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Editorial

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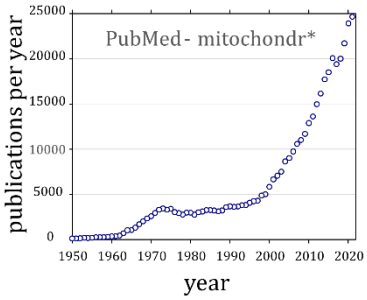

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Beyond counting papers – a mission and vision for scientific publication

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Abstract

Launching and maintaining a scientific journal must be reflected and communicated with a message at a time of excessive numbers of research papers submitted to for-profit publishers of traditional paywall and predatory journals. *Bioenergetics Communications* BEC supports the UNESCO recommendation on Open Science and DORA. BEC introduces the concept of *Living Communications* to address the conflict between (R) rapid sharing of new methods and results, (E) efficient prevention of exponentially increasing numbers of publications, and (C) quality control as a time-demanding and expensive instrument to ensure reproducibility. Weekly or monthly printed issues are yesterday's concept of prescription journals replaced by commonly and immediately accessible formats in the digital era of Open Access online publishing. The academic publishing ecosystem must be changed to re-allocate publication fees from publishers to science producers.

> *Our "Age of Anxiety" is, in great part, the result of trying to do today's job with yesterday's tools — with yesterday's concepts.* Marshall McLuhan Herbert, Fiore Quentin (1967) The Medium is the Massage. Penguin Books.

1. A vision on publications on bioenergetics

1.1. The pressure on counting papers or equations

'*.. each equation I included in the book would halve the sales*' (Hawking 1988). Ignorant of Hawking's rule, the first submission of one of my favourite personal publications included 19 equations — too many for the editor. In the resubmission all

equations were moved into the figure legends — not appropriate for publication. Then all equations disappeared and are now hidden within the figures (Gnaiger 2001). Opposite to Hawking's rule on *few* equations, *many* papers pay off in a splendid research career. How many publications are necessary for a PhD? How many papers are required for a successful job or grant application? Is a mass of papers a message?

Every scientific communication of value requires *realization* in the sense of the word that has more than two sides: (*1*) a *physical* realization of the communication as a publication (etymology: pertaining to the people) in one or several media and formats, e.g. print, pdf, podcast or POD (*portable* on demand), blog, webinar; (*2*) a *virtual* realization of the publication as the cognitive process of decoding the *potential* message of the publication media into a *realized* message, perceived by somebody who minds to comprehend the meaning of the message; and (*3*) back in the loop to a *physical* realization in the form of an innovation, as a new artefact with value of the *communication* in the real world — to make it common (Figure 1). Such values may be new counting or measuring instruments or software which are more efficient and produce fewer experimental artefacts; novel motivation procedures to increase the physical activity, caloric balance, and health of young people and the aging population enhanced by patient empowerment; agricultural and biotechnological tools for a sustainable world; new drugs with less negative side effects; more and even better vaccines; strategies for emancipation of minorities; protection of biodiversity; cultural enrichment.

Communication and value of science have been based on paper, from the papyrus of ancient Egypt to the transformations brought about by the printing press of Johannes Gutenberg that built up the pressure to publish. Metal typesetting used fonts of different sizes with a fixed metal mass of each sort of type in a typeface. Today the body mass index of a printed character is called the *font weight*, which is expressed — comparable to the units of the BMI (mass per hight squared [$kg \cdot m^{-2}$]) — as the thickness of the graphical outlines divided by the height of a character. Pressing a button on a photocopy machine produces or rather consumes a lot of papers in the xerographic — dry graphic — age. In the digital world of the internet and online publishing we still use the 15th century vocabulary and concepts of the printing press when talking about a scientific *paper* that makes or breaks a scientific career in the service of impact factors. '*A common excuse for rejection is selectivity based on a limitation ironically irrelevant in the modern age—printed page space*' (Young et al 2008). We still refer to the physical transport by courier services when spelling out *pdf* as *portable d*ata *f*ormat. Scientists have a paper *in press* to make an impression on their community. Even the term 'preprint' gives the impression, that printing is performed by application of mechanical pressure. The digital revolution has transformed the culture of scientific publication in physics and mathematics, but a fundamental liberation from a concept fixed on paper(s) is yet to be realized in the biomedical field (Gnaiger 2019).

