

**MARK
HENDERSON**

**'Timely
and important'**

Tim Harford, author of
The Undercover Economist



THE

**GEEK
MANIFESTO**

Why Science Matters

About the Book

There has never been a better time to be a geek. What was once an insult used to marginalize the curious has become a badge of honour. People who care about science have stopped apologizing for their interests, and are gaining the political confidence to stand up for them instead.

The geeks are coming. And our world needs us.

Whether we want to improve education or cut crime, to enhance healthcare or generate clean energy, we need the experimental methods of science – the best tool humanity has yet developed for working out what works. Yet from the way we're governed to the news we're fed by the media, we're let down by a lack of understanding and respect for its insights and evidence.

It's time to stop the nonsense!

In *The Geek Manifesto*, Mark Henderson explains why and how we need to entrench scientific thinking more deeply into public life. *What* politicians think matters less than *how* they think. A new movement is gathering. Let's turn it into a force our leaders cannot ignore.

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Why Science Matters

MARK HENDERSON

For Niki and Anna

'We've arranged a global civilization in which most crucial elements - transportation, communications, and all other industries; agriculture, medicine, education, entertainment, protecting the environment; even the key democratic institution of voting - profoundly depend on science and technology. We have also arranged things so almost nobody understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces.'

Carl Sagan

'A habit of basing convictions upon evidence, and of giving to them only that degree of certainty which the evidence warrants, would, if it became general, cure most of the ills from which this world is suffering.'

Bertrand Russell



THE GEEKS ARE COMING

IT WAS CHIROPRACTIC awareness week. But the awareness Simon Singh was raising wasn't quite what the British Chiropractic Association had in mind.

'You might think that modern chiropractors restrict themselves¹ to treating back problems,' the science writer declared in the *Guardian* on 19 April 2008, 'but in fact they still possess some quite wacky ideas. The British Chiropractic Association [BCA] claims that their members can help treat children with colic, sleeping and feeding problems, frequent ear infections, asthma and prolonged crying, even though there is not a jot of evidence. This organization is the respectable face of the chiropractic profession and yet it happily promotes bogus treatments.'

The notion that cracking a little girl's spine might cure her earache indeed sounds curious, but plenty of hypotheses that were once dismissed as wacky have been accepted as science on the back of sound data. The respectable face of chiropractic could thus have defended itself with respectable evidence. The BCA, which had none, chose another way to fight back. It sued Singh for libel.

That didn't look a bad idea at the time. England's defamation laws are notoriously friendly to plaintiffs, who

need not show that an alleged libel is false. The burden of proof lies on the defendant, who must demonstrate his assertion to be true, or a matter of fair comment. The legal costs involved are so steep, often running to hundreds of thousands of pounds, that even defendants who are sure of their facts can be cowed into submission for fear of bankruptcy. With the financial resources to sue, the BCA saw an opportunity to force one of Britain's most vocal and effective critics of alternative medicine to eat his words.

The chiropractors, however, hadn't reckoned on the geeks.

It was an easy mistake to make. People with a passion for science and the critical thinking on which it is founded have never been particularly conspicuous in public life, let alone formed a constituency to be crossed at your peril. Yet something is stirring among those curious kids who always preferred sci-fi to celebrity magazines and chemistry sets to trendy trainers. We've stopped apologizing for our obsession with asking how and why, and we're starting to stand up for ourselves instead.

Drawn together by the social networking power of the internet, geeks have begun to realize that we aren't alone in our world view, but that it's shared by millions. Through vibrant blogs and online forums such as Twitter and Facebook, and through the success of increasingly high-profile figures such as Singh, Brian Cox and Ben Goldacre, we've begun to fight for the value we place on science and evidence-based thinking.

What was once a term of derision has been embraced as a badge of honour, in a surge of geek pride. Armed with new confidence, and the online means to discover one another and spread our message, we are finding a public voice that is proving more powerful than we could possibly have imagined.

The geeks are on the march. The BCA foolishly threw itself in the way.

Even before the chiropractors decided to mess with one of our number, many geeks had become dogged pursuers of homeopaths, anti-vaccine activists, dodgy nutritionists and other purveyors of quackery and pseudoscience. Some geeks are scientists. Some are doctors. Many are neither. All, though, care deeply about the scientific method: the most reliable tool humanity has yet developed for distinguishing truth from falsehood. 'We're rationalists,' as Singh puts it.² 'We aren't necessarily scientists, but we have an affinity for science.'

