**Cambridge 15 / Test 1 / Reading Passage 1**

**Nutmeg – a valuable spice**

The nutmeg tree, Myristica fragrans, is a large evergreen tree native to Southeast Asia. Until the late 18th century, it only grew in one place in the world: a small group of islands in the Banda Sea, part of the Moluccas – or Spice Islands – in northeastern Indonesia. The tree is thickly branched with dense foliage of tough, dark green oval leaves, and produces small, yellow, bell-shaped flowers and pale yellow pear-shaped fruits. The fruit is encased in a fleshy husk. When the fruit is ripe, this husk splits into two halves along a ridge running the length of the fruit. Inside is a purple-brown shiny seed, 2-3cm long by about 2cm across, surrounded by a lacy red or crimson covering called an "aril". These are the sources of the two spices nutmeg and mace, the former being produced from the dried seed and the latter from the aril.

Nutmeg was a highly prized and costly ingredient in European cuisine in the Middle Ages, and was used as a flavouring, medicinal, and preservative agent. Throughout this period, the Arabs were the exclusive importers of the spice to Europe. They sold nutmeg for high prices to merchants based in Venice, but they never revealed the exact location of the source of this extremely valuable commodity. The Arab-Venetian dominance of the trade finally ended in 1512, when the Portuguese reached the Banda Islands and began exploiting its precious resources.

Always in danger of competition from neighbouring Spain, the Portuguese began subcontracting their spice distribution to Dutch traders. Profits began to flow into the Netherlands, and the Dutch commercial fleet swiftly grew into one of the largest in the world. The Dutch quietly gained control of most of the shipping and trading of spices in Northern Europe. Then, in 1580, Portugal fell under Spanish rule, and by the end of the 16th century the Dutch found themselves locked out of the market. As prices for pepper, nutmeg, and other spices soared across Europe, they decided to fight back.

In 1602, Dutch merchants founded the VOC, a trading corporation better known as the Dutch East India Company. By 1617, the VOC was the richest commercial operation in the world. The company had 50,000 employees worldwide, with a private army of 30,000 men and a fleet of 200 ships. At the same time, thousands of people across Europe were dying of the plague, a highly contagious and deadly disease. Doctors were desperate for a way to stop the spread of this disease, and they decided nutmeg held the cure. Everybody wanted nutmeg, and many were willing to spare no expense to have it. Nutmeg bought for a few pennies in Indonesia could be sold for 68,000 times its original cost on the streets of London. The only problem was the short supply. And that's where the Dutch found their opportunity.

The Banda Islands were ruled by local sultans who insisted on maintaining a neutral trading position between foreign powers. This allowed them to avoid the presence of Portuguese or Spanish troops on their soil, but it also left them unprotected from other invaders. In 1621, the Dutch arrived and took over. Once securely in control of the Bandas, the Dutch went to work protecting their new investment. They concentrated all nutmeg production into a few easily guarded areas, uprooting and destroying any trees outside the plantation zones. Anyone caught growing a nutmeg seedling or carrying seeds without the proper authority was severely punished. In addition, all exported nutmeg was covered with lime to make sure there was no chance a fertile seed which could be grown elsewhere would leave the islands. There was only one obstacle to Dutch domination. One of the Banda Islands, a sliver of land called Run, only 3km long by less than 1km wide, was under the control of the British. After decades of fighting for control of this tiny island, the Dutch and British arrived at a compromise settlement, the Treaty of Breda, in 1667. Intent on securing their hold over every nutmeg-producing island, the Dutch offered a trade: if the British would give them the island of Run, they would in turn give Britain a distant and much less valuable island in North America. The British agreed. That other island was Manhattan, which is how New Amsterdam became New York. The Dutch now had a monopoly over the nutmeg trade which would last for another century.

Then, in 1770, a Frenchman named Pierre Poivre successfully smuggled nutmeg plants to safety in Mauritius, an island off the coast of Africa. Some of these were later exported to the Caribbean where they thrived, especially on the island of Grenada. Next, in 1778, a volcanic eruption in the Banda region caused a tsunami that wiped out half the nutmeg groves. Finally, in 1809, the British returned to Indonesia and seized the Banda Islands by force. They returned the islands to the Dutch in 1817, but not before transplanting hundreds of nutmeg seedlings to plantations in several locations across southern Asia. The Dutch nutmeg monopoly was over.

Today, nutmeg is grown in Indonesia, the Caribbean, India, Malaysia, Papua New Guinea and Sri Lanka, and world nutmeg production is estimated to average between 10,000 and 12,000 tonnes per year.

**Cambridge 15 / Test 1 / Reading Passage 2**

**Driverless cars**

A

The automotive sector is well used to adapting to automation in manufacturing. The implementation of robotic car manufacture from the 1970s onwards led to significant cost savings and improvements in the reliability and flexibility of vehicle mass production. A new challenge to vehicle production is now on the horizon and, again, it comes from automation. However, this time it is not to do with the manufacturing process, but with the vehicles themselves.

Research projects on vehicle automation are not new. Vehicles with limited self-driving capabilities have been around for more than 50 years, resulting in significant contributions towards driver assistance systems. But since Google announced in 2010 that it had been trialling self-driving cars on the streets of California, progress in the field has quickly gathered pace.

B

There are many reasons why technology is advancing so fast. One frequently cited motive is safety; indeed, research at the UK’s Transport Research Laboratory has demonstrated that more than 90 percent of road collisions involve human error as a contributory factor, and it is the primary cause in the vast majority. Automation may help to reduce the incidence of this.

Another aim is to free the time people spend driving for other purposes. If the vehicle can do some or all of the driving, it may be possible to be productive, to socialise or simply to relax while automation systems have responsibility for safe control of the vehicle. If the vehicle can do the driving, those who are challenged by existing mobility models – such as older or disabled travellers – may be able to enjoy significantly greater travel autonomy.

C

Beyond these direct benefits, we can consider the wider implications for transport and society, and how manufacturing processes might need to respond as a result. At present, the average car spends more than 90 percent of its life parked. Automation means that initiatives for car-sharing become much more viable, particularly in urban areas with significant travel demand. If a significant proportion of the population choose to use shared automated vehicles, mobility demand can be met by far fewer vehicles.

