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COSMOS, ORDER, AND OBLIGATIONS: THE BIG CO_2

Mihai V. Putz
West University of Timisoara, Pestalozzi Street No. 16, Timisoara, Romania

Abstract

Although predicted for XXI century by Nostradamus the ecological disasters were continuously produced by Man, most notably those rooting in atomic and nuclear energy; however, the most subtle contribution of humankind is that regarding the carbon-oxides, the most paradoxical molecular combinations: carbon that sustain organic chemistry and life itself and the oxygen which is equivalent with air and water elements in human life; and still, their combination is harmful for each day life from some decades already. Nevertheless from the modern age, the industry was reluctantly in avoiding the carbon-oxides accumulations either on air, soil, and water; the inspired epoch of the foreground principles of life coming from ancient Indian, Chinese and Greek philosophies was abolished leaving with the modern principles of the so called Green Chemistry; they are not seen as a new paradigm of life being but a set of rules the great investors and industry should follow in order preserving the sustainability concept that is to assure "development that meets the needs of the present without compromising the ability of the future generations to meet their own needs" [1].

Worth, for clarity resuming these principles in Table 1 so that the fundamental and engineering sides of them to be seen face-to-face. Note that the fundamental principles constitute the background or the general frame or desiderate that is eventually supported by associate engineering principle; as well the green engineering is mainly constructed on "minimizing" or "maximizing" the time, space, energy, costs, being constituted either in an economical enterprise as well as an extension of the main principles of nature in terms of optimizing mass-energy and time-space. From this point ahead the physical and chemical most basic principles are seen as those acting on each process, system, or state to be created, maintained or modified. It is therefore this the main reason a most comprehensive physicochemical view of Universe should be desirable in order to asses, monitoring and controlling the micro- and macro- environment life.

Moreover, there is here the proper place and time to ask "*Where the environment frontiers are?*" with obvious impediment in clear answer; this because the environment is respecting the referential we assume: for nucleus the electrons and other nuclei or atoms is the environment, whereas for Man either the molecule (through food), atoms (through air and water) or light, the Moon, the Sun and even the entirely constellation (native and others) may constitute as more or less influential factors–thus its environment.

There is an already learned lesson of humankind that when some physical system is defined with some limit the next limits generation is further challenged; there were times when molecules were the basic constituent of matter, then the atoms, then the nuclei and electrons, then the quarks, then the rishons, now the "God" particles are searched for, as Higgs bosons are presumed, with the strange ability to create mass from no-mass reality by means of the so called "spontaneous broken symmetry" or energy-space-time fold of early universe.

With all these the "new history" of Universe should be seen through the environmental eyes of each level create by Nature: as such environmental sciences should be regarded as an endeavor in unifying all sciences that address the life and its dynamics at whatever level of comprehension, either in time or space.

In order to shortly make an idea to which questions the International Journal of Environment Sciences likes to give specific answers in Table 2 there are listed the actual most intriguing demands in science along the assumed discipline or field or research engaged in questing the issues.

However, all these issues had risen on last two hundred years of thinking and may be thought as an actual unfold of the fundamental Kantian rhetoric: *What can I know? What should I do? What can I hope? What is Man?* For sure that actual knowledge has expanded greatly both the individual and global (social) capacity of comprehending the cosmos formation, change and impact on mankind every-day

Table 1
The Twelve Principles of Green Chemistry and Engineering [2-4]

