

The Future of Scientific Publish

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Predictions are very difficult, especially about the future, Yogi Berra (and others)

The outstanding problems facing scientific publishing in general and physics in particular are related to the ever increasing volume of such publications.

It is natural and desirable that research continues, and that its results are peer reviewed and recorded for the use of others, now and in the future.

However, the rate that new research results are published is too large for any individual scientist to read or even casually peruse.

This situation causes at least two unfortunate effects. No doubt more, but we focus on two.

One is that the individual may well miss a result that contains useful, perhaps even crucial information. (call this the “oops! Missed it” effect).

The other is that the scientists as a group become ever more narrow in their focus, and in the breadth, of their grasp of the broad “big picture”. (Call this the “narrowing scope” effect.

The next two slides present a graphic example of the growing volume.

The first slide shows one month of the publications of the American Physical Society.

The next illustrates the danger of simply trying to read them all.

One month of APS publications



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Trying to read it all!



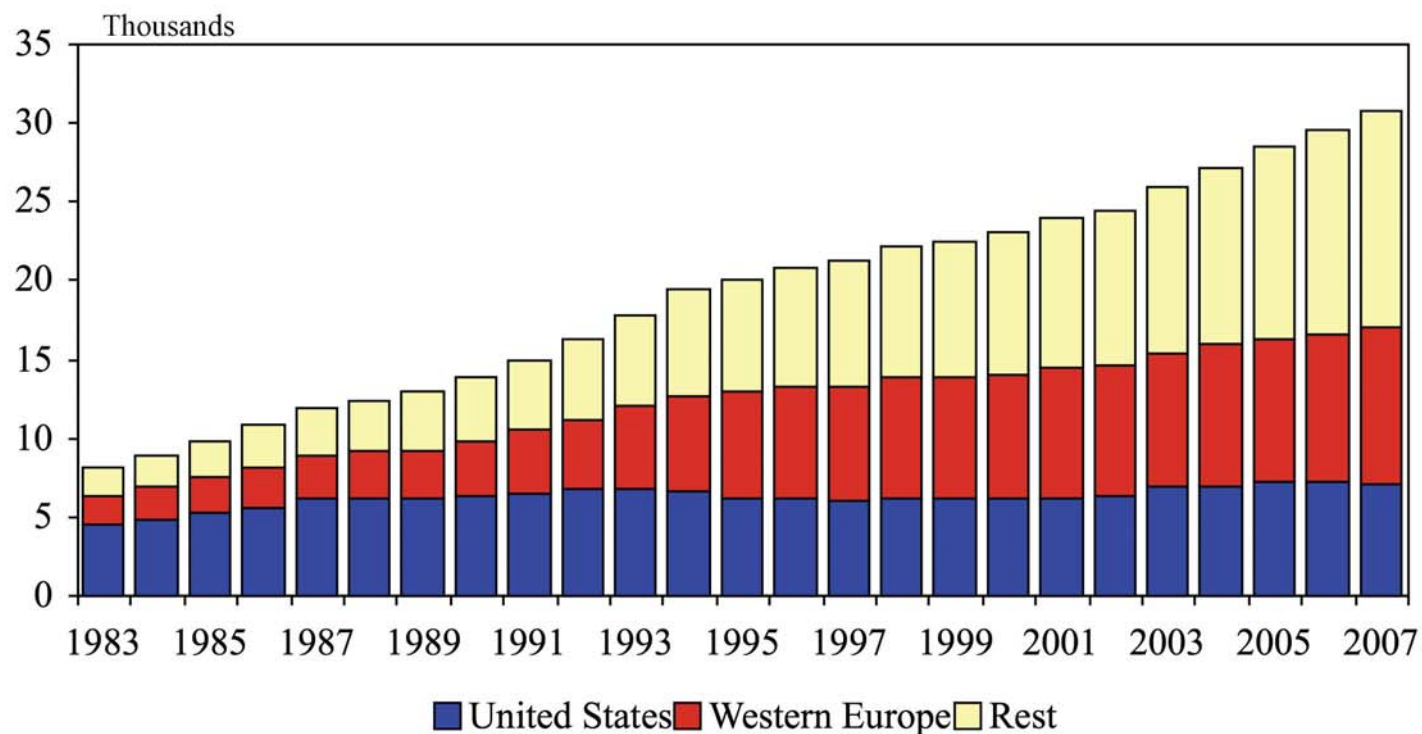
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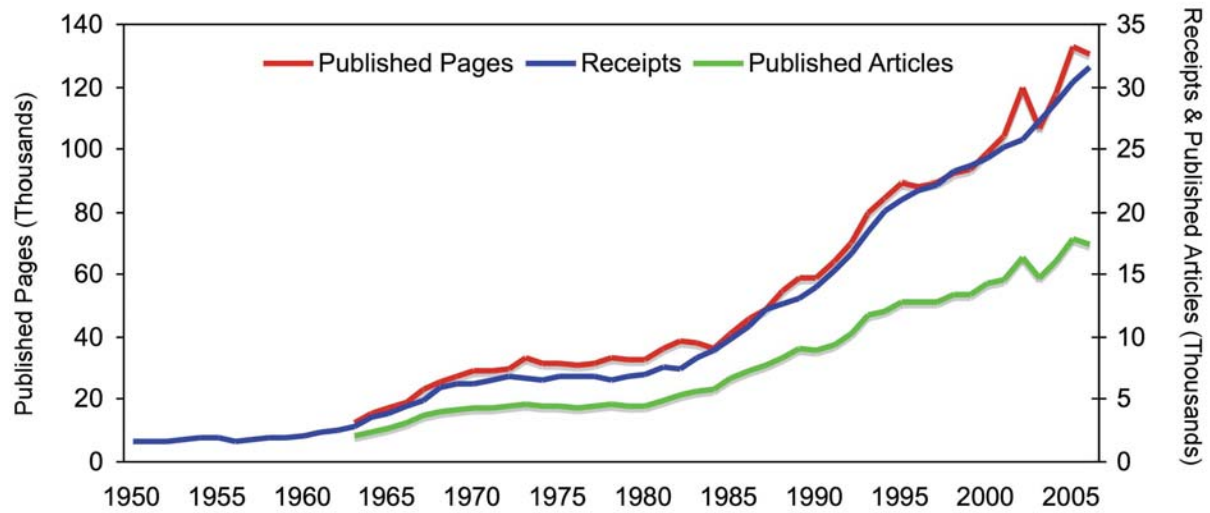
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Growth in Submissions by region of origin

