

BBC

SCIENCE & TECHNOLOGY

FOCUS

WIRELESS SPEAKERS
Which are the best?

WILL WE EVER END CANCER?



Nano racers
The first ever competition for molecular cars

Are we becoming more violent?

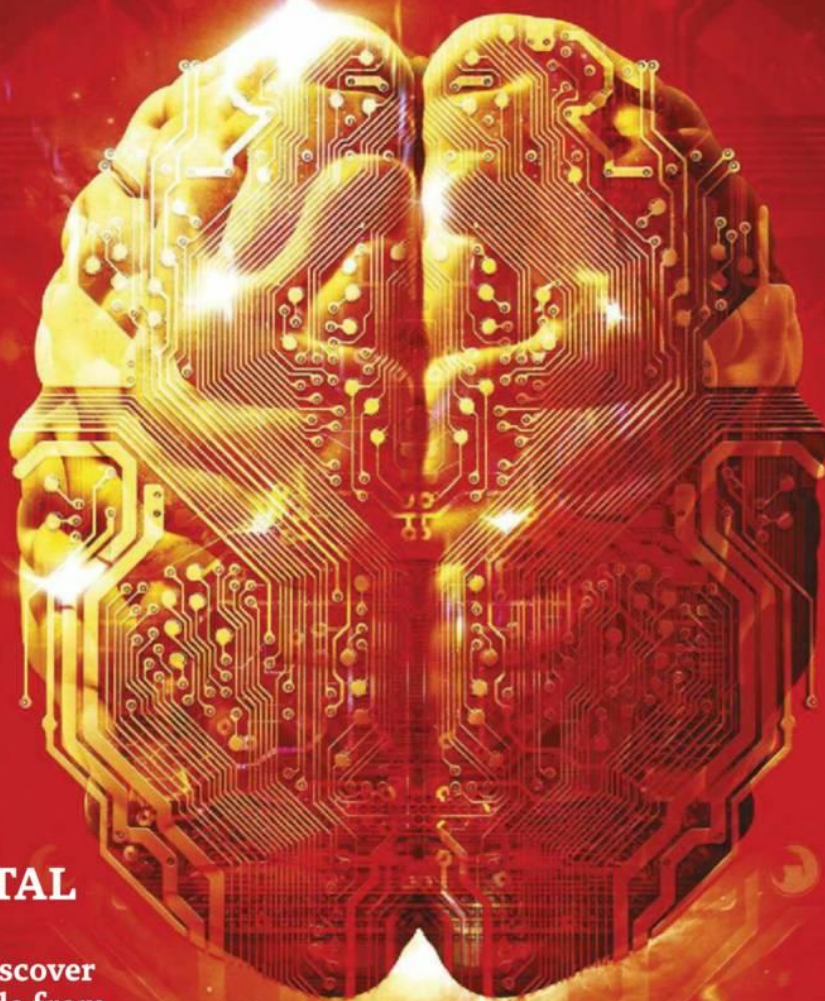
HOW TECHNOLOGY IS REWIRING YOUR BRAIN

Q&A

Why do joints crack?

Who owns the Moon?

How do Inuits get their five-a-day?



UNDERSTAND

FUNDAMENTAL PARTICLES

How we came to discover what matter is made from

WHY DOGS ARE BETTER THAN CATS

Sorry, Tiddles, science has spoken



#300 | £4.50 NOVEMBER 2016
sciencefocus.com



Dogs don't feel guilty, they're just pretending → p60

WELCOME



The eagle-eyed among you might have noticed that this is our 300th issue. A quick back-of-the-envelope calculation tells me that I've worked on the magazine for almost 30 per cent of its life (that's 83 issues, just in case you're wondering).

So, in my time on the magazine, what have I learned? Off the top of my head: space smells like rotten eggs and astronauts can't burp aboard the International Space

Station. Sea lions have the best rhythm in the animal kingdom and cows can predict earthquakes better than humans can. Water can be sticky *and* slippery and a good sneeze can travel up to eight metres away from the source. And finally, no one *really* knows what dark matter is.

