

## Encounters with Impact

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One of the recurring themes in discussions among mathematicians, whether in informal lunch hour talks or in more formal committees, is what might be called “simplistic impact-bashing.” We are more and more often facing words that seem totally foreign to us — impact, impact factor, excellence, etc. — and we feel no doubt somewhat like people who are too old to adapt to new technologies or new habits. However, despite this unanimity against them, these concepts seem inexorably to infiltrate every branch of our academic institutions, and progressively to invade the applications for financial support that we are ever more frequently required to fill out. It’s not rare to hear that there’s no point in fighting losing battles. This one is already lost, they say, and we must learn to live with the importance of “impact” in the world of “today.”

We are also sometimes called to the rescue by colleagues in other disciplines — usually the humanities—who hope our “hard” science is better armed against this quantification of research performance, since we can more easily demonstrate it via equations or irrefutable mathematical reasoning. Then we are obliged to disappoint them, for these assessments of impact are problematic at a more fundamental level, not simply that of transforming information into numbers.

It would certainly be easy to dismantle line by line the absurdity of the texts produced by organizations such as Research Council UK. Thus in summer 2012 one could read on the website of this venerable institution:

*“Impact is the demonstrable contribution that excellent research makes to society and the economy. Impact embraces all the extremely diverse ways in which research-related knowledge and skills benefit individual, organisations and nations by:*

- fostering global economic performance, and specifically the economic competitiveness of the United Kingdom;*
- increasing the effectiveness of public services and policy;*
- enhancing quality of life, health and creative output.*

*Impact has always been at the core of RCUK.*

*(...)*

*RCUK’s impact strategy was launched in March 2010 and will ensure that we build on our past successes and maximise and celebrate the impact generated from the research, people and facilities that we fund.*

*The strategy also builds upon the Excellence with Impact: Framework for the Future”<sup>1</sup>*

One is at a loss when confronted with this phraseology, in which it is often difficult to discern the slightest rapport with our own activity or what motivates it. Furthermore, “packaging” here seems almost on an equal footing with scientific content (“demonstrable,”

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<sup>1</sup> The website has since been modified.

“maximise and celebrate.”) Nevertheless, my intent in the present text is not to develop a theoretical discourse, which others can do better than I, but to give some concrete illustrations from my own encounters with this technocratic approach to scientific research, inspired by the practices of accounting or marketing. Perhaps these few elements can shed light on certain aspects that are specific to our era, in this traditional interface between the world of academic research and that of socio-economics and politics. I would also like to describe some aspects of the particular world of academic research in mathematics (which functions somewhat differently from the more “experimental” sciences), since this may be of some interest, especially to our colleagues in the humanities. The present text may seem a bit disjointed, like a collection of narrowly focused stories and typically French digressions, but I hope that despite this, a certain coherence will emerge.

I grew up and studied in France, reaching the age of 20 in 1988. It was an era in which business schools (like HEC—l'École des Hautes Etudes Commerciales) and consulting agencies (like the Arthur Andersen consulting group) had the wind in their sails and began to attract some of the best students in France. It was also a time when icons like Bernard Tapie incarnated a new kind of “success” in the media. But it was still easy for students like me, interested mainly in the scientific content of courses, to choose scientific study. I focused on mathematics, and more precisely, on probability theory, in which I defended my thesis in 1993. This era also saw the emergence of “financial mathematics,” which, in fact, used some concepts from probability theory. Many students graduating from the French grandes écoles were drawn to jobs in banks, with their lavish salaries. This phenomenon of course was not limited to France. I remember a colleague at NYU saying that he had assigned a problem to a student as a thesis topic, but that the student had dropped it and taken a job on Wall Street and was now “making twenty times my salary.”

Thus we university mathematicians were perceived early on as idealists, necessarily a bit nonconformist, and a bit “out of it,” since we did not know how to seize the “opportunities” to fill our bank accounts. But we didn't lose any sleep over this; in a sense, it gave us a chance to reaffirm our original choice, which was to be able to ponder questions that seemed to us truly scientifically interesting and stimulating, rather than chasing after “easy” money. Thus it could be said, in general, that from 1990-2005 we were miles away from worldly concerns and the canons of “success” promulgated by the media. Almost the only place for a Mathematician in the media was as the “too obvious” (because deranged) suspect in grisly murders in detective dramas. When Grigory Perelman turned down (for very coherent reasons) the million Dollars offered to him by the Clay Foundation for his solution to the Poincaré conjecture, he was immediately considered totally abnormal, since today it's considered crazy to refuse money. A few months later, I was privy to the following remark made by the French Prime Minister, who could not understand why I had chosen to remain in France when salaries in the US were so much higher: “Ah, one must turn to mathematicians to find people who do not demand more money!” I don't know if this spontaneous and humorous reaction was tinged with a kind of admiration, or condescension. Probably a mixture of the two, symptomatic of the contradictions of our world today.