No.	*Principle of Green Chemistry*	*Principle of Green Engineering*
1.	Prevention of waste that to clean afterwards	Prevention instead of treatment
2.	Inherently safer chemistry for accident prevention such as releasing, explosions, and fires	Inherent rather than circumstantial process and components to prevent hazard
3.	Atom economy in maximizing the incorporation of all material used	Conserving complexity of embedded entropy for minimizing the recycle process
4.	Less hazardous chemical systems should be designed with little or no toxicity	Design for commercial "afterlife" through their nontoxic availability
5.	Designing safer chemicals to minimize their toxicity	Durability rather than immortality since whatever compound should be degradable
6.	Safer solvents and auxiliars (separation agents)	Integrate material and energy flows allowing interconnectivity in components
7.	Designing for energy efficiency while synthetic methods should be conducted at ambient temperature and pressure whenever possible.	Maximizing efficiency in producing products through minimizing mass, energy, space, and time consumption
8.	Use of renewable raw materials and feedstocks rather than depleting them	Design for separation and purification operations should maximize recycling
9.	Reducing derivatives as those modifying physical-chemical processes since they are virtually converted in waste	Minimizing material diversity in multicomponent products towards promoting easiest disassemble process
10.	Using catalytic rather than stoichiometric reagents is desirable for maintaining the selectivity control	Output-pulled of reaction products rather than input-pushed reactants as additional starting material
11.	Design for degradation targeting biodegradability and not persistent components in environment	Renewable than depleting of material and energy inputs
12.	Real time analysis for pollution prevention by means of in-process monitoring and analytical methodologies	Meet need while minimizing the excess of unnecessary capacities or capabilities for bio-physicochemical systems

Table 2
Ones of the Main "Environmental" Human Inquiries and the Possible Fields of Research and Partial Results [5]

No.	*Human fundamental issue*	*Field or tool or result of research*
1.	Why are the laws of nature the way they are?	Large Hadron Collider (LHC) experiments at CERN hopefully will enlighten upon the existence inner existence of matter
2.	Where does mass come from?	Searching of difference between matter and antimatter, Higgs boson; WIMPS- weakly interacting massive particle are ideal candidate for dark matter
3.	Do all forces originate from one elemental force?	Big Bang in the Lab, trapping particles, filming molecules
4.	What factors define the universal constants that determine our universe?	Supersymmetry, atomic clock
5.	Do hidden dimensions really exist?	Gravitational lenses, plasma ignition
6.	How do stars and planets originate?	Computer simulations show planets and stars formed by gas and cosmic dust accumulating that eventually collide with the planet itself emitting infrared light and being heated about 1,000 degrees; cosmo-chemists search on meteorites' granules (chondrules) the early history of planets; magnetohydrodynamics helps in describing the sun and other stars' magnetic fields and plasma dynamics; studies of the solar wind (Sunrise project) by coronagraphs and of sunspots by sound speed measurements or by solar beryllium in Antarctic ice core samples; sunspot' activity may be correlated with sun activity in history (most active since 1940 with an intermediate maximum 1100 ÷ 1250); actual belief is that only a small part of increased sun activity is responsible for global worming; the honeycomb-like structure of the sun (by magnetic fields-plasma currents interaction) allows a deep seeking (about hundred km) inside

