress.

The States of Mind: Angel, Desire, Emotion, Experience, God, Idea, Judgment, Love, Memory and Imagination, Pleasure and Pain, Reasoning, Sense, Soul, and Will.

The Characters of Persons: Beauty, Duty, Good and Evil, Honor, Prudence, Courage, Temperance, Virtue and Vice.

The Forms of Human Practice: Aristocracy, Citizen, Constitution, Custom and Convention, Democracy, Family, Government, Habit, Happiness, Justice, Labor, Language, Law, Liberty, Monarchy, Oligarchy, Punishment, Revolution, Sin, Slavery, State, Tyranny and Despotism, War and Peace, and Wealth.

The Forms of Knowledge: Art, Astronomy and Cosmology, Dialectic, Education, Logic, History, Mathematics, Mechanics, Medicine, Metaphysics, Philosophy, Physics, Poetry, Religion, Rhetoric, Science; Definition, Induction, Logic, Opinion, Principle, Sign and Symbol, Truth.

The Great Ideas in Wikipedia

THE SYNTOPICON 1

[Angel](#), [Animal](#), [Aristocracy](#), [Art](#), [Astronomy](#), [Beauty](#), [Being](#), [Cause](#), [Chance](#), [Change](#), [Citizen](#), [Constitution](#), [Courage](#), [Custom](#) and [Convention](#), [Definition](#), [Democracy](#), [Desire](#), [Dialectic](#), [Duty](#), [Education](#), [Element](#), [Emotion](#), [Eternity](#), [Evolution](#), [Experience](#), [Family](#), [Fate](#), [Form](#), [God](#), [Good](#) and [Evil](#), [Government](#), [Habit](#), [Happiness](#), [History](#), [Honor](#), [Hypothesis](#), [Idea](#), [Immortality](#), [Induction](#), [Infinity](#), [Judgment](#), [Justice](#), [Knowledge](#), [Labor](#), [Language](#), [Law](#), [Liberty](#), [Life](#) and [Death](#), [Logic](#), and [Love](#)

THE SYNTOPICON 1I

[Man](#), [Mathematics](#), [Matter](#), [Mechanics](#), [Medicine](#), [Memory](#) and [Imagination](#), [Metaphysics](#), [Mind](#), [Monarchy](#), [Nature](#), [Necessity](#) and [Contingency](#), [Oligarchy](#), [One](#) and [Many](#), [Opinion](#), [Opposition](#), [Philosophy](#), [Physics](#), [Pleasure](#) and [Pain](#), [Poetry](#), [Principle](#), [Progress](#), [Prophecy](#), [Prudence](#), [Punishment](#), [Quality](#), [Quantity](#), [Reasoning](#), [Relation](#), [Religion](#), [Revolution](#), [Rhetoric](#), [Same](#) and [Other](#), [Science](#), [Sense](#), [Sign](#) and [Symbol](#), [Sin](#), [Slavery](#), [Soul](#), [Space](#), [State](#), [Temperance](#), [Theology](#), [Time](#), [Truth](#), [Tyranny](#), [Universal](#) and [Particular](#), [Virtue](#) and [Vice](#), [War](#) and [Peace](#), [Wealth](#), [Will](#), [Wisdom](#), and [World](#)

2. Wikipedia's Categories of Science and Technology

Categorical Index, or Lists of Basic Topics

[General reference](#)
[Culture and the arts](#)
[Geography and places](#)
[Health and fitness](#)

[History and events](#)
[Mathematics and logic](#)
[Natural and physical sciences](#)
[People and self](#)

[Philosophy and thinking](#)
[Religion and belief systems](#)
[Society and social sciences](#)
[Technology and applied sciences](#)

Philosophy

[Philosophy](#) • [Branches](#) • [Schools and traditions](#) • [Movements](#) • [Theories](#) • [Arguments](#) • [Philosophers](#) • [Literature](#) • [History](#) • [By era](#) • [By region](#) •

[Aesthetics](#) •

[Epistemology](#) •

[Ethics](#) •

[Logic](#) •

[Metaphysics](#)

Mathematics and Abstraction

[Algebra](#) • [Analysis](#) • [Arithmetic](#) • [Education](#) • [Equations](#) • [Geometry](#) • [Logic](#) • [Measurement](#) • [Numbers](#) • [Proofs](#) • [Statistics](#) • [Theorems](#) • [Trigonometry](#)