I've lost touch with most of my friends from student days who chose other careers. But recently I had indirect news of one my good friends from those days, Bruno. We used to

carpool together every day in his little Peugeot 104, listening to the songs of Serge Gainsbourg. Around town he is apparently now known as the “London whale,” following his misadventures with massive investments for J.P. Morgan-Chase. Other classmates are now directors of cell phone companies, or are cogs in the wheels of upper-level French administration.

The following anecdote is a good illustration of the gap between the world of decision-makers and the rhythm of the world of mathematicians. A while back, the then-President of the French Republic invited a dozen mathematicians to lunch, with the apparently genuine wish to converse with this very particular community—and probably also motivated by a certain curiosity on his part. In the course of the meal, I wanted to make the point that the academic world cannot function uniquely by competition, but must work as a community in order to be collectively more effective. I pointed to the essential role played by the anonymous (and unpaid) referees of articles submitted to journals, working in the shadows for the good of the mathematical community and of science in general. It then seemed natural to mention that two great mathematicians had spent probably six months verifying if the article that later won Ngo Bao Chau his Fields Medal was in fact correct. The President exclaimed, “Six months? Why six months of work to assure the validity of this work?” Everyone around the table laughed, and a colleague said, “Mais parce que c’est difficile, Monsieur le président!<sup>2</sup>”

About a dozen years ago an eminent American colleague told me over a pint of beer that the math departments in American universities had lost their “identity,” and that today they were run more and more like football teams. It was a question of making “coups,” of “spectacular transfers.” Recruitments are motivated by their real or imaginary impact on artificial or imaginary rankings. Even in France, where the entire academic community agrees that the international rankings of universities (such as the so-called Shanghai ranking) should not be taken seriously, the university PR machines never fail to announce any slight ranking improvement, and to interpret it as a management success. Thus, independently of any activity on my part, if I were to change employers I would probably bring with me the “points” associated with my Fields Medal—somewhat like an athlete whose team can sell branded products like T-shirts thanks to his fame.

The appearance and success of rankings is a common phenomenon. After all, in every commercial activity, an object is measured by its value or price. And the consumer must be reassured when he is purchasing, since he wants to get “a good deal.” One could make a long list of objects about which most of our contemporaries understand very little, and about which they like to rely on “ratings”—from the number of stars attributed to music CDs, to film or literary awards, to high-tech testing of products and brand-recognition for clothing. Whether we like it or not, our daily lives as Western consumers are thus rhythmized and conditioned by these criteria, and by the way advertising touches us. The more we are intellectually disarmed before a choice, the more we are subject to influence by supposedly scientific approaches aimed at helping us decide. A good example of this is the “Parker Guide” to wines. How can we estimate the value of the contents of a bottle of wine when most of us cannot differentiate among grapes? Well, it’s enough to decree that wines have a

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<sup>2</sup> « Because it is difficult, Mister President ! »

precise rating, on a scale of 100, where it is understood that a wine having 87 points is better than one having 85. And this will be followed blindly by consumers, even if it is clear to them that the quality of a wine cannot be reduced to a simple rating. And it is no coincidence that such indicators are most effective in evaluating areas where relatively irrational criteria enter the equation (in this case, taste). In the case of wine, these guidelines have a retroactive impact on the way vintners prepare their wines, in order to adapt to the criteria used by the evaluators. The effect produced is in general a uniformity in the taste of wine. Those who do not want to conform to the new standards must jump through hoops.

The university “marketplace” is no doubt similar. How does a student go about making choices? Fairly simplistic rankings are at the basis of most choices, even among the offspring of academics, who supposedly know the system from the inside. And it must be said that the different factors of “impact” used by certain organizations that finance research use the same logic. How can someone “objectively” evaluate something without understanding anything about it? It’s amusing to note that the perverse effects are similar to those produced by business norms. The most obvious, of course, is that this leads to conformity, while innovative scientific research arises from originality and creativity, in the unexpected juxtapositions of different worlds or concepts. This is not a matter of dressing things up in a provocative or unconventional fashion. It is in the content of scientific production that we find originality and real impact, not in its window-dressing.

