Accademia Gioenia di Catania
Anno di fondazione 1824

Boll. Accad. Gioenia Nat. Sci. (Catania)
58 (389), FP1–FP12 (2025)
doi:10.35352/gioenia.v58i389.132

Advantages and drawbacks of the digital revolution in scientific research publishing. Arkivoc: a virtuous example of platinum open access journal

Giuseppe Musumarra[1*], Gabi (Gebran J.) Sabongi[2†]

[1]*Accademia Gioenia di Catania, Via Etnea, 29, 95131 Catania, Italy*

[2] *3M Company, St. Paul, Minnesota, USA*

Summary

A radical change in scholarly communication occurred with the advent of internet which prompted on line digital publishing as Open Access (OA) and metrics evaluation of research. We here discuss the advantages and drawbacks of this open access revolution and, in this context, the merits of a platinum open access journal, Arkivoc, founded in 2000 with the support of a generous donation by professor Alan Roy Katritzky. This paper is a tribute to him for his vision and generosity to the advancement of free chemical publication to scientists.

Keywords: Alan Roy Katritzky; Arkivoc; Open Access; Research evaluation; Metrics; Predatory journals.

* Corresponding author. E-mail: gmusumarra@unict.it .

† Retired Vice-President. E-mail: gisbri@aol.com .

Impatto della rivoluzione digitale nel mondo delle pubblicazioni scientifiche. Arkivoc: un esempio virtuoso di rivista "platinum open access"

Riassunto

La rivoluzione digitale ha avuto un enorme impatto nel mondo della comunicazione scientifica. La pubblicazione on line di articoli open access è ormai molto diffusa, così come la valutazione della ricerca basata su parametri bibliometrici. Questi cambiamenti non sono tuttavia esenti da inconvenienti, che vengono analizzati in questo lavoro. In questo articolo si discutono inoltre l'origine e lo sviluppo di una rivista scientifica "platinum open access" (in cui sono gratuite sia la pubblicazione da parte degli autori, che la consultazione on line) chiamata Arkivoc. La sua fondazione risale al 2000 ed è stata possibile grazie ad una consistente elargizione liberale da parte del prof. Alan Roy Katritzky, illustre scienziato nel campo della chimica organica. A lui è dedicato questo lavoro, alla sua profetica intuizione, alla sua visione della scienza ed alla sua generosità volta a favorire la libera circolazione di articoli consultabili gratuitamente dalla comunità scientifica internazionale.

Parole chiave: Alan Roy Katritzky; Arkivoc; Open Access; Valutazione della ricerca; Bibliometria; Riviste "predatorie".

1. Introduction

The model for scholarly communication in science remained unchanged for over three centuries with paper scientific journals handled exclusively by scientific societies for printing and distribution. After the second world war commercial publishers started to act as actors in scientific publishing and their powerful role was consolidated in the following decades.

A radical change in scholarly communication occurred with the advent of internet which prompted on line digital publishing as Open Access (OA) undergoing a rapid growth since the beginning of the third millennium. The advantages of this revolutionary innovation were paralleled by the problems caused by the introduction of Article Processing charges (APC) to be paid by authors or by their institutions and to the increase in the cost of publications

affecting library budgets to such an extent that they were unable to provide access to a great number of journals of interest to their communities.

In this paper, after discussing the advantages and drawbacks of the open access revolution, we focus our attention on a platinum open access journal, Arkivoc, established in 2000 due to a generous donation by Professor Alan Roy Katritzky, a renowned professor of chemistry, a mentor to many of his students and researchers, a family man, and special friend to both authors of this article.

2. Open Access

2.1 The origin of Open Access publications

In the 90s scientists realized the need to make their research available widely to their colleagues and to the general public. In 1991 Paul Ginsparg founded the arXiv archive for physics preprints at Los Alamos National Laboratory (LAN-L) to make preprints in physics freely available and in the mid-90s and the first journals began to go online. The fact that universities and scientific societies outsourced the publishing of their publications to commercial publishers produced a significant increase in journal prices affecting the acquisition budgets of scholarly libraries and leading to a decrease in their supply of literature. This phenomenon is referred to as the serials crisis in the 1990s.

One response to the serials crisis and publisher monopolies was the Open Access (OA) movement, aiming at empowering researchers to retain ownership of their intellectual property rights and to make their work freely available to researchers and to the general public. Scholars and scientists reacted with initiatives such as the Budapest Open Access Initiative (BOAI), held in 2002 in Budapest. The BOAI declaration stated that "the literature that should be freely accessible online is that which scholars give to the world without expectation of payment". In 2003 the Bethesda Statement on Open Access Publishing stated the need for rapid and efficient dissemination of research results in accordance with the principles of open access and the opportunity (and the obligation) to share research results freely with the scientific community and the public. The 2003 Max Planck Society and European Cultural Heritage Online project signed the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities to support the development of the notion of open access by encouraging researchers to publish their results in open access. The above and

many other initiatives stressed the advantages of open access and gave rise to its rapid growth at the beginning of the third millennium.

