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Natural Genera, Scientific Classifications, Life, Fireworks and COVID

Géneros naturales, clasificaciones científicas, vida, fuegos artificiales y COVID

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ABSTRACT

A difficulty exists in separating the real aspects from the point of view of the researchers. A taxonomic classification is proposed in five kingdoms: plants, animals, fungi, protista and monera. *Humans are the only species capable of manipulating the biosphere on a large scale*. Behind the light, colour, sound and smoke from fireworks there is a chemical reaction and a table of chemical elements. The history of pesticides presents a set of little-known stories of environmental pollution. What communication and action to take against the climate emergency? Sustainable development is carried out in the food industry: energy consumption, water consumption, wastewater management, waste management, containers and packaging, and food waste. The 20th century advances in molecular biology–genomics are informed: what they are and what they represent for today's medicine. Drug repurposing is reviewed for coronavirus treatment and computational study based on molecular topology. Chemistry and pharmacy might be sustainable. Processing might also be sustainable.

KEYWORDS: *Coronavirus, COVID-19, New drug, Drug repurposing, Molecular topology*

RESUMEN

Existe una dificultad en separar los aspectos reales desde el punto de vista de los investigadores. Se propone una clasificación taxonómica en cinco reinos: plantas, animales, hongos, protistas y móneras. *Los humanos son la única especie capaz de manipular la biosfera a gran escala*. Más allá de la luz, color, sonido y humo de los fuegos artificiales hay una reacción química y una tabla de elementos químicos. La historia de los pesticidas presenta un conjunto de historias poco conocidas de contaminación ambiental. ¿Qué comunicación y acción seguir frente a la emergencia climática? Se lleva a cabo desarrollo sostenible en la industria alimentaria: consumo energético, consumo de agua, gestión de aguas residuales, gestión de residuos, envases y embalajes, y desperdicio alimentario. Se informan los avances del siglo XX en biología molecular–genómica: cuáles son y qué representan para la medicina de hoy. Se revisa la reutilización de medicamentos para el tratamiento del coronavirus y el estudio computacional basado en la topología molecular. La Química y la Farmacia deben ser sostenibles. El procesamiento debe ser también sostenible.

PALABRAS CLAVE: *Coronavirus, COVID-19, Fármaco nuevo, Reutilización de fármaco, Topología molecular*

INTRODUCTION

Setting the scene: *natural genera* as a basis for scientific classifications, knowledge, controversies, new disciplines, specialties, how living things being classified, 6th mass extinction being underway, fact, fiction, speculation, the science that brings fireworks to life, the history of pesticides, communication, action *vs*. the climate emergency, sustainable development in the food industry, reflections on the future of food, #BreadQuiz, questions (Qs) with a lot of crumb, a scientific exploration of the food planet, 20th century advances in molecular biology–genomics, recent scientific research pursuit in the field of biotechnology, pharmaceuticals, microbial transformation of herbal constituents, recycling old medicines for new diseases, drug repurposing (DR), research on coronavirus (CoV) disease 2019 (COVID-19) treatment, infinite protein self-assembly in health, disease, sustainable chemistry, pharmacy, sustainable processing, *Sustainable Development Goal* (SDG) 17, partnerships, history, teaching of science, digital humanities and science teaching. What are scientific classifications based on? (1) Some classifications are based on so-called natural genera. Such genres are groupings that respond to the real structure of nature and, therefore, are independent of the interests and values of humans. Chemical elements are usually used as a *paradigmatic* example of natural gender. The properties of the elements are given by nature, so they do not depend on the interests or values of the researchers. Other examples could be subatomic particles or biospecies. (2) Artificial or conventional classifications can be found, which respond to human interests; *e.g*., the classification of energy resources into renewable and non-renewable does not respond to the internal structure of nature, but to certain interests. However, the apparent simplicity is complicated when classifications are studied in detail. Thus, it is usually said that natural genera are determined by essential properties. However, what is an essential property, and how is it selected? An example of the difficulties can be seen in biospecies. What is the essence of a species? Its genetic code? Its morphological characters? Any possible answer raises different Qs about the essence of the species. Knowledge and controversies over new disciplines and specialties. The inclusion of nuclear energy and gas within the European *green* taxonomy (GT) *list* revived the debate on nuclear power and divided the countries. Spain, the committee of experts of the Commission and groups of investors were *vs*. the decision. Earlier publications in *Nereis*, *etc*. reviewed reflections on the nature of the periodic table of the elements (PTE), implications in chemical education [1], nanoscience from a two- to a three-dimensional PTE [2], PTE, quantum biting its tail, sustainable chemistry [3], periodic law [4], periodic properties (electron configuration, atomic radii, ionisation energy, electronegativity, electron affinity, metallic character, *etc*.) [5], PTE [6], PTE, heavy, rare, critical, superelements [7], PTE, chemical bond nature, nonclassical compounds [8], mesoporous, graphene composite, Li^+ battery, topology, periodicity [9], surfaces, quantum walks, knowledge, agro-toxins, PTE [10], PTE, history, education and evaluation [11]. The purpose of the present report is to review natural genera as a basis for scientific classifications, knowledge, controversies, disciplines, specialties, how living things being classified, 6th mass extinction being underway, fact, fiction, speculation, the science that brings fireworks to life, the history of pesticides, communication, action *vs*. the climate emergency, sustainable development in the food industry, reflections on the future of food, #BreadQuiz, *etc*. The aim of this work is to initiate a debate by suggesting a number of Qs, which can arise when addressing subjects of #BreadQuiz, Qs with a lot of crumb, what the main

stages in the bread process are, *etc*. It was provided, when possible, answers (As) and hypotheses on *humans are the only species capable of manipulating the biosphere on a large scale*, proprioception is based on sensory muscles, *synthesis of electrically conducting organic polymers* (COPs), self-sensing principle, at all times the energy adapts to the conditions of the muscle, hysteresis, despite the reversibility of the process, the energy is asymmetric, asymmetric reaction, the energy needed to expand is greater than that needed to contract, in nature, it is more effective to have a second muscle to contract the first than to make this contract, the signal from the muscle to the brain carries information, *Conducting Polymers*, *etc*.

