



An eruption in Indonesia may have caused the bad weather that brought Napoleon down





attack may have been caused by the volcanic eruption of Mount Tambora, in Indonesia, just two months earlier. As records of 1815 are sparse, Genge examined the records of another eruption in Indonesia in 1883 and concluded that it may be reasonable to believe that Mount Tambora had contributed to Napoleon's downfall.

Napoleon escaped from the



recorded in June 1815 was on account of the Mount Tambura eruption. What we do have is systematic data at the time of the 1883 Krakatau (Indonesia) eruption, of nearly comparable intensity. The study by Genge in *Geology* examines the mechanics of the rise of volcanic ash into the atmosphere following an eruption. It has so far been understood that the ash, which rises as high as 50 km, would not rise above the stratosphere and into the upper reaches of the atmosphere, because the stratosphere acts as a barrier, the study says. The stratosphere is where the falling of temperature with increase in the altitude, which we see in the lower atmosphere, is replaced by rising of temperature with altitude, in the upper atmosphere. Convectiondriven elevation of volcanic dust is hence not likely to go beyond the stratosphere and eruptions would have little effect on the upper atmosphere.

However, the study says, there is evidence that eruptions create high electric charges, which can lead to non-thermal forces to levitate charged ash particles. "Electrostatic interaction between charged volcanic ash particles and plumes having a net charge of the same polarity will unavoidably cause levitation of particles," the study says. And "large explosive eruptions could, therefore, have a significant effect on the global electrical circuit," the study says. "Global suppression of cloud formation would be likely to increase atmospheric H2O content, thus in the immediate aftermath of supervolcano eruptions, recovery of the ionosphere and resumption of normal cloud formation may result in enhanced cloud cover and precipitation," the study says. After the 1883, Krakatau eruption, the study says, there was a dip in the temperature and the lowest rainfall recorded was while the eruption lasted. Records of the start of the effects of aerosols, as opposed to charged volcanic ash, also show that the aerosols arrived a good time later. This would partly tally with the events of 1815, where there was an unseasonal rise in rainfall two months after the eruption. While it continued, aerosol dominated effects came later. The study says that there are no records to evaluate the effect of electrostatic levitation of ash in the 1815 event but concludes that this must be so because of the records of increased rainfall. It would not really be valid, hence, to conclude that the increased rainfall is connected with the eruption, when we are linking suppression and recovery of cloud formation due to levitation of ash with the reports of high rainfall. There is, however, as the study says, the possibility that the events are linked.



PLUS POINTS We are to blame



Traffic noise may make birds age more quickly than is natural, scientists have found. A study on zebra finches suggested those exposed to the sounds of road vehicles were less protected from damage linked with ageing. Previous research has concluded that urban birds have shorter lifespans than their rural counterparts, and academics believe high levels of artificial noise may play a role.

Researchers at the Max Planck Institute for Ornithology in Germany and North Dakota State University investigated the effect of traffic noise on the length of the telomere — caps on the ends of chromosomes that protect genes from damage — of offspring zebra finches, a species native to Australia. Shorter telomeres indicate accelerated biological ageing.

The study, published in *Frontiers in* Zoology, said that zebra finches exposed to traffic noise after they had left the nest had shorter telomeres at 120 days old even than those exposed to noise before they had left the nest and whose parents were exposed to traffic noise during courtship, egg-laying, and nesting. Finches exposed to noise after leaving the nest also had shorter telomeres than those that had not been exposed to traffic noise at all. Adriana Dorado-Correa, co-author of the study, said, "Our study suggests that urban noise alone, independent from the many other aspects of city life, such as light pollution or chemical pollution, is associated with increased telomere loss and may contribute to ageing in zebra finches. Co-author Sue Anne Zollinger said, "It may be important to consider developmental stages in birds when studying the effects of urbanisation, as the mechanisms by which these human-induced habitat changes impact individuals may change throughout their lifetime." The authors suggested that the time between 18 to 120 days after hatching is a critical period during which birds are more affected by noise. This period is when zebra finches begin learning songs, which may make them more sensitive to noise. By contrast, birds may be less sensitive to noise while still in the nest, and parent birds may be able to make behavioural changes to protect offspring from the negative effects of noise exposure, the researchers said.

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he history of the battle of Waterloo, where Britain's Lord Willington and his Prussian ally defeated Napoleon, is well recorded. Apart from some errors in generalship on the part of the French, it is believed that it was bad weather during the days of the battle that turned its course against the French.

