ARTICLE-1

What Do Whales feel ?

An examination of the functioning of the senses in cetaceans, the group of mammals comprising whales, dolphins and porpoises

Some of the senses that we and other terrestrial mammals take for granted are either reduced or absent in cetaceans or fail to function well in water. For example, it appears from their brain structure that toothed species are unable to smell. Baleen species, on the other hand, appear to have some related brain structures but it is not known whether these are functional. It has been speculated that, as the blowholes evolved and migrated to the top of the head, the neural pathways serving sense of smell may have been nearly all sacrificed. Similarly, although at least some cetaceans have taste buds, the nerves serving these have degenerated or are rudimentary.

The sense of touch has sometimes been described as weak too, but this view is prob- ably mistaken. Trainers of captive dolphins and small whales often remark on their animals' responsiveness to being touched or rubbed, and both captive and free- ranging cetacean individuals of all species (particularly adults and calves, or members of the same subgroup) appear to make frequent contact. This contact may help to maintain order within a group, and stroking or touching are part of the courtship ritual in most species. The area around the blowhole is also particularly sensitive and captive animals often object strongly to being touched there.

The sense of vision is developed to different degrees in different species. Baleen species studied at close quarters underwater – specifically a grey whale calf in cap- tivity for a year, and free-ranging right whales and humpback whales studied and filmed off Argentina and Hawaii – have obviously tracked objects with vision underwater, and they can apparently see moderately well both in water and in air. However, the posi- tion of the eyes so restricts the field of vision in baleen whales that they probably do not have stereoscopic vision.

On the other hand, the position of the eyes in most dolphins and porpoises suggests that they have stereoscopic vision forward and downward. Eye position in freshwater dolphins, which often swim on their side or upside down while feeding, suggests that what vision they have is stereoscopic forward and upward. By comparison, the bot- tlenose dolphin has extremely keen vision in water. Judging from the way it watches and tracks airborne flying fish, it can apparently see fairly well through the air–water interface as well. And although preliminary experimental evidence suggests that their in-air vision is poor, the accuracy with which dolphins leap high to take small fish out of a trainer's hand provides anecdotal evidence to the contrary.

Such variation can no doubt be explained with reference to the habitats in which indi- vidual species have developed. For example, vision is obviously more useful to species inhabiting clear open waters than to those living in turbid rivers and flooded plains. The South American boutu and Chinese beiji, for instance, appear to have very limited vision, and the Indian susus are blind, their eyes reduced to slits that probably allow them to sense only the direction and intensity of light.

Although the senses of taste and smell appear to have deteriorated, and vision in water appears to be uncertain, such weaknesses are more than compensated for by cetaceans' well-developed acoustic sense. Most species are highly vocal, although they vary in the range of sounds they produce, and many forage for food using echolo- cation1. Large baleen whales primarily use the lower frequencies and are often limited in their repertoire. Notable exceptions are the nearly song-like choruses of bowhead whales in summer and the complex, haunting utterances of the humpback whales. Toothed species in general employ more of the frequency spectrum, and produce a wider variety of sounds, than baleen species (though the sperm whale apparently pro- duces a monotonous series of high-energy clicks and little else). Some of the more complicated sounds are clearly communicative, although what role they may play in the social life and 'culture' of cetaceans has been more the subject of wild specula- tion than of solid science.

ARTICLE-2

THE ROCKET - FROM EAST TO WEST

The concept of the rocket, or rather the mechanism behind the idea of propelling an object into the air, has been around for well over two thousand years. However, it wasn't until the discovery of the reaction principle, which was the key to space travel and so represents one of the great milestones in the history of scientific thought, that rocket technology was able to develop. Not only did it solve a problem that had intrigued man for ages, but, more importantly, it literally opened the door to exploration of the universe.

