



Review Article

Assembly Line in Scientific Labs: Quality or Quantity to Evaluate Researchers' Work? A Critical Overview on Current Huge Overproduction of Scientific Articles and its Sociocultural Consequences

Enrico Prenesti*

Interuniversity Department of Regional and Urban Studies and Planning University of Turin, Viale Pier Andrea Mattioli, 39 - 10125, Turin, Italy

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*Corresponding author: Enrico Prenesti, Interuniversity Department of Regional and Urban Studies and Planning University of Turin, Viale Pier Andrea Mattioli, 39 - 10125, Turin, Italy, E-mail: enrico.prenesti@unito.it

ORCID: <https://orcid.org/0000-0002-6367-0496>

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Abstract

The mission of scientific research is currently contaminated with distortions that undermine its credibility and compromise its fruitfulness. The main question is: are research projects, fundraising, innovation, articles, and scientific findings interrelated? Does innovation and discovery paths need the frenzy of activities that leads to the huge overproduction of scientific articles? Or are we simply witnessing one of the worst consequences of globalisation, with desperate researchers forced to publish for survival rather than to pursue the genuine advance of knowledge? This article examines the environment of scientific research with its current rules, operating mechanisms, and practices. The overproduction of scientific articles is examined in light of the *infinite growth paradigm*, which was invented by economists and politicians to ensure big business for some large multinational enterprises. No natural phenomenon shows a monotonically increasing trend. The hyper-proliferation of scientific articles is, in fact, analysed from a *biological perspective* as a pathological phenomenon comparable to cellular hyper-proliferation. The huge overproduction of scientific articles is inserted in a general framework of a tendency towards hypertrophy, which can also be seen in the dramatic increase in the incidence of oncological pathologies worldwide. The anomalies discussed in relation to scientific misconduct include: i) a sensationally high and frenetic production of scientific articles, ii) a wide mass of scientific studies of little relevance that seem to respond as a priority to the well-known *publish or perish* blackmail; iii) the poorly useful role of peer review process, iv) incredible but proven cases of plagiarism and fraud, v) the improper use of bibliometric indexes to manage funding, recruitments, remunerations, and careers. It is argued that what scientific research bodies and universities need is an ethical work environment inspired by ideals of plurality, solidarity, and eclecticism. Planning the *degrowth of human activities*, in order to reprogram social regulation, is to be considered inevitable in view of overcoming the absurd infinite growth paradigm and its noxious consequences and embracing cooperation instead of competition.

Introduction

Science is a Sacred Cow is the title of a 1950 book by chemist and entomologist Anthony Standen [1]. The author argues that some scientists and teachers have «inflated egos» (certain of their superior wisdom and virtue) or «a fabulous collective ego, as inflated as a skilfully blown piece of bubble gum». This irreverent book was widely reviewed and even praised by Albert Einstein (German-born theoretical physicist, naturalised Swiss, and American, Nobel Prize 1921 in Physics, 1879 – 1955).

A 1950 editorial note in *Life* (an American magazine) states: «With tongue-in-cheek hyperbole, [Standen] suggests that a group that takes itself so seriously deserves some serious skepticism». Standen, in fact, asserted that the scientists he was referring to are mostly dull and pompous and now and that they should be laughed at from time to time. Unfortunately, he argued, the general public stood in awe of them, even when they talked Latinised nonsense. Already in 1950, then, a breach was opened in the compactness of science as a granitic and inviolable corpus of knowledge that aims to preserve and



increase itself. Nowadays, moreover, researchers are often turned into media personalities and passed off as infallible and admirable giants of knowledge. They are increasingly consulted (even publicly) to suggest ratios to solve contingent problems (health, environmental, energy, etc.), but in this way their task shifts from the study which mainly includes experimentation and speculation to conceptualise and model phenomena – to problem-solving. Do politicians use researchers' assumptions to justify policies, even uncomfortable and blatantly unjust ones, imposed on populations (often under the guise of some emergency)?

In the mainstream media, researchers are called, not by chance, *scientists*, in order to refer to the compact group of incorruptible, omniscient, and flawless professionals of the scientific method, always ready to provide evidence-based solutions according to a deterministic paradigm approach. Science is not a producer of certainties led by unblemished and fearless professionals (researchers or scientists, whatever you want to call them). A very common conceptual error is to believe that everything published in a scientific journal represents information in itself. Unfortunately, this is not the case, in order to publish, many researchers construct articles with communicative astuteness, often presenting completely partial results – not always original or derived from datasets subjected to correct data processing – that would require much broader and much more extended experiments in time to be considered significant. In the name of science, nowadays it seems that having doubts or invoking the *precautionary principle* – which are entities at the basis of the scientific method and research ethics – is an obtuse and retrograde behaviour. Nowadays, *science* is an overused term. Science itself does not exist, there exists a *scientific method* and *science professionals* operating at the top of knowledge, the researchers, committed towards the goal to uncover general principles and phenomena functioning mechanisms in order to solve problems. Science is a method of investigating the unknown made up of observations, reflections, doubts, measurements, data analysis, conceptualisation, and modelling: science outcomes are fallible and temporary, they are not comparable – and should not be compared – to an immutable and inviolable religious dogma. «I believe in science» rather than «We trust in science» has become a widespread and pervasive mantra that aims to brand as criminals those who, surprisingly, still retain *doubts* and *critical thinking* and refuse to submit uncritically to binding provisions imposed in the name of criteria passed off as scientific by government agencies and their followers and custodians.

Does it make sense for research bodies, especially academic ones, to follow trends in current issues and problems in society as if they were working at a consumer advice desk? In this mercantile society, intuitions and ideas have become commodities like any other and, therefore, subject to market dynamics. Should not scientific research be detached from political and commercial goals? Reflections and rethinking on this fundamental and fantastic profession are definitely important and urgent. This article is an overview of a leading paramount subject. The underlying inspiration emerges by a

view developed amongst biological, socioeconomical, linguistic, philosophical and epistemological concepts and consequences of a certain mercantile mentality that is distorting and denaturing a profession are examined. Let us go deeper into highlighting the distortions of this field.