D

The Massachusetts Institute of Technology investigated automated mobility in Singapore, finding that fewer than 30 percent of the vehicles currently used would be required if fully automated car sharing could be implemented. If this is the case, it might mean that we need to manufacture far fewer vehicles to meet demand.

However, the number of trips being taken would probably increase, partly because empty vehicles would have to be moved from one customer to the next.

Modelling work by the University of Michigan Transportation Research Institute suggests automated vehicles might reduce vehicle ownership by 43 percent, but that vehicles’ average annual mileage would double as a result. As a consequence, each vehicle would be used more intensively, and might need replacing sooner. This faster rate of turnover may mean that vehicle production will not necessarily decrease.

E

Automation may prompt other changes in vehicle manufacture. If we move to a model where consumers are tending not to own a single vehicle but to purchase access to a range of vehicles through a mobility provider, drivers will have the freedom to select one that best suits their needs for a particular journey, rather than making a compromise across all their requirements.

Since, for most of the time, most of the seats in most cars are unoccupied, this may boost production of a smaller, more efficient range of vehicles that suit the needs of individuals. Specialised vehicles may then be available for exceptional journeys, such as going on a family camping trip or helping a son or daughter move to university.

F

There are a number of hurdles to overcome in delivering automated vehicles to our roads. These include the technical difficulties in ensuring that the vehicle works reliably in the infinite range of traffic, weather and road situations it might encounter; the regulatory challenges in understanding how liability and enforcement might change when drivers are no longer essential for vehicle operation; and the societal changes that may be required for communities to trust and accept automated vehicles as being a valuable part of the mobility landscape.

G

It’s clear that there are many challenges that need to be addressed but, through robust and targeted research, these can most probably be conquered within the next 10 years. Mobility will change in such potentially significant ways with the technological developments, such as telepresence and virtual reality, that it is hard to make concrete predictions about the future. However, one thing is certain: change is coming, and the need to be flexible in response to this will be vital for those involved in manufacturing the vehicles that will deliver future mobility.

**Cambridge 15 / Test 1 / Reading Passage 3**

**What is exploration?**

We are all explorers. Our desire to discover, and then share that new-found knowledge, is part of what makes us human – indeed, this has played an important part in our success as a species. Long before the first caveman slumped down beside the fire and grunted news that there were plenty of wildebeest over yonder, our ancestors had learnt the value of sending out scouts to investigate the unknown. This questing nature of ours undoubtedly helped our species spread around the globe, just as it nowadays no doubt helps the last nomadic Penan maintain their existence in the depleted forests of Borneo, and a visitor negotiate the subways of New York.

Over the years, we've come to think of explorers as a peculiar breed – different from the rest of us, different from those of us who are merely ‘well travelled’, even; and perhaps there is a type of person more suited to seeking out the new, a type of caveman more inclined to risk venturing out. That, however, doesn't take away from the fact that we all have this enquiring instinct, even today; and that in all sorts of professions – whether artist, marine biologist or astronomer – borders of the unknown are being tested each day.

Thomas Hardy set some of his novels in Egdon Heath, a fictional area of uncultivated land, and used the landscape to suggest the desires and fears of his characters. He is delving into minds – we all recognise because they are common to humanity. This is surely an act of exploration, and into a world as remote as the author chooses. Earlier travel writer Peter Fleming talks of the necessity of leaving the comfort of home in order to test oneself: he felt he was exploring what he was capable of as much as the land he travelled through. He once explained how he loved ones. The explorer of the mind, the author, the scientific researcher – each one, with curiosity and courage and without any of the usual equipage of the explorer with boots and rucksack, suddenly encounters his or her new world. It is the love of finding out that sends us out into the minds of others, or over distant horizons.

In this book about the exploration of the earth's surface, I have confined myself to those whose travels were real and who also aimed at more than personal discovery. But that still left me with another problem: the word ‘explorer’ has become associated with a past era. We think back to a golden age, as if exploration peaked somehow in the 19th century – as if the process of discovery is now on the decline, though the truth is that we have named only one and a half million of this planet's species, and there may be more than 10 million – and that's not including bacteria. We have studied only 5 per cent of the species we know. We have scarcely mapped the ocean floors, and know even less about ourselves; we fully understand the workings of only 10 per cent of our brains.

Here is how some of today's ‘explorers’ define the word. Ran Fiennes, dubbed the ‘greatest living explorer’, said, ‘An explorer is someone who has done something that no human has done before – and also done something scientifically useful.’ Chris Bonington, a leading mountaineer, felt exploration was to be found in the act of physically touching the unknown: ‘You have to have gone somewhere new.’ Then Robin Hanbury-Tenison, a campaigner on behalf of remote so-called ‘tribal’ peoples, said, ‘A traveller simply records information about some far-off world, and reports back; but an explorer changes the world.’ Wilfred Thesiger, who crossed Arabia’s Empty Quarter in 1946, and belongs to an era of unmechanised travel now lost to the rest of us, told me, ‘If I'd gone across by camel when I could have gone by car, it would have been a stunt.’ To him, exploration meant bringing back information from a remote place regardless of any great self-discovery.

Each definition is slightly different – and tends to reflect the field of endeavour of each pioneer. It was the same whoever I asked: the prominent historian would say exploration was a thing of the past, the cutting-edge scientist would say it was of the present. And so on. They each set their own particular criteria; the common factor in their approach being that they all had, unlike many of us who simply enjoy travel or discovering new things, both a very definite objective from the outset and also a desire to record their findings.

I’d best declare my own bias. As a writer, I'm interested in the exploration of ideas. I’ve done my best to research the history of exploration as an outsider. I’ve lived for months alone in the Amazon jungle, and travelled across Mongolia in the footsteps of the ‘uncontacted tribes’. But I know that despite the amount of research and the number of footnotes in my books, I've found as much reward in the writing as in the journeying. The time has gone for the great continental voyages – perhaps. But there has never been a better time for the journey of the mind, and in the chapters that follow, which chart the exploration of the earth’s surface of the past, it is from down to the details – the compass readings, the disease and the discomfort, or buffalo. And yet for all the background gathering, it's the care over storytelling that matters. We do this to disregard the role the human mind has played in exploration is to miss the point. However, it’s those who have a fresh interpretation, even of a well-travelled route, can give its readers new insights.

