in *Nature* and found that 89% of last year's figure was generated by just 25% of our papers.

The most cited *Nature* paper from 2002–03 was the mouse genome, published in December 2002. That paper represents the culmination of a great enterprise, but is inevitably an important point of reference rather than an expression of unusually deep mechanistic insight. So far it has received more than 1,000 citations. Within the measurement year of 2004 alone, it received 522 citations. Our next most cited paper from 2002–03 (concerning the functional organization of the yeast proteome) received 351 citations that year. Only 50 out of the roughly 1,800 citable items published in those two years received more than 100 citations in 2004. The great majority of our papers received fewer than 20 citations.

These figures all reflect just how strongly the impact factor is influenced by a small minority of papers — no doubt to a lesser extent in more specialized journals, but significantly nevertheless. However, we are just as satisfied with the value of our papers in the 'long tail' as with that of the more highly cited work.

The citation rate of our papers also varies sharply between disciplines. Many of *Nature*'s papers in immunology published in 2003 have since received between 50 and 200 citations. Significant proportions of those in cancer and molecular and cell biology have been in the 50–150 range. But papers in physics, palaeontology and climatology typically achieved fewer than 50 citations. Clearly, these reflect differences in disciplinary dynamics, not in quality.

The impact factor also mixes citations to diverse types of content: unsurprisingly, review articles are typically the most highly cited, but citations of our Commentaries, News Features and News & Views articles also contribute in a minor way to the numerator (although these items are not counted in the denominator).

"Impact factors don't tell us as much as some people think about the quality of the science that journals are publishing."

The net result of all these variables is a conclusion that impact factors don't tell us as much as some people may think about the respective quality of the science that journals are publishing. Neither do most scientists judge journals using such statistics; they rely instead on their own assessment of what they actually read.

None of this would really matter very much, were it not for the unhealthy reliance on impact factors by administrators and researchers' employers worldwide to assess the scientific quality of nations and institutions, and often even to judge individuals. There is no doubt that impact factors are here to stay. But these figures illustrate why they should be handled with caution. ■

Toyota on a roll

Japan's approach to industrial innovation may be out of fashion, but it still delivers the goods.

For the Japanese car company Toyota, 2005 has been a bumper year. The company's global fortunes are at such a high level that the chairman, Hiroshi Okuda, suggested back in April that it might raise its prices to give "some breathing space" to its bloated US rivals, Ford and General Motors.

The car industry isn't quite the economic driver that it was a few decades ago, but cars still account for a huge portion of consumer spending. And despite the industry's traditional conservatism, it has become a hotbed of innovation in electronics, materials, environmental engineering and other spheres.

Basic scientific research usually operates a few steps away from technological innovation in the motor industry. But Toyota is doing some interesting things at its central research and development laboratory near Nagoya (see page 1026). As in other sectors, the period of transition from scientific knowledge to industrial application is shrinking.

Toyota's success has always been more about industrial efficiency than technical innovation. But its technology has progressed steadily over the past ten years, while the competition in the United States has been resting on its laurels. Now that the boom in sales of large, conservatively designed sport utility vehicles seems to be over, US car-makers are experiencing a rude awakening.

As the prospects for the Detroit industry darkened earlier this year, credit agencies humiliated Ford and General Motors by reducing the ratings of some bonds that the two companies have issued to 'junk' status. That apparently prompted Okuda's intervention: the Toyota chairman felt that a fresh crisis in the US car industry could lead to a surge in protectionist sentiment that might damage Toyota. Then, a few weeks ago, General Motors announced that it is planning to shed 25,000 people, almost a quarter of its factory workforce in North America.

Perhaps the starkest difference in approach between Toyota and its US rivals has been the way they tackled environmental innovation. Detroit car executives have acted like parodies of themselves, accepting generous subsidies from the federal government under then President Clinton's much-trumpeted Partnership for a New Generation of Vehicles programme and asking for less regulation in return — as though their participation was doing the taxpayer a favour. That initiative came and went, but when oil prices flew through the roof last year it was the Japanese manufacturers Toyota and Honda — not General Motors or Ford — who were ready at the starting gate with their ultra-economic 'hybrid' vehicles.

"When oil prices went through the roof last year, it was Toyota and Honda — not General Motors or Ford — who were ready at the starting gate with 'hybrid' vehicles."

Toyota's approach to science, technology and innovation isn't exactly off-the-wall. It can't afford to be: the company knows that the product has to work when it is delivered. And Toyota's scientists and engineers don't match the flamboyant modern paradigm of innovation, as inspired by California's Silicon Valley. They are, instead, meticulous, intensely loyal to the corporation, collaborative in outlook, and keen to keep a low profile. The outcome is impressive — and demonstrates that successful innovation can take many different forms. ■