NATURAL AND PHYSICAL SCIENCES

Science > [Natural sciences](#)

[Physical sciences](#)

• [Astronomy](#) • [Chemistry](#) • [Climate](#) • [Earth sciences](#) • [Geology](#) • [Physics](#) • [Space](#)

[Biology](#)

• [Ecology](#) • [Health sciences](#) (See also the [Health and fitness](#)) • [Medicine](#) • [Neuroscience](#) •

[Scientific method](#) • [Scientists](#)

Geography < the Earth sciences < Natural Science

THE SCIENCES OF MIND

[Thinking and thinking skills](#) •

[Attention](#) • [Cognition](#) • [Cognitive biases](#) • [Creativity](#) • [Decision theory](#) • [Emotion](#) • [Error](#) • [Imagination](#) • [Intelligence](#) • [Intelligence researchers](#) • [Learning](#) • [Memory](#) • [Memory biases](#) • [Mnemonics](#) • [Nootropics \(smart drugs\)](#) • [Organizational thinking](#) • [Perception](#) • [Problem solving](#) • [Psychological adjustment](#) • [Psychometrics](#) • [Qualities of thought](#)

[Philosophy and thinking](#)
[Religion and belief systems](#)

SOCIAL SCIENCES

[Science](#) > [Social sciences](#)

• [Anthropology](#) • [Archaeology](#) • [Cultural studies](#) • [Demographics](#) • [Economics](#) • [Heuristics](#) • [Information studies](#) • [International relations](#) • [Linguistics](#) • [Psychology](#) • [Media studies](#) • [Political science](#) • [Social scientists](#) • [Sociology](#) • [Sexology](#) • [Systems theory](#)

[Scientific method](#) • [Scientists](#)

TECHNOLOGICAL SCIENCES

[Technology and applied sciences](#)

[Agriculture & Agronomy](#) • [Architecture](#) • [Artificial intelligence](#) • [Automation](#) • [Biotechnology](#) • [Blu-ray](#) • [Cartography](#) • [Chemical engineering](#) • [Communication](#) ([Media studies](#) • [Telecommunications](#)) • [Construction](#) • [Design](#) • [Digital divide](#) • [Electronics](#) • [Energy](#) • [Ergonomics](#) • [Firefighting](#) • [Forensics](#) • [Forestry](#) • [Industry](#) • [Information science](#) • [Information technology](#) • [Internet](#) • [Management](#) • [Manufacturing](#) • [Marketing](#) • [Medicine](#) ([Unsolved problems in neuroscience](#)) • [Metalworking](#) • [Microtechnology](#) • [Military science](#) • [Mining](#) • [Nanotechnology](#) • [Nuclear technology](#) • [Nutrition](#) • [Optics](#) • [Plumbing](#) • [Robotics](#) • [Sound technology](#) • [Space exploration](#) • [Technology forecasting](#) • [Tools](#)

Computing: [Classes of computers](#) • [Companies](#) • [Computer architecture](#) • [Computer model](#) • [Computer science](#) • [Computer security](#) • [Computing and society](#) • [Data](#) • [Embedded systems](#) • [Free software](#) • [Human-computer interaction](#) • [Information systems](#) • [Internet](#) • [Languages](#) • [Multimedia](#) • [Networks](#) • [Industrial Networks](#) • [Operating systems](#) • [Platforms](#) • [Product lifecycle management](#) • [Programming](#) • [Real-time computing](#) • [Software](#) • [Software engineering](#) • [Unsolved problems in computer science](#) • [More...](#)

Electronics: [Avionics](#) • [RF & MMIC Design](#) • [Circuits](#) • [Companies](#) • [Connectors](#) • [Consumer electronics](#) • [Digital electronics](#) • [Digital media](#) • [Electrical components](#) • [Electronic design](#) • [Electronics manufacturing](#) • [Embedded systems](#) • [Integrated circuits](#) • [Microwave technology](#) • [Molecular electronics](#) • [Water technology](#) • [Optoelectronics](#) • [Quantum electronics](#) • [RFID](#) • [Radio electronics](#) • [Semiconductors](#) • [Signal cables](#) • [Surveillance](#) • [Telecommunications](#) • [Terminology](#) • [More...](#)