**Cambridge 15 / Test 2 / Reading Passage 1**

**Could urban engineers learn from dance?**

A  
The way we travel around cities has a major impact on whether they are sustainable. Transportation is estimated to account for 30% of energy consumption in most of the world’s most developed nations, so lowering the need for energy-using vehicles is essential for decreasing the environmental impact of mobility. But as more and more people move to cities, it is important to think about other kinds of sustainable travel too. The ways we travel affect our physical and mental health, our social lives, our access to work and culture, and the air we breathe. Engineers are tasked with changing how we travel round cities through urban design, but the engineering industry still works on the assumptions that led to the creation of the energy-consuming transport systems we have now: transport practices focused solely on efficiency, speed, and quantitative data. We need radical changes, to make it healthier, more enjoyable, and less environmentally damaging to travel around cities.

B  
Dance might hold some of the answers. That is not to suggest everyone should dance their way to work, however healthy and happy it might make us. Rather, the techniques used by choreographers to experiment with and design movement in dance could provide engineers with tools to stimulate new ideas in city-making. Richard Sennett, an influential urbanist and sociologist who has transformed ideas about the way cities are made, argues that urban design has suffered from a separation between mind and body since the introduction of the architectural blueprint.

C  
Whereas medieval builders improved their ideas and adapted construction through their intimate knowledge of materials and sensory and personal experience of the conditions on a site, building designs in recent years are more often created in offices on screens, detached the designer from the physical and social realities they are creating. While the design practices created by these new technologies are useful and necessary for managing the technical complexity of a modern city, they have the drawback of simplifying reality in the process.

D  
To illustrate, Sennett discusses the Peachtree Center in Atlanta, USA, a development typical of the modernist approach to urban planning prevalent in the 1970s. Peachtree created a grid of streets and towers intended as a new pedestrian-friendly downtown for Atlanta. According to Sennett, this failed because its designers had invested too much faith in computer-aided design to tell them how it would operate. They failed to take into account that purpose-built street cafés could not operate in the hot sun without the protective awnings common in older buildings, and would need energy-consuming air conditioning instead, or that its giant car park would feel so unwelcoming that it would put people off getting out of their cars. What seems entirely predictable and controllable on screen has unexpected results when translated into reality.

E  
The same is true in transport engineering, which uses models to predict and shape the way people move through the city. Again, these models are necessary, but they are built on specific world views in which certain forms of efficiency and safety are considered and other experiences of the city ignored. Designs that seem logical in models appear counter-intuitive in the actual experience of their users. The guard rails that will be familiar to anyone who has attempted to cross a British road, for example, were an engineering solution to pedestrian safety based on models that prioritise the smooth flow of traffic. On wide major roads, they often guide pedestrians to specific crossing points and slow down their progress across the road by using staggered access points to divide the crossing into two – one for each carriageway. In doing so they make crossings feel longer, introducing psychological barriers greatly impacting those that are the least mobile, and encouraging others to make dangerous crossings to get around the guard rails. These barriers don’t just make it harder to cross the road; they divide communities and decrease opportunities for healthy transport. As a result, many are now being removed, causing disruption, cost, and waste.

F  
If their designers had had the tools to think with their bodies – like dancers – and imagine how these barriers would feel, there might have been a better solution. In order to bring about fundamental changes to the ways we use our cities, engineering will need to develop a richer understanding of why people move in certain ways, and how this movement affects their experience of the city and of design problems. Movement is not simply functional. It shares with dance the potential to carry meaning and emotion from the inside out. The way we feel in different spaces can affect how well design works. Dancers who work within limitations of space, for example, adapt movement to new spatial constraints and create meaning from them based on constant feedback on how the results feel. Choreographers have deep understandings of choreological, aesthetic, and physical principles and the bodily effects of moving.

G  
Observing the choreographer Wayne McGregor, cognitive scientist David Kirsh described how he ‘thinks with the body’. Kirsh argues that by using the bodily sense to imagine McGregor’s vision, the dancers were able to find solutions that would not be possible using purely abstract reasoning. This kind of bodily thinking is exactly what is lacking in modern urban design, with its reliance on formal engineering models and quantitative assessments. As suggested above for transport engineers, it is in design teams including dancers, or where engineers attempt to physically experience designs for themselves through their own experiments with them, or model designs at full scale in the way theatre choreographers experiment with performers on sets. Above all, perhaps, they might learn to design for emotional as well as functional effects.

**Cambridge 15 / Test 2 / Reading Passage 2**

**Should we try to bring extinct species back to life?**

A  
The passenger pigeon was a legendary species. Flying in vast numbers across North America, with potentially many millions within a single flock, their migration was once one of nature’s great spectacles. Sadly, the passenger pigeon’s existence came to an end on 1 September 1914, when the last living specimen died at Cincinnati Zoo. Geneticist Ben Novak is lead researcher on an ambitious project which now aims to bring the bird back to life through a process known as ‘de-extinction’. The basic premise involves using cloning technology to turn the DNA of extinct animals into a fertilised embryo, which is carried by the nearest relative still in existence – in this case, the abundant band-tailed pigeon – before being born as a living, breathing animal. Passenger pigeons are one of the pioneering species in this field, but they are far from the only ones on which this cutting-edge technology is being trialled.

B  
In Australia, the thylacine, more commonly known as the Tasmanian tiger, is another extinct creature which genetic scientists are striving to bring back to life. ‘There is no carnivore now in Tasmania that fills the niche which thylacines once occupied,’ explains Michael Archer of the University of New South Wales. He points out that in the decades since the thylacine went extinct, there has been a spread in a ‘dangerously debilitating’ facial tumour syndrome which threatens the existence of the Tasmanian devil, the island’s other notorious resident. Thylacines would have prevented this spread because, as apex predators, they would have kept a lid on diseased devils. ‘If that contagion caused the near wipeout of previously robust populations, it could happen again with another disease. The return of top predators to Tasmania could help to ensure that devils are never again subjected to risks of this kind.’

C  
If extinct species can be brought back to life, can humanity begin to correct the damage it has caused to the natural world over the past few millennia? ‘The idea of de-extinction is that we can reverse this process, bringing species that no longer exist back to life,’ says Beth Shapiro of University of California Santa Cruz’s Genomics Institute. ‘I don’t think that we can do this. There is no way to bring back something that is 100 per cent identical to a species that went extinct a long time ago.’ A more practical approach for long-extinct species is to take the DNA of existing species as a template, ready for the insertion of strands of extinct animal DNA to create something new; a hybrid, based on the living species, but which looks and/or acts like the animal which died out.