Matthew J Genge from Imperial College and the Natural History Museum, London writes in *Geology*, the journal of the Geological Society of America, that the unseasonal rain that affected the timing of the French

island of Elba with just a few hundred followers on 26 February 1815. But by 20 March, he was master of France and had an army of two divisions. The Prussians, Austrians, Russians and the British had come together against him. As they could not guess where Napoleon would attack, their forces were spread out.

Waterloo is in modern day Belgium, then part of the Dutch Kingdom. Anglo-Dutch forces, under Wellington, were stationed on the western border of Belgium and Prussian (German) forces, under Blücher, were in eastern Belgium. Napoleon decided to engage these two forces before they could get together, with others, to invade France. On 15 June, Napoleon was able to beat the Prussians back and he sent a force under Marshal Ney to deal with the Anglo-Dutch. But there appears to have been indecision on the part of the French commander, and delay in the deployment, which gave the Prussians time to rally to the aid of the Anglo-Dutch.

The battle of Waterloo took place on 18 June 1815. It was a horrific battle and 47,000 men died. And, although Wellington was victorious, he described it as "the nearest-run thing you ever saw in your life". Many commentators believe that unseasonal rain during 16 and 17 June induced the French to delay the engagement till the ground dried. Dry ground may not have been equally helpful to the enemy, as the French were clearly superior, but the lapse of time allowed the enemy to regroup. A commentator of Victor Hugo, in *Les Misérables*, observes, "Had it not rained on the night of 17 June, the future of Europe would have been different ...an unseasonably clouded sky sufficed to bring about the collapse of a World."

Dennis Wheeler and Gaston Demarée of the University of Sunderland, UK, and Koninklijk Meteorologisch Institut van België, Belgium, had studied scattered records, which had mentioned the weather. On the strength of those, and entries in individual diaries, they concluded, in a paper in the journal of the Royal Meteorological Society, in 2005, that there had been an unexpected thunderstorm on the night of 17 June and that

was one factor that led to Napoleon's defeat. As regards the effect of the Indonesian eruption of April 1815, they note that it was in 1816, which was "a year without a summer", that the major effect of the eruption was manifest. Mount Tambora is volcano that is in Sumbawa, one of the islands in Indonesia. The eruption of April 1815 was the most devastating ever recorded. The climax was on 10 April but release of vapours and ash, and smaller eruptions, continued for the next six months. The volcanic ash spread and brought down temperatures worldwide. The following year, 1816 — as a fallout — is recorded as the second coldest year in the Northern Hemisphere since 1400. The effects were outbreak of disease, frost, rainfall, worldwide and even the Indi-

an monsoon was affected. There is very little data available to say whether the climate changes

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The independent

Liver drug for Alzheimer's



A drug, which has been used to treat liver disease for decades, could help to restore cells damaged by Alzheimer's, a new study has found.

The pioneering study, funded by Alzheimer's Research UK, discovered the drug ursodeoxycholic acid improves mitochondrial dysfunction, which is known to be a causative factor for both sporadic and familial Alzheimer's disease.

Mitochondrial abnormalities have been identified in many cell types in Alzheimer's disease, with deficits occurring before the development of the classical pathological aggregations. The energy changes have been found in many different cells from people with Alzheimer's. It is thought they are one of the earliest changes to occur in the brain cells, perhaps even before symptoms are reported by people living with the disease. Heather Mortiboys, Parkinson's UK Senior Research Fellow at the University of Sheffield's Institute of Translational Neuroscience, who led the study, said, "Most importantly we found the drug to be active in cells from people with the most common type of the devastating disease — sporadic Alzheimer's — which could mean it has potential for thousands of patients." The research also found the drug changed the shape of mitochondria by redistributing Dynamin-related protein 1 to the mitochondria in people with Alzheimer's skin cells. Drp1 is a regulator of mitochondrial shape and locates at the mitochondria to initiate fission events. It is thought this could have neuro-protective effects in Alzheimer's disease. This study suggests this pathway could be manipulated by drugs which are then neuro-protective in patients themselves. The new research was published in the Journal of Molecular Biology.