NATURAL GENERA AS A BASIS FOR SCIENTIFIC CLASSIFICATIONS: CONTROVERSIES/LIFE

A difficulty exists in separating the real aspects (understood, independent of human beings) from the point of view of the researchers [12,13]. Some authors reformulated the concept of *natural gender*, considering that natural genera not only take into account the real structure of nature, but also conventional aspects [14,15]. However, the difficulty of reaching a minimum agreement led other authors to abandon the concept of natural gender, although the real–conventional dilemma remains [16,17]. The influence of Thomas Sydenham and Carl von Linnaeus on the conceptualization of diseases and the attempt to classify *more botanico*, in the way that botanists do with plants, tried to solve a conceptual and linguistic problem about the construction and reality of diseases [18]. The moneras kingdom was reserved for all unicellular living beings, made up of a single prokaryotic cell, which could sometimes form colonies [19]. Groups of microscopic organisms were included: Archaeobacteria and Eubacteria. In 1959 Robert Whittaker recognised the existence of the kingdom of the fungi, which caused that just a decade later a taxonomic classification were proposed in five kingdoms: plants, animals, fungi, protista and monera. *Humans are the only species capable of manipulating the biosphere on a large scale*, Robert H. Cowie emphasized [20]. In order to combat the crisis, a number of conservation initiatives were successful for certain charismatic animals [21]. However, the initiatives cannot target all species and reverse the general trend of species extinction [22]. Notwithstanding, it is critical to continue the efforts, in order to cultivate a wonder for nature and document biodiversity before it disappear. Of all colours, the most difficult to obtain is intense blue [23]. The reason is that for $CuCl_2$ to emit blue light it must reach 1 200ºC, but at that temperature it also decomposes [24]. When what one wants to achieve are Ag and white flashes, Ti is used, while if what one wants is brightness and luminosity it is better to use Mg, and pyrotechnic masters opt for Ca when the objective is to dazzle with a cloud of shiny particles. Fernández Otero informed molecular materials and electrochemistry for bioreplication [25]. Proprioception is based on sensory muscles. *Synthesis of electrically COPs* [26]. Self-sensing principle: At all times the energy adapts to the conditions of the muscle. Hysteresis. In spite of the reversibility of the process, the energy is asymmetric. Asymmetric reaction: The energy needed to expand is greater than that needed to contract. In nature, it is more effective to have a second muscle to contract the first than to make this contract. The signal from the muscle to the brain carries information (weight, fatigue, temperature, *etc*.). *Conducting Polymers* [27].

THE HISTORY OF PESTICIDES: COMMUNICATION/ACTION *VS.* THE CLIMATE EMERGENCY

Bertomeu Sánchez reported the history of pesticides (Table 1) [28], *Arsenical pesticides in early Francoist Spain* [29], *Spanish Agriculture: The Long Siesta, 1765–1965* [30], *Pesticides: Past and Present* [31], *Invisible Toxics: Environmental Ignorance* [32] and *Following HCN in Valencian Country (1907–1933)* [33]. He, Nieto-Galan, Guillem-Llobat, Florensa, Gil-Farrero and Rodríguez-Giralt presented [34] the book *Invisible Toxics* [35]. The book includes a set of little-known stories of environmental pollution throughout 20th century. It transports to certain places, industries, regions, where the connivance of experts with public administrations and private companies silenced and made the main victims of toxicity invisible: workers, activists and citizens in general. *Via* a set of rigorous historical research, it shows how sophisticated mechanisms for the *construction of ignorance* are activated in the environmental conflicts that make it difficult to regulate properly products and recover diseased spaces, degraded in an almost irreversible way. The book is a denunciation of people's deregulated industrial societies, complacent with the risks of thousands of synthetic products that invade their lives, and at the same time an appeal to the responsibility of all to improve their living conditions. Toxic Anthropocene: industrial modernity and fight *vs*. environmental violence. Florensa presented her chapter on bathing suits, detectors and nuclear ignorance in the accident of Palomares, Cuevas del Almanzora, Almería, Spain (1966) [36–38]. Gil-Farrero presented her chapter on landscape restoration as a concealment of toxicity in Garraf landfill [39]. Rodríguez-Giralt presented his chapter on choreographies of abandonment, care and toxicity in slaughter areas [40]. Escrivà Garcia published communication and action *vs*. climate emergency [41]. *Man as a Geological Agent* [42]. *The artificial production of CO_2 and its influence on temperature* [43]. Global greenhouse (GH) gas emissions (GHGEs) by sector: energy (73.2%), agriculture, forestry and land use (18.4%), industry (5.2%) and waste (3.2%). *The Population Bomb* [44]. Mammal biomass: livestock (60%), humans (36%) and wild (4%). Bird biomass: chickens and other poultry (70%), and wild (30%). *Is there a hole in O_3 layer from your climate change* [45]? *Climate confusion among US teachers* [46].

Table 1. History of pesticides.

Year	Event
1874	First synthesis of DDT by Zeidler
1892–1920s	Lead arsenate employed *vs*. the gypsy moth in Massachusetts in 1890s; broadly employed in 1910s–1920s in US and Europe in agriculture and health campaigns *vs*. mosquito
1933	Kallet and Schlink published *100,000,000 Guinea Pigs*[a]
1940–1945	1940: Müller explored the uses of DDT in pest control and *vs*. malaria; 1944: 1st uses in military campaigns
1943–1945	First studies on toxicity of DDT
1962	Carson published *Silent Spring*[b]
1972–1979	DDT banned 1970s–1980s

[a] Kallet A, Schlink FJ. 100,000,000 Guinea Pigs: Dangers in Everyday Foods, Drugs, and Cosmetics. New York (NY): Vanguard; 1933.
[b] Carson R. Silent Spring. Boston (MA): Houghton Mifflin; 1962.

