

## 15 A Spec of Research to Which Anyone Can Add

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The Philosophical Transactions of the Royal Society first appeared 1665 and is the oldest journal still in print, ringing in a new journalistic era focussed on the scientific integrity of each individual paper, rather than combining efforts to drive scientific discoveries faster. While this may have ensured the development of the today's strong scientific foundation, many have begun to consider it outdated. Just as most longstanding traditions, it is time to reconsider its value to society and, where necessary, make alterations. One criticism is that the results obtained by research are not freely accessible and most data is kept secret, slowing the speed of discovery considerably. A step towards easier access and more collaboration was recently taken when the Gates Foundation—donating \$ 4bn to scientific research each year—imposed that all results and papers generated in projects they funded must be made freely available to the public [1,2]. Other foundations have made similar requests, thus making them a driving force into an open research future. This concept, also called “open research”, or “open science”, has been talked about since the 1990s, but progress towards it had been slow. The central aim is to make the research methodology, along with the data and results, freely accessible, allowing a more collaborative approach to research [3]. Whilst there are various different takes on how to apply this to today's scientific community, it seems prudent to understand what we stand to gain from this approach first.

Most non-commercial research these days is funded by the government, meaning the tax-payers' money is invested into scientific work. One can thus argue that since we fund the research, we should have free access to its results, but sadly, increasingly high subscription fees are standing in the way for most [1]. One can also argue that with the time spent on the publishing process (tailoring a paper to the journal's needs, peer-reviewing, editing, re-editing, and finally publishing it), a lot of findings never reach the light of day. This means that the money would be utilised more effectively if there was not such a high hurdle looming at the end [4]. However, one should keep in mind the real possibility of misunderstanding or misusing scientific results. Many lack the proper scientific training to correctly interpret the results, leading to misconceptions or (unwarranted) fear [5]. When considering misuse of scientific results, a prominent example is the creation of a H5N1 influenza (better known as the “bird flu”) strain by Dutch researchers, altering its structure

and making it easily transmitted between ferrets [5,6]. Humans may not seem to share many similarities with ferrets, but any previous influenza strain that was infectious among ferrets had a similar impact on human health [7]. Making results like these publicly available increases the risk of misuse [8]. Most people lack the correct training to interpret the results and outcomes of research correctly, leading to issues such as unwarranted panic [5].

From a researcher's perspective there are clear benefits to be gained from open science. One, which will sound like music to the ears of all scientists who have battled the process of publishing a paper in the past, is how much faster papers could be published [3]. Rather than wasting months looking for a suitable journal, formatting the paper to their liking, being reviewed, and then having to edit and re-edit, open access would be a fast-track way to publishing. Now the work would be selected based on its objectives, data and provided information, not whether its style suits the journal. Peer-reviewers would then be invited via the platform, with openly stated conflicts of interest, allowing the focus to fall back on the primary goal: helping authors improve their work with constructive feedback [8]. Currently, reviewing papers is viewed as a tedious task with little incentive, thus being neglected by many. With open science, however, reviews would receive their own identifier, thus making them citable and allowing the referee to benefit from the process as much as the paper's author(s) [9]. This would also silence the concern regarding anonymous peer-reviewers purposefully stalling to gain a head's start, or, conversely, being especially lenient in some cases, creating an equivalent retaliation atmosphere, rather than an unbiased assessment of the paper [10]. However, researchers view open research sceptically, since many a reputation was built on journals such as *Nature* to select and review the papers they published, making it a "stamp of approval" of sorts, to be published in it [8]. Since open research entails that everything can be submitted for publication, this prestigious position would no longer be given, and all papers views as equal. Another argument against open science may be that open source leads to unsorted information, which in turn overwhelms the scientists looking for specific data. However, these worries may easily be soothed when looking at the current direction of open science, since it is in a constant state of change and improvement [11]. Lastly, the fact that more people have access to the publication also allows for increased citation and usage, thus allowing scientific advancements to accelerate.

It has become obvious that we are in a transitional state between the well-known, rigid, journal publishing and the flexible open science approach, and that we must embrace this change if we want to gain anything from it [10].

Whilst there are many good points to be made for the old system, one must keep in mind that technology and interconnectedness are key factors nowadays, and these should not be kept out of the scientific community when it comes to collaborating and publishing [12]. A prime example for the necessity of open science is the synthesis of a cheaper, more potent treatment for schistosomiasis (a rather unpleasant illness caused by flatworms and currently affecting more than 200 million people) [4]. This has driven down the research and development cost, which has often been the breaking point of many projects [13]. Here, the focus was no longer on the race against other research teams to develop the drug, but rather the communal race against the disease.

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