Engineering: [Aerospace engineering](#) • [Bioengineering](#) • [Chemical engineering](#) • [Civil engineering](#) • [Electrical engineering](#) • [Environmental engineering](#) • [Materials science](#) • [Mechanical engineering](#) • [Nuclear technology](#) • [Software engineering](#) • [Structural engineering](#)

Transportation: [By country](#) • [Automobiles](#) • [Aviation](#) • [Cycling](#) • [Public transport](#) • [Rail transport](#) • [Road transport](#) • [Shipping](#) • [Spaceflight](#) • [Vehicles](#) • [Water transport](#)

[Technology timelines](#)

3. The European Research Council' Schema of Science and Technology: FP7, the Programme 'Ideas'.

All fields of science, engineering and scholarship the ERC's knowledge schema assigned to [three research domains](#): Mathematics, Physical sciences, Information and Communication, Engineering, Universe and Earth sciences; Life Sciences; Social Sciences and Humanities. Such an arbitrary assortment of sciences, a knowledge soup of subject fields, led to an alphabet soup of the ERC panels of arbiters, making a lip service for further fragmentation of the European science and scientists.

“Annex 1: ERC peer review evaluation panels (ERC panels)

For the planning and operation of the evaluation of ERC grant proposals by panels, the following panel structure applies. There are 25 ERC panels to cover all fields of science, engineering and scholarship assigned to three research domains: Social Sciences and Humanities (6 Panels, SH1–SH6), Physical Sciences and Engineering (10 Panels, PE1–PE10), Life Sciences (9 Panels, LS1–LS9). The panel names are accompanied by a list of panel descriptors indicating the fields of research covered by the respective ERC panels.”

I. MATHEMATICS, PHYSICAL SCIENCES, INFORMATION AND COMMUNICATION, ENGINEERING, UNIVERSE AND EARTH SCIENCES

Panel structure – PHYSICAL SCIENCES & ENGINEERING:

PE1 Mathematical foundations
PE2 Fundamental constituents of matter
PE3 Condensed matter physics
PE4 Physical and Analytical Chemical sciences
PE5 Materials and Synthesis
PE6 Computer science and informatics
PE7 Systems and communication engineering
PE8 Products and process engineering
PE9 Universe sciences
PE10 Earth system science

PE1 Mathematical foundations: 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 Geometry
PE1_6 Topology
PE1_7 Lie groups, Lie algebras
PE1_8 Analysis
PE1_9 Operator algebras and functional analysis
PE1_10 ODE and dynamical systems
PE1_11 Partial differential equations
PE1_12 Mathematical physics
PE1_13 Probability and statistics
PE1_14 Combinatorics
PE1_15 Mathematical aspects of computer science
PE1_16 Numerical analysis and scientific computing
PE1_17 Control theory and optimization
PE1_18 Application of mathematics in sciences

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 Optics and quantum optics
PE2_9 Lasers and laser physics
PE2_10 Acoustics
PE2_11 Relativity
PE2_12 Classical physics
PE2_13 Thermodynamics
PE2_14 Non-linear physics
PE2_15 General physics
PE2_16 Metrology and measurement
PE2_17 Statistical physics (gases)
73

PE3 Condensed matter physics: structure, electronic properties, fluids, nanosciences

PE3_1 Structure of solids and liquids
PE3_2 Mechanical and acoustical properties of condensed matter
PE3_3 Thermal properties of condensed matter
PE3_4 Transport properties of condensed matter,
PE3_5 Electronic properties of materials and transport
PE3_6 Lattice dynamics
PE3_7 Semiconductors
PE3_8 Superconductivity
PE3_9 Superfluids
PE3_10 Spintronics

PE3_11 Magnetism
PE3_12 Nanophysics: nanoelectronics, nanophotonics, nanomagnetism
PE3_13 Mesoscopic physics
PE3_14 Molecular electronics
PE3_15 Soft condensed matter (liquid crystals...)
PE3_16 Fluid dynamics (physics)
PE3_17 Statistical physics (condensed matter)
PE3_18 Phase transitions, phase equilibria
PE3_19 Biophysics

PE4 Physical and Analytical Chemical sciences: analytical chemistry, chemical theory, physical chemistry/chemical physics