Propagating gender biases

Children's science books reveal women are significantly underrepresented, and with these books having the ability to advertise career choices, women need to be present to demonstrate that all science subjects are fulfilling for girls

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skyoung children what they want to be when they grow up and chances are that scientific jobs such as astronaut and doctor will appear high on the list. But ask them to draw a scientist and they are more than twice as likely to draw a man than a woman. Children can form these kinds of biases from many sources. But perhaps we shouldn't be too surprised to see such an absence of women scientists in children's drawings when the illustrations we show them are often just as bad. Our study of imagery in children's science books reveals that women are significantly underrepresented. In the physical sciences in particular, the pictures frequently fail to communicate women's technical skills or knowledge. The imagery in these books gives the impression that science is a subject for men, and that careers in science, technology, engineering and maths – abbreviated as Stem – are unrewarding for women. Developmental theories explain that children learn gender expectations to help them to respond appropriately within their social environment. This influences their understanding of who they are and encourages them to behave in a way that is conventional for their gender.

"rules" about the occupations suited to each gender. This encourages them to conform to prevailing gender career stereotypes. To counter this, female role models need to be visible in books to help develop girls' interest in science as they get older, and overcome negacourageous women who have performed spacewalks, including astronaut Sunita Williams whose image is used in the montage. As Williams's face is covered by her helmet and the text only mentions men, it would be easy for children to think that women don't do spacewalks.

On the pages of another book, we do see a female astronaut, pictured floating inside a space station and smiling at the camera. The qualifications and experience required to get astronauts to this point are extensive. Places on Nasa's astronaut training programme are highly competitive with thousands of applications each year. But in the book, the woman's training, expertise and knowledge are not mentioned.

Instead, the picture caption reads, "In zero G, every day is a bad hair day.' Comments like this that focus on women's looks fail to take their contributions seriously. What's more, research shows that emphasising appearance in science role models can reduce schoolgirls' self-rated ability or make scientific jobs seem unobtainable to them. Our study also found important differences between subject disciplines. In physics books, 87 per cent of images were of men or boys; and in the few pictures where female astronauts were pictured, they were never shown driving shuttles, doing experiments or spacewalking. Books about biology, in contrast, did have an even balance of images of men and women - and female doctors are shown carrying out the same activities and having the same status as male doctors. You might think that imagery isn't important, that the messages in pictures or illustrations are trivial. A multibillion pound advertising industry disagrees with you. Advertising rarely provides detailed arguments for products or services but this doesn't make its messages less powerful. Instead, adverts rely on persuasion through peripheral cues, such as by exemplifying appealing lifestyles and using



Pictures of men and women in children's science books contribute to these expectations by teaching them



Our research analysed the children's science picture books in two public libraries in England. First we counted the frequency of images of men, women, boys and girls within the 160 available books. Then we did a detailed visual analysis of two scientific professions – astronauts and doctors. In this subset of 26 books, we examined what the male and female astronauts and doctors were doing, wearing and holding in the pictures.

We found that, overall, children's science books pictured males three times more often than females, and reinforcing the stereotype that science is a man's pursuit. The under-representation of females only worsened as the target age of the book increased. The women were generally depicted as passive, lower status and unskilled — or their presence was not acknowledged at all. For example, one children's book about space exploration shows what's involved in a spacewalk. Along with pictures of astronauts in their white padded spacesuits, we are told, "Without a spacesuit an astronaut's blood would boil and his body would blow apart." The use of male pronouns suggests the person in the suit is male.

There is no mention of the 11

imagery depicting the rewards of status or respect.

In the same way, children's books advertise career choices, and their imagery communicates what it means for men and women to be associated with these occupations. Women need to be present in children's science books to demonstrate that all science subjects are fulfilling for girls.

Research shows that, even before children go to school, they have the idea that men are better at male-dominated professions. Given that girls as young as eight are often put off maths and science by teachers and parents, it is perhaps no surprise that only 20 per cent of A-level students taking physics are female. Interviews with successful female scientists have shown that girls do seek out role models in science, but are often unable to find them.

As such, it's vital that imagery in children's books is given greater consideration. Book editors and illustrators need to make significant efforts to represent women as qualified, skillful and technically able.

They need to be pictured actively engaging in scientific activities and using appropriate tools or equipment, not merely present as assistants or observers. Women also need to be represented in greater numbers so that girls can see female role models in Stem professions and see these careers as potentially rewarding.

Parents, teachers and librarians – along with authors, illustrators and publishers – should review their books for gendered messages. Question what the images are teaching children and ask what career aspirations the books might be igniting or quashing.

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