2.2 The growth of open access and of metrics in the third millennium: advantages and drawbacks

The move to online publishing has greatly improved the discovery of textual works and in many cases decreased the cost of disseminating a work. Open access and wider dissemination practices ensure that good science is not locked behind a paywall for the majority of readers.

The growth of OA publications prompted the definition of three main kinds of OA in order to differentiate them: green OA, gold OA and Diamond or Platinum OA (discussed in section 3.2).

Green OA is when the publisher allows the author(s) to self-archive an open access copy of the article, usually allowed for a preprint version of the article.

The **Gold OA**, nowadays the most common OA, is when authors (or their affiliated institution) pay the publisher to allow open access to the content with an Article Processing Charge (APC). In this case the expense to publish gold OA in reputable journals is usually high. To pay for APCs. researchers can include these expenses in grant applications. Beneficiaries of the EU research funding program Horizon 2020 are required to make publications resulting from funded projects available in open access.

During the 2005-2014 period the percentage of world gold OA papers indexed in the Web of Science increased from 2% to 10% (Torres-Salinas et al., 2016). The increase of free full texts in the PUBMED database since 1990 is even more striking. In 1990, 47658 texts were available (22.52x %), 150980 texts (25.25 %) in 2005, 510203 (44.91 %) texts in 2014, up to 1006913 (60.6%) in 2023.

The increase in gold OA publications was paralleled by a rise in predatory publishers, opportunistic journals that exploit the scholarly need to earn tenure and promotion by charging high APC fees without carrying out peer-review or editing of submissions and falsifying impact metrics. The acme of this phenomenon was reached in 2012. In 2019 a consensus definition was achieved: "Predatory journals and publishers are entities that prioritize self-interest at the expense of scholarship and are characterized by false or misleading information, deviation from best editorial and publication practices, a lack of transparency,

and/or the use of aggressive and indiscriminate solicitation practices" (Grudniewicz et al., 2019).

A striking example was provided in 2013 by Bohannon (Bohannon, 2013) who submitted a fake and very flawed scientific article to a large number of fee-charging open-access publishers. The papers took this form: Molecule X from lichen species Y inhibits the growth of cancer cell Z. To substitute for those variables, he created a database of molecules, lichens, and cancer cell lines and wrote a computer program to generate hundreds of unique papers. Apart from these differences, the scientific content of each paper was identical. This spoof paper was accepted by 157 of the 255 open-access journals (61.6%) that said they would review it. This result is self-explanatory.

In this context it is perhaps worth examining the role of metrics in research evaluation.

Performance evaluation is a crucial tool to improve research institutions outcomes. Up to the end of last century such evaluation was based on peer review by panels including academic experts. At the beginning of the new century, it was noted that this procedure was time consuming and expensive. Hence the possibility that a quantitative metrics-based approach could provide a low-cost alternative to expensive, qualitative peer review was taken in serious consideration [4] and such a procedure was steadily adopted in many countries. Following these leads the above metric procedure was extended for the evaluation of single candidates in earning university tenure and promotion. In addition to the abovementioned advantages, metrics appeared to be a more objective system avoiding biased personal judgment. In 2012 Italian legislation introduced minimum bibliometric thresholds in terms of number of publications and citations to apply for university tenures. This started a debate, and some researchers criticized this decision claiming the supremacy of humans over artificial intelligence. (https://www.roars.it/riforma-asn-basta-commissari-umani-a-giudicare-sara-lintelligenza-artificiale/).

The authors would like to make a few considerations in this regard carefully avoiding to participate in any dispute.

There is no doubt that evaluation of scientific institutions using bibliometric tools has many advantages, but we have to consider that, to comply with the new rules, the policy of university departments and research institutions underwent a drastic change. In order to get a highly positive evaluation they aim at publishing only a few papers in journals with very high Impact Factor (IF). In a field the authors are familiar with, which is organic chemistry, such a policy led to an authors' decrease of interest for publication in once very prestigious scientific journals due to the steep descent of their IF. The decrease of opportunities for scientists to disseminate the results of sound although not outstanding research is in our opinion a drawback affecting the future of science communication.