SUSTAINABLE DEVELOPMENT IN THE FOOD INDUSTRY: THE FUTURE OF FOOD

Toldrá Vilardell informed sustainable development in the food industry [47]. Its environmental impact: energy consumption (EC), water consumption, wastewater management, waste management, containers and packaging, and food waste. Strategies on EC and GHGEs: improve the energy efficiency of transformation and conservation processes, introduce conservation technologies (electrical pulses, ultrasound, high pressure, cold plasma, *etc*.) that reduce EC, increase the use of renewable energy (RE), improve global energy management, reduce the distance of supplying raw materials and distributing products, use alternative energies (liquefied gas or compressed natural gas, hybrids, electric), and optimise vehicle loading and transport routes. Transformation from linear to circular economy. Strategies on packaging: reduction of the weight of the containers, use of recycled material in primary packaging, use of active and smart packaging, and use of biodegradable packaging. *Dry-cured ham bones* [48]. Biogas (CH_4+CO_2) generation. *More Food, Less Waste: Strategy 2017–2020* [49]. *Decalogue of Integral Sustainability of Food Industry* (Table 2) [50]. Challenges for a sustainable development of the food industry: reduce emissions from the sector, apply sustainable techniques in agriculture, livestock and fisheries resources, promote the use of RE, improve energy efficiency, reduce the consumption of resources, *e.g*., water, and reduce the sector's water footprint, minimise, reduce and revalue waste and refuse, improve packaging management, and promote research and development. In food production and consumption, people can probably predict as follows [51]: Reducing world hunger and malnutrition in the most affected countries, but also in the richest countries, will remain a social and political priority; food safety will continue to be a requirement of consumers; agricultural production must optimise the use of resources (*e.g*., water, soil), and reduce the use of fertilisers and phytosanitary products, and the production of all kinds of waste to limit the effects on the environment; large crops of cereals, legumes and oilseeds will continue to be the basis of food, and will continue to need efficient and intensive production to meet the growing demand that is occurring and continue in the immediate future because of population growth; the production of vegetables and fruits is likely to diversify into species and varieties, and in the way they are produced, from local productions to intensive ones in GHs and growing rooms; agricultural and livestock production is a matter not only of food production and high products, *e.g*., forestry, but also presents a significant impact on territorial equilibria; meat production may be reduced in the medium term, especially beef for environmental and health reasons; the production of food in the oceans is foreseeable to be directed towards the cultivation of fish, molluscs and crustaceans; world food trade will continue to be essential as a factor in access to food; the human population becomes increasingly aware that food production is an important factor in the impact of humans on the climate; concern about the health effects of food will continue or grow with rising information and people's age; diversification in food demand will respond to the cultural and social evolution of different societies. Piugdomènech Rosell carried out a scientific exploration of the food planet [52]. *Explorations of the Food Planet*. *The origins of lactase persistence in Europe* [53]. *The State of Food Security and Nutrition in the World: Safeguarding* [54]. Institute of Agrochemistry and Food Technology organised #BreadQuiz: Qs with a lot of crumb [55].

Q1. What are the main stages in the bread process?
Q2. How many types of bread are known at least in Spain?
Q3. Which of these cereals does not contain gluten?
A3. (a) Rice. (b) Wheat. (c) Barley. (d) Rye.
Q4. What is the frying of the bread?
Q5. What is the annual consumption of bread per inhabitant in Spain?
Q6. Why is the consumption of whole wheat bread recommended?
Q7. What is the scientific name of yeast used in baking?
Q8. When is it thought that human beings began to consume bread?
Q9. Which of these foods gives us the least kcal per 100 grams?
A9. (a) Whole wheat rusks. (b) White rusks. (c) White bread. (d) Whole wheat bread.
Q10. Of these: which is the best flour for making bread?
A10. (a) Bread flour. (b) Soft flour. (c) Rye flour. (d) Depends on the type of bread.
Q11. What does the W mean in flours?
Q12. What role does water vapour play at the beginning of bread baking?

Table 2. *Decalogue of Integral Sustainability of the Food Industry*.

Decalogue of Integral Sustainability of the Food Industry
1. Supply chain.
2. Local economy, stakeholders and consumers.
3. Workers.
4. Management of environmental footprints.
5. Energy management.
6. Ethical conduct.
7. Sustainable agriculture and livestock. Biodiversity.
8. Ecodesign.
9. Waste.
10. Research, innovation and development.

RECYCLING MEDICINES, DRUG REPURPOSING, COVID-19 AND PROTEIN SELF-ASSEMBLY

Jantus Lewintre informed 20th century advances in molecular biology–genomics, what they are and what they represent for today's medicine (Table 3) [56]. The transition from 20th to 21st century caused a *paradigm shift* in the vision of cancer. *Cancer research* contributes to generating knowledge, improves healthcare quality and increases survival with quality of life.

Table 3. Twentieth century advances in molecular biology–genomics.

