



Inventors' inbox

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E&T listens in on our resident inventors as they exchange emails on an idea that could have the world beating a path to their door.

Patrick: I'm generally against killing. It's almost always the result of a lack of imagination, a failure of inventiveness. As far as rats go, many people seem to have a visceral fear which justifies all sorts of horrific methods for despatching them.

In research, we use lab rats with none of the crises of conscience that would apply if puppies or kittens were involved. This is probably a result of the fact that rats are known to carry 70 diseases – including cholera, typhus, bubonic plague and leptospirosis. Humans are known vectors for some pretty nasty pathogens too, but we tend to justify killing our own species in other ways.

More significant is the fact that *Rattus Norvegicus* makes the mistake of attempting to dine at the expense of *Homo Sapiens* – to literally eat our lunch.

The US has an estimated 1.25 billion rats, causing at least \$19bn worth of damage each year.

Mark: My normal stance is that I am happy to co-exist with most things out there, as long as they leave us alone. But rats may be the exception to this rule.

Yes, I am probably the type of person you mentioned, with a visceral fear of rats. I know this, because just watching Roland Rat – a popular 1980s kids' TV puppet – brings me out in a cold sweat. A condition indoctrinated through negative language and early parental controls. Now, reading your alarming rat figures, another emotion kicks in. It is called 'survival'.

Forget the diseases that they carry for a moment – although you missed out 'Weils', which is most commonly contracted by humans – and the damage they cause. If, as recently estimated, an adult rat can eat up to 35kg of grain annually, then we must act, as our own species are booming and the food chain is diminishing thanks to biofuel crops and global warming.

There's no time to be squeamish, rats have to be banished into BBC's 'Room 101' in any way, within reason, that we can get them in there.

Patrick: I'm not sure that rats are actually causing humans to starve on a global scale yet... we are pretty good at defending ourselves.

Established techniques for despatching the vermin include: poison, strangulation, gassing, chemical castration, predators and good old-fashioned mechanical neck snapping.

It's a cliché, of course, that inventors find themselves, when not in search of perpetual motion or antigravity, looking to build a better mousetrap.

In each case, there is a need to 1) attract the rat, 2) 'neutralise' the rat, 3) clear the trap and 4) reset the process. We'd want to ensure, for reasons of both ethics and effectiveness, that every animal was swiftly killed and not just disabled. Similarly, we need to avoid having animals crawl off and die elsewhere in large numbers, causing a serious bad smell.

It would be ideal if these four processes could somehow be combined effectively.

Mark: Seemingly, humans have used every killing method in their toolbox to exterminate rats, yet they thrive.

The problem is that they are smart, quick to adapt and resilient, as well as breeding like rabbits on IVF treatment.

I do agree, broadly, with your assessment on trap requirements. Although, I believe we should not dwell too much on instant death – this does not mean that I want them to unduly suffer – as rats die in inaccessible places naturally anyway.

Patrick: My first suggestion would be to employ the following, 'natural' approach.

How about placing some bait at the top of a hollow pole? The rat-up-a-drainpipe technique? Air currents waft the delicious aroma to ground level. The rat climbs up the pole, eventually reaching the baited platform at the top which is held in place by a magnetic catch. Once the movement of the rat's weight overcomes this support force, the platform suddenly flips through 180 degrees, dumping the

rat onto a hard, sloped surface on the ground, which also directs the bodies into a waiting hopper.

To ensure fatality, this would need a 10m tall pole, but it could be disguised as a flagpole or a tree and located in a fenced-off corner of any infested premises.

Mark: I am all for a 'natural' approach, as I once lost a favoured family pet to rat poison and really want to avoid anything which has collateral damage attached.

I love and hate your idea. I love its entertainment value, almost circus-like, but hate the impracticality of it – using a long hollow pole, needing a large open space with a serious ground construction and hopper. Culling rats to save the world is one thing, but we also need to make a living. I suppose you could always sell tickets for ring-side seats!

Joking apart, to make money from the sizeable rat trap market, the trap has to demonstrate some clear benefits over its competition, by being either 'better' or 'cheaper' or, ideally, both.

Coming from a packaging background, I quite like the idea of having the rats killed in a bio-degradable plastic bag (with the words 'DEAD RAT HANDLE WITH CARE' printed on both sides). Disposing of the diseased ridden corpses would be less harrowing, easier and much safer. Plus using consumables, if justified, is a good way to make extra profit streams.

If you have ever kicked a plastic bag on a land-fill site, you will know that it is invariably inhabited by a rat, so they are certainly not 'bag-shy'. Also, when inside the bag, they are vulnerable.

The trap that I have in mind would be box-shaped, with a hole running the full length of one side – to mimic an opening in a carrier bag. The height of this hole should only allow the access of a rat/mouse and not larger-headed animals, such as cats and dogs. Our plastic bag is placed inside the box, with its top pushed through the box's hole to the outside, making it a bag for all intensive purposes, a known safe haven to the rat.

The box will have a springed mechanism that collapses, triggered by the rat inside the bag, squashing it, cutting off the air supply and exit route at the same time, and producing a visual indication that the trap has been activated.

To remove a successful kill, seal the bag first, via incorporated double-sided tape, before opening the box, or you may just get a 'rat-out -of-a-bag' or 'jack-in-the-box' surprise.

Patrick: Another alternative may be to arrange for rats entering a pipe trap to be sprayed with the (long-lasting) scent of some major predator. This would limit the subsequent breeding success of any animals and thus cut their numbers. A single droplet of 'eau-de-skunk' would surely be enough.

Actually, I have a preference for spraying a simple shape on the backs of the rats (eg a 'startle' pattern such as a pair of owl's eyes) which would deter other rats from attempting to mate with them, but I suspect that rats are smart (and reproductively oriented) enough not to fall for any such subterfuge.

Perhaps a more practical solution would be spraying each rat with a super-strong food smell (perhaps blood from a small cut caused by the trap?). The rats might then attempt to eat each other, seriously disrupting their social order.

Finally, inspired by pet rodents I used to keep as a child, comes the following suggestion. We might arrange our trap to contain a simple treadmill. I've seen lab rats happily running on these in pursuit of some out-of-range meal. Once at speed, a centripetal lock would release, opening a door in the treadmill via which the rat would be expelled against a hard wall. For a sensible size of mill, the required exit speed to ensure death (based on an equivalent energy to that of falling from 30m) is actually about 40 revs per second... so my quest is that this would be beyond the power of even the most energetic rat. There might be a way to arrange for the mill to collide with the rat's neck on exit and thus focus the available energy, but this seems pretty hard to coordinate in a low-cost system.

Mark: I see some flaws in your reasoning. Generally, in mating rituals, perfumed ('eau-de-skunk'), dandy-coated ('owl's eyes') and toned (via the treadmill) animals, are more likely to attract a mate! We could always try charming them into a river with some music, Hamelin-style.

A search carried out by the British Library Research Service (www.bl.uk/research) on 'rat traps using disposable bags' revealed eight patents: US5673509, WO2005115140, GB2407470, US5953853, US5706601, CA1186148, CA1036355 and US3769742 which can be viewed on Espacenet. Readers can send their own thoughts to engtechmag@theiet.org



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