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At the best of times, we who live in northern Europe feel the longing that Keats felt for the warm south, or Goethe for 'das Land, wo die Zitronen blühen'. They may have yearned the more strongly because the teens of the nineteenth century were not the best of times. Not by a long way.

In fact, the world's weather had fallen sick. In Europe and North America, 1816 was called 'the year without a summer'. No doubt the phrase had its equivalent in all the other languages of the northern hemisphere. Snow fell at mid-summer in New England. Eskimos journeyed as far south as the coasts of England. Those crops not killed by deep, late frosts were stunted for want of sun or blighted by the moulds and mildews that thrived in the dim, incessantly rainy months that should have been summer. There was famine in Ireland, as there would be again thirty years later, but in 1816 the Irish were not a special case. The great hunger extended all the way to China with its familiar companions, typhus and cholera. Millions died.

It was the year that Byron wrote his poem 'Darkness':

I had a dream, which was not all a dream.
The bright sun was extinguish'd, and the stars
Did wander darkling in the eternal space,
Rayless, and pathless, and the icy earth
Swung blind and blackening in the moonless air;

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Morn came and went – and came, and brought no day,
And men forgot their passions in the dread
Of this their desolation; and all hearts
Were chill'd into a selfish prayer for light.

It was the year, too, of the famous gathering at Villa Diodati, on the shores of Lake Geneva, when, as a way of passing the time indoors, the weather being so rotten, Byron suggested a competition to see who could come up with the best tale about things ghostly and macabre. Byron's personal physician, Polidori, produced and later published *The Vampyre*, working up a discarded suggestion of Byron's and laying the foundation not so much of a literary genre as of a whole entertainment industry. (When first published it was thought to be by Byron himself. For what it's worth, Goethe thought it was the best thing he'd written.) Given that both Byron and Shelley – each too chary of being outdone – had slacked out of the competition altogether, you would think Polidori's *Vampyre* would have been the outright winner. Of course, he finished a distant second to Mary Shelley's entry, *Frankenstein*, which did not so much found a literary genre as a whole new way of thinking about what it is to be human. It is not coincidental that her story begins and ends in a wintry, ice-bound world.

What was it that had darkened the skies and chilled the world? There was not one cause but several, hideously coinciding. The biggest was a volcanic explosion on the island of Sambawa, east of Bali. Mount Tambora used to be about four thousand metres in height. Since the 11th of April 1815 it has been twelve hundred metres shorter and what is

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left is hollowed into a huge crater. It was the greatest volcanic explosion since the earliest records of human history and one hundred and fifty times more powerful than the 1980 explosion of Mount St Helens in the United States. The sound was heard nearly a thousand miles away. It takes only two weeks for the stratospheric plume of a great eruption to girdle the earth. It takes years for it all to come down again. As it does, it leaves its mark as a dust layer, preserved in the ice sheets of Greenland. Examinations of core samples confirm the historical reports of the magnitude of Tambora's explosion. What they also show is that in 1808 or 1809 there had been another eruption almost as great as Tambora's. What mountain went up and where it was, nobody knows. Astonishingly enough, only two centuries ago, the beaten tracks of mankind left enough of the world untouched for such a thing to pass without report.

Even before Tambora, then, the world was being cooled by a screen of volcanic debris. Between these two great events, there were other, smaller but significant eruptions in the Caribbean. What darkened the skies and quenched the sun was sulphurous ash, whole mountains of it. But even all of this was not the only cause of a cooling world and unpredictable weather.

There may be no point in remarking that what heats the world is the sun. There may, on the other hand, be some point in remembering that warming the earth is not the point of the sun's existence. The sun goes about its own business. It just so happens that fluctuations in its business cycle result in fluctuations in the earth's temperature.