Year	Advances in molecular biology–genomics
1953	DNA structure
1977	Publication of Sanger sequencing method
1983	Polymerase chain reaction (PCR) technique development
1990–2003	Human Genome Project

Biotechnology and bioengineering are the necessities of scientific research pursuit today [57]. The success and vision of biotechnology are changing the scientific firmament. The immense success and scientific integrity in the field of bioengineering and biosciences are deeply addressed. Thoughts and scientific imagination will transform the global scientific *paradigm* in biotechnology. Microbial transformations of natural compounds picked up their significance with the advancement of steroid drugs, where such procedures play a vital work [58]. Biotransformation is the premise of life. Microorganisms were generally related for steroid biotransformation to get ready specific derivatives, the creation of which is troublesome by conventional manufactured strategies. Recycling old medicines can help in the management of rare diseases. *It is a pharmaceutical strategy that tries to prevent, combat and reverse forgotten pathologies. CiberER has promoted 14 drugs designated as orphans [those aimed at treating conditions so infrequent that manufacturers are not willing to market them under normal market conditions] by the European Medicines Agency, eight of which are repositioning*, said Beatriz Gómez González [59]. Gálvez group reported in *Nereis*, *etc*. DR for CoV treatment, computational study based on molecular topology (Fig. 1) [60], macrolides may prevent severe acute respiratory syndrome (SARS) CoV clade 2 (-2) entry into cells, a quantitative structure–activity relationship study and experimental validation [61]. Varshney group informed accelerated DR and drug development (DD) of pulmonary hypertension therapies for COVID-19 treatment *via* an artificial intelligence-integrated biosimulation platform [62]. Castillo-Garit group reviewed in *Nereis*, *etc*. biosynthetic enzymes of SARS-CoV-2 as potential targets for the discovery of antiviral drugs [63] and computational approaches targeting SARS-CoV-2 main protease (M^{pro}) to the discovery potential antiviral compounds [64]. Casas group published actionable druggable genome-wide Mendelian randomisation identifies DR opportunities for COVID-19 [65]. Lee group revised whether COVID-19 pandemic can disrupt the current DD practices [66]. Rogers group communicated DR screens identifying chemical entities for development of COVID-19 interventions [67]. Peslherbe group reported structure-based virtual screening (VS) revealing Ibrutinib and Zanubrutinib as potential DR drugs *vs*. COVID-19 [68]. Leite Diniz group discussed the mechanistic aspects and therapeutic potential of quercetin *vs*. COVID-19-associated acute kidney injury [69]. Rubio-Martínez group reported the discovery of diverse natural products as inhibitors of SARS-CoV-2 M^{pro} *via* VS [70]. Carlsson group informed ultralarge VS identifies SARS-CoV-2 M^{pro} inhibitors with broad-spectrum activity *vs*. CoVs [71]. García Seisdedos proposed infinite protein self-assembly in health and disease [72]. From deoxyribonucleic acid (DNA) to tissues: DNA→ribonucleic acid (RNA)→Proteins→Protein assemblies→Cells→Tissues. Evolutionary distance between surface and interface *is small!* The self-assembly is salt dependent. In addition, reversible… Mutations↔Infinite self-assembly. Neutralisation of hot spots→Self-assembly. Widespread protein aggregation in the folded state. Agglomeration: infinite assembly of folded proteins. Understanding agglomeration

in health and disease. GlnI-mCherry: Growth (Nutrient depletion)→Arrested growth (Nutrient restoration)→Growth. Growth (Stress)↔(Stress relief) Arrested growth. Green chemistry (GC) is extended from academic laboratories to the industry in the outlook of minimising the costs, and for environmental, health and safety risks [73]. Applications of principles involved in GC are identified from small to large scales, choosing ingredients for reactions, which minimises the waste and risk to quantify the process efficiency. The SDG 17 (Partnerships) is the last SDG, but it is by no means least [74]. If the phosphate processing industry is to grow to meet demand sustainably, it needs to share best practice, benchmark and collaborate. Being sustainable is not simply a matter of compliance: It requires companies to develop the best available technologies, not just implement them.

Table 1. Results obtained from the virtual screening of selected drugs as potential protease inhibitors and therefore useful in the treatment of COVID-19

Drug	Family	Inhibitory capability to SARS- CoV-2 protease
Nonactine	Antibiotic	10,0
Diproleandomycin	Antibiotic	8,3
Flurithromycin	Antibiotic	7,3
Brecanavir	Antiviral	7,3
Clarithromycin	Antibiotic	7,0
Erythromycin	Antibiotic	6,9
Lexithromycin	Antibiotic	6,8
Ritonavir	Antiviral	6,8
Argadin	Others	6,4
Azithromycin	Antibiotic	6,1
Cethromycin	Antibiotic	5,7

Figure 1. Selected antibiotics obtained from VS of selected drugs as potential protease inhibitors useful in COVID (*Nereis*).

HISTORY AND TEACHING OF SCIENCE: DIGITAL HUMANITIES AND SCIENCE TEACHING

Moreno Martínez discussed science in classroom and *Modesto Bargalló* Project [75]. *Chemistry Manual* [76]. *Chemical Revolution: Between History and Memory* [77]. A group devoid of memory is a vulnerable group. Perdiguero and Suay proposed COVID-19, online resources, *Forty Stories to a* Quarantine: *Historical Reflections on Epidemics and Global Health* [78], a blog and e-book of Spanish Society of Medical History [79]. Reflections on COVID-19: *scientific evidence*. Simon and

Zarzoso proposed COVID-19, online resources, Catalan Society for History of Science and Technology series *In COVID-19 Time* [80]. *The social history of workers' health and illness should alert us to the false idea that we are all equally vulnerable*. *The distances that they are proposing to us are generators of suffering and discomfort because we are subject to friction and encounter*. *Perhaps the quarantine is a symptom of the degradation of the quality of our democracies*. *The images we see of the pandemic do not correspond to the seriousness of the situation*. Trullenque Peris reviewed the current state of medicine [81]. Valls Llobet revised invisible women for medicine [82]. Plaza discussed science and how to communicate it [83].

