

SCIENCE FOCUS  
MARTIN WILLIAMS

# Volcanoes, where you can hear the earth scream

These dramatic formations are the most vivid reminder that our planet is a work in progress

Roaming across a satellite crater of Tangkuban Perahu – the ‘Upside Down Boat’ volcano in west Java, Indonesia – gives some inkling of the awesome power in the earth beneath. It’s a primeval place, an expanse of yellowish and sullen red rock forming a gently sloping depression amid jungle. Steam rises from a perpetually boiling spring, hot sulphurous gases emerge from vents.

The larger, main crater is above. Here, a column of steamy gases surges skywards, thrust from an opening at such pressure that, even from some 200 metres above, it sounds like a powerful waterfall. A road leads to the rim, where a path passes simple cafes and souvenir stalls. Hundreds of visitors arrive during the morning, as if this is as safe as a regular tourist spot.

Yet the volcano is dangerous, subject to phreatic eruptions in which water superheats to become steam that blasts rock apart. Just weeks after my visit, a phreatic eruption created a plume of ash that covered the car park, and closed the volcano to visitors. In May, a more violent phreatic eruption killed five climbers on the Mayon volcano, in the Philippines. Phreatic eruptions can be hard to predict, but increased ash coupled to seismic activity before the latest one at Tangkuban Perahu did lead to a

months, the ground was too hot to walk on. Few plants grew among the rubble.

Bamboo stalls had been erected, as simple stores and cafes for visitors. At one, a lady showed a photo of her former home – a bucolic-looking farmhouse set in lush greenery. ‘Now, my home is seven metres under this place,’ she said.

During our visit, torrential rain began to fall, turning streams into brown torrents and creating another danger on volcanoes: lahar, or mud flows resulting from fresh ash being easily eroded. As our jeep crossed a narrow bridge, the raging stream ripped a spur of land away. Later, a news report told of a man who had been collecting ash in a streambed who failed to get to safety in time. He was swept to his death in waters so powerful they also carried his truck downstream.

Indonesia has at least 76 active volcanoes, more than any other country. This results from it spanning junctions between four tectonic plates – immense sheets in the earth’s crust. One of these, the Indo-Australian Plate, dives beneath the Eurasian Plate. As the rock is pushed deeper, it melts to become magma, which rises through fissures to form volcanoes running east from Sumatra, through Java to Bali and beyond.

The area that is now Hong Kong lay along a plate boundary during the late Jurassic and early Cretaceous, leading to several episodes of volcanic activity.

These culminated in the collapse of the High Island Supervolcano, releasing 1,300 cubic kilometres of ash – roughly 130 times the volume of material erupted by the Philippines’ Mount Pinatubo in 1991. Much of the hot ash welded together to form tuff, with impressive columnar joints you can see today at places like the southeast Sai Kung Peninsula, and islands including the Ninepines.

‘Supervolcano’ is not a rigorous geological term, but is applied to volcanoes capable of massive eruptions. About 50 supereruptions have been identified, with High Island among 11 that ejected more than 1,000 cubic kilometres of material. More recently examples include Mount Toba in Indonesia, which erupted about 70,000 years ago, leaving a layer of ash across South Asia. There is a theory that this killed so many people that it caused a bottleneck in human evolution, though several researchers dispute this.

Yellowstone in the US is surely the world’s best-known supervolcano, thanks partly to science fiction tales envisaging a devastating modern eruption, and media articles such as a CNN article describing it as a ‘geological time bomb’. The latter suggested that ‘after the initial eruption, clouds of gas and rock would burn everything in its [sic] path,’ and that ‘ashfall would cover the western US and enter the jet stream with the potential to cripple air transportation and threaten the world’s food supply’.

But don’t get too alarmed: as 2012 approached – and you may remember there were notions this was the last year of the Mayan calendar, so a cataclysm would impact the earth – NASA pointed out that supervolcanoes erupted only about 1.4 times every million years.

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Tourist stalls on the rim of Tangkuban Perahu. Photo: Martin Williams

TECHNOLOGY



# CODE THIS: GIRLS HAVE A BIG FUTURE IN TECH

For all of IT’s hip modernity, programming is a male-dominated realm. Now HK female coders are encouraging more girls to follow their lead

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Priyanka Kogta has already decided her future. The 16-year-old will study computer science at a ‘US, Canadian or Hong Kong’ university, learn to code and land a job at Google. The reason? ‘Because technology is going to take over the world one day, and programming is the basics,’ she said.