Geeks take a forensic approach to the evidence behind medical claims, and are strongly committed to unfettered debate. The chiropractors' writ could scarcely have been better calculated to rile us. Legal bullying was shutting down rational argument. No self-respecting geek was going to stand for it.

As news of the lawsuit reached the blogosphere, geeks bearing *noms de plume* such as Gimpy and Zeno, the Quackometer and Adventures in Nonsense rallied to Singh's support. Almost 10,000 people joined a Facebook group started by David Allen Green, a lawyer who blogs as Jack of Kent. Others weighed in on Twitter. Many offered money to finance the defence, which Singh declined. As the bestselling author of *Fermat's Last Theorem*, *Big Bang* and *The Code Book*, he had the means to fight. The question was whether he had the stomach for a legal battle that might effectively become a full-time job for years on end.

It was a battle, too, which evidence alone might be insufficient to win. In May 2009, Mr Justice Eady ruled that, by calling their claims 'bogus',³ Singh had accused the chiropractors of deliberate dishonesty, an implication he never intended and could not really defend. Yet as he weighed up whether or not to settle and apologize, the groundswell of geek support steeled his nerve.

Quacklash

A few days after Mr Justice Eady's 'bogus' ruling, the Penderel's Oak pub in Holborn, central London, thronged with geeks.⁴ Summoned by blogs, Twitter and Facebook, they had come to discuss Singh's options. As supporters who had never met the science writer - let alone one another - shared their indignation, the mood of the meeting grew defiant.

'The reaction was extraordinary,' Singh says.⁵ 'There was a point in May when I was close to caving in. That support was really important. It made me think: "Simon, you're not crazy. You're not the only one who thinks this matters."'

Green agrees that the geeks were crucial. 'No-one would have thought badly of Simon⁶ if he had just brought the case to a halt,' he wrote later on his blog. 'The ever-growing online support helped keep him soldiering on.'

It wasn't just moral support that the geeks had to offer. A devastating counter-attack was soon under way. When the BCA released what it called a 'plethora of evidence'⁷ supporting chiropractic as an effective treatment for childhood ailments such as colic and asthma, a battalion of bloggers demolished every claim within twenty-four hours. If the plaintiffs were to rely on this in court, the defence would have refutations to hand.

Then there was what Green dubbed the 'quacklash'.⁸

Unlike most other alternative therapists, such as homeopaths or reflexologists, chiropractors are regulated in the UK. They must adhere to a set of professional guidelines that include obtaining informed consent from their patients, and they are subject to trading and advertising standards, which do not allow claims that are not supported by evidence.

Bloggers such as Andy Lewis (*the Quackometer*), Simon Perry (*Adventures in Nonsense*) and Alan Hennes (Zeno's

Blog) began to trawl chiropractors' websites for misleading and unsupported medical assertions. They then reported those who appeared to be in breach of regulatory standards. 'I don't think there could be a better use of £75 worth of stamps,' wrote Perry.⁹

There was no shortage of suitable targets. In June 2009, shortly after Mr Justice Eady's preliminary ruling, the General Chiropractic Council received complaints about more than 500 individual practitioners in just twenty-four hours.¹⁰ Chiropractors went into full-blown damage-limitation mode. Lewis got hold of an email from the McTimoney Chiropractic Association urging its members to take down their websites¹¹ and 'to remove any patient information leaflets of your own that state you treat whiplash, colic or other childhood problems in your clinic'. These, of course, were the very claims Singh had questioned to prompt the BCA's writ.

By resorting to law, the back-crackers inflicted terrible self-harm. In trying to silence a critic, the BCA invited unprecedented scrutiny of the evidence base for its techniques. Newspapers that hadn't covered the original lawsuit gleefully reported the quacklash and the threat to free speech. There was suddenly a news hook for articles examining the questionable claims made for chiropractic, and the Kafkaesque anachronisms of English libel law.

Even were the BCA to win at trial, damage to the reputation it sued to protect would reach a different scale to anything inflicted by Singh's original column. But the victory was to be Singh's. In April 2010, the Court of Appeal overturned Mr Justice Eady's ruling in a withering judgment,¹² and the chiropractors dropped their case. Singh's supporters celebrated on their blogs and on Twitter by posting: 'The BCA happily promotes bogus treatments.' One in four British chiropractors was under investigation by regulators at the time.¹³

Geek activism had helped Singh to win a seminal case, which established an important legal precedent that should protect other scientists and writers. ‘Scientific controversies must be settled by the methods of science rather than by the methods of litigation,’ the judgment noted.¹⁴ But the campaign achieved something else besides, focusing public attention on the chilling effect of English libel law on public discourse.