Many shadows and few lights mark the recent and current path of science, as has been widely highlighted in recent years by numerous courageous authors in denunciation articles. In the last three decades, we have witnessed the following epistemological changes concerning science:

- From a scientific method adopted to guide managers and management (formal debut in 1911, with *The Principles of Scientific Management* by Frederick W. Taylor [2]) to the mercantile management of science,
- From science guiding and inspiring politics to politics affecting scientists in order to command populations with arguments passed off as objective and based on irrefutable evidence (which does not exist),
- From science intended as an ethical mission for public interest to science subjected to market rules for someone's profits and the control of populations (in the health sector, a concrete example of distorted use of biosciences in a dogmatic sense is the *biopolitics* derived by the *biopower theory* by the French social theorist and philosopher Michel Foucault, 1926 – 1984).

Although we are facing a situation of unprecedented proportions, the trend toward huge overproduction of scientific articles originated a long time ago. Researchers work under enormous pressure in order to manufacture papers that are mostly useless to the progress of humanity, since the current working conditions, reminding that of the assembly line, allow neither reflection nor intuition. Considerations on socio-political and ethical aspects of scientific research are unfortunately commonly neglected so it is not ethics that establishes the priorities and determines the limits. A hyper-production of scientific articles is not necessarily a sign of hyper-creativity. Who benefits from this hyper-productivity? Science, understood as a process of producing new knowledge? Research institutions? Publishers? Governments?

This article offers an overview of the dark side of science [3], which works by distorting the genuine progress of knowledge, bending it to the interests of supranational lobbies and their dominating goals. G. Pacchioni, author of the article entitled *The Overproduction of Truth: Passion, Competition, and Integrity in Modern Science* [4], argues that, under the weight of its immense productivity, modern science is heading for a collapse. In their recent article entitled *Slowed canonical progress in large fields of science*, J. S. G. Chu and J. A. Evans [5] wrote: «In many academic fields, the number of papers published each year has increased significantly over time. Policy measures aim to increase the quantity of scientists, research funding, and scientific output, which is measured by the number of papers produced. These quantitative metrics determine the career trajectories of scholars and evaluations of academic departments, institutions, and nations» (Web of Science



dataset used, analysing papers published between 1960 and 2014 inclusive). A wide study is reported in the article authored by the academic scholars M. Thelwall and P. Sud [6]: changes in the magnitude of the coverage of a major citation index, Scopus, over 121 years from 1900 to 2020 are analysed. Just a piece of data, the number of scientific journals increased at a rate of 3.3% – 4.7% per year between 1900 and 1996. The title of the article appeared in the journal *Nature* in 2016, signed by the freelance writer E. Landhuis [7], is also eloquent: *Information overload*. Information overload also makes it difficult to distinguish what is information from the humongous amount of misinformation circulating online and offline.

Does it make sense for public research bodies, particularly universities, to follow these trends and the influence of contingent social and political issues? Does it make sense that public research bodies are subjected to market rules? Considerations on socio-political and ethical aspects of scientific research are commonly neglected, although scientific results strictly depend upon the *vision* that any scientist has of him/herself, of the natural and social world, and of his/her profession with related repercussions.

Starting a bibliographical research on a given scientific topic can be discouraging, since several thousand documents can be detected by the database employed. A refined selection of the documents found in the first round of search is nearly always possible, of course, but the overload anyway remains and a critical investigation is necessary in order to understand the reasons for the massive increase of scientific articles over the last thirty years or so. Let us formulate a hypothesis. As a researcher does. Are we recording an increment in sensitivity towards the scientific approach to planet troubles? A significantly greater number of researchers, than in the past, are currently engaged in this profession (most of them with underpaid temporary employment). If so, to what end, exactly? Or, has the internet simplified and intensified the connection between people, providing a huge growth of relevant scientific results arising from fruitful international collaborations?

Over the last three decades, we have witnessed a constant and rapid increase in the number of scientific papers published in highly specialised and peer-reviewed journals around the world. This fact can be observed and evaluated according to different perspectives. One can appreciate this growth by associating the number of scientific papers with the quality, variety, and abundance of recent scientific thought, thereby arguing that many papers are the obvious and linear consequence of many innovative scientific ideas that impact both social activities and the quality of life. On the other hand, one could ask oneself how the scientific research environment, with its peculiar working mechanisms and rules, has recently changed. A relatively recent article [8] examined the growth rate of science publication between 1907 and 2007, recording significant differences in various scientific fields (natural sciences, social sciences, engineering, and so on) and general difficulty of analysis mainly due to the variety of communication forms (conference proceedings, full articles,

short communications, monographs, reviews, and so on) and to databases organisation.

Visiting the backstage of research laboratories may reserve a few surprises for non-experts. Sadly, today researchers are forced to multiply their capacity to publish in order to obtain prestige, power, ordinary research funds, and research-related jobs (including tenures, promotions, grants, etc.) for themselves and their collaborators. Scientific articles are currently used as a tool to regulate temporary employment (a huge skilled and underpaid workforce), recruitment, and career progression. In this sense, one is setting up a generation of researchers that are enslaved to the scientific articles they have to frequently churn out, i.e. whose institutional aim is shifted from scientific research activity to the publication of scientific-level communications. Current science is subservient to politics – instead of the opposite, as it should be – and used to build strategies of domination. “Publish or perish” is the locution coined to describe the pressure existing against researchers in universities and other research bodies to rapidly and continually publish scientific articles to sustain or develop recruitment, careers, and new funding. Categorising, ranking, evaluating, and, above all, counting publications has become the dominant international way of managing scientific research topics, funding, and researchers. This is a sterile and manipulative exercise. Single researchers, as well as the corresponding affiliating institutions, are evaluated by the administrators on the basis of the number of articles produced per year. Furthermore, additional credit points are allocated to those scientists who bring funding to their institution, which penalises those who do not. Even though a researcher may not have original ideas, s/he can progress in his/her career by regularly producing scientific articles (using common professional tricks) and finding funding. Having funding to investigate and speculate in order to get findings is an obvious recipe, but the race for innovation and discovery requires first of all serenity and lucidity, beyond humongous amounts of funding. It should also be remembered that giant steps were made in the field of biochemistry using truly inexpensive histochemical techniques, for example. Researchers are distracted from their study by the pressing need to obtain funding, which is noxious for the research practice because it distracts from reflection and the courtship of intuition. In lucky cases, articles quickly produced in assembly lines, according to a routine consolidated approach able to produce publishable data, are mannerist products, mere applications of codified disciplines diligently written by professionals of science. In many unlucky cases, however, the articles are merely useless repetitive exercises written by those who are forced to do so in order to survive: junk articles.