There is the well-known, approximately eleven-year-long,

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cycle in the occurrence of sunspots, those visible whirlpools in the sun's magnetic fields. Sunspots are associated with variations in the amount of energy the sun radiates. Times when there are few sunspots are cooler than times of many. The effect is small but measurable in its effects on earth over the eleven-year cycle. There are much longer cycles and, sometimes, long periods of apparent anomaly in the sun's magnetic activities. These both seem to have a greater influence on earthly weather. From 1645 to 1715, for instance, the sun seems to have been magnetically remarkably lazy. There was no shortage of reliable astronomers observing the sun in the second half of the seventeenth century, and they were seeing few or no sunspots. The nineteenth-century German astronomer Gustav Spörer pulled together observations made between 1672 and 1699 and found fewer than fifty sunspots recorded. To get an idea of how different this is, you only have to know that in a typical thirty-year period of the twentieth century somewhere between forty thousand and fifty thousand spots are likely to have been reported. During the seventy years that this period of minimal solar activity lasted, the weather was terrible. Longer and colder winters were separated by colder, less reliable summers. The growing season in Europe was consistently shortened by one or sometimes two months. The result was chronic shortages punctuated by famines, accompanied by visitations of all the diseases that afflict humanity in such conditions. The period of this solar doze is known to astronomers as the 'Maunder Minimum'. Another sustained period of magnetic laziness in the sun – the 'Dalton Minimum' – was recorded

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between 1795 and the 1820s, coincidentally and almost perfectly matching the years of Shelley's life. It, too, was responsible for a colder, less predictable climate and, by the by, made 1812 a bad year to pick for invading Russia. When Mount Tambora threw its vast mass into the equation, producing even greater effects on the weather than the magnetic quiescence of the sun, it was acutely worsening a climate that was already suffering.

A digression is irresistible. Antonio Stradivari timed his birth well. He was born in 1644 and thus lived and worked through the Maunder Minimum. More to the point, so did the Alpine spruce that he used in making his violins. Cold winters and cool summers mean slow growth, especially so in the north-slope wood that luthiers prefer in their search for tone-woods. A long run of such conditions means growth that is not only slow but also even over the whole life of the tree. The annual rings are close and, from ring to ring, the amount of weak, fast produced, early-season wood is at a minimum compared to strong, late-season wood. The result is spruce with ideal qualities of strength and resonance. The secret of Stradivari and his great contemporaries has nothing to do with mysterious lost recipes for varnish but much to do with the mysterious life of the sun.

Stradivari made more than eleven hundred instruments, so cherished that more than six hundred are still with us. The most illustrious, called 'The Messiah', was made in 1716, at the end of this long phase. It would be interesting to know whether musicians are aware of any special quality in violins made of spruce that grew up, along with Shelley, through the Dalton Minimum. Allowing for seasoning of the

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timber, that would probably mean violins from good makers around 1830. Please let me know.

Whatever the effect might be on musical tone-woods, the compounding of serial volcanic explosions of barely imaginable magnitude with the effects of a long downturn in the solar economy is a sure recipe for rotten weather, and lots of it. When Shelley went to Italy, the screen of dust was thinning and the sun had begun to turn the magnetic corner. Weather in the northern hemisphere, in short, had started to look up. For us children of the north, the hot, bright days and velvet nights of Italy still exercise their seduction. We like the change and we are ready to pay for it. For Shelley's generation it was beyond change. It was a transformation more like alchemy, changing much of life's lead into gold.

For the painter Turner, arriving in Italy a year after Shelley, it's not too much to say the effect was not dissimilar to taking LSD. It had a profound effect on his relations with light and colour. Over two months he made something like twenty-five colour sketches a day, leading to the masterpieces of *San Giorgio Maggiore* and *Looking East from the Giudecca*. The fantastic sunsets that he blazed into paint and that find their way into Shelley's poetry were also products of Tambora's ashes, still in the sky. One of the few unarguably appealing things about Casa Magni was the broad terrace, perched on its strange arcade above the beating waves and offering its vast view to the west. Tambora must still have painted a sunset or two for Shelley.