An intellectual breakthrough, brilliant though it may be, does not automatically ensure that the transition is made from theory to practice. Despite the fact that rockets had been used sporadically for several hundred years, they remained a relatively minor artefact of civilisation until the twentieth century. Prodigious efforts, accelerated during two world wars, were required before the technology of primitive rocketry could be translated into the reality of sophisticated astronauts. It is strange that the rocket was generally ignored by writers of fiction to transport their heroes to mysterious realms beyond the Earth, even though it had been commonly used in fireworks displays in China since the thirteenth century. The reason is that nobody associated the reaction principle with the idea of travelling through space to a neighbouring world.

A simple analogy can help us to understand how a rocket operates. It is much like a machine gun mounted on the rear of a boat. In reaction to the backward discharge of bullets, the gun, and hence the boat, move forwards. A rocket motor's 'bullets' are minute, high-speed particles produced by burning propellants in a suitable chamber. The reaction to the ejection of these small particles causes the rocket to move forwards. There is evidence that the reaction principle was applied practically well before the rocket was invented. In his Noctes Atticae or Greek Nights, Aulus Gellius describes 'the pigeon of Archytas', an invention dating back to about 360 BC. Cylindrical in shape, made of wood, and hanging from string, it was moved to and fro by steam blowing out from small exhaust ports at either end. The reaction to the discharging steam provided the bird with motive power.

The invention of rockets is linked inextricably with the invention of 'black powder'. Most historians of technology credit the Chinese with its discovery. They base their belief on studies of Chinese writings or on the notebooks of early Europeans who settled in or made long visits to China to study its history and civilisation. It is probable that, some time in the tenth century, black powder was first compounded from its basic ingredients of saltpetre, charcoal and sulphur. But this does not mean that it was immediately used to propel rockets. By the thirteenth century, powder- propelled fire arrows had become rather common. The Chinese relied on this type of technological development to produce incendiary projectiles of many sorts, explosive grenades and possibly cannons to repel their enemies. One such weapon was the 'basket of fire' or, as directly translated from Chinese, the 'arrows like flying leopards'. The 0.7 metre-long arrows, each with a long tube of gunpowder attached near the point of each arrow, could be fired from a long, octagonal-shaped basket at the same time and had a range of 400 paces. Another weapon was the 'arrow as a flying sabre', which could be fired from crossbows. The rocket, placed in a similar position to other rocket-propelled arrows, was designed to increase the range. A small iron weight was attached to the 1.5m bamboo shaft, just below the feathers, to increase the arrow's stability by moving the centre of gravity to a position below the rocket. At a similar time, the Arabs had developed the 'egg which moves and burns'. This 'egg' was apparently full of gunpowder and stabilised by a 1.5m tail. It was fired using two rockets attached to either side of this tail.

It was not until the eighteenth century that Europe became seriously interested in the possibilities of using the rocket itself as a weapon of war and not just to propel other weapons. Prior to this, rockets were used only in pyrotechnic displays. The incentive for the more aggressive use of rockets came not from within the European continent but from far-away India, whose leaders had built up a corps of rocketeers and used rockets successfully against the British in the late eighteenth century. The Indian rockets used against the British were described by a British Captain serving in India as 'an iron envelope about 200 millimetres long and 40 millimetres in diameter with sharp points at the top and a 3m-long bamboo guiding stick'. In the early nineteenth century the British began to experiment with incendiary barrage rockets. The British rocket differed from the Indian version in that it was completely encased in a stout, iron cylinder, terminating in a conical head, measuring one metre in diameter and having a stick almost five metres long and constructed in such a way that it could be firmly attached to the body of the rocket. The Americans developed a rocket, complete with its own launcher, to use against the Mexicans in the mid-nineteenth century. A long cylindrical tube was propped up by two sticks and fastened to the top of the launcher, thereby allowing the rockets to be inserted and lit from the other end. However, the results were sometimes not that impressive as the behaviour of the rockets in flight was less than predictable.

Since then, there have been huge developments in rocket technology, often with devastating results in the forum of war. Nevertheless, the modern day space programs owe their success to the humble beginnings of those in previous centuries who developed the foundations of the reaction principle. Who knows what it will be like in the future?