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

PE5 Materials and Synthesis: 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 Corrosion
PE5_6 Porous materials
PE5_7 Ionic liquids
PE5_8 New materials: oxides, alloys, composite, organic-inorganic hybrid, superconductors
PE5_9 Materials for sensors
PE5_10 Nanomaterials: nanoparticles, nanotubes
PE5_11 Biomaterials synthesis
PE5_12 Intelligent materials – self assembled materials
PE5_13 Environment chemistry
PE5_14 Coordination chemistry
PE5_15 Colloid chemistry
PE5_16 Biological chemistry
PE5_17 Chemistry of condensed matter
PE5_18 Homogeneous and heterogeneous catalysis
PE5_19 Characterization methods of materials
PE5_20 Macromolecular chemistry,
PE5_21 Polymer chemistry
PE5_22 Supramolecular chemistry
PE5_23 Organic chemistry
PE5_24 Molecular chemistry

PE6 Computer science and informatics: informatics and information systems, computer science, scientific computing, intelligent systems

PE6_1 Computer architecture
PE6_2 Database management
PE6_3 Formal methods
PE6_4 Graphics and image processing
PE6_5 Human computer interaction and interface
PE6_6 Informatics and information systems

PE6_7 Theoretical computer science including quantum information

PE6_8 Intelligent systems

PE6_9 Scientific computing

PE6_10 Modelling tools

PE6_11 Multimedia

PE6_12 Parallel and Distributed Computing

PE6_13 Speech recognition

PE6_14 Systems and software

PE7 Systems and communication engineering: electronic, communication, optical and systems engineering

PE7_1 Control engineering

PE7_2 Electrical and electronic engineering: semiconductors, components, systems

PE7_4 Simulation engineering and modelling

PE7_5 Systems engineering, sensorics, actotics, automation

PE7_6 Micro- and nanoelectronics, optoelectronics

PE7_7 Communication technology, high-frequency technology

PE7_8 Signal processing

PE7_9 Networks

PE7_10 Man-machine-interfaces

PE7_11 Robotics

PE8 Products and process engineering: product design, process design and control, construction methods, civil engineering, energy systems, material engineering

PE8_1 Aerospace engineering

PE8_2 Chemical engineering, technical chemistry

PE8_3 Civil engineering, maritime/hydraulic engineering, geotechnics, waste treatment

PE8_4 Computational engineering

PE8_5 Fluid mechanics, hydraulic-, turbo-, and piston engines

PE8_6 Energy systems (production, distribution, application)

PE8_7 Micro (system) engineering,

PE8_8 Mechanical and manufacturing engineering (shaping, mounting, joining, separation)

PE8_9 Materials engineering (biomaterials, metals, ceramics, polymers, composites, ...)

PE8_10 Production technology, process engineering

PE8_11 Product design, ergonomics, man-machine interfaces

PE8_12 Lightweight construction, textile technology

PE8_13 Industrial bioengineering

PE8_14 Industrial biofuel production

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

PE9_18 Solar planetology

PE10 Earth system science: physical geography, geology, geophysics, meteorology, oceanography, climatology, 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 Paleoclimatology, paleoecology

PE10_7 Physics of earth's interior, seismology, volcanology
PE10_8 Oceanography (physical, chemical, biological)
PE10_9 Biogeochemistry, biogeochemical cycles, environmental chemistry
PE10_10 Mineralogy, petrology, igneous petrology, metamorphic petrology
PE10_11 Geochemistry, crystal chemistry, isotope geochemistry, thermodynamics,
PE10_13 Sedimentology, soil science, palaeontology, earth evolution
PE10_14 Physical geography
PE10_15 Earth observations from space/remote sensing
PE10_16 Geomagnetism, paleomagnetism
PE10_17 Ozone, upper atmosphere, ionosphere
PE10_18 Hydrology, water and soil pollution

II. LIFE SCIENCES

Panel structure

LS1 Molecular and Structural Biology and Biochemistry
LS2 Genetics, Genomics, Bioinformatics and Systems Biology
LS3 Cellular and Developmental Biology
LS4 Physiology, Pathophysiology and Endocrinology
LS5 Neurosciences and neural disorders
LS6 Immunity and infection
LS7 Diagnostic tools, therapies and public health
LS8 Evolutionary, population and environmental biology
LS9 Applied life sciences and biotechnology

LS1 Molecular and Structural Biology and Biochemistry: molecular biology, biochemistry, biophysics, structural biology, biochemistry of signal transduction