I could go on, but I suspect many of you have been on this journey of discovery with me. So all I really want to say is thank you. Thank you to you, the tens of thousands of readers whose undying curiosity has driven you to buy our magazine and keep our post bags stuffed full of brilliant questions for the last 25 years. Without you, there would be no *BBC Focus*, so please get in touch and let us know what you think about the magazine and what you'd like to see us cover in the future. Here's to the next 300 issues!

Enjoy the issue.

Daniel Bennett

Daniel Bennett, Editor

IN THIS ISSUE



DR JOHN BRADSHAW
John is a visiting fellow at the University of Bristol's School of Veterinary Sciences, where he studies cat and dog behaviour. This month, he finds out if our pet pooches can make us healthier and happier. → p56



JO CARLOWE
Freelance journalist Jo has a particular interest in health, psychology and well-being. In this issue, she takes a look at whether our modern addiction to technology could be meddling with our minds. → p38



DR DAVID HAMMOND
With conflict in Syria and Iraq, and terrorism in Europe, it can be depressing to turn on the news. But are we really getting more violent? War expert David explores the evidence. → p76

WHAT WE'VE FOUND OUT THIS MONTH

200km-high water jets leap out of the surface of Europa, one of Jupiter's moons → p15



A messy desk could be a sign that you're a creative genius → p112

Monkeys can write Shakespeare → p23



Caffeine levels in your body halve every six hours → p98

CONTACT US

- ➔ **Advertising**
neil.lloyd@immediate.co.uk
0117 300 8276
- ➔ **Letters for publication**
reply@sciencefocus.com
- ➔ **Editorial enquiries**
editorialenquiries@sciencefocus.com
0117 314 7388
- ➔ **Subscriptions**
focus@servicehelpline.co.uk
0844 844 0257*
- ➔ **Other contacts**
sciencefocus.com/contact

WANT MORE BBC FOCUS?

- FOLLOW SCIENCEFOCUS
- FACEBOOK
 - TWITTER
 - PINTEREST
 - YOUTUBE

Are we becoming more violent?

WITH THE CONFLICT IN SYRIA, TERRORIST ATTACKS IN FRANCE AND RACIAL TENSIONS IN THE USA, IT'S EASY TO THINK WE'RE BECOMING MORE VIOLENT. BUT DO THE STATS PAINT A DIFFERENT PICTURE?

WORDS: DR DAVID HAMMOND

David is a senior research fellow at the Institute for Economics and Peace. His research areas include the drivers of peace and conflict, terrorism and counter-terrorism, and assessment of state risk.

W

e are living in the most peaceful time in human history, at least according to the acclaimed book *The Better Angels Of Our Nature*, written by eminent psychologist Steven Pinker. Through analysis of historical estimates, Pinker details how common violence was in our past. Back then there were clans, witch trials and crusades to contend with. Today, evidence suggests that the developed world has never had to worry less about violence.

To account for this, Pinker describes the process of civilisation. The evolution of national governments allowed the emergence of fair and consistent trade.

But 9/11, the War on Terror and ongoing conflicts in Syria and Iraq demonstrate that violence is far from a bygone problem. The United Nations High Commissioner for Refugees (UNHCR) estimates that 65 million people are now forcibly displaced because of violence, which is the highest number since WWII.

The Global Terrorism Index 2015 showed that deaths from terrorism have increased ninefold since the year 2000.

So this is the most peaceful time in history, yet there are also recent trends in violence. And it is this juxtaposition that leads to a surprisingly statistical debate.