Physical Review and Physical Review Letters Submissions
1983 - 2007



Physical Review and Physical Review Letters



There are some partial solutions

For the “oops, missed it, effect”:

We have **Virtual journals**.

These are journals that extract articles in a range of journals which deal with a particular area. An example is the virtual journal devoted to **quantum information and computation**

We also have various RSS feeds

For the **narrowness effect** we do have some publications which provide articles that present an overview of a broad area, accessible to most physicists.

Although useful, these are not a solution

For example, the virtual journals have some shortcomings

- a) They select all papers in the area without discrimination based on the user's interests.
- b) They are limited to the area in some fairly direct way such as title, keywords, etc. As a result a user whose interests spanned several defined areas would miss papers of interest.
- c) They make no priority selection among the papers and as such will almost certainly produce too much to read.

Broadly accessible review articles are published in *Physics Today*

These are by and large excellent (in my opinion) but are not in sufficient number to remedy the situation. Although they attempt to cover all areas over time, they are not specifically planned with a clear goal of providing a coherent “anti narrowness” thrust.

The new online publication of the APS, *PR select*, which will provide “accessible” descriptions of particularly important papers in PR and PRL is also an “antinarownness” force. But again by being based on published research papers, the coherent coverage of a broad area may be absent.

An approach to the future

A reasonable decision would be to continue the publication of the journals with their peer review and their editorial standards, essentially as they are now. Of course, with ongoing improvements as we continue to do. But basically the journals would continue to publish all credible and useful research.

However, we will take the point of view that the body of journals constitute a **data base** which can be searched and from which communications to physicists are derived.

How to use the data base?