DISCUSSION

The keys to European taxonomy [84]: *Green New Deal* and avoid *greenwashing*. Can nuclear energy and gas be green? What is the European GT? Why is it important? What does GT include? Is nuclear a green energy? In addition, the gas? What does it mean that they be included in GT *list*? What are the positions of the major powers? Will this classification finally come out ahead? What is a delegated act? Why has it been controversial? How does declaring nuclear energy *green* affect people [85]? How many nuclear power plants are there? When do they come to an end? Beer is one of the most appreciated alcoholic beverages worldwide and presents a higher nutritional value than other alcoholic beverages. It contains many endogenous antioxidant (AO) compounds, mainly arising from malt and hop, among which the phenolic compounds are important for preventing or delaying oxidation processes, during brewing and final-product storage. Because of the natural bioactive compounds found in beer, moderate consumption might provide a number of benefits for human health. The mechanisms behind the effects involve AO compounds from beer, which act in different ways, *via* the complexation of redox-catalytic metal ions, free-radical scavenging and peroxides decomposition. Fermentation is regarded as GC and, therefore, fermented food will play a significant role in people's ability to feed a growing global population in a sustainable way. Conventional and nonconventional microorganisms play a significant role in many fermented foods. Microorganisms are not only important for the organoleptic quality of fermented products, they also present impact on shelf life and nutritional value and, in some cases, even providing host-beneficial effects. Fermented food products offer a multicultural microbial society where synergistic and antagonistic interactions take place. Microbial biodiversity of fermented food is unfortunately usually neglected and not investigated in depth, especially not at the intraspecies level. However, detailed knowledge on the microbiota and its interactions is required for improvement of product quality, production of food products of consistent quality, for development of suitable starter cultures, and prevention of food spoilage and food waste. Peptide-based therapeutics enjoyed renewed interest, in part thanks to the advancement in recombinant technology and chemical synthesis. Peptides generally present limited toxicological liabilities and rendering them as appealing alternatives to small-molecule drug candidates. Notwithsatnding, it is perhaps unlikely that the renaissance of peptide-based therapeutics will equally extrapolate to neglected diseases. Pharmaceutical companies remain reluctant to invest diseases deemed to be potentially unprofitable. The search for effective therapeutics *vs*. dengue virus (DENV) will continue to rely on public–private partnerships integrating contributions from academia, research institutes and philanthropy. The open-source tools, *e.g.*, AutoPepGEN, should contribute to the global goal of the

discovery of novel peptide therapeutics with DENV inhibitory activity. Schüth and Corma revised organisation and future directions of research in Germany in the times of CoV pandemic [86]. Infection research: research into adaptation of the public health system, research into efficacy of globally different intervention strategies, research into strategies for more resilient systems, and fast-response assay development, drug development and vaccine development strategies. *Response of science system in Germany relatively fast and good, because of RKI, HZI, MPIs with related activities*… Beyond CoV pandemic: research and fight the spreading of zoonotic diseases, explore the power of messenger (m)RNA vaccines and therapeutics, and explore and develop strategies *vs*. multiresistant pathogens. An apparent sense of urgency is more present in people's lives since the pandemic began. No perfect way to design an algorithm exists, but the process that should be followed is clear [87]. For Gemma Galdon, the problem to be addressed should first be well defined. The next step should be to understand what are the data that could help solve it. Argüelles Ordóñez reported COVID-19 and the ethics of scientific publications [88].

CONCLUSION

As of the discussion of the current results, the next conclusions can be sketched.

1. The research shows what is understood by natural gender, the problems associated with said concept and some solutions to said problems. Finally, it shows that the question has epistemic, metaphysical and ethical implications that go beyond the debate on natural genders itself. In the educational the tree of life was divided into six kingdoms. By when next redefinition?
2. Plant-origin bactericides can be a prime step to disease management because of their eco-friendly nature. The synthetic drugs of plant origin are of greater advantage to user, public and radical environmentalist. Synthetic antibiotics are used to control several phytopathogens. The awareness of environmental problems with the chemoantibiotics led to the search for nonconventional chemicals.
3. Pharmacophore models are useful and efficient tools for drug discovery. However, no guarantee exists that all the compounds identified *via* pharmacophore models will show activity. Down-selected compounds are to be tested in *in vitro* and subsequently in *in vivo* assays. Iterative three-dimensional shape-based pharmacophore searching and large virtual compound library can be effective.
4. *Antigenic original sin*: secondary instead of primary response. The dengue virus vaccine causes worse disease. The vaccine is conjugated *vs*. a certain serotype; when a person is infected with another serotype, the memory of the first one causes a serious, haemorrhagic disease. Ethics is important in the production, use and dispensing of medicines. Scientific research is also important.