EASY IELTS

ARTICLE-3

The Risks of Cigarette Smoke

Discovered in the early 1800s and named nicotianine, the oily essence now called nicotine is the main active insredient of tobacco. Nicotine, however, is only a small component of cigarette smoke, which contains more than 4,700 chemical compounds, including 43 cancer-causing substances. In recent times, scientific research has been providing evidence that years of cigarette smoking vastly increases the risk of developing fatal medical conditions.

In addition to being responsible for more than 85 per cent of lung cancers, smoking is associated with cancers of, amongst others, the mouth, stomach and kidneys, and is thought to cause about 14 per cent of leukemia and cervical cancers. In 1990, smoking caused more than 84,000 deaths, mainly resulting from such problems as pneumonia, bronchitis and influenza. Smoking, it is believed, is responsible for 30 per cent of all deaths from cancer and clearly represents the most important preventable cause of cancer in countries like the United States today.

Passive smoking, the breathing in of the side-stream smoke from the burning of tobacco between puffs or of the smoke exhaled by a smoker, also causes a serious health risk. A report published in 1992 by the US Environmental Protection Agency (EPA) emphasized the health dangers, especially from side-stream smoke. This type of smoke contains more, smaller particles and is therefore more likely to be deposited deep in the lungs. On the basis of this report, the EPA has classified environmental tobacco smoke in the highest risk category for causing cancer.

As an illustration of the health risks, in the case of a married couple where one partner is a smoker and one a non-smoker, the latter is believed to have a 30 per cent higher risk of death from heart disease because of passive smoking. The risk of lung cancer also increases over the years of exposure and the figure jumps to 80 per cent if the spouse has been smoking four packs a day for 20 years. It has been calculated that 17 per cent of cases of lung cancer can be attributed to high levels of exposure to second- hand tobacco smoke during childhood and adolescence.

A more recent study by researchers at the University of California at San Francisco (UCSF) has shown that second-hand cigarette smoke does more harm to non-smokers than to smokers. Leaving aside the philosophical question of whether anyone should have to breathe someone else’s cigarette smoke, the report suggests that the smoke experienced by many people in their daily lives is enough to produce substantial adverse effects on a person’s heart and lungs.

The report, published in the Journal of the American Medical Association (AMA), was based on the researchers’ own earlier research but also includes a review of studies over the past few years. The American Medical Association represents about half of all US doctors and is a strong opponent of smoking. The study suggests that people who smoke cigarettes are continually damaging their cardiovascular system, which adapts in order to compensate for the effects of smoking. It further states that people who do not smoke do not have the benefit of their system adapting to the smoke inhalation. Consequently, the effects of passive smoking are far greater on non-smokers than on smokers.

This report emphasizes that cancer is not caused by a single element in cigarette smoke; harmful effects to health are caused by many components. Carbon monoxide, for example, competes with oxygen in red blood cells and interferes with the blood's ability to deliver life- giving oxygen to the heart. Nicotine and other toxins in cigarette smoke activate small blood cells called platelets, which increases the likelihood of blood clots, thereby affecting blood circulation throughout the body.

The researchers criticize the practice of some scientific consultants who work with the tobacco industry for assuming that cigarette smoke has the same impact on smokers as it does on non-smokers. They argue that those scientists are underestimating the damage done by passive smoking and, in support of their recent findings, cite some previous research which points to passive smoking as the cause for between 30,000 and 60,000 deaths from heart attacks each year in the United States. This means that passive smoking is the third most preventable cause of death after active smoking and alcohol-related diseases.

The study argues that the type of action needed against passive smoking should be similar to that being taken against illegal drugs and AIDS (SIDA). The UCSF researchers maintain that the simplest and most cost-effective action is to establish smoke-free work places, schools and public places.

ARTICLE-4

Artificial Intelligence

From SIRI to self-driving cars, artificial intelligence (AI) is progressing rapidly. While science fiction often portrays AI as robots with human-like characteristics, AI can encompass anything from Google's search algorithms to IBM's Watson to autonomous weapons.