D  
This complicated process and questionable outcome begs the question: what is the actual point of this technology? ‘For us, the goal has always been replacing the extinct species with a suitable replacement,’ explains Novak. ‘When it comes to breeding, band-tailed pigeons scatter and make maybe one or two nests per hectare, whereas passenger pigeons were very social and would make 10,000 or more nests in the same size. The disappearance of this and other key species in ecosystems in the eastern US have had side-effects, as the lack of disturbance caused by so many birds, spread because of missing tree seeds and branches means there has been minimal growth of young trees. This has left forests stagnant and therefore unable to respond to environmental changes, or to regenerate the forest after a disturbance. According to Novak, a hybridised band-tailed pigeon, with the added nesting habits of a passenger pigeon, could, in theory, re-establish that forest disturbance, thereby creating a habitat necessary for a great many other native species to thrive.

E  
Another popular candidate for this technology is the woolly mammoth. George Church, professor at Harvard Medical School and leader of the Woolly Mammoth Revival Project, has been focusing on cold resistance, the main way in which the extinct woolly mammoth and its nearest living relative, the Asian elephant, differ. By pinpointing which genetic traits made it possible for mammoths to survive the icy climate of the tundra, the project’s goal is to return mammoths, or a mammoth-like species, to the area. ‘My highest priority would be preserving the endangered Asian elephant,’ says Church, ‘expanding their range to the huge ecosystems of the tundra. Necessary adaptations would include smaller ears, thicker hair, and extra insulating fat, all for the purpose of reducing heat loss in the tundra, and all traits found in the now extinct woolly mammoth.’ This repopulation of the tundra and boreal forests of Eurasia and North America with large mammals could also be a useful factor in reducing carbon emissions – elephants punch holes through snow and knock down trees, which encourages grass growth. This grass growth would help reduce temperatures, and mitigate emissions from melting permafrost.

F  
While the prospect of bringing extinct animals back to life might capture imaginations, it is, of course, far easier to try to save an existing species which is merely threatened with extinction. ‘Many of the technologies that people have now, when they think about de-extinction can be used as a form of “genetic rescue”,’ explains Shapiro. She prefers to focus the debate on how this emerging technology could be useful for the world today and why various genetic work isn’t in the first place being used to conserve endangered species, to fix genetic modifications which lead to disease, or to create species we may need in the future. ‘I would also say there’s an incredible moral hazard to not doing anything at all,’ she continues. ‘We know that what we are doing today is not enough, and we have to be willing to take some calculated and measured risks.’

**Cambridge 15 / Test 2 / Reading Passage 3**

**Having a laugh**

*The findings of psychological scientists reveal the importance of humour*

Humans start developing a sense of humour as early as six weeks old, when babies begin to laugh and smile in response to stimuli. Laughter is universal across all human cultures and even exists in some form in rats, chimps, and bonobos. Like other human emotions and expressions, laughter and humour provide psychological scientists with rich resources for studying human psychology, ranging from the development of language to the neuroscience of social perception.

Theories focusing on the evolution of laughter point to it as an important adaptation for social communication. Take, for example, the recorded laughter in TV comedy shows. Back in 1950, US sound engineer Charley Douglass hated dealing with the unpredictable laughter of live audiences, so started recording his own ‘laugh tracks’. These were intended to help people at home feel like they were in a social situation, such as a crowded theatre. Douglass even recorded various types of laughter, as well as mixtures of laughter from men, women, and children. In doing so, he picked up on a quality of laughter that is now interesting researchers: a simple ‘haha’ communicates a remarkable amount of socially relevant information.

In one study conducted in 2016, samples of laughter from pairs of English-speaking students were recorded at the University of California, Santa Cruz. A team led by more than 30 psychological scientists, anthropologists, and biologists then played the recordings to listeners from 24 diverse societies, from indigenous tribes in New Guinea to jewellers in India and Europe. Participants were asked whether they thought the people laughing were friends or strangers. On average, the results were remarkably consistent: worldwide, people’s guesses were correct approximately 60% of the time.

Researchers have also found that different types of laughter serve as codes to complex human social hierarchies. A team led by Christopher Oveis from the University of California, San Diego, found that high-status individuals had different laughs from low-status individuals, and that strangers’ judgements of an individual’s social status were influenced by the dominant or submissive quality of their laughter. In their study, 48 male college students were randomly assigned to groups of four, with each group composed of two low-status members, who had just joined their college fraternity group, and two high-status members, older students who had been active in the fraternity for at least two years. Laughter was recorded as each student took a turn at being teased by the others, involving the use of mildly insulting nicknames. Analysis revealed that, as expected, high-status individuals produced more dominant laughs and fewer submissive laughs relative to the low-status individuals. Meanwhile, low-status individuals were more likely to change their laughter based on their position of power; that is, the newcomers produced more dominant laughs when they were in the ‘powerful’ role of teasers. Dominant laughter was higher in pitch, louder, and more variable in tone than submissive laughter.

A random group of volunteers then listened to an equal number of dominant and submissive laughs from both the high- and low-status individuals, and were asked to estimate the social status of the laughter. In line with predictions, laughers producing dominant laughs were perceived to be significantly higher in status than laughers producing submissive laughs. “This was particularly true for low-status individuals, who were rated as significantly higher in status when displaying a dominant versus submissive laugh,” Oveis and colleagues note. “Thus, by strategically displaying more dominant laughter when the context allows, low-status individuals may achieve higher status in the eyes of others.” However, high-status individuals were rated as high-status whether they produced their natural dominant laugh or tried to do a submissive one.

Another study, conducted by David Cheng and Lu Wang of Australian National University, was based on the hypothesis that humour might provide a respite from tedious situations in the workplace. This ‘mental break’ might facilitate the replenishment of mental resources. To test this theory, the researchers recruited 74 business students, ostensibly for an experiment on perception. First, the students performed a tedious task in which they had to cross out every instance of the letter ‘e’ over two pages of text. The students then were randomly assigned to watch a video clip eliciting either humour, contentment, or neutral feelings. Some watched a clip of the BBC comedy Mr. Bean, others a relaxing scene with dolphins swimming in the ocean, and others a factual video about the management profession.