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No.	*Human fundamental issue*	*Field or tool or result of research*
7.	Is there life on other planets?	Casini journey to Saturn via Venus and Jupiter leading with Huygens probe on moon Titan, photographing other 33 ones, analyzing the Saturn rings by means of dust detector Cosmic Dust Analyzer (CDA) as well as Saturn atmosphere by specialized Magnetic Imaging Instrument; the Mars landers Spirit and Opportunity chemically analyzed some ferric compounds reached in 2004; the Mars Express mission clarified the water existence on Mars as a consequence of volcanic followed by total frozen processes;
8.	How and when did the cosmos come into existence?	The foam-like form of Universe as suggested by Big Bang simulation and experimentally by Wilkinson Microwave Anisotropy Probe (WMAP) satellite reveals 96% of Universe filled with dark matter and energy; cosmic background radiation is studied by ESA's Herschel space telescope and by Planck satellite;
9.	What determines the characteristics of the cosmos?	After the evenly afterglow Big Bang the cooling of universe favors quantum effects to emphasize the tiny fuzziness of irregularities (matter-antimatter) from which the original supersymmetry was broken; accelerating mass particles determine appearance of gravitational waves that slightly deform the space; general theory of relativity applies among cluster of galaxies that act as optical lens by their enormous gravitation filed developed thus allowing visualization of objects far away as distorted or enlarged;
10.	What happens behind the horizon of black holes?	Drawn gases into black holes radiate in X-ray and Gamma range; rotating black holes deform the light waves in different, however observable, way; Wilky Way is unveiling with many black holes and mysterious Gamma ray sources; planned X-ray space telescopes (ESA X-ray satellite XMM-Newton) are able to cope mapping black holes in 170,000 nearby galaxies; notably the black hole in the middle in the Milky Way which has been more active some hundred years ago with 3,6 million times our sun mass; cosmic jets are produced by mater created by gas and stars devouring black holes; pairs of neutron stars rotate around each other (at 20% of speed light) to form (in million of million of years) black holes after (thousandth of a second) their fusion;
11.	What is dark matter and energy?	Clustering of many galaxies that is not supported only by observed matter is assumed on behalf of dark matter additional forces; Astrophysicists suppose a structure made by neutrinos or by supersymmetrical neutralinos; CERN projects the Planck satellite to explore dark matter while dark energy cannot be confirmed in lab or by quantum mechanics
12.	How will the universe evolve?	Neutron starts, nova explosions, black holes collisions, and galaxies that rotate around each other followed by gravitational wave emissions are presumed as the motor of universe evolution; the Galaxy Evolution from Morphology and Spectral Energy Distribution (GEMS) project aims reproducing the life of a galaxy of our type by using Hubble space telescope able to look 4.5 billion years before our solar system birth
13.	Which laws govern the quantum world?	From cold trapped bosons to fermions; nanoworld without gravity; 3D reconstruction of atomic structure; collecting and transmitting light driving collective electrons
14.	How can we systematically influence materials?	High-temperature superconductors from Buckyballs; supermolecular architecture and nano-tree; nuclear magnetic resonance exposes polymer movement; custom superconductors (ceramics of yttrium-barium-copper oxide); molecules from quantum points; polymer crystals, carbon ring formation, chemical reactions catalyzed on ridges and edges; ferofluids; protein structures as transporters; cobalt clusters driven by magnetic fluids
15.	Can we build artificial intelligence that work with light?	Computing with Spin; electrons between metals and superconductors; magnetic logic in chips; photonic crystals; light transistors and laser chips
16.	What is life?	Molecular motors controlling the cells' movement, division and interactions; self-destruction cellular programs (apoptosis) controlling cell production and elimination of damaged ones; 3D images (tomography) of living cells; protein-protein interactions.

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No.	Human fundamental issue	Field or tool or result of research
17.	How are form and function of life's building blocks connected?	Nano-transporters as membrane-covered containers transporting chemical substances; immune fluorescence microscopy; fluorescent proteins; 3D insights into the intact cell nucleus via cryo-electron tomography
18.	How do molecules and cells communicate?	Computer-aided design of active agents model bonds between proteins and inhibitors; organizing chaos in cell transport by absorption of nutrient and information from environment; circadian clock controlled at molecular level
19.	Which cellular defects lead to disease?	Molecular medicine, biologically active natural substances; quantum dots as markers to individual genes, nucleic acids and small molecules within cell; harmful proteins
20.	How can we apply nature's structural principles?	Imitating nature by bio-molecular morphology; transport of matter (chemical compounds) in cells; smallest rotor in the world (Llyibacter tartaricus bacterium) forming minimum ATP essential energy; biological salt sensor (betaine transporter of protein from cell membrane of soil bacteria)
21.	Which programs control the development of organisms?	Genomics, protein synthesis (gold-fluorescent protein) targeting coding capacity by adding amino acids; microtubes as tiny polymer tubes transport the cell organelles; neuronal stem cells with key role in central nervous system; converting body cells into pluripotent stem cells; 3D visualization of inside cell by two-interferential lasers allows examination of the Golgi apparatus (the post office of the cell) in correcting transportation of proteins
22.	Why do we age?	Mutations in genome; molecular markers who reneder tissues activity visible; nerve cell receptors reaction controlled by chemokine gradient
23.	How did biological diversity arise?	Human genome project; studying Hox genes role in embryogenic development; cell differentiation; control and simulation using green fluorescent protein (GFP); fluorescent chromosomes; studying of nematode worms with some known 960 cells;
24.	How do cells organize to form tissue and organs?	Function of proteins, chemical genetics pursuing chemical substances that modulate the function of the gene products; expanding genetic code using artificial amino acids
25.	Which diseases arise due to defects in genes and proteins?	Genes in action during embryonic development; neutrophiles: specialized cells of immune system fight against pathogens; thymus organ producing T-lymphocytes (zebrafish research model); protection via adaptation at genetic level (Arabidopsia thaliana model plant); antibiotic actinomycin itself binding in double-strand DNA prevents reverse transcriptase (used by retroviruses like HIV)
26.	How do nerve cells transmit signals?	Logistics of the synapses transfer and network information between neurons.
27.	How does the brain work?	Plasticity features tracking down memory; morphology of learning and forgetting spinules connections between nerve cells; continuously and intermittent signal transmission to synapses; sixth sense for recognizing mates as is the case of mice species through smelling specific immune molecules.
28.	What causes illness of the nervous system?	Thyroid hormone closely related with brain development; tau protein in brain or alpha synucleic links with Parkinson's disease; special motor proteins, the kinesins, are responsible for cellular transport or its breakdown along the axons to the synapses.
29.	How is information coordinated in the brain?	Astrocytes, a group of neuroglial cells, modulate communication between nerve cells; green fluorescent astrocytes highlights the neuronal network activity; Wernicke's center in the cerebral cortex processes the language
30.	Can we repair our brain?	Positron Emission Tomography (PET) recognizes the neurodegenerative diseases damaging the axons (as Alzheimer brain disorder); glial cells (oligodendrocytes) embed the nerve tracts in insulating layer of myelin of which disease is known as Charcot-Marie-Tooth (CMT) disease.
31.	What is consciousness?	Study of homo erectus child skull unveils the brain deficiency to favor speaking immediate after birth; astrocytes, special neuroglial cells, while attaching the blood vessels in the brain with their extensions assure the interaction of different neuronal cells.