MYTHS AND TRENDS

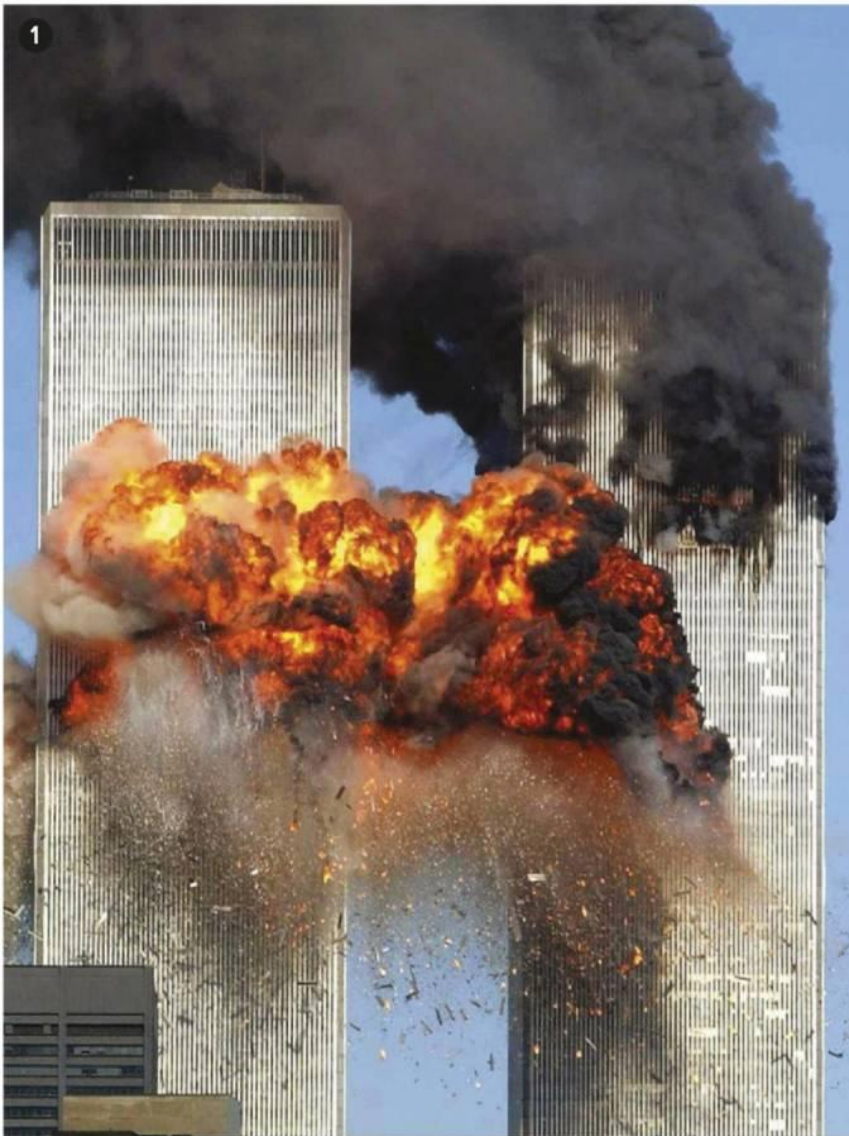
First, some good news: violence is rare. Lewis Fry Richardson, a Durham meteorologist turned conflict analyst, estimated that only 1.6 per cent of people died at the hands of another between 1820 and 1945. Sociologist Randall Collins suggests that, contrary to popular belief, humans generally do not find violence easy. Most bar fights

end once one person makes contact with another and rarely escalate into the all-out brawls of Hollywood. In WWII it is estimated that as few as 15 to 25 per cent of soldiers actually fired upon the enemy when being fired upon themselves. Fear, it seems, became incapacitating. Many troops reported simply 'firing in the air' lest being branded a coward. In general, Collins suggests that people require intense social pressure to resort to violence at all. Furthermore, in an age where individualism is stronger than patriotism, armed forces are finding recruitment a challenge, and finding popular support for war is increasingly difficult.

Pinker's work demonstrates violence has declined in recent decades. Homicide rates, estimates of rape, domestic violence and even wars all appear to be falling. But a lot has happened since the publication of Pinker's book in 2011. The Global Peace Index, a measure of 23 indicators ranging from interpersonal violence to terrorism to international conflict, shows that the world is less peaceful than it was 10 years ago. Civil wars continue in Syria and Iraq. Terrorist attacks in Europe have increased since January 2015 when two brothers forced themselves into the offices of the French satirical paper *Charlie Hebdo*, killing 11 people with assault rifles. While homicide rates in the US have halved since 1995, mass shootings in 2015 killed 205 people, around five times as many than 2014. In the UK, violent crime has been on the increase since 2013 with reported hate crime increasing by 42 per cent after Brexit on 13 June 2016.