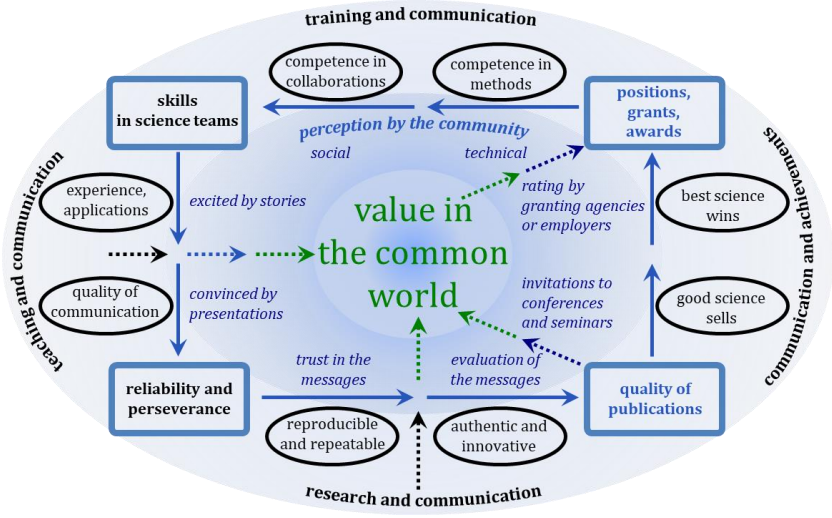


Figure 1. Quality: the best science wins – an optimistic view on the academic publication ecosystem. Quality of publications starts with training driven by values in the common world, leading to reliability. Perseverance in research and communication open the doors to achievements. Communication and perception are required to translate research into value in the common world.

1.2. BEC and REC: rapid – efficient - controlled

The preprint is part of a stepwise publication and validation process: *MitoFit Preprints* is the fast lane of Open Access communication without peer review (Gnaiger 2019). Open Peer Review of any preprint or other manuscript submitted to BEC follows the UNESCO recommendation on Open Science including '*possible disclosure of the identity of the reviewers, publicly available reviews and the possibility for a broader community to provide comments and participate in the assessment process*' (UNESCO 2021). The Science Citation Index lists no Open Access journal under the title word *Bioenergetics* (https://mjl.clarivate.com/home; accessed 2021-12-30). Diversity in ecosystems is linked to stability (Arese Lucini et al 2020). The journal *Bioenergetics Communications* aims to increase diversity in the academic publishing ecosystem, meeting a demand since "*the small proportion of results chosen for publication are unrepresentative of scientists' repeated samplings of the real world*" (Young et al 2008).

Bioenergetics Communications takes a next step from pre-print to re-print. The BEC concept of *Living Communications* pursues a novel culture of scientific communication, addressing the conflict between (**R**) rapid sharing of new methods and results, (**E**) efficient prevention of exponentially increasing numbers of publications, and (**C**) quality control as a time-demanding and expensive instrument to ensure reproducibility. Extending the preprint concept, updates of *Living Communications* may be posted on the BEC website of the resource publication. Updated versions are submitted for Open Peer Review with full traceability. The reviewers of updated versions are not necessarily identical to the reviewers of the resource publication. In contrast to static papers, the evolution of *Living Communications* is more resourceful and efficient than an independent 'new' publication. *Living Communications* provide a pathway along the scientific culture of lively debate towards tested and trusted milestones of research, from pre-print to re-print, from initial steps to next steps.

Time and money are wasted when publishing new follow-up papers with partial duplication of introductions, methods, discussions, and references. The sheer number of publications is reduced when *Living Communications* are updated, complemented, and extended by the original authors or extended teams and consortia (with section authors, see Section 1.3) — to address the '*value-impact crisis in the struggle to forge scientific innovation into knowledge and community benefits*' (Gnaiger 2019).