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No.	Human fundamental issue	Field or tool or result of research
32.	What individual differences make us unique?	Recognizing, perception and interpreting environmental moving (by core-spin tomography) involve specific neuronal populations; wires in the brain visualized by serial block-face scanning electron microscopy (SBFSEM); oxygen saturation in the blood (BOLD signal) measures the neuron activity
33.	How do seeing and hearing, feelings and memories originate?	Neurobiology; flies-the best in movement perception with only about 120 nerve cells; garden warbles have a good memory while traveling the world (more than 10,000 km); 400 million year of evolution for hearing (studies on zebrafish larva); genes controlling the crystallization of the bones (otoliths) in the ear; smell is sustained by glomeruli structures in olfactory cells; starbust cells from retina cells in the eye whose activity is evaluated by multiquantum microscopy;
34.	What are our origins?	Archeological methods enlighten on chimpanzees' nutcracker ability; no evidence in DNA exchange between Neanderthal and modern man; learning process is shared by dogs and humans based on exclusion principle;
35.	How did language and culture come into being?	Some 6,500 spoken languages with less than 100 official ones throughout the world while estimating for end of 21st century only a half will survive; the DobeS (Documentation and Endangered Languages) project; speech gene presumed as FOXP2 responsible for articulation, understanding, and singing (for birds)
36.	Can complex systems be measured?	Supercomputer: 100 nanoseconds from a cell wall life was simulating by few months of computing; chaotically combination of oxygen and carbon monoxide on a platinum surface to form carbon dioxide; carbon-cycle world-wide by measuring forests inhaling and exhaling all over the world; interchange between face-centered-cubic and body-centered-cubic iron atomic arrangements in steel production; tracking atomic motion in real time by scanning tunneling microscopy (STM); chip transferring from electronics to chemistry allows explosive detectors, pollutant monitoring, super-fast protein analyses
37.	How can we deal with increasing volumes of data?	Supercomputers and teraflops; astronomical images require tera-and penta-byte range; quantum computer by Bose Einstein condensates of more than 100,000 atoms in a lattice formed from light; visualization of data by diagrams with featured properties; microlasers (of light wave lengths) enhance the potential in solving the informational noise and chaos in telecommunication and spectroscopy
38.	How do we arrive at exact data to very our ideas of the world?	The problem of axiom of choice (i.e. it is always possible to chose one possibility form several, barely distinctive) was proofed to be redundant in debugged software; chips acting as a nerve sensors
39.	How can we cope with the increasing complexity of questions put to science?	Supercomputing: catalysis may be visualized at the atomic and inter-atomic bonding under realistic temperature and pressure; shortcut proofs for higher-order logical propositions in software
40.	What methods allow us to understand complex networks?	Mathematical quasi-crystals model plastic deformation by abstract patterns and tessellations; approximating non-linear processes with linear ones; knot theory applies on polymer and plastic description of their flexibility and viscoelasticity; quantum geometry based on non-commutativity or non-permutability phenomena accommodate with non-commutativity algebra with great impact in unifying gravitation with quantum effects;
41.	How much of our world can we simulate on computers?	Diseases can be identified on computer simulations and monitoring; chaotic excitation models can predict cardiac dysrhythmia and fibrillations (heart chamber spasms); creating a 3D remote planetary nebula from a 2D angular photograph; shaping the crystalline atomic structure in calculation; simulation of plasma, i.e. interaction among photons, electrons and ions; modeling the ovate family and homeodomain proteins in multi-cell organisms evolution
42.	How does complexity arise?	Large errors can accompany the 2D into 3D formation or vice-versa projection; viruses complex structures as nested in one; generating test functions to approximate local processes; chaotic mixing of