A relatively recent secondary effect, made possible by technological progress (email, electronic publishing) is the appearance of journals that one could almost qualify as “fake.” Somewhat like knock-offs in the fashion world, these new journals have names quasi-identical to major international journals. A glance at the list of editors of these journals reveals no recognizable names of mathematicians who publish in quality international publications. Thus one must suppose that there is no critical review of the content published. Certain countries that lack the funds for serious evaluation of their universities by those able to discern true publications from pseudo-publications are thus easily fooled, and honest researchers, for example in certain North African or Asian countries, who publish a good article now and then in a serious journal, are outgunned by colleagues who publish dozens of articles in phantom journals, which no one has or ever will read. It must be noted that factors of “impact” can also easily be manipulated by multiple cross-references, and it is not clear at this point how widespread this practice may be.

One aspect that makes mathematicians vulnerable to the criteria of impact is precisely the fact that the readership of their research articles is quite limited. As already implied in the anecdote about the article by Ngo Bau Chau, the people capable of completely understanding the content of some deep papers are only a small fraction of the mathematical community. This is a real concern, and I’m not here to debate the issue of fractioning knowledge into limited sub-communities (precisely because it’s often when one succeeds in bringing together different ideas from different specialties that the most spectacular progress is made). But one cannot judge the quality or originality of an article based upon its readership. There are some top mathematicians, the importance of whose work can be easily explained, and who may have received prizes, but whose officially computed “impact factor” is extremely low. Such examples are helpful when we are on an

interdisciplinary panel and trying to defend a dossier with very few publications, but of exceptionally high quality.

It is often held that a mathematician's most creative period is in his thirties. There are numerous examples to contradict this, but it's nevertheless true that young mathematicians can revolutionize a field, or manage to resolve problems that defy their elders. When we as mathematicians take on a graduate student, it is not because we need a research "team." It's more of a mentorship of the next generation that will quickly take our place. This fosters the understanding by every mathematician that he or she is only a link in a long chain that will continue, and hence it is very important to transmit to the next generation the ideas, intuitions and also the values that we hold. Paradoxically, mathematicians are rather solitary workers, but also generally generous, eager to share our ideas.

The mathematical community is organized around some national and international structures that function relatively efficiently. The International Mathematical Union (IMU) holds a world congress every four years, and hands out awards and prizes, thereby helping to publicize mathematical research. It is worthwhile to note to what extent these main institutions remain controlled by active mathematicians, who do not become professional administrators, but choose, for the good of the community, to sacrifice some of their time to "tasks of general interest." The recent revolt of part of our community against the practices of certain commercial publishers, which resulted in a call to boycott journals published by Elsevier (<http://costofknowledge.org>), is symptomatic of this community, which does not want to cede control to the outside. I have often participated in meetings in which committees of mathematicians have discussed in pragmatic and explicit ways how to function in the most efficient and coherent way for the good of the community, while discreetly getting around the relatively absurd official rules being imposed upon us.

Even though not everything is a bed of roses in the mathematical community, many of us recognized ourselves in the words of John Ball, then-president of the IMU, who said in his inaugural address in 2006:

*"Mathematics is a profession of high standards and integrity. We freely discuss our work with others without fear of it being stolen, and research is communicated openly prior to formal publication. Editorial procedures are fair and proper, and work gains its reputation through merit and not by how it is promoted. These are the norms operated by the vast majority of mathematicians. The exceptions are rare, and they are noticed.*

*Mathematics has a strong record of service, freely given. We see this in the time and care spent in the refereeing of papers and other forms of peer review. We see it in the running of mathematical societies and journals, in the provision of free mathematical software and teaching resources, and in the various projects world-wide to improve electronic access to the mathematical literature, old and new. We see it in the nurturing of students beyond the call of duty."*

Here is a concrete ideal that is a rather far cry from the definition of impact given by the Research Council UK. It's hard to say if the existence of our very particular community—functioning somewhat in counter-current to the tendencies that seem to govern the current evolution of our societies—should be seen as an anachronistic and temporary survival of a bygone world, or as the seed of a different future. It is needless to say which scenario I find preferable...