Like cell division, article division of a *Living Communication* makes sense, if it grows to the extent that the new version should be divided into separate articles. Then two updated *Living Communications* refer to the same resource article. The following examples illustrate the concept of *Living Communications*:

- **Protocols** and **Technical communications** (Cardoso et al 2021; Komlodi et al 2021a,b) should be published in the detail necessary to help other scientists to apply them accurately. Such details are subject to change. An evolutionary series of protocols (with numbered versions) is maintained up to date. Ambiguities on methodological details are eliminated by reference to the published and archived version.
- **Reviews** (Krako Jakovljevic et al 2021), **Monographs** (Gnaiger 2020), and **Consortium communications** (Gnaiger et al 2020) may be updated regularly, generating an evolutionary series of reviews with numbered versions. All versions are archived, and the review does not age.
- **Hypothesis communications** evolve potentially into full articles supported by later experiments. There are too many publications, but there are not enough innovative publications.
- **Preliminary communications** evolve stepwise. Even Newton's theory of gravity represents a preliminary communication to explain the world. Science is a sequence of preliminary results (pre-liminary = before threshold). A *Preliminary Communication* undergoes peer review and exposes the investigator to critical assessment before completion of a project (notably PhD projects). The further course of a project may benefit from the BEC publication process with Open Peer Review.
- In **Open Peer Review**, constructive peer reviewers may become coauthors in the progress of a *Living Communication*.
- **Updated versions** replace unnecessary new publications. Updated sections are marked as a guide to readers familiar with previous versions.

1.3. Counting on teams and consortia

Diverse methods and models — from molecules to organelles and cells to patients — can be accommodated within a single publication only by teams. Independent validation of reproducibility and repeatability requires an extension of teams to research consortia. These strengthen the value of each individual contribution, yet the visibility of individual coauthors declines with the number of names listed in the middle between first and last. What is the message of the third author? First and last authors are shared occasionally,

but I have never seen a shared third-authorship. Traditional patterns of authorship enhance the trend towards multiple publications with rotating first authors. Too high emphasis is placed on the number of publications by the individual scientist and the first or senior author. The position of the senior author has changed since I was listed as last author in 'my' first publication that appeared before starting my PhD (Wieser et al 1974).

My favorite example of a ground-breaking publication by a consortium includes 56 authors (Green et al 2010). This 13-pages paper is rather a book and presents a unique appreciation of author contributions in the supplement: '*I suggested that each section of this supplementary material would have separate authors and include a corresponding author to whom any interested readers would be referred in case they had questions. .. People actually delivered their supplementary sections, which eventually swelled to 19 chapters and 174 pages*' (Pääbo 2014). In *Bioenergetics Communications* we will upgrade this concept by the option of listing separate authors and a specific corresponding author in each relevant section of the main paper. This clarifies author contributions beyond conventional declarations. Sections with section authors can be listed in CVs or PhD theses, achieving transparency and recognition of the contributing section authors. Section separation lowers the pressure on increasing the number of publications.

2. Counts and crises

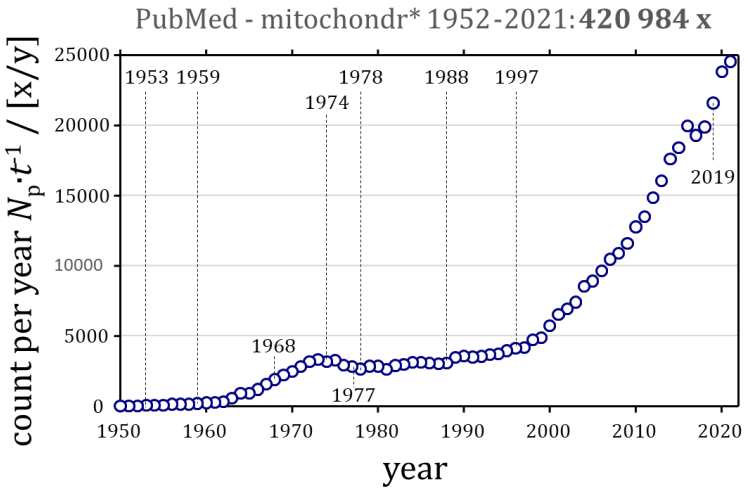
If I consider a high number of publications in my CV or in our journal as a good thing, why should an exponentially rocketing number of new publications in PubMed be bad?

2.1. Publication counts and the inflation-attention crisis

'*For most published papers, "publication" often just signifies "final registration into oblivion". .. Only 73 of the many thousands of articles ever published by the 187 BMC-affiliated journals had over 10 000 accesses through their journal Web sites in the last year*' (Young et al 2008). At a time of exponentially increasing numbers of publications, strategies are required to bring the progressive inflation to a halt (Figure 2). The contrary is achieved by elaborating journal impact factors or h-indices which forge a scientific career into a number and into an addiction and craving to increase the publication counts.