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No.	Human fundamental issue	Field or tool or result of research
		oscillation is about 100 times more effective (quicly) than simple diffusion; the Darwin dictum (the fittest will survive) was generalized also to certain organism that slowly adapt to environment based on symbiotically (in economy: Red King) effect.
43.	Are there limits to our perception of the world?	Filtering out the interferences, static noise, superimposed patterns; simulation of the first structure appeared after 300,000 years from Big Bang (by VIRGO project); modeling the star formation and black holes' growth by colliding galaxies simulation; stability of rocks depend of the accumulation liquid inside; mimicry and its simulation; cellular Kryo-electron tomography allows intact 3D inside of cells' and of their living visualization
44.	Can we predict the behavior of complex systems?	Newton's motion equation can be used for atomic simulation of macro-micro phenomena like glass breaks, steel tears or rubber bursts; electronic connections was turned out into catalytic activity by computation; computing energy valleys of proteins allowing spiral-shape determinations of proteins and of their function therefore; tomographs of the brain shifts in surgery; metabolism diagrams show complex interactions of consumers and (bio)chemical reactions; modeling the earth crust dynamics by wax model of micro-plates (cc. 400 km in diameter) of plate tectonics that being heated from below and cooled from above are rotating
45.	We will succeed in mastering global challenges?	Emulating photosynthesis (breaking down the water with light and combining with carbon dioxide into sugar-carbohydrates- and oxygen) by simple chemical models; light harvesting protein complex II (consisting of more than 10,000 atoms) allows sun reactive center photosynthesis process; advancing depollution by (hyper)-accumulating heavy metals (lead for instance) in plants (e.g. A. halleri symmilar with A. thaliana–whit full genome sequenced–the At GenExpress project); genetic impoverishment of agricultural varieties may be avoided by discovering (natural) immune genes against fungi (e.g. the Mlo gene defect of Ethiopian grain faith against powdery mildew fungi); transgenic plants that produce more biomass by increasing leaf generation
46.	How can we secure sustainable development?	Building fusion reactor for merging atomic nuclei by the hydrogen plasma (heated to over 100 million degrees Celsius) surrounded by magnetic fields; constructing materials from carbon nanowires allowing the storage of the hydrogen as a future fuel; fuel cell working on membrane selective permeability to protons only; pest control by induced defense in plant world (e.g. acacias' sweet nectar production); studying interaction between plant and their pest (e.g. the corn and its guest Ustilago fungus); bioengineering employing the plants' energy depots by their storage; plants as a source of raw materials and energy in industry become the playground for genetic engineering: planting a piece of DNA into a bacterium which is driven in selected cells of a plant to stimulate growing
47.	How can we control disease?	Cancer medicines (antibody against cancer-Trastuzumab) specifically targeting the defective signal cell systems; producing mass bioactive substances from bacteria leaving with sea sponges may provide anti-tumor drugs; comparative genomic analysis allow identifying the carcinogenic bacteria (e.g. Helicobacter pylori for chronic gastritis) respecting the non-pathogenic ones; discovery of defensins that neutralize the lethal toxin of antrax bacilli prevent bioterrorism; molecular and cellular mechanism of diseases make possible the global prophylactic fight against multi-resistance of microbes and viruses of influenza, tuberculosis, malaria or AIDS in a moving world; studying defense mechanism through identifying the regulator genes that control the resistance to pathogens (see the Arabidopsis model plant).
48.	Can aging be delayed?	DNA chips may give information about active genes in molecular misinformation and aging that behold aging and disease symptoms; stem cells with a regenerative potential are more active in amphibians (e.g. the axolotl) while somehow suppressed in