The students then completed a task requiring persistence in which they were asked to guess the potential performance of employees based on provided profiles, and told that 10 correct assessments in a row would lead to a win. However, the software was programmed such that it was nearly impossible to achieve 10 consecutive correct answers. Participants were allowed to quit the task at any point. Students who had watched the Mr. Bean video ended up spending significantly more time working on the task, making twice as many predictions as the other two groups.

Cheng and Wang then replicated these results in a second study, during which they had participants complete long multiplication questions by hand. Again, participants who watched the humorous video spent significantly more time working on this tedious task and completed more questions correctly than did the students in either of the other groups.

“Although humour has been found to help relieve stress and facilitate social relationships, the traditional view of task performance implies that individuals should avoid things such as humour that may distract them from the accomplishment of task goals,” Cheng and Wang conclude. “We suggest humour is not only enjoyable but more importantly, energising.”

**Cambridge 15 / Test 3 / Reading Passage 1**

**Henry Moore (1898–1986)**  
*The British sculptor Henry Moore was a leading figure in the 20th-century art world*

Henry Moore was born in Castleford, a small town near Leeds in the north of England. He was the seventh child of Raymond Moore and his wife Mary Baker. He studied at Castleford Grammar School from 1909 to 1915, where his early interest in art was encouraged by his teacher Alice Gostick. After leaving school, Moore hoped to become a sculptor, but instead he complied with his father’s wish that he train as a schoolteacher. He had to abandon his training in 1917 when he was sent to France to fight in the First World War.

After the war, Moore enrolled at the Leeds School of Art, where he studied for two years. In his first year, he spent most of his time drawing. Although he wanted to study sculpture, no teacher was appointed until his second year. At the end of that year, he passed the sculpture examination and was awarded a scholarship to the Royal College of Art in London. In September 1921, he moved to London and began three years of advanced study in sculpture.

Alongside the instruction he received at the Royal College, Moore visited many of the London museums, particularly the British Museum, which had a wide-ranging collection of ancient sculpture. During these visits, he discovered the sculptures of ancient Egyptian and African sculpture. As he became increasingly interested in so-called “primitive” forms of art, he turned away from European sculptural traditions.

Moore also travelled around Europe and studied the sculptures of 1925 travelling in France. When he visited the Trocadero Museum in Paris, he became interested in a plaster cast of a Mayan\* sculpture of the rain spirit. It was a male reclining figure with its knees drawn up together, and its head at a right angle to its body. Moore became fascinated with this stone sculpture, which he thought had a power and originality that no other stone sculpture possessed. He himself started carving a variety of subjects in stone, including depictions of reclining women, mother-and-child groups, and masks.

Moore’s exceptional talent soon gained recognition, and in 1926 he started work as a sculpture instructor at the Royal College. In 1933, he became a member of a group of young artists called Unit One. The aim of the group was to convince the English public of the merits of the emerging international movement in modern art and architecture.

Around this time, Moore moved away from the human figure to experiment with abstract shapes. In 1931, he held an exhibition at the Leicester Galleries in London. His work was enthusiastically welcomed by fellow sculptors, but the reviews in the press were extremely negative and turned Moore into a notorious figure. There were calls for his resignation from the Royal College, and the following year, when his contract expired, he left to start a sculpture department at the Chelsea School of Art in London.

Throughout the 1930s, Moore did not show any inclination to please the British public. He became interested in the paintings of the Spanish artist Pablo Picasso, whose work inspired him to distort the human body in a radical way. At times, he seemed to abandon the human figure altogether. The pages of his sketchbooks from this period show his ideas for abstract sculptures that bore little resemblance to the human form.

In 1940, during the Second World War, Moore stopped teaching at the Chelsea School and moved to a farmhouse about 20 miles north of London. A shortage of materials forced him to focus on drawing. He did numerous small sketches of Londoners, later turning these ideas into large coloured drawings in his studio. In 1942, he returned to Castleford to make a series of sketches of the miners who worked there.

In 1944, Harlow, a town near London, offered Moore a commission for a sculpture depicting a family. The family work signals a dramatic change in Moore’s style, away from the radical experimentation of the 1930s towards a more natural and humanistic subject matter. He did studies of this design for the sculpture, and then three were cast in bronze and issued in limited editions of seven to nine copies each. In this way, Moore’s work became available to collectors all over the world. He chose to limit the number of each edition to take on ambitious projects and start working on the scale he felt his sculpture demanded.

Critics who had begun to think that Moore had become less revolutionary were proven wrong by the appearance, in 1950, of the first of Moore’s series of standing figures in bronze, with their unexpected, twisted shapes and their combination of human and impressionistic forms. He also raised his subject matter in the 1950s with works such as *Warrior with Shield* and *Falling Warrior.* These were partly influenced by his visit to Greece in 1951, when he had the opportunity to study ancient Greek and Roman works of art.

In his final years, Moore created the Henry Moore Foundation to promote art appreciation and to display his work. Moore was the first modern English sculptor to achieve international critical acclaim and he is still regarded as one of the most important sculptors of the 20th century.

**Cambridge 15 / Test 3 / Reading Passage 2**

**The Desolenator: producing clean water**

A

Travelling around Thailand in the 1990s, William Janssen was impressed with the basic rooftop solar heating systems that were on many homes, where energy from the sun was absorbed by a plate and then used to heat water for domestic use. Two decades later Janssen developed that basic idea he saw in Southeast Asia into a portable device that uses the power from the sun to purify water.

B

The Desolenator operates as a mobile desalination unit that can take water from different places, such as the sea, rivers, boreholes and rain, and purify it for human consumption. It is particularly valuable in regions where natural groundwater reserves have been polluted, or where seawater is the only water source available. Janssen saw that there was a need for a sustainable way to clean water in both the developing and the developed countries when he moved to the United Arab Emirates and saw large-scale water processing. ‘I was confronted with the enormous carbon footprint that the Gulf nations have because of all of the desalination that they do,’ he says.

C

The Desolenator can produce 15 litres of drinking water per day, enough to sustain a family for cooking and drinking. Its main selling point is that unlike standard desalination techniques, it doesn’t require a generated power supply, chemicals, or expensive spare parts. It measures 120 cm by 90 cm, and is easy to transport, thanks to its two wheels. Water enters through a pipe, and flows as a thin film between a sheet of double glazing and the surface of a solar panel, where it is heated by the sun. The warm water flows into a small boiler (heated by a solar-powered battery) where it is converted to steam. When the steam cools, it becomes distilled water. The device has a very simple filter to trap particles, and this can easily be shaken to remove them. There are two tubes for liquid coming out: one for the waste – salt from seawater, fluoride, etc. – and another for the distilled water. The performance of the unit is shown on an LCD screen and transmitted to the company which provides servicing when necessary.