Artificial intelligence today is properly known as narrow AI (or weak AI), in that it is designed to perform a narrow task e.g. only facial recognition or only internet searches or only driving a car. However, the long-term goal of many researchers is to create general AI (AGI or strong AI). While narrow AI may outperform humans at whatever its specific task is, like playing chess or solving equations, AGI would outperform humans at nearly every cognitive task.

In the near term, the goal of keeping AI's impact on society beneficial motivates research in many areas, from economics and law to technical topics such as verification, validity, security and control. Whereas it may be little more than a minor nuisance if your laptop crashes or gets hacked, it becomes all the more important that an AI system does what you want it to do if it controls your car, your airplane, your pacemaker, your automated trading system or your power grid.

Stephen Hawking, Elon Musk, Steve Wozniak, Bill Gates, and many other big names in science and technology have recently expressed concern in the media and via open letters about the risks posed by AI, joined by many leading AI researchers. Why is the subject suddenly in the headlines?

The idea that the quest for strong AI would ultimately succeed was long thought of as science fiction, centuries or more away. However, thanks to recent breakthroughs, many AI milestones, which experts viewed as decades away merely five years ago, have now been reached, making many experts take seriously the possibility of super-intelligence in our lifetime. While some experts still guess that human-level AI is centuries away, most AI researches at the 2015 Puerto Rico Conference guessed that it would happen before2060. Since it may take decades to complete the required safety research, it is prudent to start it now.

Because AI has the potential to become more intelligent than any human, we have no surefire way of predicting how it will behave. We can't use past technological developments as much of a basis because we've never created anything that has the ability to, wittingly or unwittingly, outsmart us. The best example of what we could face may be our own evolution. People now control the planet, not because we're the strongest, fastest or biggest, but because we're the smartest. If we're no longer the smartest, are we assured to remain in control?

ARTICLE-5

Tickling and Laughter

The fingers of an outstretched aim are nearing your body; you bend away folding your torso, bending your head to your shoulder in hopes that you don't get tickled; but the inevitable occurs: yon arc tickled and in hysterics you chuckle, titter, and burst into uncontrollable laughter. Why do we laugh when we are tickled?

Tickling is caused by a light sensation across our skin. At times the light sensation can cause itching; however, most of the time it causes giggling. If a feather is gently moved across the surface of the skin, it can also cause tickling and giggling. Heavy laughter is caused by someone or something placing repeated pressure on a person and tickling a particular area. The spots tickled often are feet, toes, sides, underarms, and neck which cause a great deal of laughter. Yngve Zotterman from Karolinska Institute has found that tickling sensations involve signals from nerve fibers. These nerve fibers are associated with pain and touch. Also, Zotterman has discovered tickling sensations to be associated not only with nerve fibers but also with sense of touch because people who have lost pain sensations still laugh when tickled. But really, why do we laugh? Why are we not able to tickle ourselves? What part of the brain is responsible for laughter and humor? Why do we say some people have no sense of humor?

Research has shown that laughter is more than just a person's voice and movement and that it requires the coordination of many muscles throughout the body. Laughter also increases blood pressure and heart rate, changes breathing, reduces levels of certain neurochemicals (catecholamines, hormones) and provides a boost to dying immune system. Can laughter improve health? It may be a good way for people to relax because muscle tension is reduced after laughing. Human tests have found some evidence that humorous videos and tapes can reduce feelings of pain, prevent negative stress reactions and boost the brain's biological battle against infection.

Researchers believe we process humor and laughter through a complex pathway of brain activity that encompasses three main brain components. In one new study, researchers used imaging equipment to photograph die brain activity of healthy volunteers while they underwent a sidesplitting assignment of reading written jokes, viewing cartoons from The New Yorker magazine as well as "The Far Side" and listening to digital recordings of laughter. Preliminary results indicate that the humor-processing pathway includes parts of the frontal lobe brain area, important for cognitive processing the supplementary motor area, important for movement; and the nucleus accumbens, associated with pleasure. Investigations support the notion that parts of the frontal lobe are involved in humor. Subjects' brains were imaged while they were listening to jokes. An area of the frontal lobe was activated only when they thought a joke was funny. In a study that compared healthy individuals with people who had damage to their frontal lobes, the subjects with damaged frontal lobes were more likely to choose wrong punch lines to written jokes and didn't laugh or smile as much at funny cartoons or jokes.