LS1_1 Molecular biology and interactions
LS1_2 General biochemistry and metabolism
LS1_3 DNA biosynthesis, modification, repair and degradation
LS1_4 RNA synthesis, processing, modification and degradation
LS1_5 Protein synthesis, modification and turnover
LS1_6 Biophysics
LS1_7 Structural biology (crystallography, NMR, EM)
LS1_8 Biochemistry of signal transduction

LS2 Genetics, Genomics, Bioinformatics and Systems Biology: genetics, population genetics, molecular genetics, genomics, transcriptomics, proteomics, metabolomics, bioinformatics, computational biology, biostatistics, biological modelling and simulation, systems biology, genetic epidemiology

LS2_1 Genomics, comparative genomics, functional genomics
LS2_2 Transcriptomics
LS2_3 Proteomics
LS2_4 Metabolomics
LS2_5 Glycomics
LS2_6 Molecular genetics, reverse genetics and RNAi
LS2_7 Quantitative genetics
LS2_8 Epigenetics and gene regulation
LS2_9 Genetic epidemiology
LS2_10 Bioinformatics
LS2_11 Computational biology
LS2_12 Biostatistics
LS2_13 Systems biology
LS2_14 Biological systems analysis, modelling and simulation

LS3 Cellular and Developmental Biology: cell biology, cell physiology, signal transduction, organogenesis, developmental genetics, pattern formation in plants and animals

LS3_1 Morphology and functional imaging of cells
LS3_2 Cell biology and molecular transport mechanisms
LS3_3 Cell cycle and division
LS3_4 Apoptosis
LS3_5 Cell differentiation, physiology and dynamics
LS3_6 Organelle biology
LS3_7 Cell signalling and cellular interactions
LS3_8 Signal transduction
LS3_9 Development, developmental genetics, pattern formation and embryology in animals

LS3_10 Development, developmental genetics, pattern formation and embryology in plants
LS3_11 Cell genetics
LS3_12 Stem cell biology
LS4 Physiology, Pathophysiology and Endocrinology: organ physiology, pathophysiology, endocrinology, metabolism, ageing, regeneration, tumorigenesis, cardiovascular disease, metabolic syndrome
LS4_1 Organ physiology
LS4_2 Comparative physiology
LS4_3 Endocrinology
LS4_4 Ageing
LS4_5 Metabolism, biological basis of metabolism related disorders
LS4_6 Cancer and its biological basis
LS4_7 Cardiovascular diseases
LS4_8 Non-communicable diseases (except for neural/psychiatric, immunity-related, metabolism-related disorders, cancer and cardiovascular diseases)
LS5 Neurosciences and neural disorders: neurobiology, neuroanatomy, neurophysiology, neurochemistry, neuropharmacology, neuroimaging, systems neuroscience, neurological disorders, psychiatry
LS5_1 Neuroanatomy and neurosurgery
LS5_2 Neurophysiology
LS5_3 Neurochemistry and neuropharmacology
LS5_4 Sensory systems (e.g. visual system, auditory system)
LS5_5 Mechanisms of pain
LS5_6 Developmental neurobiology
LS5_7 Cognition (e.g. learning, memory, emotions, speech)
LS5_8 Behavioral neuroscience (e.g. sleep, consciousness, handedness)
LS5_9 Systems neuroscience
LS5_10 Neuroimaging and computational neuroscience
LS5_11 Neurological disorders (e.g. Alzheimer's disease, Huntington's disease, Parkinson's disease)
LS5_12 Psychiatric disorders (e.g. schizophrenia, autism, Tourette's syndrome, obsessive compulsive disorder, depression, bipolar disorder, attention deficit hyperactivity disorder)
LS6 Immunity and infection: immunobiology, aetiology of immune disorders, microbiology, virology, parasitology, global and other infectious diseases, population dynamics of infectious diseases, veterinary medicine
LS6_1 Innate immunity
LS6_2 Adaptive immunity
LS6_3 Phagocytosis and cellular immunity
LS6_4 Immunosignalling
LS6_5 Immunological memory and tolerance
LS6_6 Immunogenetics
LS6_7 Microbiology
LS6_8 Virology
LS6_9 Bacteriology
LS6_10 Parasitology
LS6_11 Prevention and treatment of infection by pathogens (e.g. vaccination, antibiotics, fungicide)
LS6_12 Biological basis of immunity related disorders
LS6_13 Veterinary medicine
LS7 Diagnostic tools, therapies and public health: aetiology, diagnosis and treatment of disease, public health, epidemiology, pharmacology, clinical medicine, regenerative medicine, medical ethics
LS7_1 Medical engineering and technology
LS7_2 Diagnostic tools (e.g. genetic, imaging)
LS7_3 Pharmacology, pharmacogenomics, drug discovery and design, drug therapy
LS7_4 Analgesia
LS7_5 Toxicology
LS7_6 Gene therapy, stem cell therapy, regenerative medicine
LS7_7 Surgery
LS7_8 Radiation therapy
LS7_9 Health services, health care research
LS7_10 Public health and epidemiology
LS7_11 Environment and health risks including radiation
LS7_12 Occupational medicine
LS7_13 Medical ethics
LS8 Evolutionary, population and environmental biology: evolution, ecology, animal behaviour, population biology, biodiversity, biogeography, marine biology, eco-toxicology, prokaryotic biology
LS8_1 Ecology (theoretical, community, population, microbial, evolutionary ecology)
LS8_2 Population biology, population dynamics, population genetics, plant-animal interactions