The libel action turned Singh – well known for a science writer but hardly a household name – into a cause *célèbre*. He became a symbol of free speech and principled skepticism,¹⁵ [fm1](#) championed by celebrities such as Ricky Gervais and Stephen Fry. Galvanized by the packed public meeting at the Penderel’s Oak, Tracey Brown and Sile Lane, of the charity Sense About Science, began a ‘Keep Libel Laws Out of Science¹⁶’ petition, soon to carry 20,000 names. Out of that grew a wider campaign for libel reform which is now starting to bear fruit.

The narrow aversion of a serious injustice, which still left a vindicated Singh £60,000 out of pocket because of legal costs he could not recover,¹⁷ offered convincing evidence that libel law had become a serious threat to free expression. Labour, the Liberal Democrats and the Conservatives all pledged to support reform in their 2010 election manifestos. In May 2012, the day before this book was first published in the UK, the Conservative–Liberal Democrat coalition introduced a defamation bill, which will force libel claimants to demonstrate ‘serious harm’, offer protection to academic publications, and improve the defence of ‘honest opinion’. As this edition of *The Geek Manifesto* went to press, the Government was considering proposals with all-party support to create a strong new public interest defence as well.

Journalists, human rights activists and some lawyers had been complaining for years about the iniquities of English libel law, to little effect. A bunch of geeks, led by a brave

and resourceful figurehead in Singh, provided the catalyst for change.

The value of science

The Singh case was a victory for an emerging force with the potential to change politics and society for the better, which has slowly begun to gather strength over the past half decade. Fed up with being marginalized, and mustered by new media, the geeks are coming. Our countries need us.

Libel law is far from the only arena of public life that could use our influence. The majority of the most pressing contemporary problems would be a little more tractable if our leaders were to listen more carefully to what geeks have to say. From drugs to climate change, from education to the economy, the scientific approach that we champion has more to contribute to effective public policy than most politicians and civil servants have hitherto acknowledged.

As those of us who care deeply about science and its experimental method start to fight for our beliefs, geeks have a historic opportunity to embed critical thinking more deeply in the political process. But if we are to achieve anything, we need to turn our numbers and confidence into political muscle.

The Geek Manifesto seeks to define this challenge and to suggest how we can rise to it. It will explain how and why politics lets science down and fails to exploit its powerful approach to evidence in pursuit of effective policy. Above all, it will explore how geeks can turn our irrepressible energy and analytical rigour into a movement with real clout – how we can move on from railing against science abuse and begin to prevent it.

This isn't a traditional manifesto in the sense of a laundry list of policy prescriptions. When it does make detailed proposals, it is on the understanding that not all

geeks will agree. Science thrives because it is always open to new ideas, so long as they can survive skeptical scrutiny, and this burgeoning movement should likewise draw strength from diversity and criticism. The manifesto's aim is to win your broad support for its central proposition: that a more scientific approach to problem-solving is applicable to a surprisingly wide range of political issues, and that ignoring it disadvantages us all. Precisely what politicians think is less important than how they think.

Precisely what politicians think is less important than how they think

Most of our leaders believe science is one of two things. It is a collection of facts, a body of knowledge about the world that can be taught and learned, such as gravity, evolution or photosynthesis. Or it is the technology that is the fruit of that knowledge: the computers, vaccines and aeroplanes that change the way we live.

Neither is wrong, but as geeks appreciate, science is something else besides. 'Science is more than a body of knowledge,' said Carl Sagan,¹⁸ the great astronomer and popularizer of science. 'It is a way of thinking.' In the metaphor of the skeptical writer Michael Shermer, it is not a noun but a verb.¹⁹ It is something people do, a method like no other for establishing how the world works. You have an idea, then you gather the soundest possible evidence against which to evaluate it. If the data allow, your idea can be tentatively accepted. If not, it must be set aside.

Science is provisional, always open to revision in the light of new evidence: it is comfortable with changing your mind, indeed it often insists on it. It is anti-authoritarian: anybody can contribute, and anybody can be wrong. It makes testable predictions and then seeks actively to test

them. Over time, it is self-correcting, because of the importance it places on trying to prove the most elegant ideas wrong. It is comfortable with uncertainty, knowing that even its best answers will simply be better approximations of the truth.