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LITERATURE CITED

[1] Torrens F, Castellano G. Reflections on the nature of the periodic table of the elements: Implications in chemical education. In: Seijas JA, Vázquez Tato MP, Lin SK, editors. Synthetic organic chemistry. Basel (Switzerland): MDPI; 2015. Vol. 18, p. 1-15.
[2] Torrens F, Castellano G. Nanoscience: From a two-dimensional to a three-dimensional periodic table of the elements. In: Haghi AK, Thomas S, Palit S, Main P, editors. Methodologies and applications for analytical and physical chemistry. Waretown (NJ): Apple Academic–CRC; 2018. p. 3-26.
[3] Torrens F, Castellano G. The periodic table, quantum biting its tail, and sustainable chemistry. In: Torrens F, Haghi AK, Chakraborty T, editors. Chemical nanoscience and nanotechnology: New materials and modern techniques. Waretown (NJ): Apple Academic–CRC; 2020. p. 25-32.
[4] Torrens F, Castellano G. Periodic law. In: Putz MV, editor. New frontiers in nanochemistry: Concepts, theories, and trends. Waretown (NJ): Apple Academic–CRC; 2020. Vol. 1, p. 389-95.
[5] Torrens F, Castellano G. Periodic property. In: Putz MV, editor. New frontiers in nanochemistry: Concepts, theories, and trends. Waretown (NJ): Apple Academic–CRC; 2020. Vol. 1, p. 397-402.
[6] Torrens F, Castellano G. Periodic table. In: Putz MV, editor. New frontiers in nanochemistry: Concepts, theories, and trends. Waretown (NJ): Apple Academic–CRC; 2020. Vol. 1, p. 403-25.
[7] Torrens F, Castellano G. Periodic table of elements: Heavy, rare, critical, and superelements. In: Yaser AZ, Khullar P, Haghi AK, editors. Green materials and environmental chemistry: New production technologies, unique properties, and applications. Waretown (NJ): Apple Academic–CRC; 2021. p. 91-103.
[8] Torrens F, Castellano G. Periodic table, chemical bond nature, and nonclassical compounds. In: Yaser AZ, Khullar P, Haghi AK, editors. Green materials and environmental chemistry: New production technologies, unique properties, and applications. Waretown (NJ): Apple Academic–CRC; 2021. p. 105-13.
[9] Torrens F, Castellano G. Mesoporous, graphene composite, Li battery, topology, and periodicity. In: Kulkarni S, Rawat NK, Haghi AK, editors. Green chemistry and green engineering: Processing, technologies, properties, and applications. Waretown (NJ): Apple Academic–CRC; 2021. p. 149-62.
[10] Torrens F, Castellano G. Surfaces, quantum walks, knowledge, agro-toxins and periodic table. In: Haghi AK, editor. Renewable materials and green technology products: Environmental and safety aspects. Waretown (NJ): Apple Academic–CRC; in press.
[11] Torrens Zaragozá F. Periodic table of the elements, history, education and evaluation. Nereis 2021;2021(13):147-64.
[12] Soler Parra J, personal communication.
[13] Bird A, Tobin E. Natural kinds. Stanford (CA): Stanford Encyclopedia of Philosophy; 2018.
[14] Devitt M. Resurrecting biological essentialism. Philos Sci 2008;75:344-82.
[15] Hacking I. Natural kinds: Rosy dawn, scholastic twilight. Roy Inst Philos Suppl 2007;61:203-39.
[16] Havstad JC. Messy chemical kinds. Br J Philos Sci 2018;69:719-43.

[17] Soler Parra J. Defining life as a non-essentialist natural kind. Quaderns de Filosofia 2019;6(2): 27-41.
[18] Barona Vilar JL. Saberes y controversias. Nuevas disciplinas y especialidades. In: Barona Vilar JL, editor. La Facultad de Medicina de Valencia: Cinco Siglos de Historia, València (Spain): Universitat de València; 2021. p. 159-89.
[19] Gargantilla P ¿Cómo se clasifican los seres vivos? ABC 2021;2021(Dec. 12):1-1.
[20] Leakey RE, Lewin R. The Sixth Extinction: Patterns of Life and the Future of Humankind. Palatine (IL): Anchor; 1996.
[21] La Vanguardia. La sexta extinción masiva está en marcha: ¿Realidad, ficción o especulación? La Vanguardia 2022;2022(Jan. 14):1-1.
[22] Martinez-Frias J. *No mires arriba*: La sexta extinción y la estupidez humana. The Conversation 2022;2022(Jan. 25):1-1.
[23] Russell MS. The Chemistry of Fireworks. Cambridge (UK): The Royal Society of Chemistry; 2008.
[24] Gargantilla P. La ciencia que da vida a los fuegos artificiales. ABC 2021;2021(Sep. 20):1-1.
[25] Fernández Otero T, personal communication.
[26] Shirakawa H, Louis EJ, MacDiarmid AG, Chiang CK, Heeger AJ. Synthesis of electrically conducting organic polymers: Halogen derivatives of polyacetylene, $(CH)_x$. J Chem Soc Chem Commun 1977;1977:578-80.
[27] Fernández Otero T. Conducting Polymers: Bioinspired Intelligent Materials and Devices. London (UK): The Royal Society of Chemistry; 2016.
[28] Bertomeu Sánchez JR, personal communication.
[29] Bertomeu-Sánchez JR. Arsenical pesticides in early Francoist Spain: Fascism, autarky, agricultural engineers and the invisibility of toxic risks. J History Sci Technol 2019;13(1):76-105.
[30] Simpson J. La Agricultura Española (1765–1965): La Larga Siesta. Cambridge (UK): Cambridge University; 1995.
[31] Bertomeu-Sánchez JR. Introduction. Pesticides: Past and present. J History Sci Technol 2019;13(1):1-27.
[32] Guillem-Llobat X, Nieto-Galan A, editors. Tóxicos Invisibles: La Construcción de la Ignorancia Ambiental. Barcelona (Spain): Icaria; 2020.
[33] Guillem-Llobat X. Following hydrogen cyanide in the Valencian Country (1907–1933): Risk, accidents and standards in fumigation. J History Sci Technol 2019;13(1):51-75.
[34] Bertomeu JR, Nieto-Galan A, Guillem-Llobat X, Florensa C, Gil-Farrero J, Rodríguez-Giralt I, personal communication.
[35] Guillem-Llobat X, Nieto-Galan A, editors. Tóxicos Invisibles: La Construcción de la Ignorancia Ambiental. Antrazyt No. 504. Barcelona (Spain): Icaria; 2020.
[36] Florensa C. Bañadores, detectores e ignorancia nuclear en el accidente de Palomares (1966). In: Guillem-Llobat X, Nieto-Galan A, editors. Tóxicos Invisibles: La Construcción de la Ignorancia Ambiental. Antrazyt No. 504. Barcelona (Spain): Icaria; 2020. p. 133-58.
[37] Howard J. White Sepulcres: Palomares Disaster Semicentennial Publication. València (Spain): Universitat de València; 2016.
[38] Ecologistas en Acción. Accidente de Palomares (1966). Ecologistas en Acción 2022;2022(Jan. 17):1-1.