D

A recent analysis found that at least two-thirds of the world’s population lives with severe water scarcity for at least a month every year. Janssen says that by 2030 half of the world’s population will be living with water stress – where the demand exceeds the supply over a certain period of time. ‘It is really important that a sustainable solution is brought to the market that is able to help these people,’ he says. ‘Many countries don’t have the money for desalination plants, which are very expensive to build. They don’t have the money to operate them, which are very maintenance intensive, and they don’t have the money to buy the diesel to run the desalination plants, so it is a really bad situation.’

E

The device is aimed at a wide variety of users – from homeowners in the developing world who do not have a constant supply of water to people living off the grid in rural parts of the US. The first commercial versions of the Desolenator are expected to be in operation in India early next year, after field tests are carried out. The market for the self-sufficient devices in developing countries is twofold – those who cannot afford the money for the device outright and pay through microfinance, and middle-income homes that can lease their own equipment. ‘People in India don’t pay for a fridge outright; they pay for it over six months. They would put the Desolenator on their roof and hook it up to their municipal supply and they would get very reliable drinking water on a daily basis,’ Janssen says. In the developed world, it is aimed at niche markets where tap water is unavailable – for camping, on boats, or for the military, for instance.

F

Prices will vary according to where it is bought. In the developing world, the price will depend on what deal aid organisations can negotiate. In developed countries, it is likely to come in at $1,000 (£685) a unit, said Janssen. ‘We are a venture with a social mission. We are aware that the product we have envisioned is mainly finding application in the developing world and humanitarian sector and that this is the way we will proceed. We do realise, though, that to be a viable company there is a bottom line to keep in mind,’ he says.

G

The company itself is based at the Imperial College London, although Janssen, its chief executive, still lives in the UAE. It has raised £340,000 in funding so far. Within two years, he says, the company aims to be selling 1,000 units a month, mainly in the humanitarian field. They are expected to be sold in areas such as Australia, northern Chile, Peru, Texas and California.

**Cambridge 15 / Test 3 / Reading Passage 3**

**Why fairy tales are really scary tales**

*Some people think that fairy tales are just stories to amuse children, but their universal and enduring appeal may be due to more serious reasons*

People of every culture tell each other fairy tales but the same story often takes a variety of forms in different parts of the world. In the story of *Little Red Riding Hood* that European children are familiar with, a young girl on the way to see her grandmother meets a wolf and tells him where she is going. The wolf runs on ahead and disposes of the grandmother, then gets into bed dressed in the grandmother’s clothes to wait for Little Red Riding Hood. You may think you know the story — but which version? In some versions, the wolf swallows up the grandmother, while in others it locks her in a cupboard. In some stories Red Riding Hood gets the better of the wolf on her own, while in others a hunter or a woodcutter hears her cries and comes to her rescue.

The universal appeal of these tales is frequently attributed to the idea that they contain cautionary messages: in the case of *Little Red Riding Hood*, to listen to your mother, and avoid talking to strangers. “It might be what we find interesting about this story is that it’s got this survival-relevant information in it,” says anthropologist Jamshid Tehrani at Durham University in the UK. But his research suggests otherwise. “We have this huge gap in our knowledge about the history and prehistory of storytelling, despite the fact that everyone loves a good story and always has done,” he says. That hasn’t stopped academics, including linguists, folklorists and others devising theories to explain the importance of fairy tales in human society. Now Tehrani has found a way to test these ideas, borrowing a technique from evolutionary biologists.

To work out the evolutionary history, development and relationships among groups of organisms, biologists examine the characteristics they have in common in a process called “phylogenetic analysis”. Tehrani has used the same approach to compare related versions of fairy tales to discover how they have evolved and which elements have survived longest.

Tehrani’s analysis focused on *Little Red Riding Hood* in its many forms, which include another Western fairy tale known as *The Wolf and the Kids*. Checking for variants of these two tales and similar stories from Africa, East Asia and other regions, he ended up with 58 stories recorded from oral traditions. Once his phylogenetic analysis had established that they were indeed related, he used the same methods to explore how they have developed and altered over time.

First he tested some assumptions about which aspects of the story alter least as it evolves, indicating their importance. Folklorists believe that what happens in a story is more central to the story than the characters in it — that visiting a relative, only to be met by a scary animal in disguise, is more fundamental than whether the visitor is a little girl or three siblings, or the animal is a tiger instead of a wolf.

However, Tehrani found no significant difference in the rate of evolution of incidents compared with that of characters. “Certain episodes are very stable because they are crucial to the story, but there are lots of other details that can evolve quite freely,” he says. Neither did his analysis support the theory that the central section of a story is the most conserved part. He found no significant difference in the flexibility of events there compared with the beginning or the end.

But the really big surprise came when he looked at the cautionary elements of the story. “Studies on hunter-gatherer folk tales suggest that these narratives include really important information about the environment and the possible dangers that may be faced there — stuff that’s relevant to survival,” he says. Yet in his analysis such elements were just as flexible as seemingly trivial details. What, then, is important enough to be reproduced from generation to generation?

The answer, it would appear, is fear — blood-thirsty and gruesome aspects of the story, such as the eating of the grandmother by the wolf, turned out to be the best preserved of all. Why are these details retained by generations of storytellers, when so many other features are not? Tehrani has an idea: “In an oral context, a story won’t survive because of a great teller. It also needs to be interesting when it’s told by someone who’s not necessarily an experienced oratory storyteller.” Maybe being swallowed whole by a wolf, only to be cut out of its stomach alive is so gripping that it helps the story remain popular, no matter who is telling it.

Jack Zipes at the University of Minnesota, Minneapolis, is unconvinced by Tehrani’s views on fairy tales. “Even if they’re gruesome, they won’t stick unless they matter,” he says. He believes the perennial theme of parents as victims is more important. While *Little Red Riding Hood* explains why we shouldn’t talk to strangers, stories like *Hansel and Gretel* explain why we should not be abandoned. The same goes for many of the stories told elsewhere. In Chinese and Japanese versions (often known as *The Tiger Grandmother*), the villain is a tiger that turns on its own grandchildren and devours them.