This scientific method is not perfect by any stretch: scholars of 'science studies' have shown effectively that the idealized picture presented in the last paragraph is rarely quite fulfilled in practice. Individual scientists are people, with prejudices, motives and values, and they make mistakes. What sets their approach to thinking apart is that they are aware of these limitations, and try to compensate for them by taking a skeptical attitude even to cherished and beautiful ideas – not least because they appreciate that if they fail to test them properly, somebody else certainly will. 'Science is a way of trying not to fool yourself,' explained Richard Feynman,²⁰ the Nobel prize-winning physicist. 'The first principle is that you must not fool yourself, and you are the easiest person to fool.'

This embedded self-criticism makes science, to paraphrase Sir Winston Churchill, the worst means of discovery, excepting all the others that have been tried from time to time. Its power, however, is too often confined to an intellectual ghetto: those disciplines that have historically been considered to be 'scientific'. Though this method of inquiry has great things to contribute to all sorts of pursuits beyond the laboratory, it remains missing in action from far too much of public life.

Its absence matters more than ever because, as John Holdren, President Obama's chief science adviser, explains:²¹ 'more and more of the public policy issues that are before [us] ... have science and technology content'. If we are to stand a chance of containing global warming, the solutions will rely on understanding the atmospheric effects of greenhouse gases, the technologies that can generate clean energy and the psychology of behaviour change. If we

are properly to exploit advances in genetics and neuroscience to deliver better healthcare, and to spend national resources on the drugs and therapies that are most beneficial to patients, science will be central.

As a source of innovation and business ideas, science is a foundation stone of growth. It is vital to economies like Britain's and America's, which cannot compete on labour costs with China, India and Brazil. Food security, drugs control, forensic investigations, pandemics: the list of policy questions that require politicians to be intelligent consumers of science is as long as your arm.

It's actually hard to think of an issue to which science is irrelevant. When Sir David King was the chief scientific adviser to Tony Blair's government,²² he challenged senior civil servants to suggest an area of public policy in which science didn't matter. One mandarin from the Department for Work and Pensions piped up to claim that his whole portfolio could do without it. The challenges this department faces over the next half century will be defined by Britain's ageing population. Yet a senior official within it felt that science had nothing worthwhile to contribute.

Science matters when it has amassed good evidence that defines a policy challenge, such as climate change, and the effects that different solutions might have. In many ways, it matters still more when the evidence base is weak and questions are more open. If ministers want to know how best to teach children to read, or how best to rehabilitate drugs offenders, they can use the methods of science to find out.

Even when a challenge is so urgent that there is no time to wait for research, ministers can at least ensure that the policy solution is properly evaluated so that lessons can be learned from its successes and shortcomings. Policy decisions aren't the last word, but they are the start of experiments that could and should be mined for evidence that can be used to make better choices in future.

It's true that you can't study schools or prisons by setting up a controlled experiment in a laboratory, but neither can you recreate the Big Bang or re-run human evolution in a test tube to watch how they happened. Politics asks tough questions of our leaders, but science provides a great tool for answering them. If it can help us to understand the first microseconds of creation and the descent of man, the scientific method can surely improve understanding of how best to tackle the pressing social questions of our time. Teaching techniques, sentencing policies, policing strategies: all could be investigated with this tool to establish whether they work. All too often they are not, leaving everybody uncertain about their worth.

This value of science, however, is seldom grasped either by the ministers, advisers and officials who take the decisions that shape everybody's lives or by opinion-formers in the media and think-tanks to whom they typically listen. The privileged place of the humanities and their graduates in politics, the media and public intellectual life, famously identified by C. P. Snow in his 'Two Cultures' lecture of 1959,²³ is still a serious issue today. There are fifty-five US senators with law degrees - more than half the Senate's membership. None has a PhD in the natural sciences, and only one, Chris Coons of Delaware, has an undergraduate science degree.²⁴ The UK's 650 MPs include just three with science PhDs, only one of whom, Julian Huppert of Cambridge, has worked in research.²⁵

You don't have to be a trained scientist to understand what science has to offer. Several of the most effective recent British science ministers, such as Lord Sainsbury of Turville and the present incumbent, David Willetts, are humanities graduates, as are backbench champions such as Phil Willis, who adeptly chaired the House of Commons Science and Technology Select Committee for many years. Their presence, though, is insufficient to compensate for

heavy under-representation of one of the most important professions in our society.