[39] Gil-Farrero J. La restauración del paisaje como ocultación de toxicidad en el vertedero del Garraf. In: Guillem-Llobat X, Nieto-Galan A, editors. Tóxicos Invisibles: La Construcción de la Ignorancia Ambiental. Antrazyt No. 504. Barcelona (Spain): Icaria; 2020. p. 159-84.
[40] Rodríguez-Giralt I, Tironi M. Coreografías del abandono: Cuidado y toxicidad en zonas de sacrificio. In: Guillem-Llobat X, Nieto-Galan A, editors. Tóxicos Invisibles: La Construcción de la Ignorancia Ambiental. Antrazyt No. 504. Barcelona (Spain): Icaria; 2020. p. 237-56.
[41] Escrivà Garcia A, personal communication.
[42] Sherlock RL. Man as a Geological Agent: An Account of His Actions on Inanimate Nature. London (UK): H.F. and G. Witherby; 1922.
[43] Callendar GS. The artificial production of carbon dioxide and its influence on temperature. Q J Roy Meteorol Soc 1938;64(275):223-40.
[44] Ehrlich PR. The Population Bomb. New York (NY): Ballantine; 1968.
[45] Meira Cartea PÁ. ¿Hay un agujero en la capa de ozono de tu cambio climático? De la cultura científica a la cultura común. Mètode 2015;2015(85):49-55.
[46] Plutzer E, McCaffrey M, Hannah AL, Rosenau J, Berbeco M, Reid AH. Climate confusion among U.S. teachers. Science 2016;351:664-5.
[47] Toldrá Vilardell F, personal communication.
[48] American Chemical Society. Dry-cured ham bones – A source of heart-healthy peptides? ScienceDaily 2019;2019(Jan. 16):1-1.
[49] MAPA. Más Alimento, Menos Desperdicio: Estrategia 2017–2020. Madrid (Spain): Ministerio de Agricultura, Pesca y Alimentación (MAPA); 2017.
[50] MAPA. Decálogo de Sostenibilidad Integral de la Industria Alimentaria. Madrid (Spain): Ministerio de Agricultura, Pesca y Alimentación (MAPA); 2020.
[51] Puigdoménech P. Exploracions del Planeta Menjar. Sense Fronteres No. 44. Alzira (València, Spain): Bromera–Universitat de València; 2020.
[52] Piugdomènech Rosell P, personal communication.
[53] Itan Y., Powell A, Beaumont MA, Burger J, Thomas MG. The origins of lactase persistence in Europe. PLoS Comput Biol 2009;5:e1000491–1-13.
[54] WFP. The State of Food Security and Nutrition in the World (SOFI): Safeguarding against Economic Slowdowns and Downturns. Rome (Italy): United Nations World Food Programme; 2019.
[55] Aleixandre A, Calle J, Santamaría M, Ruiz M, personal communication.
[56] Jantus Lewintre E, personal communication.
[57] Palit S. Advancements in bioremediation and biotechnology—A critical overview. In: Esteso MA, Ribeiro ACF, Haghi AK, editors. Chemistry and Chemical Engineering for Sustainable Development: Best Practices and Research Directions. Waretown (NJ): Apple Academic–CRC; 2020. p. 179-94.
[58] Badwar MR, Bakliwal AA, Talele S, Jadhav AG. Generation of natural pharmaceuticals based on microbial transformation of herbal constituents. In: Mahapatra DK, Talele SG, Haghi AK, editors. Applied Pharmaceutical Science and Microbiology: Novel Green Chemistry Methods and Natural Products. Waretown (NJ): Apple Academic–CRC; 2021. p. 61-82.
[59] Corada ES. Medicamentos de siempre para nuevas enfermedades. La Razón 2021;2021(Nov. 1):1-1.
[60] Galvez J, Zanni R, Galvez-Llompart M. Drugs repurposing for coronavirus treatment: Computational study based on molecular topology. Nereis 2020;2020(12):15-8.