Mathias Clasen at Aarhus University in Denmark isn’t surprised by Tehrani’s findings. “Habits and morals come and go, but the things that scare us, and the fact that we seek out entertainment that’s based on fear, don’t change,” he says. He adds that the ancient storytelling tradition teaches us what to be afraid of. “Children who listen to scary stories learn how to predict and avoid danger. So maybe we’re biologically predisposed to be afraid without needing to experience real danger, and so build up resistance to natural fears.”

**Cambridge 15 / Test 4 / Reading Passage 1**

**The return of the huarango**  
*The arid valleys of southern Peru are welcoming the return of a native plant*

The south coast of Peru is a narrow, 2,000-kilometre-long strip of desert squeezed between the Andes and the Pacific Ocean. It is also one of the most fragile ecosystems on Earth. It hardly ever rains there, and the only year-round source of water is located tens of metres below the surface. This is why the huarango tree is so suited to life there: it has the longest roots of any tree in the world. They stretch down 50–80 metres and, as well as sucking up water for the tree, they bring it into the higher subsoil, creating a water source for other plant life.

Dr David Beresford-Jones, archaeobotanist at Cambridge University, has been studying the role of the huarango tree in landscape change in the Lower Ica Valley in southern Peru. He believes the huarango was key to the ancient people’s diet and, because it could reach deep water sources, it allowed local people to withstand years of drought when their other crops failed. But over the centuries huarango trees were gradually replaced with crops. Cutting down native woodland leads to erosion, as there is nothing to keep the soil in place. So when the huarangos go, the land turns into a desert. Nothing grows at all in the Lower Ica Valley now.

For centuries the huarango tree was vital to the people of the neighbouring Middle Ica Valley too. They grew vegetables under it and made products from its seed pods. The leaves and bark were used for herbal remedies, its wood for cooking and heating. The huarango forests in the valley have already been cleared for fuel and agriculture — initially, these were smallholdings, but now they’re huge farms producing crops for the international market.

‘Of the forests that were here 1,000 years ago, 99 per cent have already gone,’ says botanist Oliver Whaley from Kew Gardens in London, who, together with ethnobotanist Dr William Milliken, is running a pioneering project to protect and restore the rapidly disappearing habitat. In order to succeed, Whaley needs to get the local people on board, and that has meant overcoming local prejudices. ‘Increasingly aspirational communities think that if you plant food trees in your home or street, it shows you are poor, and still need to grow your own food,’ he says. In order to stop the Middle Ica Valley going the same way as the Lower Ica Valley, Whaley is encouraging locals to love the huarangos again. ‘It’s a process of cultural resuscitation,’ he says. He has already set up a huarango festival to reinstate a sense of pride in their eco-heritage, and has helped local schoolchildren plant thousands of trees.

‘In order to get people interested in habitat restoration, you need to plant a tree that is useful to them,’ says Whaley. So, he has been working with local families to attempt to create a sustainable income from the huarangos by turning their products into foodstuffs. ‘Boil up the beans and you get this thick brown syrup like molasses. You can also use it in drinks, soups or stews.’ The pods can be ground into flour to make cakes, and the seeds roasted into a sweet, chocolatey “coffee”. ‘It’s packed full of vitamins and minerals,’ Whaley says.

And some farmers are already planting huarangos. Alberto Benevides, owner of Ica Valley’s only certified organic farm, which Whaley helped set up, has been planting the tree for 13 years. He produces syrup and flour, and sells these products at an organic farmers’ market in Lima. His farm is relatively small and doesn’t yet provide him with enough to live on, but he hopes this will change. ‘The organic market is growing rapidly in Peru,’ Benevides says. ‘I am investing in the future.’

But even if Whaley can convince the local people to fall in love with the huarango again, there is still the threat of the larger farms. Some of these cut across the forests and break up the corridors that allow the essential movement of mammals, birds and pollen up and down the narrow forest strip. In the hope of counteracting this, he’s been encouraging farmers to intersperse forest corridors on their land. He believes the extra woodland will also benefit the farms by reducing their water usage through a lowering of evaporation rates and by offering a refuge for bio-control insects.

‘If we can record biodiversity and see how it all works, then we’re in a good position to move on from there. Desert habitats can reduce down to nothing or to very little,’ Whaley explains. ‘It’s not like a rainforest that needs to have this huge expanse to survive. Life has always been confined to oases and islands here. If you just have a few trees left, the population can grow up quickly because it’s used to exploiting extreme conditions. If we can work out what’s going on in these places, we’ve got the potential to reforest other arid areas, not just in Peru but around the world. If we can do it here, in the most fragile system on Earth, then that’s a real message of hope for lots of places, including Africa, where there is drought and they just can’t afford to wait for rain.’

**Cambridge 15 / Test 4 / Reading Passage 2**

**Silbo Gomero – the whistle ‘language’ of the Canary Islands**

La Gomera is one of the Canary Islands situated in the Atlantic Ocean off the northwest coast of AFRICA. This small volcanic island is mountainous, with steep rocky slopes and deep, wooded ravines, rising to 1,487 metres at its highest peak. It is also home to the best known of the world’s whistle ‘languages’, a means of transmitting information over long distances which is perfectly adapted to the extreme terrain of the island.

This ‘language’, known as ‘Silbo’ or ‘Silbo Gomero’ – from the Spanish word for ‘whistle’ – is now shedding light on the language-processing abilities of the human brain, according to scientists. Researchers say that Silbo activates parts of the brain normally associated with spoken language, suggesting that the brain is remarkably flexible in its ability to interpret sounds as language.

‘Science has developed the idea of brain areas that are dedicated to language, and we are starting to understand the scope of signals that can be recognised as language,’ says David Corina, co-author of a recent study and associate professor of psychology at the University of Washington in Seattle.

Silbo is a substitute for Spanish, with individual words recorded into whistles which have high- and low-frequency tones. A whistler – or \*silbador\* – puts a finger in his or her mouth to increase the whistle’s pitch, while the other hand can be cupped to adjust the direction of the sound. ‘There is much more ambiguity in the whistled signal than in the spoken signal,’ explains lead researcher Manuel Carreiras, psychology professor at the University of La Laguna on the Canary island of Tenerife. Because whistled ‘words’ can be hard to distinguish, \*silbadores\* rely on repetition as well as awareness of context, to make themselves understood.

