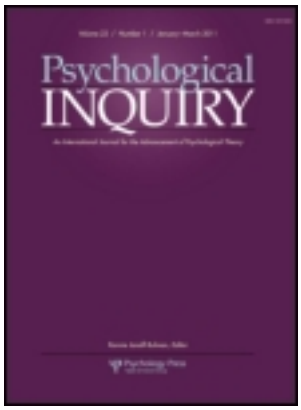

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# Scientific Utopia … or Too Much Information? Comment on Nosek and Bar-Anan

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# Scientific Utopia . . . or Too Much Information? Comment on Nosek and Bar-Anan

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Brian A. Nosek and Yoav Bar-Anan (this issue) propose six changes to scientific publication. As the editor of a prominent psychology journal,[1] I was asked to comment on their ideas. On one hand, I enthusiastically endorse *all* of their suggestions—although I worry about how some could be implemented. (For example, I worry about a financial model in which producers rather than consumers pay.) On the other hand, I believe that their suggestions could exacerbate a problem we already have—that of too much (unorganized) information—and that additional changes to the existing system would be necessary so that scientists could work efficiently and effectively in the new "utopia."

As we are all aware, scientific publication is growing rapidly. It is already difficult to keep up with what we each need to know. Our scientific utopia would amass even more information and, especially, more information of needed types (e.g., replications and failures to replicate, papers that are critical of existing dominant paradigms, etc.), which is certainly a good thing. Having everything digital, with open access, and with links across papers,[2] will make individual papers easier to find and retrieve. Thus, in utopia, the problem won't be getting information; rather, it will be finding and getting the *right* information.

Psychology has just been through an explosion of research during the Decade of the Brain (1990s) and the Decade of Behavior (2000s). We don't have a name for where we are now (pre-utopia?), but I would like it to be the Decade of Putting-It-All-Together. I would want the scientific utopia to not only allow us to publish more empirical articles, but also, and especially, help us aggregate and integrate what we know.

Accordingly, I have four additional suggestions for the imminent utopia. They all involve improving how we update, find, and connect our knowledge. First, researchers need to be able to easily trace updates to published papers. For example, if a paper contains errors when it is published, researchers will often miss the publication of later corrections. Or if an author changes his or her name (e.g., from Ranganath to Ratliff), prior papers won't be found in most searches. And, of course, currently, after a paper is retracted, researchers are still able to locate, use, and cite it while remaining blissfully unaware of its tainted status. This need can easily be met given the doi (digital object identifier) system. In the new digital utopia, researchers could automatically be told about a paper's status when accessing the original.

The next three suggestions are not as easy to implement because they cannot be simply automated—they involve some human intervention. The second suggestion is that we need to make it easier to trace back ideas that are the sources for what you are currently reading. Suppose you are reading a paper that makes you want to go back and read the earlier cited work. But the paper cites some long article, or worse yet a book, with no page numbers to guide you to where in the prior work the point was made. The simple fix, of course, is that authors should be required to cite to chapters or sections or page numbers of any publication that is longer than a short empirical article. In legal scholarship, there are armies of law student volunteers who vie for the privilege of checking the page number accuracy of every citation in to-be-published law review articles.[3] It's sure helpful for those of us doing legal research.

The third suggestion is more complicated. Researchers need better ways to filter from the mass of published information what we need to know. Nosek and Bar-Anan address this issue in their section on filters on topic and content. Yes, it would be nice if some service would send me papers that are likely to be of interest to me (I sure do like my suggestions from Amazon and Netflix and genius) and papers that cite existing articles that I'm particularly interested in

[1] I am the editor of the APS journal *Perspectives on Psychological Science.* Of course, everything I say here is my personal opinion and should not be taken as representing the views of, say, the journal's publisher.

[2] I use the term "papers" rather than "articles" because I hope that somehow books and book chapters will be better integrated into the various search and retrieval methods we will have in the future.

[3] If you don't do legal scholarship, you might miss the sarcasm. Manuscripts are sent to law reviews, mostly published by law schools, where (typically) 2nd- and 3rd-year law students decide what will be published. These students have excelled in their course work and/or succeeded in a writing competition to be selected for Law Review. The "entry-level" Law Review position is cite checking. However, being on Law Review is a necessary step for some prestigious future positions, especially becoming a Law Clerk—the legal assistant to a judge or justice.

(oh, right, I already have that, too). But I'm still a bit worried about how new paper selections for me would be made. How would similarities between papers be determined? Current practices in labeling papers have turned keywords into an almost useless mess. Word counts have forced authors to cut their reference sections. (Although, of course, those could be lengthened in the digital future.) Researchers strive to give new names to phenomena that were discovered in the past. And sometimes fields develop similar research that should be cross-cited but isn't, perhaps because they use entirely different terms (see, e.g., Ranganath, Spellman, & Joy-Gaba, 2010). Thus, I'm not worried about automated systems being able to filter a large mass of papers into a small set of papers of interest; rather, I am worried about not having methods to find papers that would be of interest but would not be found by an automated system. Legal scholarship solved some of that in the predigital age with the system of West topic and key numbers. Every court case was hand-coded for the issues it dealt with using an elaborate topic coding system. Of course, the key number system has become vastly less important in the electronic era of full-text searching. But, again, sometimes similar ideas are not phrased in similar language. I would like some structure in psychology, perhaps a better keyword taxonomy, that could help us find the important cross-connections. As we know from research on similarity and analogy, much can be learned when people think at higher levels of abstraction.

The fourth suggestion builds on the previous three and would allow us to trace the approval and influence of a paper over time. For example, suppose you are interested in what is being written about your most prominent empirical paper. It is now, fortunately, easy to find *who* has cited it. But it is much more difficult to find out what it was cited *for*. Is it just background in a literature review of the current state of the field? Did the authors use your materials or methods? And, more important, did they replicate your study or fail to replicate it? Like the second suggestion, this requires adding something to citations: Not only should citations give page numbers, but they should also be coded as to why the publication is being cited. Again, legal scholarship is ahead of us with Shepard's Citations™—a tool that reveals whether a subsequent case has followed, overruled, questioned, and so on, an earlier case it cites.[4]

Imagine using a tool where you can see *how* your empirical paper has been cited. In the center of your screen is the name of your publication. Emanating from it are short links (to papers published soon after) that are predominantly red—indicating failures to replicate. But there are also longer links (to papers published much later) that are predominantly green, showing later replication success. The yellow links show theory and review papers that question your findings, the blue links are to those papers that cite it approvingly, and the gray links are to papers that mention it neutrally. (Of course there is a lot more potential for such a tool.[5]) One useful consequence of such a coding system is to make it much easier to find and aggregate information for reviews and meta-analyses, that is, for the types of research that are so important to creating a coherent science.

As I was writing this comment, I was reminded of the so-called paradox of expert memory. Typically, people who are holding more individual pieces of information in memory take longer to search for a specific piece of information than people with less information. However, in fields in which people are experts, they both have more information and are quicker to retrieve individual pieces. Why? Perhaps it is because that with expertise information becomes integrated and cross-connected; it is less a bunch of pieces and more a coherent whole.

I have argued here that along with increases in quantity of and access to information, we need to be developing tools that will help us make more efficient and effective "expert" use of our accumulating knowledge. We don't just need to publish more; we need to make it easier to find the information we require from the increasing ocean of information, and we need to connect what we find with what we know. Then . . . utopia, here we come.

## Note

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[4]I have often wanted to ask a graduate student to "Shepardize" a published study. Finally I have a graduate student with a law degree—so I do!

[5]I think I just invented the color version of this tool. Will the future developer please cite me?