[61] Galvez J, Zanni R, Galvez-Llompart M, Benlloch JM. Macrolides may prevent severe acute respiratory syndrome coronavirus 2 entry into cells: A quantitative structure activity relationship study and experimental validation. J Chem Inf Model 2021;61:2016-25.
[62] Chakravarty K, Antontsev VG, Khotimchenko M, Gupta N, Jagarpu A, Bundey Y, Hou H, Maharao N, Varshney J. Accelerated repurposing and drug development of pulmonary hypertension therapies for COVID-19 treatment using an AI-integrated biosimulation platform. Molecules 2021;26:1912–1-18.
[63] Castillo-Garit JA, Cañizares-Carmenate Y, Pérez-Giménez F. Biosynthetic enzymes of the SARS-CoV-2 as potential targets for the discovery of new antiviral drugs. Nereis 2021;2021(13):17-23.
[64] Castillo-Garit JA, Cañizares-Carmenate Y, Pham-The H, Pérez-Doñate V, Torrens F, Pérez-Giménez F. A review of computational approaches targeting SARS-CoV-2 Main Protease to the discovery new potential antiviral compounds. Curr Top Med Chem 2022;2022:266738781666622042613355 5–1-13.
[65] Gaziano L, Giambartolomei C, Alexandre C, Pereira AC, Gaulton A, Posner DC, Swanson SA, Ho YL, Iyengar SK, Kosik NM, Vujkovic M, Gagnon DR, Bento AP, Barrio-Hernandez I, Rönnblom L, Hagberg N, Lundtoft C, Langenberg C, Pietzner M, Valentine D, Gustincich S, Tartaglia GG, Allara E, Surendran P, Burgess S, Zhao JH, Peters JE, Prins BP, Di Angelantonio E, Devineni P, Shi Y, Lynch KE, DuVall SL, Garcon H, Thomann LO, Zhou JJ, Gorman BR, Huffman JE, O'Donnell CJ, Tsao PS, Beckham JC, Pyarajan S, Muralidhar S, Huang GD, Ramoni R, Beltrao P, Danesh J, Hung AM, Chang KM, Sun YV, Joseph J, Leach AR, Edwards TL, Cho K, Gaziano JM, Butterworth AS, Casas JP, VA Million Veteran Program COVID-19 Science Initiative. Actionable druggable genome-wide Mendelian randomization identifies repurposing opportunities for COVID-19. Nat Med 2021;27:668-76.
[66] Won JH, Lee H. Can the COVID-19 pandemic disrupt the current drug development practices? Int J Mol Sci 2021;22:5457–1-12.
[67] Bakowski MA, Beutler N, Wolff KC, Kirkpatrick MG, Chen E, Nguyen TTH, Riva L, Shaabani N, Parren M, Ricketts J, Gupta AK, Pan K, Kuo P, Fuller MK, Garcia E, Teijaro JR, Yang L, Sahoo D, Chi V, Huang E, Vargas N, Roberts AJ, Das S, Ghosh P, Woods AK, Joseph SB, Hull MV, Schultz PG, Burton DR, Chatterjee AK, McNamara CW, Rogers TF. Drug repurposing screens identify chemical entities for the development of COVID-19 interventions. Nat Commun 2021;12:3309–1-14.
[68] Kaliamurthi S, Selvaraj G, Selvaraj C, Singh SK, Wei DQ, Peslherbe GH. Structure-based virtual screening reveals ibrutinib and zanubrutinib as potential repurposed drugs against COVID-19. Int J Mol Sci 2021;22:7071–1-22.
[69] Leite Diniz LR, de Santana Souza MT, Sucupira Duarte AB, Pergentino de Sousa D. Mechanistic aspects and therapeutic potential of quercetin against COVID-19-associated acute kidney injury. Molecules 2020;25:5772–1-19.
[70] Rubio-Martínez J, Jiménez-Alesanco A, Ceballos-Laita L, Ortega-Alarcón D, Vega S, Calvo C, Benítez C, Abian O, Velázquez-Campoy A, Thomson TM, Granadino-Roldán JM, Gómez-Gutiérrez P, Pérez JJ. Discovery of diverse natural products as inhibitors of SARS-CoV-2 M^{pro} protease through virtual screening. J Chem Inf Model 2021;61:6094-106.
[71] Luttens A, Gullberg H, Abdurakhmanov E, Vo DD, Akaberi D, Talibov VO, Nekhotiaeva N, Vangeel L, De Jonghe S, Jochmans D, Krambrich J, Tas A, Lundgren B, Gravenfors Y, Craig AJ,

Atilaw Y, Sandström A, Moodie LWK, Lundkvist Å, van Hemert MJ, Neyts J, Lennerstrand J, Kihlberg J, Sandberg K, Danielson UH, Carlsson J. Ultralarge virtual screening identifies SARS-CoV-2 main protease inhibitors with broad-spectrum activity against coronaviruses. J Am Chem Soc, 2022;144:2905-20.

[72] García Seisdedos H, personal communication.

[73] Shahare HV, Gedam SS. Sustainable chemistry and pharmacy. In: Kulkarni S, Rawat NK, Haghi AK, editors. Green Chemistry and Green Engineering: Processing, Technologies, Properties, and Applications. Waretown (NJ): Apple Academic–CRC; 2021. p. 109-21.

[74] Mourchild H. Sustainable processing. World Fertilizer 2021;2021(Mar.):15-8.

[75] Moreno Martínez L. In: Book of Abstracts, VII Morning of *History and Teaching of Science: Digital Humanities and Science Teaching*; 2021 Feb 26-Mar 5; Internet, València (Spain): Universitat de València–Centre de Formació del Professorat; 2021. O–4; p. 1-1.

[76] Bargalló M. Manual de Química. Reus (Tarragona, Spain): Sardá; 1919.

[77] Bertomeu Sánchez JR, García Belmar, A. La Revolución Química: Entre la Historia y la Memoria. València (Spain): Universitat de València; 2006.

[78] Campos R, Perdiguero-Gil E, Bueno E, editors. Cuarenta Historias para una *Cuarentena*: Reflexiones Históricas sobre Epidemias y Salud Global. Madrid (Spain): Sociedad Española de Historia de la Medicina; 2020.

[79] Perdiguero E, Suay I. In: Book of Abstracts, VII Morning of *History and Teaching of Science: Digital Humanities and Science Teaching*; 2021 Feb 26-Mar 5; Internet, València (Spain): Universitat de València–Centre de Formació del Professorat; 2021. O–6; p. 1-1.

[80] Simon J, Zarzoso A. In: Book of Abstracts, VII Morning of *History and Teaching of Science: Digital Humanities and Science Teaching*; 2021 Feb 26-Mar 5; Internet, València (Spain): Universitat de València–Centre de Formació del Professorat; 2021. O–7; p. 1-1.

[81] Trullenque Peris R. L'Estat Actual de la Medicina: Perspectives de Futur. Arxius i Documents No. 66. València (Spain): Institució Alfons el Magnànim–CVEI–Diputació de València; 2017.

[82] Valls Llobet C. Mujeres Invisibles para la Medicina: Desvelando Nuestra Salud. Madrid (Spain): Capitán Swing; 2020.

[83] Plaza JA. ¿Está cambiando la pandemia la ciencia y la manera de comunicarla? The Conversation 2021;2021(Dec. 30):1-1.

[84] Caballero Á. ¿Pueden ser verdes la energía nuclear y el gas? Las claves de la taxonomía europea. RTVE 2022;2022(Feb. 2):1-1.

[85] Ordiz E. El debate nuclear en España: Cómo nos afecta que se declare *verde*, cuántas centrales existen y cuándo tocan a su fin. 20 Minutos 2022;2022(Feb. 2):1-1.

[86] Schüth F, Corma A, personal communication.

[87] Pascual MG. Un método pionero para diseñar algoritmos éticos y responsables. El País 2022;2022(Feb. 2):1-1.

[88] Argüelles Ordóñez JC. Covid-19 y la ética de las publicaciones científicas. The Conversation 2022;2022(Jan. 16):1-1.