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Fast Lane to Slow Science

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Abstract

Fast Science is bad for scientists and bad for science. Slow Science may actually help us to make faster progress. But how can we slow down? Here, I offer preliminary suggestions for how we can transition to a healthier and more sustainable research culture.

More speed, more haste, more stress, more waste

I vividly remember first seeing Charlie Chaplin's film *Modern Times*. In this film, machine-like workers are forced to work more and more quickly to the point of absurdity. Little did I know then that I would find myself in a strangely similar position in academia. Over the past fifty years, I have experienced increasing pressure to 'speed up' and increasing means of doing so. I used to be amazed that by a click of a button you can analyse data. Now I am amazed that you can collect data by a click. Perhaps most staggering though is the relentless increase in the number papers published each year. Some of this increase is simply because there are more researchers. But individual researchers have also dramatically increased their output. As implied by the stream of review papers and meta-analyses, hardly anyone has time to read original studies. When I was first hired, I had proudly published one paper, and ten years later I had accumulated a mixed bunch of 28 publications, none highly cited. I would have no chance today.

Many of us acknowledge that the current 'publish or perish' culture has a corrupting effect on scientists as well as on science itself [1]. Scientists have become disillusioned by research bubbles and crashes that are reminiscent of free market failures [2]. The relentless pace does not just mean that there is little chance to cultivate broader interests — it may be responsible for impairing the mental health and well-being of researchers. It also leads to a loss of talented people from the pool of researchers, inevitably resulting in decreased diversity. In addition, Fast Science leads to cutting corners and has almost certainly contributed to the reproducibility crisis. There are helpful recommendations to remedy the failings [3], but by themselves they can add to both work and information overload [4]. Truly, we need to ask ourselves, what good does the glut of fast appearing publications do for science, swelled perhaps in the future by reports of null results and replication failures?

Less, but better

How then can we move from Fast Science to Slow Science? Perhaps interested individuals, including those representing major funders and universities, could set up a Working Group.

The first step could be a small conference, where practical ideas could be discussed. Some of these might result in pilot trials. Here are some of my own preliminary suggestions.

Think in longer timescales and survey larger horizons

A basic assumption in Slow Science is that we must look differently at time scales and consider the bigger aims of science. As researchers we sometimes need to be reminded that we are contributing to an astonishing human effort, which transcends an individual's lifetime. We ultimately work for the sake of truth and for the benefit of society because we have reason to believe that science continuously improves our models of the world. A far-sighted vision is necessary to create and test big theories, regardless of obstacles.

This perspective has consequences for how funders view the lengths of grant proposals and of intervals for evaluations. At present, early career researchers believe that they need to amass publications and citations to get grants. Established researchers need to continue to obtain grants to maintain their teams and facilities. Relentless expansion seems a rational strategy in these circumstances. With secure infrastructure including tenured key staff, there could be a flexible trade-off with size and duration of grants. We need to encourage and reward researchers who embark on long term projects, which depend on collaborations and may not have a short-term pay-off.

Provide models for the next generation of scientists

With larger horizons integral to Slow Science, nurturing future generations of scientists must be given particular weight. This involves more than skill training and inspiration. We must teach students about the history of science: its noble goals, how it moves forward through failure as well as success, through collaboration as well as competition. In addition, researchers should not only take, but actively model, thinking pauses. I myself regret not having done this more often. When I look at my CV, I see papers that I wish I had not published, either because they are not sufficiently original or methodologically robust. I think it is important to tell younger researchers about this regret and make them aware that in time they might feel similarly. There are plenty of examples to show that a scientist's reputation in the long run will be built on their best publications, and lessened or even undermined by their weaker ones.

Assess quality rather than quantity

It is easy to agree that quality rather than quantity should be the grounds for giving grants, for hiring people, for promoting them and giving awards. We should therefore be keen to do a better job of assessing quality. Strangely, we seem to shrink from this. Perhaps this is because it feels too subjective, and likely tainted by a bias that stems from being part, or wishing to be part, of high-status networks. How then, do we assess quality? Perhaps we can trust authors themselves to be reasonably good judges of their work. Deep down I know that some of my ideas and experiments are better than others. For me, the best papers will always have something new and fascinating to say within a well-argued theoretical framework. They also have to be concise and use simple language. For others, a different set of values might apply, perhaps their best paper challenges a widely accepted idea, and perhaps it must be long and technical.

Insights from psychology might also be levered to obtain valid evaluations that stand the test of time. For example, experimental studies of individuals making value-based decisions,

suggest that they can increase their accuracy if they also attend to and rate their confidence [5], e.g. in judging how likely it is that the work is reproducible. This applies to judging their own work as well as that of others.

Acknowledge team work

In the admirable drive to create a transparent research culture [6], collaborations are becoming more visible, and this has replaced the old idea of the lone genius. It has now been demonstrated empirically that new solutions to big problems can be found more readily when researchers of diverse skills and different, even adversarial viewpoints, interact with each other [7]. This process is not without difficulty. For instance, it is necessary to allow time to achieve common ground and a common language, again highlighting the need to think in longer timescales [8]. I also want to highlight the need for vigilance to assess reliability and to discriminate fact from fake. Engaging with those who bring different perspectives (aka 'reviewer 2'), will make us become aware of the flaws in our theories and experiments [9]. The inherently collaborative nature of science means it is critical to find appropriate ways of crediting teamwork. A suggested taxonomy is based on the idea that authors be replaced by contributors [10]. Why not develop a system that allows listing in the manner of film credits?

Restrict output

The most provocative of my suggestions is to drastically restrict the number of grants anyone can hold at any one time. Impossible? Not necessarily [11]. Funders and institutions as well as publishers would be vital to help regulate an initially voluntary triage to a pre-arranged number. There would need to be trial runs to identify unintended side effects. Perhaps such trials would eventually lead to new models of science communication which will overcome some of the problems of the traditional journal article as well as provide answers to the tricky problem of credits.

In case such restriction seems bizarre, I want to draw attention to a precedent in viticulture, where the output of Grands Crus vineyards is drastically limited [12]. Here too there is a trade-off between quality and quantity, and detailed care of individual plants is not compatible with mass production. Because of their special status, Grands Crus are constantly scrutinised by critics and this has invigorated the pursuit of excellence. Obviously, restriction may not fit every type of wine producer - nor every researcher. Some may well deliberately opt for quantity.

Two lanes, two speeds

I am conscious of adding to the flood of opinion pieces that express concern with the state of current research culture. However, it occurred to me that sadly, many of the remedies proposed (e.g. publishing replications and negative findings) may well increase information overload and do not address the underlying causes. To me it seems key to reach a consensus about doing 'less but better'. For this it will be crucial to develop tools to assess quality. It would be exciting to set a goal and have a contest between those who continue in the fast lane, and those who decide to switch lanes. My bet is on those in the slow lane to reach the goal first.

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