

# MORE IS LESS ?

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Scientists are expected to keep abreast of current research developments. On the face of it, this might seem like the easiest thing to do. How does one do it? By attending seminars, reading recently published books, articles in journals and periodicals. Without even looking at the data, it is clear that the number of active scientific journals and number of published articles are increasing at a faster rate. For those who need the numbers, here it is -- journals grew by about 3% per year for the last 200 years, but now it stands at 5%. Growth of articles is even more staggering. The open repository of scholarly articles, arXiv, hosted at Cornell University, received about 30000 articles in the year 2000, while it received 180000 articles in 2020. This is about 25% annual growth rate. It is in this backdrop that one understands the magnitude of what it means to keep abreast of recent research developments.

Historically, keeping track of scientific literature was not such a major issue for scientists. The first scientific journal "The Philosophical Transactions of Royal Society" was started in 1665. During the next two centuries, the growth of journals was

somewhat slow. Most of the prestigious journals of today, "Physical Review Letters" for example, are less than 100 year old. But more importantly, it represented an unhurried era that probably lasted until very recently. It was the time when journals were actually printed on paper. Even today many are printed on paper, but easy internet access has effectively made them irrelevant. To a practicing scientist, this means that the information was coming through slowly; one takes more time to assimilate it, and even more time to work on follow-up ideas. Almost until the early 20th century, papers would not even carry an abstract. In cricketing terms, it was a test match era of sorts. Just as you would watch the game patiently for 5 days to know the result (it could even be a draw), you also need to read the full paper to know what the results are. That was the bygone era.

In the current era of T-20 matches, one needs to assimilate new papers and think ahead, metaphorically, at the speed of light for what may be termed "break-through ideas". For instance, about 290 papers appear every week in the condensed matter physics section of arXiv

alone. It is probably not unreasonable if the situation just demanded that a contemporary scientist shed some laziness and work a bit faster. It is more than that. With increasing numbers of journals and papers, add to it the video lectures and conference talks and other popular social media information, what started as a trickle some two decades back has now become a flood of ceaseless information. To handle this excessive information, there are online tools and mobile apps that promise to help us keep our heads above the water level. Some of these apps even use machine learning tools to 'learn' what we like and dislike, and will filter and show us those papers that, in its opinion, are relevant to our work. To make matters worse, fake and predatory journals and some scientific societies have muddied the scene for crass commercial considerations.

Faced with an overdose of scholarly literature in science, increasingly one tends to miss out interesting papers and results. Sometime back, a colleague told me that he reads only those papers that helps him carry out the immediate work. Imagine that 100 years back, Einstein had the time to read a paper he received from an unknown person in India, translate it and got it published. It led to Bose-Einstein statistics. Today, is too much choice, too much information becoming counter-productive? Is it leading to information fatigue? Is more information, in reality, less than optimal? Perhaps, there is no easy solution to these issues. There could be sustainable solutions if instead of focussing only on numbers and growth rates everywhere -- ranging from number of papers, impact metrics to more profits -- we focus on more substantive issues central to science and research.