On an international level there are also ominous signs. The Doomsday Clock, which is compiled by the *Bulletin Of The Atomic Scientists*, estimates how close we are to global disaster from threats posed by climate change, deteriorating international relations and nuclear weapons. In 2015 the clock was set at three minutes to disaster, the worst assessment since 1984 when US and Russian relations were at their worst. And the list of instabilities that could be the prelude to an escalation of violence is long. The 2014 Russian annexation of Crimea and ongoing conflict in ●

Conflict analyst Lewis Fry Richardson estimated that 1.6 per cent of people have died at the hands of another



1

1 From a statistical angle, some analysts say terrorist attacks behave like earthquakes, with many smaller events leading to a catastrophic one like 9/11

2 Following the attack on French satirical paper *Charlie Hebdo* in early 2015, terrorism in Europe has increased

3 Modern conflicts tend to be domestic in nature, but are no less violent for citizens such as these pro-government fighters in Iraq

4 As of 2015, the Doomsday Clock has sat at three minutes to midnight, the closest to disaster since 1984



2



3



4

PHOTOS: GETTY X3, ALAMY



ABOVE: During WWII, it is estimated that as few as 15 per cent of soldiers actually fired upon the enemy

BELOW: Modern drones can perform strikes remotely; could this make pulling the trigger easier?



PHOTO: GETTY X2

• Ukraine has tested post-Cold War relations, exacerbated by the shooting down of a Russian plane by Turkey in 2015. This year, over 52,000 people have been detained or arrested in the aftermath of the failed military coup that took place in Turkey on 15 July.

Elsewhere, on the 12 July, tensions heightened between China and the rest of the world after Beijing refused to accept the international tribunal in The Hague that ruled in favour of the Philippines in territorial disputes over the South China Sea.

THE STATISTICS OF VIOLENCE

To understand the arguments regarding whether we are becoming less violent, it is useful to consider a simple yet seemingly unrelated analogy: a sandpile. As sand falls it naturally forms a conical structure. Pour some more sand into the middle and it piles up higher and higher. Now imagine you add sand grains in a slow and controlled manner to a fully formed sandpile. Each grain falls and then comes to rest somewhere along the slope where friction balances gravity. This happens for many grains of sand, but eventually a single grain falls that causes one side of the pile to collapse, displacing a lot of sand in its wake. While simple, the forces and interactions taking place between the sand grains in the pile are difficult to

model accurately and the effect of any single grain has to be treated as random.

First described in 1987 by the fathers of complexity theory, Per Bak, Chao Tang and Kurt Wiesenfeld, the randomness of the sandpile is strikingly similar to other phenomena. There are many grains of sand that have little effect but there is an occasional grain that has a major impact. In mathematical terms, this randomness can follow something called a 'power law'. Here, there are many small, low impact events and the occasional highly consequential event. In 2005, Aaron Clauset and Maxwell Young, computer scientists from the Santa Fe Institute,

showed that terrorism followed the same statistical patterns of earthquakes, with many small attacks and infrequent but devastating events such as 9/11.

To illustrate, scale is useful. The United Nations Office of Drugs and Crime estimated that in 2012, almost 500,000 people were killed by homicide. The Global Terrorism Index shows that almost 33,000 people were killed by terrorism in 2014. According to the Uppsala Conflict Database, deaths from violent conflict in 2015 totalled 118,435. The World Health Organization estimates of 800,000 deaths by suicide every year. So, given the current global population of 7.4 billion, the mortality rate from all of these disparate forms of violence is around 20 people per 100,000. By contrast, WWII killed 60 million people in a worldwide population of 2.3 billion, an annual mean rate of over 435 people per 100,000. In absolute average terms, WWII killed as many individuals every seven weeks as we would expect today in one year of violence. When violence follows power laws, extremes need to be prioritised.

While patterns of violence provide interesting analogues with other phenomena, it is also disconcerting: in power laws it is not as unlikely to see an event bigger than the biggest on record. This is true for earthquakes, and may be true for violence.