Politics suffers accordingly. As we will see, too few of our leaders understand either the conditions science needs to thrive or the powerful contribution it can make to policy-making. They see science as an optional extra, to be used when it suits an agenda and to be ignored when it does not. And they do this in large part because we let them. Science isn't a voting issue. Abusing and undervaluing it carries no political cost.

It doesn't have to be that way. Fortunately, there's an increasingly vibrant community out there with the potential to form that constituency and to create that political cost. I'm talking about the geeks.

The age of the geek

There has never been a better time to be a geek. Poorly served for years by the mainstream media and entertainment, we are demanding, and getting, more and more attention - in popular culture if not yet in politics. Proper geeks are becoming proper celebrities, with an impact and reach that stretches well beyond their core audiences. Whisper it, but being a geek is becoming cool.

Professor Brian Cox has brought rock-star cool to physics, turning entropy and relativity into mainstream Sunday-evening television entertainment. His *Wonders of the Solar System* and *Wonders of the Universe* programmes have topped BBC2's ratings²⁶ with well over 3 million weekly viewers. His sex appeal, irreverence and boyish enthusiasm have made him a coveted guest on popular talk shows that allow him to reach a completely new audience. Jonathan Ross even presented him with a model of the Large Hadron Collider made of sex toys, bringing new meaning to his catchphrase 'And that's why I love physics.'

Cox is a geek who wears the label with pride. Many people know that he used to play keyboards in D:Ream, the band whose anthem 'Things Can Only Get Better' was memorably used by New Labour in the 1997 general election. Fewer know that he was a teenage bus-spotter. 'I liked the Class 51 that Greater Manchester used to have,' he told Hugo Rifkind of *The Times*.²⁷ 'I used to write down the numbers. But I went from that to being basically, well, going to clubs and listening to music, and being in a band within a year. But I was always into the science. It was always a part of my psyche.'

Ben Goldacre is another self-proclaimed geek who has become a champion of his tribe. The targets of his 'Bad Science' column²⁸ in the *Guardian* - the mail-order PhD nutritionist Gillian McKeith, manipulative drug companies and scaremongering journalists - have enraged geeks for years. Goldacre gave this outrage a media voice. His *Bad Science* book was a bestseller, shifting more than 300,000 copies in the UK alone.²⁹ Goldacre's take-no-prisoners approach has inspired hundreds of other geeks to start blogging in similar fashion, exposing quackery and pseudoscience wherever they find it. Anybody who plays fast and loose with the evidence must now live in fear of being 'Goldacred' - whether by Goldacre himself or by one of his many confederates.

On stage and television, many of Britain's most successful comedians confess to geeky stirrings. Dara O'Briain is a physics graduate who peppers his routine with jokes about homeopathy.³⁰ Ben Miller, of the Armstrong and Miller double act, started a PhD in quantum physics before his comedy career took off. Tim Minchin, the comic pianist, performs a nine-minute beat poem called 'Storm':³¹ a diatribe aimed at a new-ager spouting pseudoscientific nonsense at a chattering-class dinner party.

Then there's Robin Ince, who as well as reading Feynman and Sagan in his gigs - and describing Simon

Singh's antagonists as 'spine wizards' - has become a geek impresario. He co-hosts with Cox *The Infinite Monkey Cage*, the award-winning Radio 4 programme that blends science with comedy, and has brought a similar fusion to the stage. Ince's *The School for Gifted Children*, *Nine Lessons and Carols for Godless People* and *Uncaged Monkeys* mix comedy from the likes of O'Briain and Minchin with short, sharp, thought-provoking presentations by Cox, Singh and Richard Dawkins. In December 2009, a capacity crowd of 3,600 filled the Hammersmith Apollo for the *Nine Lessons*. O'Briain opened his headline slot with a cry of: 'Welcome to Nerdstock!'

The success of Nerdstock caught Ince completely by surprise. 'People were waiting for something like this,' he says.³² 'It's all about what I'd call the rise of the new geeks. The shame is disappearing. It's been building for ten years. People like Brian and Ben are proper geeks, but they're cool enough to have that wider appeal. Brian might be a polished presenter, but start talking to him about physics or science funding, and he's a proper geek all right.'

It was the enthusiasm of confirmed geeks that made these shows work in the first place, but they're now breaking out beyond this core market. 'It's about reigniting a passion for science that might have got lost somewhere in people's secondary education,' says Ince. 'I get people coming up to me after gigs to ask what they should read by Sagan and Feynman. I get mums saying they listen to the *Monkey Cage* with their children on the way back from school. This stuff reaches a huge audience, which might not get it any other way.'