- 1) The present use of specific searches would, of course, continue.
- 2) However another much more ambitious use can be envisioned. This will be discussed in the following. This use is aimed at the “**OOPs, missed it**” problem. For lack of a better name let us call it the **AI** (artificial intelligence) approach

The AI approach

We envision a computer program which can be tailored to each individual physicist.

This program would interact with the physicist to find out what his/her interests were.

In addition it would be “trained” to perform a priority ordering of the papers it read which was consistent with the interests of the user.

Finally, it would be told how many papers (pages?) the user would be able to deal with per week.

Ideally, this program would read the full text of all the scientific publications in the relevant time period (we take one week to be concrete)

It evaluates the papers just as the physicist would if he/she had done the reading. And it would select the papers to be read just as he/she would have done.

Clearly, such an AI program is not something we can expect to be produced in its ideal form at present.

The key question is: can a good enough approximation be produced so that it is a viable solution to the problem? Of course, one may expect that as time progresses, the program will evolve to a more and more nearly ideal form.

Why might an adequate approximation be achievable?

The full representation of the mental landscape of an individual in a computer is clearly not practical.

However, physics is a much more constrained topic than the full landscape! We have key words, phrases, diagrams and figures, even complete sentences, and reference lists, that could be used in such a program.

It seems to me that the R&D to produce such an AI program is an effort that should begin.

How it might be used

Let us assume that at some time in the future such a program is developed. How might that change the use of scientific publications?

First, as noted before, we assume that the journals continue to publish as they are now and constitute the data base upon which the program operates.

The basic idea of this approach is that each physicist is associated with his/her own version of the program. This has interesting consequences.

Some organization would need to be the owner and “caretaker” of the AI program. How would the costs of this operation be recovered?

For the sake of discussion imagine the organization is the APS. The APS could (would) still produce the journals and would sell subscriptions to Universities and institutions as it now does. The program would be developed under APS auspices and have a “central” part that would be the same for all users. It would also have user specific parts that would be developed as the program “interviewed” the user.

The user specific parts could reside at central servers or possibly at the user's computer.

The simplest business model would be to have no extra charge for the program but to increase the journal subscription price to account for the additional cost due to the program.

Other business models are certainly conceivable.

For example each user could pay a fee for the use of the program.

When this is first introduced, one might expect a period when the use of the program would involve no extra cost to subscribers or users.

Another interesting aspect has to do with journals produced by different publishers, for example the APS, AIP, or Elsevier

Ideally, arrangements would be made so that the program could “read” all of the world wide literature. This raises contractual aspects which although (I think) are manageable, are certainly challenging!

If this approach could be made to work it would alleviate the “Oops, missed it” problem, but because it starts with the research literature it does not do much for the “narrowness” problem.

The “Narrowness” Problem

The increasing narrowing of the scope of physics understanding resulting from the “constant” generation of new fields of specialization is a complex phenomenon.

The publication of “accessible” descriptions of articles in the “data base” of which *PR Select* is example will be helpful. It is not clear, however, that any such research article based approach can provide a sufficient force for breadth of understanding.

Narrowness...

It may be that a new type of journal is needed.

This would be one which published articles which treated a field of physics from a broad perspective. An article would have a particularly new advance in mind, but would develop the background needed to appreciate the importance and “place” the advance in the context of the field.

The choice of articles would be guided by the desire to increase the breadth of knowledge and understanding of the readers.

Narrowness, the *Journal*

The number of articles per issue would be few, perhaps two or three.

The rate of publication would be modest, perhaps monthly.

To be effective, the community of physicists would need to feel that this journal is one they “must read”. Establishing this attitude would be one of the major challenges for this approach.

Another challenge is finding the proper authors for these articles.

Narrowness, the *Journal*, Cont'd.

The launching of such a journal would be a major undertaking and would only be possible if an important governing body in the physics world, such as the APS council and executive committee deemed it worthwhile.

In the final analysis the key ingredient will be the importance the physics community itself places on maintaining the scope and breadth of its members.

Summary

Just as the physical strength of individuals has been immensely augmented by mechanization, The intellectual abilities of individuals needs to be augmented by the electronic equivalent of mechanization.

Thus, the advent of some type of “near” AI programs to help us read seems inevitable.

The problem of the increasing specialization of physics and attendant loss of breadth is difficult but may lead to new journals.