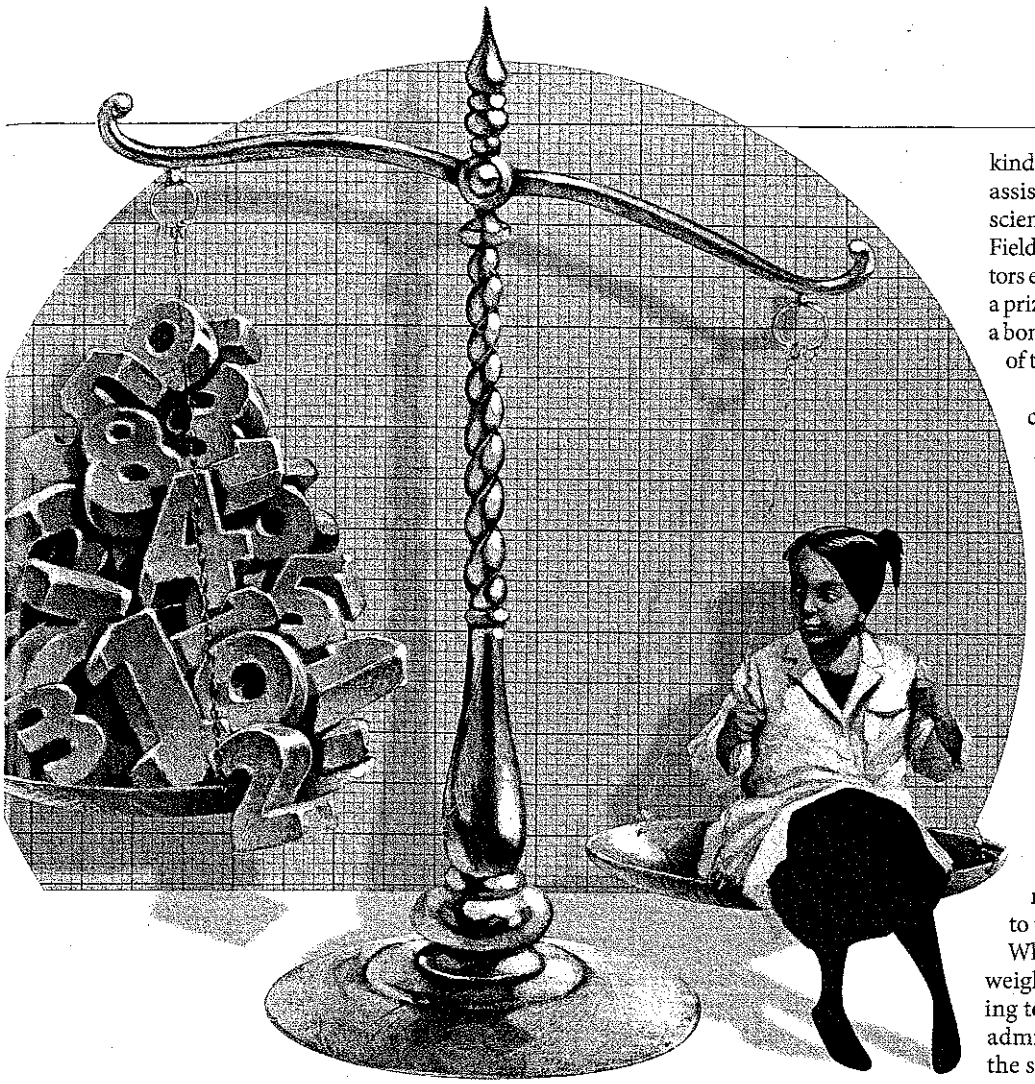

ILLUSTRATIONS BY DAVID PARKINS

Motivate people with prizes

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Pay levels and pay rises in some academic institutions — such as the University of Western Australia in Perth and the Vienna University of Economics and Business — are based heavily on metrics such as numbers of publications and citations. This is not a sensible policy.

The primary motivation of scholars is not money. They are driven by curiosity, autonomy and recognition by peers; in exchange, they accept lower pay[5].

Giving pay rises on the basis of simple measures of performance means that the inducement to 'beat the system' can get the upper hand. Research reverts to a kind of 'academic prostitution', in which work is done to please editors and referees rather than to further knowledge[6]. Motivation to do good research is crowded out[7]. In Australia, the metric of number of peer-reviewed publications was linked to the funding of many universities and individual scholars in the late 1980s and early 1990s. The country's share of publications in the Science Citation Index (SCI) increased by 25% over a decade, but its citation impact ranking dropped from sixth out of 11 OECD countries in 1988 to tenth by 1993 (ref. 8).

The factors measured by metrics are an imperfect indicator of the qualities society values most in its scientists. Even the Thomson Reuters Institute for Scientific Information (ISI) uses citation metrics only as one indicator among others to predict Nobel prizewinners. Of the 28 physics Nobel prizewinners from 2000 to 2009, just 5 are listed in ISI's top 250 most-cited list for that field.

"If journals listed the papers that they had rejected alongside the published science it could form the basis of a demerit system."

An incentive system for scholars has to match their main motivating factors. Prizes and titles are better suited for that purpose than citation metrics. Honorary doctorates, different kinds of professorships and fellowships (from assistant to distinguished), membership of scientific academies and honours such as the Fields Medal or Nobel prizes are great motivators even for those who do not actually win such a prize. The money attached to such rewards is a bonus, but less important than the reputation of the award-giving institution[9].

If academic rewards are linked to overall contributions to research as reflected in prizes, scientists will pursue their work driven more by research agendas than by simple metrics.

Learn from game theory

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Giving bad answers is not the worst thing a ranking system can do — the worst thing is to encourage bad science. The next generation of scientific metrics needs to take this into account.

When scientists order elements by molecular weight, the elements do not respond by trying to sneak higher up the order. But when administrators order scientists by prestige, the scientists tend to be less passive. There is a powerful feedback between the ranking systems used to assess scientific productivity and the actions of scientists trying to further their careers via these ranking systems.

If tenure committees value quantity over quality, faculty members have strong incentives to churn out large numbers of lower-quality papers. Some advisers even encourage young academics to publish the smallest possible slivers of their work to raise self-confidence and satisfy bean counters — from deans to department heads to those in charge of handing out grants. Sadly, this is probably good advice given the current reward systems.

Because of this feedback, the problem of ranking scholarly output cannot be viewed simply as a problem in applied statistics, in which we wish to extract maximal information from a data set. Instead it is a game-theoretic problem in mechanism design.

The first step in addressing any mechanism-design problem is to identify the desired outcomes. Two objectives the community might set its sights on are alleviating