Almost all research bodies, even public ones, are workplaces dominated and distorted by market interests with researchers and professors overloaded with bureaucracy that weighs down, tires, and distracts. In my opinion, we are witnessing an epochal and very dangerous systematic strain of the research profession, whose main aspects can be summarised through the following points aimed at distinguishing amongst:



- Scientific research providing outstanding outcomes based on an insight that reveals what was previously in the shadows,
- Scientific research based on ordinary and diligent collection of data, easily interpretable within established scientific paradigms (concepts, theories, models, and practices),
- Scientific research containing errors in data collection (experimental design step), in measurements and/or interpretation (modelling step) due to ignorance, naivety, or hurry,
- Scientific research contaminated by real deceptions based on false data (even invented), or intentionally biased elaboration of data, and other aberrations [9].

Attention: prolonged distortion is turning into a drift, so a serious shift towards slowness and decency is urgently needed, with a recovery of the sense of public institution (currently agonising) disconnected from commercial and profit logic and freed from propaganda.

The criteria/policies of the scientific journals: writing a scientific article

The overproduction of scientific articles is strictly interrelated with the hypertrophic proliferation of specialised journals. The glut of scientific reports from researchers – tyrannised by their institutions of affiliation and, therefore, driven by the need and the urgency to publish – has allowed journals to proliferate dramatically (an oncogenic-like phenomenon, see paragraphs 3 and 4) and to assume bossy behaviours. The overproduction of scientific articles allows specialised journals to choose and discard them due to an overabundance of submissions. A range of criteria is adopted, such as scientific quality (methodological rigor, statistical adequacy in data treatment, innovation, and so on) in the showcase and others backstage. Beyond the articles' intrinsic quality, which remains difficult to evaluate, most journals are committed to creating the most different acceptance barriers by imposing extremely heavy conditions on authors. Formatting a scientific article according to a journal's specific guidelines, and completing a submission on its website, can be very demanding. Instructions for authors on how to prepare a manuscript for submission include a series of editorial oddities whose purpose would appear to be finding formal reasons to reject articles (with so many submissions, the point is to choose the best, obviously). Here is a list of the most common elements found in these instructions for authors:

- Running title: an abstract of the article title, with a limited number of words allowed,
- Structured abstract: a mini-article divided into micro-paragraphs, with a limited number of words allowed,
- Graphical abstract: a relevant image visually showing the content of the work,

- Audio summary: the abstract of the abstract, acoustically showing the content of the work, with a limited number of words allowed,
- Phonetic spelling of the name and surname of the principal investigator in view of the audio summary (a sarcastic but legitimate question: is the summary also sung or just read?),
- Cover letter: an extended version of the abstract addressed to the editor of the journal in order to highlight its originality and merits (field of investigation covered, novelties, aims, etc.) of the article,
- Requests to each author to disclose private information, more or less pertinent to the article, but especially related to funding (such as public engagements),
- Request to specify the particular type of contribution to the article by each author,
- Stringent rules for tables, figures, captions, text (with a limited number of words allowed), and references (system of citation imposed), all of which are to be strictly observed in view of submission without any guarantees of acceptance: a leap in the void that costs plenty of work and energy, to be repeated elsewhere in case of rejection.

Homologating articles' format and the themes of scientific research means flattening the differences in the worldviews of individual researchers, which represses their *creativity*. What seems absurd is that many journals require rigid and mandatory adherence to a standard editorial format for the preparation of the manuscript to be submitted. Also, the list of references must be drawn up in accordance with editorial guidelines. Much time is lost in drafting a manuscript according to editorial standards. In the event of rejection, the author has to start anew to match the guidelines of another journal. Why is a first approach to publishing based exclusively on content almost inconceivable? The standard format of a scientific article is well known to all researchers; in case of acceptance, it will be possible to take care of editing the article according to the specific editorial format (which is a task of the publisher, except in the case of the ready-to-print approach, if accepted by authors). It should be remembered and underlined, however, that there are journals that operate with criteria inspired by the lightening of burdens in order to simplify and speed up the interchange with the authors.

In short, only the largest research groups, supported by multiple contributions from different sources, who bring together various types of skills, are able to quickly face the demands of most research journals; and this is one of the indirect methods of *article selection*. Hence, only those who can count on strong support (financial, administrative, technique, etc.) and trained staff can stay in the race for publication. Moreover, only those who have access to large funding can hire runners (researchers) and buy equipment (places, libraries, instruments, reagents, PC, subscriptions, advisories, etc.) suitable for participating in the race. To survive in this



jungle of rules, regulations, standards, and formalities, then, a researcher is forced to become a fundraiser, a manager, an accountant, a clerk typist, an IT specialist as well as a dynamic and smart networker who tours the world in order to collect information, first-hand news, consent, and alliances at i) congresses/conferences, ii) workshops, and iii) informal academic meetings.

The infinite growth paradigm

As long as we continue to think obsessively in terms of growth – economic, scientific, technological, etc. we will have to compare the working conditions of the research bodies to oncological diseases, whose incidence is growing worldwide. The fact that researchers are falling into such a *cognitive trap* is beyond paradoxical. The *infinite growth paradigm* (or *unlimited growth paradigm*) was invented by unscrupulous economists and politicians to enhance industrial production and consumption of goods [10]. Infinite growth in biology is nonsense and is, at best, a preview of death. The paradigm of infinite growth, much vaunted in economic and political terms, is a mere *antiscientific* deception, perhaps also due to the scientific misconduct of (at least) the last four decades: no natural phenomenon is indefinitely increasing (as far as it is known today), since each is characterised by: i) a latency phase, ii) a growth phase, iii) a stability phase, and iv) a decline phase up to the extinction. With regard to biological phenomena, the larger and more complex the living organism, the more rapidly it decays and dies out. Therefore, imposing on members of societies (researchers included) the myth of competition joined with the infinite growth paradigm as a virtuous reference, and as an inevitable horizon, implies inducing *oncogenic thoughts*, just because *overthinking* (ruminative thoughts due to fear induced by inadequacy feeling) might contribute to overstress and wear down the immune system, thus fostering a dysregulation (the *Psycho-Neuro-Endocrine-Immunology* doctrine ensures the existence of a well-defined interrelation between the psyche and the immune system). Probably also promoted by conclusions drawn in fraudulent clinical studies [11], one knows that there is a big business in the sale of antineoplastic drugs, which is anyway a marker of the huge and rising incidence of this disease and of the therapeutic approach adopted. Notwithstanding, the analogy that is being focused on between the huge overproduction of scientific articles and the oncological hyper-proliferative phenomenon goes much beyond the fact that the biomedical field suffers from large losses in the quality of its scientific research and publications [12].