Kogta is not alone in her ambition. In 2008, a group of female Google engineers in Israel decided to tackle this disparity and launched an initiative called MindTheGap, organising trips to the Google HQ for young girls and encouraging them to pursue more typically right-brain subjects as maths, science and technology. Twitter followed suit with its Women in Engineering group, saying ‘we want there to be more women who pursue careers in this field’. And in 2010, Reshma Saujani, a former New York hedge fund lawyer who ran for Congress, albeit unsuccessfully, founded Girls Can Code, a now global movement sponsored by Twitter, Google and eBay that runs workshops aiming at getting girls hooked on programming.

The initiative arrived in Hong Kong last weekend, in partnership with the Women’s Entrepreneurs Online team, also a Google pursuit. At an ‘app jamming’ session in Tin Hau, Kogta and 30 other girls gave up their Saturday to learn the languages of fallen-over ‘Vs’, where a misplaced comma can bring a website down.

The workshop was structured on a curriculum developed for Stanford University and taught by Michelle Sun, a former Goldman Sachs banker who was a student at one of the first-ever wom-

en-only programming boot camps in San Francisco.

‘I always liked maths and science, but the thought never crossed my mind to study computer science,’ the University of Chicago economics graduate said. ‘It was only when I started working with firms like 10 Cent and Alibaba at Goldman that I realised how technology could change people’s lives.’

Of the 30 young girls from schools around Hong Kong learning to code at Sun’s event, most are studying technology – even if they remain in a gender minority in the classroom. Minnie Yip Ming-yuen, a 15-year-old pupil at the Diocesan Girls School, for whom mastering languages like CSS and Java could be as important as being fluent in Mandarin in the job market, has taken programming lessons at school. She believes it is becoming less surprising for women to



Jennifer Barba and Michelle Sun

## There are few female role models for the younger generation

ADRIANA GASCOIGNE, WOMEN IN TECH

be interested in coding. ‘I would love to make an app that changes people’s lives,’ she says.

While the apps created at Girls Can Code events are basic – for example, the morning was spent on an app that lets a user pat a kitten on the head – Sun, a self-taught coder, says the idea of such events is to inspire girls to look for resources elsewhere so they don’t fall behind their male counterparts who are historically more prone to spend free time in front of a computer screen.

In his TedTalk, MIT Media lab professor Mitch Resnick urged children and young adults to move from being mere users of technology to become creators. New York Mayor Michael Bloomberg made learning to code his 2012 new year’s resolution, in Estonia all first-graders are taught programming, while in Britain, the debate over whether Java should join maths on the syllabus still rages.

But information technology remains a male-dominated field. Two-thirds of all engineering jobs in the United States today are filled by men. Women account for just 6 per cent of chief executives in the top 100 US tech companies but make up 31 per cent of the IT workforce.

Resnick highlights the wealth of free learning resources. One programme geared towards engaging women is called Girl, Develop It, a non-profit organisation with online workshops in Java, PHP, Ruby and Rails, Python and Android; while Code School, Treehouse and Computer Clubhouse are less gender-specific resources, Black Girls Code targets African-American women.

Kary Ho, a web developer at a digital marketing start-up in Hong Kong who is fluent in XHTML, CSS, jQuery, ajax and PHP, says the desire to find and utilise such resources is the mark of a good coder. ‘Learning from the internet is almost a must for

programmers, one to three hours per day, at least, even once you’re qualified.’ Ho studied computer engineering at the Institution of Vocational Education in Sha Tin where, she says, her course of 40 had just three other girls.

She believes the lone nature of the job can put women off.

‘Programmers always work on their own, even when in a team,’ Ho said. ‘They work without any social communication and rely on documents or instruction guides to study and understand their work. Women tend to want to interact more.’

Despite this, Adriana Gascoigne believes women can thrive in such roles. The former Los Angeles advertising executive founded Women In Tech in 2007, while working for a YouTube-esque start-up called GUBA. What began as a regular event in San Francisco now has 38 chapters around the world from Kuwait to Japan, with 9,000 members.

Gascoigne’s events aim to connect like-minded women. ‘The best products are built by teams made of diverse sets of individuals,’ she said. ‘Men have dominated to date because tech companies have not done a good job of making recruitment of women a priority. There are few female role models to show the younger generation the ropes.’

While role models are scarce, Jennifer Barba, founder of Pretty-Booked.com, an online resource for making beauty appointments in Hong Kong, says they are out there. She cites Natalie Massenet, founder of online shopping site Net-a-Porter, as her inspiration.