The \*silbadores\* of Gomera are traditionally shepherds and other isolated mountain folk, and their novel means of staying in touch allows them to communicate over distances of up to 10 kilometres. Carreiras explains that \*silbadores\* are able to pass a surprising amount of information via their whistles. ‘In daily life they use whistles to communicate short commands, but any Spanish sentence could be whistled.’ Silbo has proved particularly useful when fires have occurred on the island and rapid communication across large areas has been vital.

The study team used neuroimaging equipment to contrast the brain activity of \*silbadores\* while listening to whistled and spoken Spanish. Results showed the left temporal lobe of the brain, which is usually associated with spoken language, was engaged during the processing of Silbo. The researchers found that other key regions in the brain’s frontal lobe also responded to the whistles, including those activated in response to sign language among deaf people. When the experiments were repeated with non-whistlers, however, activation was observed in all areas of the brain.

‘Our results provide more evidence about the flexibility of human capacity for language in a variety of forms,’ Corina says. ‘These data suggest that left-hemisphere language regions are uniquely adapted for communicative purposes, independent of the modality of signal. The non-Silbo speakers were not recognising Silbo as a language. They had nothing to grab onto, so multiple areas of their brains were activated.’

Carreiras says the origins of Silbo Gomero remain obscure, but that indigenous Canary Islanders, who were of North African origin, already had a whistled language when Spain conquered the volcanic islands in the 15th century. Whistled languages survive today in Papua New Guinea, Mexico, Vietnam, Guyana, China, Nepal, Senegal, and a few mountainous pockets in southern Europe. There are thought to be as many as 70 whistled languages still in use, though only 12 have been described and studied scientifically. This form of communication is an adaptation found among cultures where people are often isolated from each other, according to Julien Meyer, a researcher at the Institute of Human Sciences in Lyon, France. ‘They are mostly used in mountains or dense forests,’ he says. ‘Whistled languages are quite clearly defined and represent an original adaptation of the spoken language for the needs of isolated human groups.’

But with modern communication technology now widely available, researchers say whistled languages like Silbo are threatened with extinction. With dwindling numbers of Gomera islanders still fluent in the language, Canary authorities are taking steps to try to ensure its survival. Since 1999, Silbo Gomero has been taught in all of the island’s elementary schools. In addition, locals are seeking assistance from the United Nations Educational, Scientific and Cultural Organization (UNESCO). ‘The local authorities are trying to get an award from the organization to declare [Silbo Gomero] as something that should be preserved for humanity,’ Carreiras adds.

**Cambridge 15 / Test 4 / Reading Passage 3**

**Environmental practices of big businesses**

The environmental practices of big businesses are shaped by a fundamental fact that many of us offend our sense of justice. Depending on the circumstances, business may maximize the amount of money it makes, at least in the short term, by damaging the environment and hurting people. That is still the case today for fishermen in an unmanaged fishery without quotas, and for international logging companies with short-term leases on tropical rainforest land in places with corrupt officials and unsophisticated landowners. When government regulation is effective, and when the public is environmentally aware, environmentally clean big businesses may out-compete dirty ones, but the reverse is likely to be true if government regulation is ineffective and if the public doesn’t care.

It is easy for the rest of us to blame a business for helping itself by hurting other people. But blaming alone is unlikely to produce change. It ignores the fact that businesses are not charities but profit-making companies, and that publicly owned companies with shareholders are under obligation to those shareholders to maximize profits, provided that they do so by legal means. US laws make a company’s directors legally liable for something termed “breach of fiduciary responsibility” if they knowingly manage a company in a way that reduces profits. The car manufacturer Henry Ford was in fact successfully sued by shareholders in 1919 for raising the minimum wage of his workers to $5 per day: the courts decided that, while Ford’s humanitarian sentiments about his employees were nice, his business existed to make profits for its stockholders.

Our blaming of businesses also ignores the ultimate responsibility of the public for creating the conditions that let a business profit through destructive environmental policies. In the long run, it is the public, either directly or through its politicians, that has the power to make such destructive policies unprofitable and illegal, and to make sustainable environmental policies profitable.

The public can do that by suing businesses for harming them, as happened after the Exxon Valdez disaster, in which over 40,000 m³ of oil were spilled off the coast of Alaska. The public may also make their opinion felt by preferring to buy sustainably harvested products; by making employees of companies with poor track records feel ashamed of their company and complain to their own management; by preferring their governments to award valuable contracts to businesses with a good environmental track record; and by pressing their governments to pass and enforce laws and regulations requiring good environmental practices.

In turn, big businesses can exert powerful pressure on any suppliers that might ignore public or government pressure. For instance, after the US public became concerned about the spread of a disease known as BSE, which was transmitted to humans through infected meat, the US government’s Food and Drug Administration introduced rules demanding that the meat industry abandon practices associated with the risk of the disease spreading. But for five years the meat packers refused to follow these, claiming that they would be too expensive to obey. However, when a major fast-food company then made the same demands after customer purchases of its hamburgers plummeted, the meat industry complied within weeks. The public’s task is therefore to identify which links in the supply chain are sensitive to public pressure: for instance, fast-food chains or jewelry stores, but not meat packers or gold miners.

Some readers may be disappointed or outraged that I place the ultimate responsibility for business practices harming the public on the public itself. I also believe that the public must accept the necessity for higher prices for products to cover the added costs, if any, of sound environmental practices. My views may seem to ignore the belief that businesses should act in accordance with moral principles even if this leads to a reduction in their profits. But I think we have to recognize that, throughout human history, in all politically complex human societies, government regulation has arisen precisely because it was found that not only did moral principles need to be made explicit, they also needed to be enforced.

To me, the conclusion that the public has the ultimate responsibility for the behavior of even the biggest businesses is empowering and hopeful, rather than disappointing. The conclusion is not a moralistic one about who is right or wrong, admirable or selfish, a good guy or bad guy. In the past, businesses have changed when the public came to expect and require different behavior, to reward businesses for behavior that the public wanted, and to make things difficult for businesses practicing behaviors that the public didn’t want. I predict that in the future, just as in the past, changes in public attitudes will be essential for changes in businesses’ environmental practices.