The comments developed in this essay are based on epistemological, neurolinguistic, sociolinguistic, socioeconomic, neurochemical, immunochemical, and psychobiological elements and concern the need to tend to a downward revision of every form of overproduction in the world (material and immaterial), starting from the choice of the language used in the internal dialogue, the institutional communications and the quality of interpersonal relationships.

In fact, the authoritarian call to grow, or develop tools for growth, is everywhere and characterises a ubiquitous push to

increase efforts and investments regardless of a serious and ethical evaluation of the underlying reasons and possible consequences. Infinite growth and indiscriminate productivity are scamming chimeras, manipulative and harmful paradigms: those who fall for it, and let themselves be overwhelmed, risk becoming seriously ill. Moreover, increasing the rhythm of publications is like progressively increasing the consumption of carbohydrates, sweets, or chocolate: it is an *addiction!* The craving for scientific articles follows the same rules as the craving for food starches (contained in cereals, pseudo-cereals, potatoes, chestnuts, or legumes), sugars, or cocoa: it is an illness, a psychological dependence dopamine-mediated. The competitive model is an excellent way to push every component of society to strive in order to produce at their full potential. Sadly, many people are prone to be deceived by the toxic myth of competition, probably because it intercepts survival mechanisms (that makes one believe that each one survives at the expense of the sacrifice of others) to which each one is ancestrally trained beyond logic, knowledge, or ethics.

Let us now continue to examine the basilar aspects of the most common policies regulating the scientific research field, leaving room for the most disturbing aspects.

The analogy between scientific and cellular overproduction

The 2014 document by the IARC (International Agency for Research on Cancer) containing the World Cancer Report [13] gives a comprehensive overview of the disease worldwide. It emerges that cancers figure among the leading causes of morbidity and mortality worldwide, with approximately 14 million new cases and 8.2 million cancer-related deaths in 2012. Moreover, the number of new cases is expected to rise by about 70% over the next two decades. The same source reveals that there were close to 20 million new cases of cancer in the year 2022 alongside 9.7 million deaths from cancer. In ten years, the increase in cancer cases, if the reported data are correct, is approximately 42.9%. Therefore, the incidence of cancer worldwide is increasing rapidly and at a worrying rate.

These data show that humanity lives according to an anti-biological lifestyle, which implies thinking and behaving in a dysfunctional way to the vital psychophysical mechanisms.

Let us examine some possible causes of this, beyond the usual debated stereotypes (although pertinent and sensible) on smoking, alcoholism, obesity, infections, and environmental pollution. Even though researchers are currently producing impressive masses of scientific articles in the biomedical field, one of the most feared diseases in the world is progressing unstopably despite the efforts of oncological research to fight and defeat it. Any phenomenon characterised by a hypertrophic base is the result of people acting in societies characterised by an unhealthy, compulsive, oversteering, and often useless and senseless tendency to *overproduction* (scientific, industrial, crafts, and so on), such as cancer cells in an altered metabolism with an uncontrolled cellular division. Moreover, all this because it was built a predatory society based on the sale of objects and on craving for profit where people, for fear



of becoming impoverished, tend to accumulate goods and capital and, consequently, thoughts, emotions, feelings, and unresolved traumas.

It results in a type of *accumulation mindset* dysfunctional for change and renovation [14].

The keyword is, in fact, *alteration* or, suitably, according to biochemistry and physiology terminology, *dysregulation*: we are witnessing the psychophysical decline of people exhausted by competition (a terrifying *stressor*) in the struggle for survival that ignores (at least partially) that it is being manipulated to be silenced. And here are fewer and fewer doubts that prolonged and exhausting stress – that is, *distress*, according to the distinction on various forms of stress introduced by Hans Selye, an Austrian-Canadian physician, and endocrinologist, 1907 – 1982 – may be the cause or contributing cause of cancer [15-17].

Professional researchers currently are:

- Obsessively focused on trivial details to give technical meaning to an article that legitimises its publication in a specialised journal,
- Jailed in sterile competitions with their peers to grab a keynote or communication in a congress, for a grant, funding, a temporary contract, and so on,
- Kidnapped by captious intellectual speculations around tiny details that distract from the search for new ways, new concepts, new models, new explanations of phenomena under study,
- Possessed by the narcissistic demon to predominate in their field of expertise.

That being specified, where do we want to go? This situation is particularly serious and significant for those researchers who are university professors because they neglect their teaching commitments to devote him/herself full-time to scientific research, fundraising, and publication activities that allow them to justify their presence within their universities and, therefore, their remuneration. In her 1990 book, P. Smith [18] claims that:

- The well-known *publish or perish* blackmailing diktat generates useless research and articles while leading university professors away from their students in the quest for job stability,
- Academic fundamentalism, the refusal of professors to acknowledge ideas that do not fit their own agenda, is on the rise,
- Universities are becoming increasingly dependent on government and big business as these entities award more research grants.

There is a great deal of confusion between i) publishing as a tool for communicating and disseminating new knowledge,

and ii) publishing as an act in itself (i.e. aimed at purposes collateral to the development of knowledge).

From a biological perspective, the hyper-proliferation of scientific articles is a pathological phenomenon comparable to cellular hyper-proliferation due to the loss of the regulatory capacity of metabolism.

For each thing, a state of *balance* (a normotrophic state), one of *deficiency* (a hypotrophic state), and one of *excess* (a hypertrophic state) exists. Excess as well as deficiency are debilitating states bringing with them metabolic alert that activates the pathways of cellular stress (increasing free radical production and specific hormone levels, such as that of cortisol and epinephrine) until the appearance of chronic inflammation of organs, immune disorders, and cancer. As well-known [19], in fact, cortisol suppresses the immune function and also many types of cancer are recognised as having a dis-immune origin. Several diseases that are marked and sustained by chronic inflammation result in significantly increased risks of cancer, such as colon cancer in patients with ulcerative colitis [20,21]. Cortisol (an immunosuppressant biomolecule) has a direct effect on shrinking the thymus and inhibiting white blood cell production and activity. Cortisol suppresses the ability of white blood cells to secrete chemical messengers (interleukins and interferon), so the different varieties of immune-system cells become unable to communicate with each other in a way that would allow them to more effectively fight off infections. Moreover, cortisol can actually act as a signalling biomolecule towards many immune-system cells, simply instructing them to shut off and stop working (that is, the cells die). Cancer cells are full of bioactivity and vigour, but they kill the organisms within which they develop.