But is violence really like earthquakes just because the numbers look alike? Philosopher John Gray is sceptical of the ability of statistics to capture the true nature of violence, as it's a topic that requires understanding of history, politics, economics, sociology and even psychology. While care certainly needs to be taken when interpreting statistics on violence, it is also true that the world is a complex system, and complex systems occasionally produce unpredictable results. Like the one grain of sand that causes an avalanche in the sandpile, no one could have predicted that Gavrilo Princip's opportunistic assassination of Archduke Franz Ferdinand would spark WWI.

But randomness doesn't mean that the odds can't change over time. So when it comes to violence, is there any evidence that the world is changing the odds toward peace?

THE LONG PEACE

The absence of large scale conflicts between superpowers in the post-WWII period has been described by eminent war historian John Gaddis as •

On average, WWII killed as many individuals every seven weeks as we would expect today in one year of violence

Controversial presidential candidate Donald Trump has claimed that the UN, which promotes international cooperation, is ineffective



PHOTO: GETTY

Donald Trump, running on a campaign of border protection, recently suggested that NATO is obsolete

• the 'Long Peace'. The frequency of wars between countries has plummeted since 1945: the battles fought today are largely domestic in nature. Even today, nuclear weapons have only been used twice in warfare, despite tensions surrounding the Cold War. In a world in which military technology is capable of total annihilation of our species, humanity has so far managed to avoid Armageddon.

In light of this, in 2011 Pinker asked the obvious question: has something changed? There are clear developments in the post-WWII period that could account for the decline in violence. Democracy has continued to spread across the world. The emergence of the United Nations has offered new avenues of diplomacy and has enshrined the principle of sovereignty of state and borders. The use of chemical, biological and nuclear weapons have become an international taboo. The European Coal and Steel Community opened up markets for trade and eventually led to the European Union, offering an example of the benefits that come with regional integration. Meanwhile, across the Atlantic, civil rights movement represented a turning point in race relations in the US.

While recognising that the Long Peace may not be a perpetual peace, Pinker offers the theory that the

post-WWII period has shifted from a game where countries conquer or be conquered, to a more cooperative system where war will only occur when the benefits outweigh the costs.

JUST LUCK?

However, as many experts have pointed out, there may be alternate explanations for the data. For example, Tanisha Fazal, associate professor of political science and peace studies at Indiana's University of Notre Dame, highlights that the reason that fewer people are dying in wars may be because there have been advancements in medical treatments over the years. The Long Peace could also just be a

run of luck in the power law nature of violence. In books such as *The Black Swan*, statistician and risk analyst Nassim Taleb has famously written extensively on the follies of projecting future trends from past data. In his work with probability expert Pasquale Cirillo, Taleb shows that the expected time between wars with at least five million casualties is 93 years. Taleb and Cirillo's work suggest that, when violence is dominated by extremes, it is too early to say with statistical confidence that the world has shifted towards peace only 71 years after WWII.

CURRENT CLIMATE




So is the fact that the world is less peaceful than it was 10 years ago a statistical fluctuation or something more serious? Well, almost 50 years after the civil rights movement in the US, the current Black Lives Matter protests show that tensions surrounding race issues remain. The EU project was dealt an unexpected blow with the Brexit referendum. In the current US presidential election, Donald Trump, running on a campaign of border protection, recently suggested that NATO is obsolete and that the UN was ineffective. The factors that Pinker ascribes as central to the Long Peace seem to be under attack.

But there are good reasons not to get despondent. In a 2013 interview, US politician Donald Rumsfeld explained a simple truth: "belief in the inevitability of conflict can become one of its main causes".

It is easy to focus on negatives, but the Global Peace Index shows that there is good news in the world. While wars continue, the most peaceful countries continue to become more and more peaceful. So it is fitting to finish this article with the insightful observation of Steven Pinker: "Instead of asking 'why is there war?' we might ask 'why is there peace?' We can obsess not just over what we have been doing wrong but also what we have been doing right".

There are undoubtedly challenges to face, but the post-WWII period has more than enough 'rights' to enable us to face them. 🗳️

DISCOVER MORE

   Listen to an episode of *The Life Scientific* with psychologist Steven Pinker at bbc.in/2cMRhwR

 Watch an episode of *Panorama* about the Islamic State terrorist attacks in Europe at bbc.in/2cctCai