LS8_3 Systems eEvolution, biological adaptation, phylogenetics, systematics
LS8_4 Biodiversity, comparative biology
LS8_5 Conservation biology, ecology, genetics
LS8_6 Biogeography
LS8_7 Animal behaviour (behavioural ecology, animal communication)
LS8_8 Environmental and marine biology
LS8_9 Environmental toxicology
LS8_10 Prokaryotic biology
LS8_11 Symbiosis

LS9 Applied life sciences and biotechnology: agricultural, animal, fishery, forestry and food sciences; biotechnology, chemical biology, genetic engineering, synthetic biology, industrial biosciences; environmental biotechnology and remediation

LS9_1 Genetic engineering, transgenic organisms, recombinant proteins, biosensors
LS9_2 Synthetic biology and new bio-engineering concepts
LS9_3 Agriculture related to animal husbandry, dairying, livestock raising
LS9_4 Aquaculture, fisheries
LS9_5 Agriculture related to crop production, soil biology and cultivation, applied plant biology
LS9_6 Food sciences
LS9_7 Forestry, biomass production (e.g. for biofuels)
LS9_8 Environmental biotechnology, bioremediation, biodegradation
LS9_9 Biotechnology, bioreactors, applied microbiology
LS9_10 Biomimetics
LS9_11 Biohazards, biological containment, biosafety, biosecurity

III. SOCIAL SCIENCES AND HUMANITIES

Panel structure - Social Sciences and Humanities:

SH1 Individuals, institutions and markets
SH2 Institutions, values, beliefs and behaviour
SH3 Environment and society
SH4 The Human Mind and its complexity
SH5 Cultures and cultural production
SH6 The study of the human past

SH1 Individuals, institutions and markets: *economics, finance and management*

SH1_1 Macroeconomics, growth, business cycles
SH1_2 Microeconomics, institutional economics
SH1_3 Econometrics, statistical methods
SH1_4 Financial markets, banking and corporate finance
SH1_5 Competitiveness, innovation, research and development
SH1_6 Consumer choice, behavioural economics, marketing
SH1_7 Organization studies, strategy
SH1_8 Human resource management, employment and earnings
SH1_9 Public administration, public economics
SH1_10 Income distribution, poverty
SH1_11 International trade, economic geography
SH1_12 Economic history, development

SH2 Institutions, values, beliefs and behaviour: *sociology, social anthropology, political science, law, communication, social studies of science and technology*

SH2_1 Social structure, inequalities, social mobility
SH2_2 Ageing, work, social policies
SH2_3 Kinship, cultural dimensions of classification and cognition, individual and social identity, gender
SH2_4 Myth, ritual, symbolic representations, religious studies
SH2_5 Ethnography
SH2_6 Globalization, migration, interethnic relations
SH2_7 Transformation of societies, democratization, social movements
SH2_8 Political systems, legitimacy of governance
SH2_9 Legal systems, constitutions, foundations of law
SH2_10 Private, public and social law
SH2_11 Global and transnational governance, international law, human rights
SH2_12 Communication networks, media, information society
SH2_13 Social studies of science and technology, S&T policies, science and society

SH2_14 History of science and technology

SH3 Environment and society: *environmental studies, demography, social geography, urban and regional studies*