The abovementioned policy is detrimental to the interests of young researchers working in research institutions as they also undergo metric evaluation, but with different criteria rewarding the number of publications and citations. The effects are that “some researchers salami-slice their research to spread it across more papers. Others target low-quality journals that are deemed less demanding” (Butler, 2011). Another consequence might be to further stimulate the avidity of predatory publishers and encourage unethical scientists to take advantage of them. “Efforts to counter predatory publishing need to be constant and adaptable. The threat is unlikely to disappear as long as universities use how many publications a scholar has produced as a criterion for graduation or career advancement. The publish-or-perish culture, a lack of awareness of predatory publishing and difficulty in discerning legitimate from illegitimate publications fosters an environment for predatory publications to exist. Predatory journals are also quick to adapt to policies and measures designed to foil them” (Hedding, 2019). Actually “predation in publishing is mostly a consequence, not a cause. Predation arose because there was a complete formalization in official science or only points of published papers are important for getting a job at universities and elsewhere. Few people wonder what is written in these articles (Masic, 2021). Therefore, the problem is not just with the publishers. Scientists themselves are also to blame. Many are taking unethical shortcuts and paying for the publication of plagiarized or self-plagiarized work. Honest scientists stand to lose the most in this unethical quagmire. Unethical scientists gaming the system are earning tenure and promotion at the expense of the honest” (Beall, 2012). Publication of this paper had some effects, as noted by Masic “The story of "Beall's List" induced and spoiled a lot of matters in the science editing area. Since 2010, this list has disavowed many authors and discouraged them from possibly applying their article to a journal to which they would potentially send many under-informed authors on predation in scientific publishing undermine the author's doubts about their decisions, when it comes to where, when and to whom to send an article with the results of their study” (Masic, 2021). Actually, editors and reviewers “need to approach the evaluation of manuscripts submitted to journals with higher responsibility” (Masic, 2021) not rejecting articles without arguments, but accepting them after checking their novelty and that they are written following appropriate methodologies.

In conclusion the advantages of open access and metrics evaluation have been paralleled by drawbacks after their application.

3. Arkivoc

3.1 Alan Roy Katritzky (1928-2014): a generous top renowned scientist

Professor Katritzky (Fig. 1) had a bright career start first at Oxford University, England and then at Cambridge University, England followed by being nominated as the founding Professor of Chemistry (1962) at the University of East Anglia, England (1962-1980). He was elected FRS, (Fellow of the Royal Society) England in 1980 and appointed Kenan Professor of Chemistry at the University of Florida, USA from 1980 until his death in 2014.

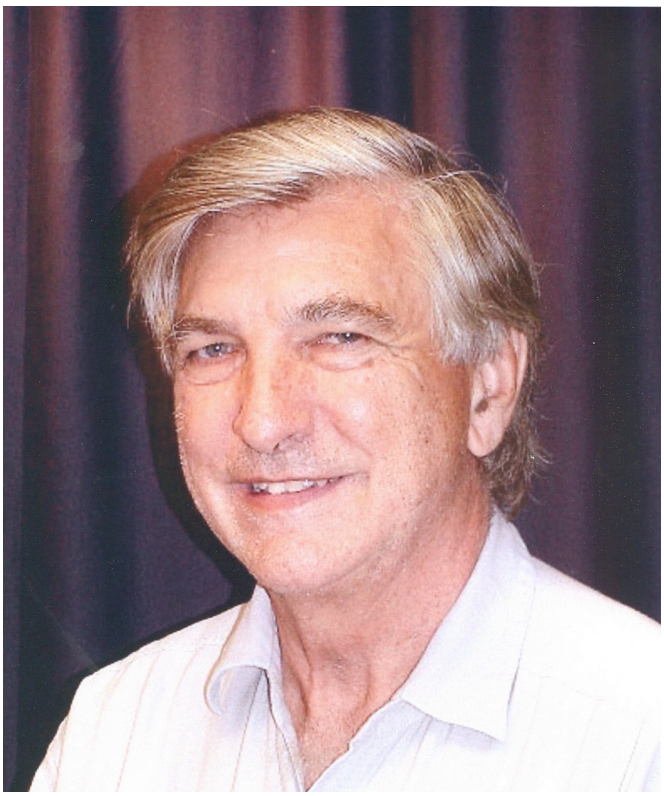

Fig. 1. Professor Alan Roy Katritzky (1928-2014).

In the early 1960's the University Grants Committee of England made plans to establish seven new universities one of which was the University of East Anglia, in Norwich, England to which Professor Katritzky was nominated as department chair at the age of 34.

At his second career at the University of Florida he devoted his time to graduate research and started by founding the Center of Heterocyclic Chemistry at

Gainesville, Florida which gained a large and active research school of many nationalities.