In this murky social atmosphere of competition and protagonism – in which the race for survival (which is a leading cause of discomfort due to anxiety and anguish produced by the sense of inadequacy provoked by the continually increasing social demands for adaptation) is masked by search of excellence – specialised journals wallow at low cost on the work of researchers stressed and forced to work in a senseless assembly line (of Tayloristic taste) against all logic and decency. In my opinion, this is how the world of scientific research and articles can be interpreted at this moment. The overproduction of unnecessary, mannerist, and repetitive scientific articles is an unequivocal sign of ethical and cognitive decline, and of lack of creativity.

This is the dark side of science today, which is declining, cloying, inconclusive, and sometimes noxious, especially when the precautionary principle is ignored to leave room to kinky experimentations.

How many researchers are aware of this? How many researchers are interested in this? How many researchers are aware of their real task and mission on Earth? How many researchers are aware of being working inside a misleading network that aims to marginal objectives, typically mercantile, with respect to that of the progress of humanity? How many researchers have the time, culture, and enough courage to reflect on these paramount issues?



Research evaluation: the peer review scam and the bibliometric indexes

The instrument to which the scientific community delegated – naively – the custody of the scientific quality is compromised, as documented by the paper entitled *The peer-review scam* appeared on Nature in 2014 [22]. Already in 2006, Donald Gillies [23] argued against what he named a *Research Assessment Exercise* (RAE), moreover explaining that such a tool was introduced in 1986 in the UK by Margaret Thatcher and continued by Tony Blair, thus revealing a political interest connected to. Afterwards, peer review was introduced in other countries and it is now widely accepted and used to make decisions for publications in scientific research journals.

Peer review is the assessment process at the heart of the current scientific publishing process: unfortunately, various type of distortions contaminates the process [23,24] and no one can be sure that the quality of the scientific articles is guarded by the peer reviewers selected free of charge from journals between expert researchers. As stated by D. Gillies [23]: «Thus a great deal of taxpayers money will be spent on an exercise whose likely effect is to make research output worse rather than better. Only one conclusion can be drawn from this, namely that RAEs should be abolished rather than introduced».

An important topic of peer reviewing is that authors of scientific articles ignore the identity of reviewers, but reviewers generally know both the author's identity and affiliation: this is one of the unacceptable distortions of this odd workplace. When will researchers be allowed to operate under *double-blind conditions* to ensure true equality as well as disinterested and unbiased evaluation of scientific articles? Not all agree with this, but double-blind peer review is considered by many to be the fairest system of evaluation of scientific articles.

In 2005, PLoS Medicine published an essay by J. P. A. Ioannidis entitled *Why most published research findings are false* [25]; it surpassed one million views in late April 2014 and was called «an instant cult classic» in a Boston Globe editorial of July 27, 2006. This essay discusses the implications of many aspects of the conduction and interpretation of scientific research, also examining the role of statistical methods of data analysis that affect how it is more likely for a research claim to be false than true. It should be emphasized, however, that insisting on the true/false binomial – for research designed and conducted in good faith – is limiting; *black-and-white* or *binary thinking*, in fact, is the consequence of a typical mindset that produces biases. Dichotomous interpretation all good or all bad, with no middle ground, is the failure of a particular and, sadly, widespread thinking pattern.

J. Bohannon – a biologist and science journalist based at Harvard University – in his 2013 article published on Science [26] showed the result of his investigation. In September 2013, he submitted a *fake scientific article* to a large number of fee-charging open-access publishers, revealing that less than 40% were living up to their promise of rigorously peer-reviewing what is published. This approach was criticised by some

commentators as well as by some publishers of fee-charging journals, who complained that his sting only targeted one type of open-access journal and no subscription-based journals, damaging the reputation of the open-access movement.

Distinguishing true from fake is sometimes really difficult, nevertheless, the dark side of science is not science and, likewise, scientism is not science. Even more difficult is to distinguish a genuine effort (successful or not) made to understand an aspect, even a subtle or apparently secondary one, of a phenomenon of interest from a diligent routine homework done to sew an article useful for an extra-scientific purpose. The fuel of science is doubt, not truth. Scientific scepticism, or zetetics, is an epistemological position that focuses essentially on the practice of asking whether or not certain statements are supported by adequate arguments based on empirical research and reproducibility, as required without exception by the scientific method. For decades now, science has been marketed as the *new religion* – with its officiating, followers, and fanatics – and this is because most people are ignorant and insecure to the point of being senselessly hungry for certainties. Given this situation, in which rejecting religion is equivalent to being branded a heretic, zetetics should be a subject taught in schools and universities. Objectivity does not exist in any aspect of the phenomenal reality, everything is perceptual and, at the limit, *inter-subjective*. The belief that the outcomes of researchers are objective is a gross misunderstanding that causes various distortions and, especially in the biomedical field, several real disasters. Evidence-based, deterministic medicine, whose results are too often generalised and overstated, has produced rigid clinical protocols for any pathology and has nullified assessments based on the biochemistry of the individual, altering trust in physicians and national health systems. Medicine that fights symptoms with suppressive drugs is not the only way to conceive and conduct medicine. The pursuit of objectivity in the biomedical field has supplanted clinical assessments based on the decoding of symptoms (semiotics) to make room for myriads of clinical tests passed off as selective but, in reality, often characterised by very high percentages of false positives and negatives that cause incorrect diagnoses. The products of the scientific method are not the mirror of a hypothetical objective reality, but only *interpretative models* (intrinsically limited, that is valid only under strict conditions) of very limited portions of the phenomenal reality. Therefore, the products of the scientific method, including drugs, do not provide certainties about the result, but they are a comfort to those who are so ignorant as to believe without checking (consulting multiple sources, at least) and so convinced that there is only one solution to every problem.

Authentic science, based on ethics, doubt, and *precaution*, aims first of all to understand, to develop explanations of natural phenomena using evidence and logic; it does not want to control or reassure or pass off researchers as infallible and incorruptible superheroes.

The precaution principle is the ruler of doubtful matter coming from scientific investigation. Whenever doubts, uncertainties, or ambiguities arise with respect to the safe



application of some new product, especially in the biomedical area, to stop at once the process is a duty. We will always be faced with margins of uncertainty during a research path, but especially in the biomedical area a change of paradigm is necessary in order to put in the middle health and not illness: *promoting health is different from fighting diseases*.