A growing public appetite for live science doesn't end with the funny stuff. Science festivals are going from strength to strength. The Cheltenham Science Festival, first staged in 2002, sold more than 30,000 tickets in 2011,³³ with another 12,000 people attending free events. Cambridge, Nottingham, Edinburgh and Brighton are just a

few of the cities that stage similar events. New York's World Science Festival, founded in 2008, attracts hundreds of thousands of people.³⁴ The Amazing Meeting, an annual celebration of science and skepticism founded by the magician and quackbuster James Randi, sells out in hours in both Britain and the United States.

Online social networking has allowed geeks to find more people of like mind, and to meet each other in the flesh and form real communities. Dozens of British towns and cities now have branches of Skeptics in the Pub (SiTP),³⁵ which hold debates and discussions about science and critical thinking. 'There is an ever expanding army of geeks and the wonderful thing about it is its somewhat anarchic nature,' says David Colquhoun,³⁶ Professor of Pharmacology at University College London and an SiTP regular. 'No organization, no hierarchy, just a collection of people with similar ideas, trying to improve things in their spare time. It doesn't matter how old you are (15 to, ahem, 75), or how many letters you have after your name, you can take part on equal footing.'

There is a huge community out there with a strong affinity for things scientific and an interest in contributing to the world. 'We are entering the age of the geek,' Cox told the *Sunday Times*.³⁷ 'The science scene - or maybe we should call it the rational thought scene - is definitely developing. It's cool these days to actually think. My optimistic hope is that it will become very cool to really think about things ... rather than do reactive bullshit based on no knowledge.'

A political challenge

If we want to make sure things can only get better, this growing cultural confidence isn't enough. The geek awakening needs to spawn a political movement - a popular force that nobody running for office feels they can

safely ignore, and that the shrewder ones will want to appeal to and exploit.

There is an analogy here, if an imperfect one, with what groups like Stonewall have done for gay rights. A respect for science is obviously very different from sexual orientation, and we shouldn't imagine that geeks are the victims of discrimination and hate in the same way that homosexuals have been. But gay politics has none the less achieved something important that we can seek to emulate. It has changed perceptions, making casual homophobia or even indifference to gay rights unacceptable among people who seek office in Britain. Politicians know that if they fail to engage with the gay community, and fail to develop coherent positions on the issues that concern them, they risk punishment at the ballot box.

If we can do that for science, we will have made an outstanding start. Too few people who care about science make it a deciding factor at the ballot box. Geeks, like gays, will always weigh all sorts of issues when we vote. But science must be one of them.

The numbers are with us. The Campaign for Science and Engineering estimates that more than 3 million people in Britain have some sort of science background:³⁸ a relevant degree, or a job in a research-intensive industry such as pharmaceuticals or IT. That amounts to about 7 per cent of the electorate, or almost as many voters as all the ethnic minorities put together.³⁹ In the US, the National Science Foundation counts at least 5.5 million working scientists and engineers,⁴⁰ to say nothing of others with a broader scientific education or career. Add in their families, and the many lay people who value science, and there is a vast constituency waiting to be tapped.

We're moving in the right direction. Geek activism helped to swing the Singh case and to force libel reform on to the political agenda. When UK science funding was threatened in the 2010 spending review, clever lobbying

and a grassroots petition turned mooted cuts of 30 per cent into a spending freeze. When Professor David Nutt was sacked in 2009 as the government's chief drugs adviser for questioning evidence for classification decisions on cannabis and ecstasy, ministers were taken aback by the scale of the geek backlash and changed the rules by which they consider scientific advice. An appetite for political science is there.

These have been real achievements, which demonstrate how geeky voices, raised in the right way, can make a difference. But there is so much more to be done. If geeks are finally starting to show up on politicians' radar, we remain little more than a blip. We must learn from these campaigns, and take them much further.

There's a real opportunity here. If we get things right, we have the chance to create a constituency that politicians not only have to notice, but one they actually want to attract. Before the 2010 general election, David Cameron, Gordon Brown and Nick Clegg did everything they could to engage with Mumsnet,⁴¹ the spectacularly popular and increasingly influential website for mothers. Its success is a good model for geeks: mums don't agree on everything in politics any more than geeks do, but they have a set of broadly common values. It isn't too much to hope that future candidates for prime minister or president might be equally keen to court the geek vote.

Let's make that happen. Let's create a political cost for failing science. Politics has had it too easy for too long. It's time for a geek revolution.