Sun agrees. She holds up Marissa Mayer as proof of female potential. Now chief executive of Yahoo, Mayer was the first woman engineer hired at Google in 1999 and the brain behind the crisp look of the famous search bar. ‘When you think about how many people use that search bar every day, it’s mind blowing. What a beautiful design.’

# Studies on animals are often ‘biased’

Researchers say brain disorder therapies first tested on animals often fail in human trials

Agence France-Presse

Medical research that uses animals to test therapies for human brain disorders is often biased, claiming positive results and then failing in human trials, US researchers said.

The findings by Stanford University researchers may help explain why many treatments that appear to work in animals do not succeed in humans. Bias also wasted money and could harm patients in clinical trials, said the study in *PLOS Biology*.

Researchers examined 160 previously published meta-analyses of 1,411 animal studies on potential treatments for multiple sclerosis, stroke, Parkinson’s disease, Alzheimer’s disease and spinal cord injury, all done on more than 4,000 animals.

Just eight showed evidence of strong, statistically significant associations using evidence from more than 500 animals.

Only two seemed to lead to ‘convincing’ data in randomised controlled trials in humans, it said. The rest showed a range of problems, from poor study design, to small size, to an overarching tendency towards publishing only studies in which positive effects could be reported.

Statistically, just 919 of the studies could be expected to show positive results, but almost twice as many – 1,719 – claimed to be positive.

‘The literature of animal studies on neurological disorders is probably subject to considerable bias,’ the paper concluded. ‘Biases in animal experiments may result in biologically inert or even harmful substances being

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The number of papers based on animal studies in the medical PubMed database



taken forward to clinical trials, thus exposing patients to unnecessary risk and wasting scarce research funds.’

Animal studies make up a ‘considerable portion’ of biomedical literature, with some five million papers in the medical PubMed database, it said.

While animal research existed to test safety and efficacy before new treatments were tried in humans, most interventions failed when they reached human clinical trials, the researchers said. They said the bias probably originated when scientists conducting the studies chose a way of analysing the data that appeared to give a better result.

Solutions may include stricter guidelines for study design and analysis, pre-registration of studies so that the results must be published whether positive or negative, and making raw data available to other scientists.

SHORT SCIENCE

## Plant-eating dinosaurs could grow new teeth

Long-necked plant-grazing dinosaurs that roamed the earth 150 million years ago evolved a nifty way of fixing broken teeth. They just grew new ones, a US study said last week. Scientists analysed fossils of two of the largest herbivores to have lived in North America – diplodocus and camarasaurus – and found they grew fresh smiles every six weeks or so. They carried several spares, much like human adult teeth that descend after baby teeth fall out, researchers said in the journal *PLOS One*. ‘A nearly [30-metre] sauropod would have had a fresh tooth in each position about every one to two

months, sometimes less,’ researcher Michael D’Ermic from New York’s Stony Brook University said. AFP

## Obesity gene makes you hungry for more

Researchers have further unravelled how a version of a gene linked to obesity risk causes people to gain weight – it makes them more likely to feel hungry after a meal and to prefer high-calorie foods. The study, published in the *Journal of Clinical Investigation*, found that individuals who inherited the high-risk version of the FTO gene from both of their parents had higher levels of the appetite-

stimulating hormone ghrelin in their bloodstream, which leaves them hungry even after eating. Real-time brain imaging also revealed that the FTO gene regulated the brain’s responses to ghrelin and to images of food. But exactly how FTO affects appetite and weight gain remains a mystery. Researchers hypothesised that gut hormones that regulated appetite and the brain’s responses might be the missing link. The study marked the first examination of how FTO variation regulated ghrelin and led to obesity, study co-author Rachel Batterham from University College London said. Batterham’s group recruited 359 healthy, normal-weight European men. Forty-five had two copies of the



A study shows why some people are always hungry. Photo: Reuters

obesity-risk version of FTO, while the rest had the low-risk variant.

## Wetsuit tipped to hide swimmers from sharks

An Australian research firm has launched what is touted as the world’s first anti-shark wetsuit, using new discoveries about the predators’ eyesight to stake off or evade an attack. Working in conjunction with the University

of Western Australia’s Oceans Institute, entrepreneurs Hamish Jolly and Craig Anderson developed two lines of wetsuit designed to protect divers and surfers from sharks. ‘It’s based on new breakthrough science which is all about visionary systems for predatory sharks,’ Anderson said. ‘We’ve been able to interpret that science and convert that into, basically, materials that create some confusion for sharks’ visual systems.’ The blue-and-white ‘Elude’ range, designed for divers and snorkellers, used research findings about sharks’ perceptions of light and colour blindness to essentially ‘hide you in the water column’, Anderson said. AFP