Once the sieve of peer reviewers and the journal editor is passed, a scientific article enters a new dimension of evaluation, that of rankings based on bibliometric indexes. With respect to the use of bibliometric indexes, Richard R. Ernst, the Nobel Prize in Chemistry 1991, wrote [27]: «And as an ultimate plea, the personal wish of the author remains to send all bibliometrics and its diligent servants to the darkest omnivore black hole that is known in the entire universe, in order to liberate academia forever from this pestilence. And there is indeed an alternative: Very simply, start reading papers instead of merely rating them by counting citations». Bibliometric indicators have been devised to quantify scientific production and to try to evaluate its impact on the scientific community. They can be classified according to whether the unit of analysis is the author (individual or group) or journal. Bibliometric indicators are unable to evaluate the *quality* of scientific production nor are they as objective as their staunch supporters of the regime would have us believe. Bibliometric indexes are used as management tools to promote or slow down lines of research worldwide and to manage the recruitment and career of researchers. Scientific journals, but also universities, are classified according to various indexes to make them more or less attractive to customers. Bibliometric indexes are often misused as if they referred to the quality of articles but, in reality, they are only parameters related to the quantity of consultation and citation. Scientific research is in fact self-referential, even in the face of a substantially shared working method that, instead, must be monitored and periodically revised in light of *epistemological speculations*. The true and only evaluator of scientific research is history.

Science/technology vs process/product and associated consequences

Confusion between science and technology (between basic and applied science) is killing the content, the mission, and probably the investigation method of science too. Moreover, by thinking in sociocultural terms and paying attention to teaching methodologies, the more one relies on technology, the less one develops cognitive and critical skills. Basic science (also known as pure or fundamental science) aims to expand the boundaries of knowledge developing theories and explicative or predictive models through fundamental research driven by curiosity; it aims to uncover fundamental principles and laws that govern the universe, without immediate practical applications in mind. Applied science takes the knowledge gained from basic science and applies it to solve real-world practical problems and develop practical applications. Science is a *process* that can, sometimes, give rise to a *product*: confusing processes and products can produce ambiguities dysfunctional to the progress of knowledge acquiring. The evolution of scientific thought – as a process – is sacrificed on the altar

of the product, productivity, and profit, because researchers are delegated the task of fundraising for the maintenance of membership. The movement of research funding is regulated worldwide by *scientific projects* and the testimony of the research work is entrusted to publications: for these reasons, the most frequently expressed research products, as they are usable, are scientific articles (various formats are considered) and patents. Being focused on the need to produce *publishable products* of their research, researchers are simple *slaves of papers*, rather than curious devotees of the scientific method. The rush to obtain a *publishable scientific product* produces artefacts of good faith (errors) or of bad faith (frauds). Very short experimentations, measurements conducted with obsolete or inadequate instruments/equipment, approximate data processing without adequate testing, confusion of correlation with causality, surveys on a very small group of people, and conclusions drawn hastily and guided by the *expectations* placed by the experimenters are just examples of the bleak panorama under discussion. In particular, the rush to publish a *scientific product*, in order to justify one's position in a research institution, generates distortions that may include *fraud*. D. M. Markowitz and J. T. Hancock of Cornell University (USA), in their article entitled *Linguistic Traces of a Scientific Fraud: The Case of Diederik Stapel* [28] wrote: «This research supports recent findings that language cues vary systematically with deception and that deception can be revealed in fraudulent scientific discourse». The incidence of fraud in scientific publications is such that it has even urged linguists to work to succeed in revealing deceptive articles from the details of linguistic choices. On the other hand, R. G. Steen and co-workers published an article entitled *Why Has the Number of Scientific Retractions Increased?* [29]; authors wrote: «The increase in retracted articles appears to reflect changes in the behaviour of both authors and institutions. Lower barriers to the publication of flawed articles are seen in the increase in the number and proportion of retractions by authors with a single retraction. Lower barriers to retraction are apparent in an increase in retraction for “new” offenses such as plagiarism and a decrease in the time-to-retraction of flawed work».

It is time to stop this perverse chain that confuses the path of evolution of scientific thought with the products derived from it over time as simple applicative consequences.

The experimenter expectancy effects

The Rosenthal (or experimenter/expectancy) effect is the name for a theory that holds that the expectations of an experimenter concerning the results of an experiment may have an unconscious effect that directs the results of said experiment toward the expectation of the experimenter [30]. In too many cases, current scientific research is built on the *confirmation* of something. Karl R. Popper (Austrian-born British philosopher of natural and social science, 1902 – 1994): «It is easy to obtain confirmations, or verifications, for nearly every theory – if we look for confirmations. Confirmations should count only if they are the result of risky predictions... A theory which is not refutable by any conceivable event is non-scientific. Irrefutability is not a virtue of a theory (as people



often think) but a vice. Every genuine test of a theory is an attempt to falsify it, or refute it» [31].

The Rosenthal effect is recognised as physiological in scientific research (as in other fields), but the rush (or really the urgency) to publish pushes to get results mostly classifiable into existing and consolidated models. The Rosenthal effect is very active in researchers, also because they struggle every day with the same things (related to their narrow field of expertise), sometimes losing lucidity (which is incompatible with the concentration on a task). Moreover, researchers are guided by the burning hope to obtain something relevant to stand out and emerge (and this easily produces junk articles) or, more simply, to avoid being fired. The use and abuse of the scientific method and its results have led, over time, to the coining of the term *scientism*, which is the alarming reflection of situations determined by arbitrary decisions, assumed as a function of theorems passed off as scientifically founded but, in reality, merely the fruit of opinions and ideologies (typically, culturally linked to the *beliefs* of a certain period of time). Researchers are not geniuses, but fallible human beings with their beliefs and prejudices: it is, therefore, useless and harmful to overestimate their abilities and, above all, to stress them with hurry, competition, blackmail on productivity, and precariousness. All this is if one wants a fair society for intra- and interpersonal harmony and psychophysical health of individuals. If, instead, one wants a society of alarmism and emergencies built on the problems and behaviours determined by fears, then it is useful to label and demonise as antiscientific everything that is adverse to the despotic technocratic power exercised through sanitary and technological control of people.

Frequent and compulsive evaluations to stimulate the sense of competition

By instilling an obsession for the rankings one can create competition to tire and distract researchers with the struggle for survival. Researchers are evaluated by their affiliation institution by way of the number of articles and bibliometric indexes (as the h-index that measures both the productivity and citation impact of the publications), journals are ranked with bibliometric criteria and indexes. The obsessive idea of being involved in a dichotomy between loser and winner distorts the work of researchers. The arbitrary and improper use of bibliometric indicators, as the impact factor, is also criticised in the literature [32]. Obsession with the international ranking of journals and universities is aimed at disseminating malevolence and to discriminate, not to ensure quality, as someone likes to believe or induces others to believe. Competition is a cliché, a myth, a trap for the mind. Society is inundated with half-truths and misconceptions about the economy and finance in general and free enterprise in particular. It is time to emphasise and promote *cooperation*, not competition.