⁴¹ British geeks generally prefer the American spelling 'skeptic' and 'skepticism', with a k instead of a c, when it's used to describe an allegiance to rationalism and science. This distinguishes such skeptics from sceptics who don't really found their doubts on science, such as climate sceptics.



GEEKING THE VOTE

Why science matters to politics

ON THE EVENING of 14 October 2009, David Tredinnick got to his feet in the House of Commons¹ to open a debate. The Conservative MP for Bosworth, in Leicestershire, was desperately worried that the Health Minister, Gillian Merron, had overlooked a grave threat to the wellbeing of the public. The object of his concern wasn't pandemic flu, or air pollution, or childhood obesity. It was the moon.

'At certain phases of the moon there are more accidents,' he gravely informed the House. 'Surgeons will not operate because blood clotting is not effective, and the police have to put more people on the streets.' It wasn't the first time he had raised the subject in Parliament. Back in 2001, Tredinnick told the Commons² that 'science has worked out that pregnancy, hangovers and visits to one's GP may be affected by the awesome power of the moon', and quoted a newspaper report suggesting that arson attacks double when the moon is full.

He stopped short of mentioning werewolves, but you probably don't need to be told that their existence is about as well supported by science as his other claims.

So convinced is Tredinnick of the political significance of the movements of the heavens that he charged the

taxpayer £755.33 for astrology software³ and consultancy services (which he later repaid when his expense claim became public). His commitment to the lunatic fringe of science does not end there: he is an assiduous promoter of just about every alternative medicine on the market, and recently asked the Health Secretary to congratulate homeopathic chemists on their contribution to containing swine flu.⁴

It's tempting to think of Tredinnick as little more than a harmless eccentric, with opinions so far outside the mainstream that they carry very little influence. Would that this were so. In the summer of 2010, his fellow Conservative MPs elected him to a seat on the House of Commons Health Select Committee. Yes, a man who genuinely appears to believe that surgeons prefer not to operate when the moon is full, and who has called on the Department of Health to be 'very open to the idea of energy transfers⁵ and the people who work in that sphere', is now among the eleven politicians tasked with holding that department to account.

He isn't alone. Serving alongside Tredinnick on the health committee we find Nadine Dorries, a Tory MP who likes to promote an urban myth about a twenty-one-week foetus grasping a surgeon's finger⁶ - repeatedly denied by the surgeon - to support her demand for restricting abortion.

Neither is a fondness for pseudoscience confined to the backbenches. Peter Hain, a long-serving minister in the governments of Tony Blair and Gordon Brown, convinced himself that homeopathy cured his son's eczema, and promoted alternative medicine from a position of power.⁷ Anne Milton, a current Conservative Health Minister, cites her grandmother's experience as a homeopathic nurse in support of NHS funding of alternative medicine.⁸

In the United States, weird views about the findings and importance of science straddle party boundaries in similar

fashion. At a House of Representatives hearing in 2007 on the Intergovernmental Panel on Climate Change's most recent report, Dana Rohrabacher, a Republican congressman from California, took issue with conventional explanations for sharp global warming in prehistoric times.⁹ 'We don't know what these other cycles were caused by in the past,' he said. 'Could be dinosaur flatulence, you know, or who knows?' When Tom Coburn, an Oklahoma senator and medical doctor, asserted that 'condoms do not prevent most STDs',¹⁰ his reward was to be appointed by President Bush to the chairmanship of an HIV advisory group.

Tom Harkin, the influential Democratic senator for Iowa, convinced that his allergies were cured by a supplement known as bee pollen,¹¹ secured the creation of the US National Center for Complementary and Alternative Medicine, which wastes about \$130 million a year on studies of what you might call bogus therapies.¹² Gary Goodyear, Canada's Science Minister, is a chiropractor who in 2009 refused to say whether he believed in evolution,¹³ telling a journalist from Toronto's *Globe and Mail*: 'I'm not going to answer that question. I am a Christian, and I don't think anybody asking a question about my religion is appropriate.'

Houses of indifference

We'll meet many of these characters again later, in [Chapter 8](#) and [9](#). But, thankfully, they're not all that typical of politicians. The level of scientific misunderstanding they show, which sometimes borders on outright hostility to science and its methods, lies at the extreme end of the spectrum. Yet the very fact that they have been able to succeed in politics despite such opinions, and to rise to positions of considerable power and influence, is indicative of the value that politics places on science. Too few

politicians even recognize the absurdity of their views. Tredinnick and Dorries aren't figures of fun who lack the respect of their colleagues: they were *elected* to the select committee where their unscientific positions have the potential to do most damage.