SH3_1 Environment and sustainability

SH3_2 Environmental regulation and mediation

SH3_3 Social and industrial ecology

SH3_4 Geographical information systems, cartography

SH3_5 Human and social geography

SH3_6 Spatial and regional planning

SH3_7 Population dynamics

SH3_8 Urbanization and urban planning, cities

SH3_9 Mobility and transportation

SH4 The Human Mind and its complexity: *cognition, psychology, linguistics, philosophy and education*

SH4_1 Evolution of mind and cognitive functions, animal communication

SH4_2 Human life-span development

SH4_3 Neuropsychology and cognitive psychology

SH4_4 Clinical and experimental psychology,

SH4_5 Formal, cognitive, functional and computational linguistics

SH4_6 Typological, historical and comparative linguistics

SH4_7 Acquisition and knowledge of language: psycholinguistics, neurolinguistics

SH4_8 Use of language: pragmatics, sociolinguistics, discourse analysis

SH4_9 Second language teaching and learning, language pathologies, lexicography, terminology

SH4_10 Philosophy, history of philosophy

SH4_11 Epistemology, logic, philosophy of science

SH4_12 Ethics and morality, bioethics

SH4_13 Education: principles, techniques, typologies

SH5 Cultures and cultural production: *literature, visual and performing arts, music, cultural and comparative studies*

SH5_1 Classics

SH5_2 History of literature

SH5_3 Literary theory and comparative literature, literary styles

SH5_4 Textual philology and palaeography

SH5_5 Visual arts

SH5_6 Performing arts

SH5_7 Museums and exhibitions

SH5_8 Numismatics, epigraphy

SH5_9 Music and musicology, history of music

SH5_10 History of art and architecture

SH5_11 Cultural studies, cultural diversity

SH5_12 Cultural memory, intangible cultural heritage

SH6 The study of the human past: *archaeology, history and memory*

SH6_1 Archaeology, archaeometry, landscape archaeology

SH6_2 Prehistory and protohistory

SH6_3 Ancient history, ancient cultures

SH6_4 Medieval history

SH6_5 Modern and contemporary history

SH6_6 Colonial history, entangled histories, global history

SH6_7 Military history,

SH6_8 Historiography, theory and methods of history

SH6_9 History of ideas, intellectual history

SH6_10 Social, economic, cultural and political history

SH6_11 Collective memories, identities, lieux de mémoire, oral history

SH6_12 Cultural heritage

In fact, founded on the unifying science of Ontology, all the scientific research and knowledge, philosophical, scientific, mental, social, engineering, is to be naturally organized as a [Knowledge Web of Sciences](#), thus reconstituting the ERC's mixture of knowledge fields in the most systematic ways:

- Natural Sciences, studying the physical world and its entities, properties and relations, including Physical Sciences with Earth Sciences, Chemical Sciences, Biological Sciences, and Natural Mathematics, with all its cross-disciplines, as mathematical foundations of natural sciences, natural semantics, biophysics, bioinformatics, etc.;
- Mental Sciences, studying the mental world and its entities, properties and relations, namely, SH4 the Human Mind, analyzed by psychology, neuroscience, cognitive sciences, linguistics, with all cross-disciplines as mathematical foundation of mental sciences, neuro-linguistics, neuro-cognition, etc;

- Social Sciences, studying the social world and its entities, properties and relations, namely, SH1 Individuals, institutions and markets, SH2 Institutions, values, beliefs and behaviour, SH3 Environment and society, SH5 Cultures and cultural production, SH6 The human past;
- Technology, or Engineering Sciences, engaged with applied sciences, or application of scientific knowledge to real world problems, including LS 9 Applied Life Sciences, PE6 Computer science and informatics; PE7 Systems and communication engineering; PE8 Products and process engineering, etc. (see the Table of Converging Sciences and Emerging Technologies).