Competition is a toxic driving force imposed as an implicit criterion to stimulate commitment in people: it forces to identify any medium to survive to pressing and urgent demands, thus scam of any type may arise that pollute the society by undermining cooperation and trust.

The idea of competition is drummed into anyone, already at school. From sports to exam tests, it is about competing with others. At school and university, instead of guiding pupils to do their best, one pushes to convince them to do better than other pupils do. It is all good for you, they are told, it gives you an incentive to improve and it fits you for the world of work. Competition leads to a unified science that deprives the scientific path of the contributions deriving from the slowness and space granted to inertia prodromal to intuition. Clearly, laboratories and libraries are full of competent, passionate, and motivated researchers, the focus of this essay is on the functioning mechanism regulating their work, of market tendencies, and not on individuals, who are often crushed by the insane pressures of their employers in contempt of ethics.

Funding activities and scientific discoveries relationship

A huge amount of funds runs around scientific research worldwide, and this may lead to reflection: are we assisting in the expansion of a useful intellectual exercise or a specific form of business cleverly masked by a microscope? The large concentration of funds distributed under the label of *pure or applied scientific research* gives rise to lobby communities (centres of power) and this compromise the correct selection of either topics, methods, or researchers all over the world, thus creating a restricted number of scientific groups able to control and monitor the funds' distribution so as the specialised journal's policies. K. R. Popper: «It is a myth that the success of science in our time is mainly due to the huge amounts of money that have been spent on big machines. What really makes science grow is new ideas, including false ideas» [33]. There are no exceptions to this basic rule, because no amount of funding, however large, can change this. Moreover, scientific research is not simply a field of application of the human intellect, in fact, as A. Einstein wrote: «The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honours the servant and has forgotten the gift». The rush to publish is in contrast with the calm and clarity that are needed to find out something truly new and useful for humanity.

In hurry, that is, with an imposed convulsive rhythm, one can only assemble mass-produced objects along an assembly line.

Who benefits?

Just a simple but crucial question: '*Cui prodest?*'. Who benefits from such a huge overproduction of scientific articles? To science as a process of knowledge production? To the many public and private scientific institutions? To the publishers? To the governments? Many answers are possible. Surely, it benefits the publishers and all those interested in acquiring personal prestige and power acting as editors, guest-editors, and being members of editorial boards (it nurtures their CV). And also the large volume of publications related to conference proceedings is involved in the business of science. The bosses of the research institutions are happy to use the publications to direct selections for hiring and career advancements. Moreover, publications are discriminant – in appearance – in



regulating fluxes of funding paid by public or private financiers of scientific research.

Quality and quantity are variables inversely proportional. The huge growth of the number of scientific articles can be considered a marker of the collapse of scientific quality, which rising by creativity for innovation producing new ideas for solutions to old interrogatives or problems. Another vision of the relationship between quantity and quality in scientific research is given by K. R. Popper: «It is not his possession of knowledge, of irrefutable truth, that makes the man of science, but his persistent and recklessly critical quest for truth» [34]. On the other hand, even bibliometric indexes are only numbers related to the volumes of consultation, nothing connected to quality.

The perverse mechanism of evaluating the quality of the research based on the counting of articles must be stopped worldwide, thus allowing researchers to conduct their investigations without the rush to publish intermediate results, often rough, incorrect, or irrelevant.

We live in a distortion of researchers driven by the impulse to make measurements in order to quickly record and process publishable results. The imprisonment of these researchers is established by the priorities determined by the entities, often governmental, recruiting them to procure funds and ensure the international prestige mode that allows access to the world rankings of research institutions.

No researcher should be subjected to the stressor to discover something in a set time: this is a nonsense approach to this profession, it is real bullying.

Asking to testify about one's work as a researcher through publications means perpetrating a deception against defenceless humanity and against those who would like to operate honestly and publish only *meaningful and ethical-based results* of their scientific path. Creative work, such as that of researchers and university professors, must be subtracted from the control of mercantile and entrepreneurial principles. By eliminating competition, expectations, the command-control paradigm, and profit from the equation of the scientific research one can foster openness to the growth mentality [35], proactive confrontation, exchange for the common good, and the lateral thinking to give space to creativity. What researchers need is an ethical-based workplace guided by ideals of plurality, solidarity, and eclecticism untethered from profits. It is about getting out of the hamster wheel of paradigms and hypnotic propaganda, opening your mind and choosing to act for the *good*, rather than to please a regime or satisfy your own egocentrism. In a society that produces problems and promotes catastrophes, flourishes a type of science screwed on itself, built on distorted paradigms, and guided by deviant incentives. The researcher who works with passion, dedication, and competence on the advancement of knowledge is moved from his/her authentic mission in order to work predominantly on the distortions artificially imposed by supranational dominant lobbies interested in conserving and increasing their power by subjugation. Here is who benefits.

Scientific paradigms

Beliefs and methodologies that define a scientific discipline at any given time are what Thomas S. Kuhn (American physicist, historian, and philosopher of science, 1922 – 1996) termed a '*scientific paradigm*' [36]. Kuhn challenges the traditional view of science as a linear, objective process of accumulating knowledge. The master narrative guides researchers' questions, the methods they employ, and the interpretation of their results. It is not merely a theory, but the entire worldview within which scientific inquiry takes place. Scientific paradigms are not only working tools for researchers, but reflect the challenges, discoveries, and transformations that shape the path to a deeper understanding of phenomenal reality. Kuhn also argued that choosing between different theories or paradigms is not just a rational process based on empirical evidence: he highlighted the role of non-epistemic factors such as social dynamics and psychological factors.

Historical and cultural factors shape what is considered scientific knowledge and what is not.

A scientific paradigm codifies and crystallises the status quo of knowledge about something: since it is useful for this purpose, it is obvious that it hinders the formulation of new visions for new scientific models of the phenomenon under study. Idolising a given scientific paradigm – which is *scientism* – allows researchers to stay aligned with the demands of the dominant elite (who are often financiers), whilst venturing in search of new ideas for new paradigms requires inventiveness and a lot of courage to overcome the criticism and ostracism of conformist colleagues (including those acting as reviewers in the peer review process of scientific articles).

