THIS WEEK

Don't feed the trolls

Patent abuse slows down research and innovation, and must be confronted. Delays to US legislation are not reassuring, but there has been some progress in the courts.

Not long after news of his experiments got out, the trolls came for Rob Carlson. A consultant in Seattle, Washington, Carlson is part of a growing movement of biohackers who tinker with biotechnology in their garages. But when word reached the media several years ago that Carlson intended to commercialize his inventions, he was threatened with lawsuits from people who claimed to hold patents that covered the entire field of proteomics — the study of the proteins that make up cells and organisms. If Carlson did not pay a substantial settlement, the purported patent holders said, they would sue him for infringement.

And so Carlson was introduced to the world of patent trolls, a pejorative term for people or organizations who file or license patents solely to use them to extort money from firms that infringe them. In 2012, patent trolls accounted for 62% of all patent legislation in the United States; in 2011, such cases cost companies US$29 billion. Attempts to rein in patent abusers are mounting. On 2 June, the Supreme Court issued a decision that tightens requirements for patent claims to be clear and unambiguous, potentially limiting the broad claims that foster abuse. US President Barack Obama has made tackling trolls a priority, and last December, the House of Representatives passed a bill proposing an 'Innovation Act', which included measures to counteract the problem.

But on 21 May, Senator Patrick Leahy (Democrat, Vermont), chair of the Senate Judiciary Committee, announced that he was taking the bill off the committee's agenda. He said that nearly a year of hard work had failed to produce legislation that would temper trolls without harming genuine patent holders. With Congress heading into an election in November, it is unlikely that the bill will be resurrected this year.

The legislation's demise highlights how hard it is to design patent policy that satisfies two large technological domains. Trolls mainly target technology firms, in part because patents on software and business methods are often broad. Many technology companies already find patents to be a nuisance — particularly those that make broad claims on business methods or software (see *Nature* **509,** 152–154; 2014).

By contrast, the biotechnology and pharmaceutical industries hold their patents dear: intellectual-property protection can be important during the often lengthy struggle to win regulatory approval for a drug or genetically engineered crop. Trolls have not so far tended to trouble these industries, but that may change. In a study released this year, researchers found dozens of university-held patents that could be deployed against bioscience companies, including some that cover methods to screen for or manufacture new drugs (R. Feldman and W. N. Price *UC Hastings Research Paper No. 93* http://doi.org/s2m; 2014).

Universities also value patents, both to encourage the commercialization of academic inventions and as a source of revenue. Academic technology-transfer offices tend to raise the bulk of their funds from licensing biomedical patents. In April, the Association of University Technology Managers joined groups including the Biotechnology Industry Organization in signing a letter to Leahy, opposing the proposed Innovation Act. The bill would make it difficult and expensive to enforce their patents, they said.

University opposition to the Innovation Act has fuelled claims that some academic institutions have themselves become patent trolls. Industry insiders have made this assertion many times over the years, particularly as universities have become more aggressive in protecting their patent holdings by suing potential infringers. A popular term for a patent troll is a 'non-practising entity': a party that does not intend to market products based on its patents. By this very broad definition, universities — which license their patents instead of marketing products directly — would be patent abusers. But of course they are not, as long as they hold their mission to help society above their drive to bring in cash. Academic institutions need to make their priorities clear: the practice of licensing patents to trolls to raise funds does not help their public image (see *Nature* **501,** 471–472; 2013).

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It is disappointing that Congress will do nothing in the near future to slow the steady march of the patent troll. But luckily, legislation is not the only option. By the end of June, the Supreme Court is expected to rule in a complex patent case that could narrow the scope of software and business-methods patents (see *Nature* **507,** 410–411; 2014). The US Patent and Trademark Office has initiatives to make it easier to determine who owns a patent. And the US Federal Trade Commission is studying troll behaviour. If the target is better defined, it may well become easier to design legislation that hits the mark. ■

Renewed energy

Reforms at the US Department of Energy are recharging research.

When physicist Steven Chu took over as head of the US Department of Energy (DOE) in 2009, he vowed to reform its research culture. Many felt that the department had become much too bureaucratic — too rigid, too unresponsive to new opportunities, too divided into disciplines and too isolated from the needs of the marketplace.

The following year, Chu launched five Energy Innovation Hubs intended to mimic the research style that he remembered from his time working at the AT&T Bell Labs in Murray Hill, New Jersey. Each hub would focus on a well-defined challenge in the area of renewable energy

— a top priority for the then-new administration of US President Barack Obama. It would bring together all the necessary expertise, from basic and applied research to engineering and early product development.

Four years later, there is justified, if cautious, optimism about the outcome of Chu's experiment. Viewed purely as research projects, most of the hubs seem to be doing well. In the next few months, the Joint Center for Artificial Photosynthesis, headquartered at the California Institute of Technology in Pasadena, hopes to demonstrate a first-generation prototype of an 'artificial leaf' — a cheap, robust and highly efficient system able to make liquid fuels out of sunlight, air and water (see page 22). The Joint Center for Energy Storage Research, headquartered at the DOE's Argonne National Laboratory near Chicago in Illinois, is likewise making good progress towards its goal: devices that can store much more electricity in much less space than the current champions, lithium-ion batteries (see *Nature* **507,** 26–28; 2014).

