

by mathematicians as a sure sign that their work is undervalued.

These negative associations have been reinforced by a number of popular stories about great mathematicians. The American inventor of cybernetics theory, Norbert Wiener, for example, is frequently depicted as the archetypal absent-minded professor. It is said he once lost his way walking home from the Massachusetts Institute of Technology. He came across a small girl in the street and asked if she could give him directions. "Yes, daddy," she replied, "I'll take you home."

Kurt Gödel, whose incompleteness theorem sent shock waves through mathematics in the 1930s, was a noted misanthrope, who shunned human contact at the Institute for Advanced Study in Princeton, preferring colleagues to communicate via pieces of paper stuffed through the crack beneath the door of his office.

Despite — or, perhaps, because of — such behaviour, the history of mathematics is probably more colourful than that of any other scientific discipline. And there seems to be an insatiable public appetite for tales of the almost supernatural intellectual powers of its more famous figures.

Srinivasa Ramanujan, for example, an Indian mathematician of towering ability in number theory who died at the age of only 32, first came to the attention of the eminent British mathematician G. H. Hardy by sending his notebooks to him while he worked as a clerk in Madras. Hardy correctly concluded that even if he couldn't follow all of the proofs, only a genius could have thought of the theorems they were seeking to address.

Hardy invited him to Cambridge, but Ramanujan caught a cold that developed into a terminal case of tuberculosis. When Hardy visited his ailing protégé one day by taxi, he commented that the cab's number, 1729, was "rather dull". On the contrary, Ramanujan insisted, it is the smallest number expressible as the sum of two different pairs of cubes.

Earlier eras have produced equally poignant anecdotes. One thinks, for example, of Évariste Galois, the unruly French mathematician who made great strides in group theory. He frantically scribbled down his work for posterity on the eve of his fatal duel in 1832 at the age of just 20. Such stories have propelled books such as Simon Singh's on Fermat's last theorem to bestseller status.

These tales are popular not just for their panache, but because they celebrate mathematicians as pure intellectuals who, unlike physicists, biologists or chemists, are untainted by applications of their work. For even though mathematics is eminently useful, its application barely features in its public reputation. Disciplines that are traditionally inclined to disdain pure theory — biology springs to mind — should take note of the success with which mathematics, this most theoretical of disciplines, has haplessly bungled its way into people's hearts. ■

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A dog's life

The first cloned dog was born at some cost, and there needn't be many more.

An Afghan hound born in South Korea in June adds dogs to the small list of animal species that have been successfully cloned (see page 641). The birth marks another first for the Korean-based group that cloned the first human embryos last year.

The development has some scientific significance, on account of the emerging importance of the dog as a model for the study of certain aspects of human genetics, development, behaviour and disease.

A dog genome project is being undertaken by a US team, and the cloning of dogs could provide an additional tool for researchers. The number of cloned dogs that will be needed for such research is probably small, however. Scientists such as Elaine Ostrander of the US National Human Genome Research Institute, head of the dog-genome project, do most of their work with pets living at home, not with kennels of animals bred for research. So the ability to clone dogs is unlikely to have more than a marginal impact on how such research is done.

Cohorts of cloned dogs could potentially be used to study the respective influence of genes and environment on particular traits, however. And if it were possible to derive embryonic stem-cell lines from cloned dog embryos — something that's so far only been done in mice and humans — then canine diseases could be studied more easily in Petri dishes, perhaps providing insights into disease

mechanisms and even identifying new therapies. Deriving embryonic stem cells would also pave the way to therapeutic cloning in dogs — perhaps providing a useful animal model for research into human health.

The initial dog-cloning experiment has proven the process to be remarkably inefficient, however, with only two live births — and one survivor — from a total of 1,095 embryos implanted in 123 surrogate mothers. This offers scant prospects for commercial pet cloning, the application of the work that the media is likely to make a fuss about. It is unlikely that even the most obsessive pet owner would contemplate preparing more than 100 failed pregnancies for just one successful birth — especially when there is no guarantee that the cloned dog will behave like the one they hope to duplicate. In such circumstances, the cloning of dogs for pet owners remains ethically indefensible.

The Korean researchers named their new dog Snuppy, for Seoul National University puppy (one can almost imagine the name being chosen — presumably on a conference call with the university press office). Let us wish him a long and happy life and hope that now that the concept behind the birth is proven, dogs are cloned only when strictly required for research purposes, and that effort is concentrated on work that carries the most likely rewards for canine and human health. ■

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