Conclusion

Planning the degrowth of human activities in order to reprogram the social regulation (degrowth transition) – thus allowing to restart of the paradigm of cooperation, and leaving aside that absurd of unlimited growth – is dramatically important and urgent: concepts and examples must come from the holders of knowledge, *open-minded researchers* in the first place.

In a *degrowth perspective*, the roles of scientific research, work and consumptions should be readdressed and redesigned on new bases in post-growth societies, whose onset is to be considered inevitable.

Knowledge and human beings are not commodities: distorting and bending the work of researchers for profit, and other advantages of ruling elites, is a crime against humanity. If researchers are subjected to productivity and market laws, it is obvious that the products of scientific research will be designed for sale and exhibition, but not for the good of humanity. Furthermore, just as advertising is responsible for pushing consumers to purchase, similarly advertising and regime propaganda will do everything to impose the products of scientific research, ensuring i) the subjugation/obedience of the population, and ii) sensational billings for multinationals.



In countertendency, stopping the production in an assembly line of useless, expensive, and sometimes harmful scientific articles is very urgent to restore dignity to researchers, allowing them to engage in activities of study not finalised to the financing of their institutions but only to conceptualise and model natural phenomena of interest for humanity. Only human consciousness is steadily growing, albeit very slowly. It is essential and urgent to untie public research institutions by cash needs and budget so that the researchers can study and experiment without wasting their time in occupations foreign to their mission. This would also eliminate the tensions and conflicts caused by both the competition for funding and the need to publish at all costs to prove one's worthiness. But, in this way, the power system associated with the scientific research environment would crash...

Many today's researchers confuse or pretend to confuse, in order to publish scientific articles and survive, a series of measurements with a novelty, the diligent accumulation of data with innovation, and innovation with discovery. Jules H. Poincaré (French mathematician, 1854 – 1912): «Science is built up of facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house» [37]. Nowadays, data science is often intended as a method to extract information from a cluster of data (the *facts* to which Poincaré refers), nevertheless, a general abuse of data – and of outputs coming from dataset analysis based on soft modelling – is often identifiable in the current science approach.

Unfortunately, many scientific articles contain simple data collection with minimal processing and commentaries: measurement results are first organised and then framed within consolidated reference theories and interpreted and commented on according to purposes that are primarily contingent on achieving a publication. In the field of environmental sciences, then, there are various articles that report monitoring results that are the responsibility of national environmental agencies, rather than research institutions. Even barbers, tailors, surveyors, salesmen, plumbers, and carpenters should strenuously publish in accredited international journals the diligent results of their daily work. And, moreover, all commercial receipts should be published in the (perhaps nascent?) international research journal “*Tickets and Invoices*” (conceptually founded today by myself for the joyful occasion), which would not disappoint the readers for the importance and variety of its articles. In the same way, a bartender could publish periodic reports on his/her current business resulting from statistical processing of his/her tax receipts and paid bills in the international journal “*Tickets and Invoices*”: if s/he does not do so, it is only because fashion is not still launched and because s/he is afraid that such an article could end up in the hands of the tax authorities and get him/her into trouble. However, according to this type of society based on deception, competition, consumption, and profit, I presume that whoever finds the international and trendy abovementioned journal “*Tickets and Invoices*” will have great success and a huge amount of article submissions.

What is being discussed has remote origins, it is not simply the mirror of current decadent societies, which does not spare even the sector of scientific research, commoditised,

manipulated, and overexploited. Many decades ago Enrico Fermi (Italian physicist, Nobel Prize in Physics 1938, 1901 – 1954) wrote: «The profession of the researcher must return to his tradition of research for the love of discovering new truths. Because in all directions we are surrounded by the unknown and the vocation of the man of science is to move forward the frontiers of our knowledge in all directions, not only in those that promise more immediate compensations or applause». Overproduction of scientific articles requires an overabundance of data – commonly very easy to acquire, nowadays – better if also suitable for frightening, surprising, or amusing depending on the social needs to be faced at the moment. The quality of the aforementioned data, and the quality of the method of elaboration of the same, opens up a world, even more so with the advent of *data science*, which processes data with algorithms that operate independently from a physical model of the phenomenon (soft modelling).

Science is simply collapsing on itself, being the victim of a manipulative governance that spreads competition and a paradigm of infinite growth (inexistent and conceptually senseless) to divert the course of the discoveries by tiring the researchers and placing them in the rank of manager, accountant, clerk, cashier and, often, handyman too. Stephen R. Covey (American educator, writer, businessman, and speaker, 1932 – 2012): «Management works in the system; leadership works on the system», and it is worth pointing out that *a researcher is a leader*, not a manager, a fixer, an accountant, a clerk, a technician, and not a janitor. Instead, unfortunately, researchers are currently simply operators of assembly lines of research bodies whose main goal is the research of funds, rather than of novelties for increasing knowledge.

A humongous production of scientific articles is not necessarily a sign of originality, neither of ingenuity, nor of creativity, nor of commitment, since in many cases, the experimental work and that of drafting the text is fractioned among many people organised in assembly lines for the production in series, exactly as happens for objects leaving industrial chains (Tayloristic assembly line).

Not surprisingly, the issues addressed by the most productive and funded research groups are almost always highly repetitive and develop over decades of work mostly with *variations on the theme* approach (jargon that I borrow from the language of music).

The products of scientific research cannot be subjected to metric evaluations of any kind. Scientific articles are not a commodity and cannot be counted or included in rankings (we are not talking about top ten hits of pop songs): these are only senseless operations of bad taste for the exercise of power and to address the attention towards certain topics of scientific investigation (as those of biomedical, environmental, or energetic fields, as long as the researcher respects the assumptions and orientations of the dominant narrative).

Contributing to the advancement of knowledge remains an extraordinary intellectual and ethical adventure. However, subjection to market rules creates a distraction from the mission to uncover new knowledge and distortions of the



system's dynamics, leading to the marginalisation of the application of the *precautionary principle* with risks and consequences of involution for all humankind. When humanity is ready to express interest in an ethic of knowledge, one will assist a new age of science that will bring generous fruits in terms of innovation and discoveries, with significant relapses in health and psychological wellness. It is time to clean up scientific research environments from toxic waste to developing new flexible scientific paradigms, in the awareness that *science is a path*, that nothing can be considered true, right, and incontrovertible, and, above all, that nothing is definitive.

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