Only one of the five hubs has fallen by the wayside. The Energy Efficient Buildings hub, headquartered in Philadelphia, Pennsylvania, was eventually judged to be too diffuse in its goals for DOE purposes, and too oriented towards trying to get people to use currently available technology. But it still exists. In April it took a new name — the Consortium for Building Energy Innovation — and relaunched itself as an independent research and demonstration centre.

There are also grounds for optimism about the hubs' larger purpose of transforming the DOE research culture — although in this case, the progress is less clear-cut. In some ways the agency is as bureaucratic as ever. And talk of change within the department has provoked its share of resistance from individuals who feel that their programmes are threatened.

Nevertheless, there is considerable excitement in the DOE — a sense of new opportunities, new ventures, new people. The hubs are responsible for some of that feeling, as are innovations such as the Advanced Research Projects Agency — Energy (ARPA-E), established in 2009 to fund speculative, high-risk, high-reward investigations, and a network of Energy Frontier Research Centers, launched the same year to promote cutting-edge basic research.

But at least as important is the sense that the people at the top understand and support reform. Chu's initiatives have been continued by his successor, physicist Ernest Moniz — who last year told Congress that the hubs would be a good model for reforming the DOE's network of 17 national laboratories. Last month, Moniz appointed a panel to review the national labs, with a report due early next year.

Obama's administration has been supportive. In both his 2013 and 2014 State of the Union addresses, Obama called for a US$1-billion National Network for Manufacturing Innovation. An interagency programme modelled in part on the DOE's energy hubs, this would comprise 15 or more centres looking to cut the energy, time and materials required to make things. The goal is to help US industries to compete with low-cost factories in emerging nations such as China, and to make it easier for start-up companies — including many renewable-energy firms — to bring new products to market. Congress has not yet acted on this proposal, but the administration has established several centres using existing funds from the DOE and other agencies.

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Such efforts need to be supported and encouraged — especially by Congress, which holds the federal purse strings, and by the energy industry, which can tap vast amounts of cash for activities it perceives to be in its interest. And even here there is reason for optimism. Despite the ideological warfare that has riven Washington DC in recent years, both parties have generally endorsed the DOE's reform efforts. And industry leaders seem ready to work closely with researchers to bring innovative products to market. One example is the Clean Energy Trust, a Chicago-based consortium of energy companies that supports renewable-energy start-ups.

Congress and the Obama administration could greatly help this movement by reviving the idea of the Clean Energy Deployment Administration: a 'green bank' that would pool public and private money for large-scale investments in clean-energy infrastructure. The idea was proposed a few years ago, but abandoned amid budget wrangles. Now that the federal deficit is easing and the economy has begun to improve, it could find renewed support on both sides of the aisle. The future, for once, is starting to look brighter. ■

Integrity mentors

Policies in Ireland and China make Nature*'s 2014 mentoring awards timely.*

Last month the Chinese Academy of Sciences issued a powerfully worded statement *Towards Excellence in Science* (go.nature.com/pnhi9k). In encouraging a scientific culture of challenging the status quo, it includes a passage that speaks to laboratory behaviour: "To achieve scientific excellence, the scientific community needs to consciously advocate and uphold the scientific spirit, promote the value and focus of science in seeking truth and innovation, establish management structures and mechanisms that suit the characteristics and rules of scientific research, and discourage scientific behaviour aimed only at short-term success or individual benefits."

This week, the Irish Universities Association has issued a Concordat on research integrity, which includes mention of two aspects (among several) of scientific behaviour needing support: "reliability in performing research (meticulous, careful and attentive to detail), and in communication of the results (fair and full and unbiased reporting), and objectivity: interpretations and conclusions must be founded on facts and data capable of proof and secondary review; there should be transparency in the collection, analysis and interpretation of data, and verifiability of the scientific reasoning."

Such statements could all too easily be ignored unless they have teeth. In that spirit, readers might do well to focus on a clause in a document produced by Science Foundation Ireland (SFI), the country's main funding agency and a collaborator on the integrity Concordat. On page 32 of its strategic plan, *Agenda 2020*, is the statement that research integrity will be scrutinized by external audits (go.nature.com/xjudiz). Congratulations to the SFI for showing more determination than most to back words with actions.

Excellent science requires, not least, a capacity for researchers to be ruthlessly self-critical — in other words, assuring technical integrity. On discovering something interesting, they need to assume at the outset that they are deluded — that the combination of their object of study and their experimental, or theoretical or simulation set-up is conspiring to make them mistakenly believe that they have a startling new insight to offer an admiring world. They need to show their analyses or data to trusted but critically minded colleagues, in order to avoid mistakes and cherry-picking. Such a culture is best bred by tough but supportive laboratory mentors. In its annual mentoring awards, which has been held since 2005, *Nature* has rewarded outstanding mentors in many countries and regions.

Given Ireland's evident determination to sustain best practices, it is timely that this year's mentoring competition is for scientists resident in that country and in Northern Ireland. Candidates need to be nominated by past mentees using forms available at go.nature.com/hmezau. Deadline: 4 August. ■

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