Over his 60-year career in academia he carried out chemical research that benefited not only academia, but industry too, in the fields of chemical synthetic work for pharmaceuticals, agrichemicals, polymers, dyes, spectroscopy, peptide synthesis, and many others. His work with his co-researchers was published in nearly 2200 scientific papers in premiere scientific publications, scientific books and volume series of pure and applied chemistry.

Prof. Katritzky's ability and talent was to relate to others not only as a scientist but also as a warm and gracious person particularly with his students and research collaborators of many nationalities from across the globe, over many years. He was able to add a critical personal relationship with all who worked with him, and this made him not only a renowned scientist but a benevolent Person. He died on 10th February 2014, survived by his wife, Linde, his children Rupert, Margaret, Erika and Freda.

He was a scientist very sensitive to the dissemination of science all over the world, including less developed countries, from where during his long academic career he gladly accepted many students in his laboratory. Here is where he discovered a gap and a need to be filled for an economic access to scientific publication by many scientists who lacked the funds to advance their research through the traditional journal publication avenue which had become extremely expensive.

In a climate of high subscription charges often levied by commercial publishers and scientific societies alike, he had the idea to launch a scientific journal in the field of organic chemistry with a very different philosophy, designed for universal on-demand distribution at no cost to authors (no page charges or other fees), or readers (no access or downloading charges). His intention was to promote the dissemination of organic chemical research worldwide to benefit students and researchers, particularly those at less well-endowed institutions, by publishing articles in the journal totally free of charge to authors and readers with no article processing or submission charges. This project was achieved in the year 2000 through a personal donation with the establishment of ARKAT USA, Inc., a not-for-profit entity registered as a charity. The ARKAT USA, Inc. was intended to support the Center of Heterocyclic Chemistry, the annual meetings of Heterocyclic chemistry researchers at the University of Florida known as FloHet which allow interactions and exchange of ideas for researchers in the field of Heterocyclic Chemistry. Its mission is clearly stated in the following statements (https://www.arkat-usa.org/about-arkivoc/arkat-usa-inc/) : "ARKAT provides accessibility free of charge for philanthropic reasons to address certain inequalities in the scientific marketplace. The escalating subscription costs of established scientific journals makes it increasingly difficult for researchers to access primary chemical literature. This problem of af-

fordability affects even relatively well endowed universities in North America and Europe but is particularly acute in Eastern Europe and developing countries. The contraction of library budgets at universities has led to the disappearance (often by amalgamation) of many second and some first rank journals. The remaining first rank journals are constrained by cost and space limitations to accept and publish only the most original and high calibre research results. Consequently, a great deal of sound research work is probably wasted (or even duplicated) because it can only be published, if at all, in a journal of very limited distribution. This is a tragedy since discoveries which could potentially benefit mankind do not come to light. ARKAT aims to help break down the above barriers and redress the inequities.".

The above statements elucidate the reason why in 2000 Katritzky promoted with personal funds the establishment of a worldwide Free Web based Chemical Journal Publication called Arkivoc (acronym for Archive of Organic Chemistry) for the advancement of chemical publication free of charge. Since its first publication until Arkivoc published an average of 250 papers annually (http://www.arkat-usa.org). To our knowledge in the variegated scenario of science publication editing Arkivoc is a unique example of journal for the publication of organic chemistry papers.

3.2. Arkivoc, a platinum OA journal in the present OA scenario

Diamond or Platinum OA is a non-commercial open access in which neither the author nor the reader pays. This OA model is not common for many reasons. Many journals are not indexed so that their contents cannot be found in databases. Moreover, only about half of platinum OA journal articles have a DOI which prevents future access. In addition, publishing expenses have to be covered by foundations, charities, or personal donations.

There are three main actors in publishing a research paper: the author, the editor and reviewers.

The last category receives no financial compensation either by scientific societies or commercial publishers and it is presently becoming quite difficult for average IF journals to find qualified reviewers who dedicate their time for this activity.

As far as editors are concerned they belong to two main categories: scientific societies and commercial publishers. We here report the cost of publishing a gold OA article in the field the authors are familiar with, which is chemistry. Two important scientific societies in this field are the Royal Society of Chemistry (RSC) and the American Chemical Society (ACS). For a few RSC gold OA

journals the Article Processing Charge (APC) is £2000, while others have APC waived until 2025-2028. The RSC flagship journal, Chemical Science, is diamond OA, i. e. the RSC makes outstanding articles available for free to the scientific community. The same policy is shared by ACS where ACS Central Science, the top journal, is diamond open access, while the cost of gold OA varies in the range $ 1935 – 3500 depending on the journal category.