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No.	Human fundamental issue	Field or tool or result of research
		mammals; computer simulation of fiber bundles in mineralized tendons and osteoporosis therapy; searching in regenerating the cells involved in insulin production (for avoiding diabetes) among pancreatic cells but also from digestive enzymes; studying the ras protein structure for the crucial role in regulating signal transmissions that trigger cell division (and tumor grow by endless division); bridging the red (animal) with green (plant) biochemistry for cellular programs;
49.	What influence does mankind have on planet Earth?	Global warming increases the greenhouse gas and carbon cycle with stable carbon on the ground quickly enhanced in atmosphere ending then on oceans as feed for reefs' micro-organisms; increasing of carbon monoxides (CO) in atmosphere merge with free hydroxyl radicals (OH) to form carbon dioxide that reduce its self-cleaning potential;
50.	How can we preserve the earth's protective systems?	Studying the slash-and-burn process over the Amazon; discovering methane-eating bacteria that convert it into carbon dioxide and building meter-high calcium carbonate reefs; understanding the oxygen transport (by specialized cells, e.g. aerenchyma) in flooded territories as Amazon ten month per year; aerosols display multiple features for climate dynamics: they dissipate and absorb thermal energy and light, may nucleate in droplets and clouds as they attract water vapors and are either natural or by human impact produced;
51.	What keeps eco-systems in balance?	Climate models including carbon-hydrological interacting cycles; study of bacterias' natural ecosystems (e.g. Achromatium bacterial in fresh water lakes leaves only in its natural habitat);; study of toxic eaters bacteria as the giant Thiomargarita namibiensis (cc. 0.75 mm) immune for hydrogen sulphide; life cycle in coral reefs through mucus secretion that feed microorganisms that further release nutrients in reef and support overgrow processes; magnetic fields protect the Earth from cosmic rays; the protective ozone layer preventing the cosmic hazardous radiation coming on earth is depleting by chemical reaction occurring on the surface of nitric acid trihydrates crystals that turn the inactive chlorine compounds (HCl for instance) into active chlorine; future emissions of climate related gases and aerosols may change the increasing of the greenhouse gases concentration and balance the global warming.
52.	How do organisms communicate?	DNA microarray technology allows in monitoring a large number of micro-organisms and of their interaction at the same time; studying the cooperative and social behavior of bacteria (e.g. Myxococcus xanthus bacteria) towards food searching or spreading (preventing) infectious diseases; interaction between plants and insects in fighting against pests.
53.	How can we better predict natural disasters?	Genetic diversity may constitute a viable tool in enhancing resistance to natural disasters as heat waves, storms and flooding; studying the Deinococcus radiodurans bacterium that resists both long dry periods as well to great amount of radioactivity (cc. 1,500 times that lethal for humans); studying who insects transform (by specific defense glands) the toxic precursors from plants into toxic compounds for predators protection; the rise in greenhouse gases produce the same change in air pressure fluctuation as in past (122,000 years ago in the last inter-glacial period) was done by natural astronomical phenomena that titled the earth orbit around the sun; studying a world climate model to account for the natural variability of atmosphere, ocean and biosphere while calibrating it with past climate conditions and testing it for the future.

life; there is now the big challenge to act on modifying it or to control or to drive at least as such our comprehension to not collide with our existence nor to strike back upon life as we understand either on micro and macro-scale.

Overall, the research lines on both Tables 1 and 2 are intended to be covered by the present new launched International Journal of Environment Sciences, contributing on its own to an as much possible coverage of all human nature scientific activities and achievements or ideas aiming the programmatic combination of the moral *obligations* with natural and driven *order* in micro- and macro- *cosmos*, the big CO_2 of life!

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