If mercifully few politicians are actively anti-science, many are indifferent to it. They often lack an understanding and appreciation both of basic scientific concepts and language and, more importantly, of its robust approach to developing reliable knowledge. Many are simply uninterested. In the last House of Commons the Conservatives regularly failed to fill all their allocated seats on the Science and Technology Committee and at the time of writing two of Labour's seats stand vacant. One has remained unfilled for more than a year.

In his famous 'Two Cultures' lecture of 1959, C. P. Snow posed a challenge:¹⁴ 'A good many times I have been present at gatherings of people who, by the standards of the traditional culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of scientists,' he said. 'Once or twice I have been provoked and have asked the company how many of them could describe the Second Law of Thermodynamics. The response was cold: it was also negative. Yet I was asking something which is the scientific equivalent of: *Have you read a work of Shakespeare's?*

'I now believe that if I had asked an even simpler question - such as, What do you mean by mass, or acceleration, which is the scientific equivalent of saying, *Can you read?* - not more than one in ten of the highly educated would have felt that I was speaking the same language. So the great edifice of modern physics goes up, and the majority of the cleverest people in the western world have about as much insight into it as their neolithic ancestors would have had.'

Were Snow's challenge to be repeated today in Parliament or Congress, it is hard to believe that more than one in ten members could rise to it. Few politicians have even a firm appreciation of the methods of inquiry that revealed the Second Law of Thermodynamics in the first place. That in large part reflects the backgrounds of the men and women who are elected to office.

There are 650 MPs in the House of Commons. Some 158 have a background in business and ninety were political advisers or organizers.¹⁵ There are eighty-six lawyers, and thirty-eight journalists and publishers. These professions bring valuable perspectives, but another one is all but missing. A solitary MP - Julian Huppert, the Liberal Democrat member for Cambridge - worked as a research scientist before beginning his political career. Only two of his colleagues even have science PhDs: Stella Creasy, the Labour MP for Walthamstow, in psychology, and Therese Coffey, the Conservative MP for Suffolk Coastal, in chemistry.

The wider scientific credentials of the House of Commons are decidedly weak too. An analysis by *The Times* after the 2010 general election¹⁶ identified only about seventy MPs who had shown any consistent interest in the subject at all. The higher up you go on the political food chain, the worse this representation of science gets. Only one of the twenty-three members of the current Cabinet has a science background: Vince Cable, the Business Secretary, read natural sciences at university (though he switched to economics). In the previous Labour Cabinet, John Denham and Margaret Beckett were the only science graduates.

The situation is no better in the US,¹⁷ where the current House of Representatives includes among its 435 members just one physicist, one chemist, one microbiologist and six engineers. Another sixteen congressmen are medical doctors, and there are two psychologists, two dentists, a

veterinarian and an ophthalmologist. There are no research scientists or engineers at all in the Senate, and just two medical doctors, a vet and an ophthalmologist. Lawyers make up 38 per cent of the House and 55 per cent of the Senate.

There are, of course, some politicians without academic training in science, medicine and engineering who have a geek's affinity for what they have to offer. David Willetts, the UK's current Science Minister, a philosophy, politics and economics graduate, is a good example, as is Phil Willis, a former history teacher who became an effective chairman of the Commons Science and Technology Committee. Henry Waxman, the California congressman, a lawyer and political science graduate, is another politician who effectively champions science and its methods.

The more normal attitude of politicians drawn from law, business and the humanities, however, is studied indifference. Before the last election, Adam Afriyie, then the Tory Shadow Science Minister, pledged to hold compulsory science seminars¹⁸ for new Conservative MPs as part of their induction course. When the Parliamentary Office for Science and Technology held such a session, open to all parties, it had become optional and barely a dozen MPs turned up.¹⁹ The sparse attendance included people like Huppert, who least need insight into how science can help them to do their jobs. Even MPs who profess an interest sometimes do so out of lip service. A recent participant in the Royal Society's pairing scheme, which links scientists and politicians, repeatedly forgot his pair's name and described him as 'the work experience²⁰'.

David Cameron took eighteen months after becoming prime minister to make a major speech about science and technology. When three UK scientists won Nobel Prizes in 2010, he omitted to congratulate them.²¹ Tony Blair extolled science in a speech to the Royal Society in 2002, but he had been five years in Downing Street before he got