The situation is different if we consider well known science publishers with high reputation (November 2024). Elsevier's APCs are set on a per journal basis, fees range between approximately 200 and 10,400 US Dollars, excluding tax , with many in the range $2000-4000, (https://www.elsevier.com/about/policies-and-standards/pricing). The Wiley APC costs for over 500 journals vary from 840$ (Advances in cell and gene therapy) to 6730$ (Advanced Science). However, waivers and discounts are applicable for authors in specific cases.

From the above considerations it is evident that only outstanding articles can be published free of charge in a few top scientific society journals. Their free availability to the scientific community is certainly meritorious. However, these papers are often produced by research groups with a high international reputation which usually take advantage of huge research grants.

Golden OA costs affect the majority of scientists who receive limited research funds by funding agencies which oblige them to publish the result of their work in OA journals (see section 2.2) and get frustrated as the majority of their financial credit goes to publishers rather than to expenses needed to carry out research. The situation is even worse for young emerging scientists and for those who do not live in wealthy countries. The discomfort for this condition has recently been pointed out: "The aim of the academic journals would be to make the best research available widely. As for the hefty OAJ fees, this is not only incongruous but to some extent it also hampers the research as well as science. The journals which are charging such exorbitant fees are surely not "open" but these journals are open for rich and closed for poor" (Meo, 2014).

Arkivoc is presently a refereed platinum OA journal serving a wide audience of organic chemistry researchers. Its international Editorial Board includes authorities in their respective fields, and guarantees a rigorous selection procedure.

It is striking that Katritzky envisaged the present scenario of scientific publications more than two decades in advance and it deserves appreciation the fact that he did not hesitate to generously provide significant personal economic resources for the benefit of science and of young and underprivileged scientists. His intuition led to the establishment of Arkivoc, a diamond open access refereed journal providing the opportunity to publish and disseminate reliable information in a limited field of science, i. e. organic chemistry.

The need of an on line freely available scientific journal with peer review was shared by members of Accademia Gioenia di Catania, a scientific non-profit institution including subjects such as chemistry, mathematics, physics, life sciences, engineering, applied sciences as well as history and philosophy of science. This belief led to the establishment in 2020 of an on line platinum OA journal, Bollettino dell'Accademia Gioenia di Catania, founded two decades later than Arkivoc in a different scenario. Its essence is still based on Katritzky's intuition and relies on the voluntary contribution of academic members with the aim to provide the same opportunity to contemporary researchers in a wider scientific context.

4. Conclusions

The digital revolution has had a dramatic impact on the world of scientific communication. The advent of open access journals made research widely available on the web to the scientific community. However, high article processing fees charged by publishers to authors represent a limitation for many of them, especially young and underprivileged scientists, who cannot take advantage of such an opportunity. In this paper we discussed the merits of a platinum open access journal, Arkivoc, founded in 2000 with the support of a personal donation by professor Alan Roy Katritzky who envisaged the present scenario of scientific publications many years in advance. This article is a tribute to him for his prophetic vision and for his generosity to the advancement of free chemical publication to scientists.

References

Beall J. 2012. Predatory publishers are corrupting open access *Nature* 489: 179. https://doi.org/10.1038/489179a.

Bohannon J. 2013. Who's Afraid of Peer Review? *Science* 342: 60-65. https://doi.org/10.1126/science.2013.342.6154.342_60.

Butler L., Mcallister I. 2011. Evaluating university research performance using metrics. *European political science* 10: 44-58. https://doi.org/10.1057/eps.2010.13.

Grudniewicz A., Moher D., Cobey K. D: and 32 co-authors 2019. Predatory journals: no definition, no defence *Nature* 576: 210-212. https://doi.org/10.1038/d41586-019-03759-y.

Hedding D.W. 2019. Payouts push professors towards predatory journals *Nature* 565: 267. http://dx.doi.org/10.1038/d41586-019-00120-1.

Masic I. 2021. Predatory Journals and Publishers - Dilemmas: How to Assess it and How to Avoid it? *Med. Arch.* 75(5):328-334. https://doi.org/10.5455/medarh.2021.75.328-334.

Meo S.A. 2014. Open access journals: open for rich, closed for poor. *Journal of the College of Physicians and Surgeons Pakistan* 24 (8): 611.

Torres-Salinas D., Robinson-Garcia N., Aguillo I.F. 2016. Bibliometric and benchmark analysis of gold Open Access in Spain: Big output and little impact. *El Profesional de la Informacion* 25(1):17-24. https://doi.org/10.3145/epi.2016.ene.03.