Updating the figures presented earlier (Gnaiger 2019), PubMed lists 10, 18, 37, and 68 publications per day in 1991, 2001, 2011, and 2021, when searching for 'mitochondr*' (Figure 2). The publication counts increased 1.9-fold every ten years. The same exponential trend for 'photosynthe*' shows a doubling of publications every 10 years from 1991 to 2021, at 16 counts per day in 2021. Assuming a publication charge of € 1200 per article, scientists mentioning mitochondria or photosynthesis pay € 100 000 every day in 2021 for 'selling' their output to publishers — over € 36 Mill per year. We would not waste such sums from our private pockets. "*The government funds all stages of research production, but must then pay again to have access to the research results*" (Hagve

2020). "*Scientists create work under their own direction – funded largely by governments – and give it to publishers for free; the publisher pays scientific editors who judge whether the work is worth publishing and check its grammar, but the bulk of the editorial burden – checking the scientific validity and evaluating the experiments, a process known as peer review – is done by working scientists on a volunteer basis. The publishers then sell the product back to government-funded institutional and university libraries, to be read by scientists – who, in a collective sense, created the product in the first place*" (Buranyi 2017).



1953 Hans Krebs, Fritz Lipmann
1959 Severo Ochoa, Arthur Kornberg
1968 Lars Onsager
1974 George Emil Palade, Albert Claude, Christian de Duve
1977 Ilya Prigogine
1978 Peter D Mitchell
1988 Johann Deisenhofer, Robert Huber, Hartmut Michel
1997 Paul D Boyer, John E Walker, Jens C Skou
2019 William G Kaelin, Peter J Ratcliffe, Gregg L Semenza

Figure 2. Number of publications N_p [x] on mitochondria per year [y]. Nobel price laureates are marked who are particularly relevant for mitochondrial physiology and bioenergetics, and the thermodynamics of irreversible processes. Data on publication counts retrieved from PubMed 2021-12-27.

Even increasing the number of potentially reproducible publications is a lost investment if they get buried under the avalanche of the sheer number of new publications. The fraction of publications that are not even read by all coauthors is unknown and may be disturbingly high, suggesting an attention crisis related to the inflation of scientific papers. Looking at the title, names of authors and acknowledgements, and screening the abstract do not qualify as attention. Therefore, citation is not even a proper measure of attention, although it goes a far way to indicate attention.

2.2. Accountability and the reproducibility-repeatability crisis

We live in a paradise of reproducibility of printed materials by simply copying digital files on electronic devices or papers on inexpensive copy machines. Nevertheless, Open Access in science is an unfulfilled dream in the scientific publishing business generating revenue of $25 billion USD with 1.5 million articles published/year (Triggle et al 2017). Reproducing the publications for a wider and wider audience should increase the number of critical readers and the feedback to authors with suggestions for corrections of any published errors, thus potentially reducing the number of erroneous

publications. However, the flood of publications expelled science from the never-existing paradise of scientific reproducibility. Ioannidis et al (2014) suggest that the fraction of irreproducible results published may be as high as 85 %. The combined effects of the inflation crisis and reproducibility crisis do not shed an optimistic light on publication quality and corresponding awards (Figure 1).

2.3. Messages and the value-impact crisis

Publications are a currency. Publication metrics are concerned with putting a numerical value on the currency. While the value of good scientific practice is quite generally accepted, a value-impact factor of a scientific publication is difficult to define (Gnaiger 2019). "*Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, .. form a community of learners with shared aspirations to improve the ways research is assessed for decisions that impact research careers*" (Declaration on Research Assessment DORA https://sfdora.org/ accessed 2021-12-30).

3. Conclusion

The burden of responsibilities for an urgent change of the academic publishing ecosystem and scientific communication culture must be shared between the shoulders of individual scientists, the backbone of scientific institutions, and the neurology of governmental regulations and funding agencies.

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Weblinks

Bioblast: the mt-information synthase, from Richard Altmann's Bioblasts to mitochondrial physiology - http://www.bioblast.at/index.php/Bioblast:About
BEC, Bioenergetics Communications - https://www.bioenergetics-communications.org/
COPE, Committee on Publication Ethics - https://publicationethics.org/
DORA, Declaration on Research Assessment - https://sfdora.org/
Gentle Science - http://www.bioblast.at/index.php/Gentle_Science
MiP*s*, Mitochondrial Physiology Society - http://www.mitophysiology.org
MitoFit Preprints: the Open Access preprint server for mitochondrial physiology and bioenergetics - http://www.mitofit.org/index.php/MitoFit_Preprints
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