IV. THE GLOBAL RESEARCH SPACE and the EUROPEAN RESEARCH AREA

Merging the 21st Century Science, Technology and Humanities, a federate metascience of SAPIENTOLOGY is arising as a footing for the Global Research Framework of Science and Technology, a cornerstone for a global knowledge society, encompassing emerging international knowledge areas, with their frameworks, programs, organizations, platforms, and initiatives, such as the [European Research Area](#) (ERA). Integrating all the EU's scientific resources, the ERA is to be formed as a trans-European system of R&D programs and organizations, as the Framework Programs for Research and Technical Development, European Research Council, Joint Research Center, and European Institute of Technology. All with a big view to fulfill the next decade strategic goal set up by the 2000 [Lisbon European Council](#), 'to become the most competitive and dynamic knowledge-based economy in the world'. Unlike the industrial economies moved by traditional physical machines and mechanisms, the knowledge economy is to be propelled with the advanced ICT, which core is constituted by the knowledge processing machines and communication systems making an essentially new category of technologies. It is projected that the base of such a knowledge society will be made of the European Research Area, comprising human resources, world-class researchers, communication infrastructures, interdisciplinary research organizations, public knowledge bases, joint research programs and policies, and world-wide cooperation.

The grand vision of the Europe of Knowledge, Knowledge-Intensive Society, Knowledge Base of Europe and Technological Know How, acts as a spiritual dynamic on the participants of the European Commission's Framework Programmes for Research, Technological Development and Demonstration. As an essential part of the overall strategy, the EU initiated large R&D projects in Information Society Technologies in the realm of semantic web. In order to lay down the knowledge infrastructures of the upcoming Information Society the EU's Research Council and the European Parliament allocated 3.8 billion Euro for Knowledge Technologies within the 6th European Union Framework Programme (FP6) for Research and Technological Development, with a budget of 17.5 billion euro (CORDIS/FP6, 2006). Within the FP6 Programme, all the web-based knowledge technology projects are largely concerned with ontology research, design, learning, and management.

The European Commission 7th Framework Programme for Research, Technological Development and Demonstration has formally launched January 1st, 2007 (CORDIS/FP7, 2006). The whole FP 7th Budget amounts to 54b € with the indicative breakdown for Cooperation – 32 365 €million; Ideas – 7 460 €million, People – 4728 €million, Capacities (research infrastructure) – 4 217 €million, Euroatom – 2751 €million, and the Joint Research Council – 1751 €million. Under the Cooperation the following thematic priorities are highlighted: Health, Food, Agriculture and Biotechnology, Nanosciences and new Production Technologies, Energy, Environment, Transport, Socio-Economic Sciences and Humanities, Space and Security.

A second lion share here went to the specific programme 'Ideas', guided by the [European Research Council](#). It is stated that "the [ERC](#) ... is a flagship component of the European Union's Seventh Framework Programme (FP7) with an overall budget for the ERC of €7.5 billion over 7 years (2007-2013). Being 'investigator-driven', or 'bottom-up', in nature, the ERC approach allows researchers to identify new opportunities and directions for research, rather than being led by priorities set by politicians. This approach ensures that funds are channeled into new and promising areas of research with a greater degree of flexibility." But organizing all fields of scientific knowledge as three isolated or loosely connected domains, Mathematics, Physical Sciences, Information and Communication, Engineering, Universe and Earth Sciences; Life Sciences; Social Sciences and Humanities, hardly serves to such high aims as a single European Knowledge, Research and Innovation Area.

Building a European Area of Research, Education and Innovation as a precondition of Knowledge Europe requires a systematic organization and unification of knowledge and scholarship, unifying all the meaningful fragments of existing research activities, programmes, and policies and so revealing new highly integrative and synthetic research domains and directions and fields. For without the unified science and technology, there is no solid knowledge and research foundation: both for the World Research and Innovation System and its core part, the ERA.

CONCLUSION

1. The world as a whole is the largest reality federated entity mapped by the united science and technology;
2. Science affords to know the world, while Technology affords to change the world;
3. Scientific inquiry, mathematical modeling, philosophical investigation, humanistic research, technological activity are complementary parts of a systematic search of knowledge of the world, its elements and principles and laws with all the possible ways of its changing and control;
4. Engineering is the application of scientific knowledge in developing technologies of all possible kinds and sorts: ontological, logical, epistemological, mathematical, semiotic, natural (physical, chemical, biological); mental (linguistic, cognitive, psychological, neural), social (political, economic, sociological, historical), and special philosophical technologies (of natural philosophy and philosophy of mind, of axiology and aesthetics, of praxiology and ethics) as well as all the inter-, multi-, and trans- technologies;
5. Science, Arts, Philosophy, and Technology are interconnected parts of Unified Science and Knowledge of the World, designated as SAPIENTOLOGY, UniScience, TranScience, or MetaScience, the scientific wisdom of reality, nature, mind, society, and technology, the fundamental cause of humanity's progress and prosperity.

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