Even though we may know more about what parts of the brain are responsible for humor, it is still hard to explain why we don't laugh or giggle when we tickle ourselves. Darwin theorized within "The Expressions of the Emotions in Man and Animals" that there was a link between tickling and laughter because of the anticipation of pleasure. Because we cannot tickle ourselves and have caused laughter, Darwin speculated surprise from another person touching a sensitive spot must have caused laughter. Some scientists believe that laughing caused by tickling is a built-in reflex even babies have. If we tickle ourselves in the same spot as our friend tickled us, we do not laugh as we did previously. The information sent to our spinal cord and brain should be exactly the same. Apparently, for tickling to work, the brain needs tension and surprise. When we tickle ourselves, we know exactly what will happen…there is no tension or surprise. How the brain uses this information about tension and surprise is still a mystery, but there is some evidence that the cerebellum may be involved. Because one part of the brain tells another: "It's just you. Don't get excited". Investigations suggest that during self-tickling, the cerebellum tells an area called the somatosensory cortex what sensation to expect, and that dampens the tickling sensation. It looks as if the killjoy is found in the cerebellum. Further explorations to understand tickling and laughter were conducted by Christenfeld and Harris. Within 'The Mystery of

Ticklish Laughter and “Can a Machine Tickleyn they explained that people laughed equally whether tickled by a machine or by a person. The participants were not aware that who or what was tickling them. However, the laughter was equally resounded. It is suggested that tickling response is a reflex, which, like Darwin suggested earlier, is dependent on the element of surprise.

Damage to any one part of the brain may affect one’s overall ability to process humor. Peter Derks, a professor of psychology, conducted his research with a group of scientists at NASA-Langley in Hampton. Using a sophisticated electroencephalogram (EEG), they measured the brain activity of 10 people exposed to humorous stimuli. How quickly our brain recognizes the incongruity that deals with most humor and attaches an abstract meaning to it determines whether we laugh. However, different people find different jokes funny. That can be due to a number of factors, including differences in personality, intelligence, mental state and probably mood. But according to Derks, the majority of people recognize when a situation is meant to be humorous. In a series of experiments, he noticed that several patients recovering from brain injuries could not distinguish between something funny and something not.

Dr. Shibata of the University of Rochester School of Medicine said our neurons get tickled when we hear a joke. The brain’s ‘Tunny bone” is located at the right frontal lobe just above the right eye and appears critical to our ability to recognize a joke. Dr. Shibata gave his patients MRI scans to measure brain activity, trying to find out what part of the brain is particularly active while telling the punch line of a joke as opposed to the rest of the joke and funny cartoons in comparison to parts of the cartoons that are not funny. The jokes “tickled” the frontal lobes. The scans also showed activity in the nucleus accumbens, which is likely related to our feeling of mirth after hearing a good joke and our “addiction” to humor. While his research was about humor, the results could help lead to answers and solutions to depression. Parts of the brain that are active during humor are actually abnormal in patients with depression. Eventually, brain scans might be used to assess patients with depression and other mood disorders. The research may also explain why some stroke victims lose their sense of humor or suffer from other personality changes. The same part of the brain is also associated with social and emotional judgment and planning.

ARTICLE-6

The Ingenuity Gap

Ingenuity, as I define it here, consists not only of ideas for new technologies like computers or drought-resistant crops but, more fundamentally, of ideas for better institutions and social arrangements, like efficient markets and competent governments. How much and what kinds of ingenuity a society requires depends on a range of factors, including the society’s goals and the circumstances within which it must achieve those goals—whether it has a young population or an ageing one, an abundance of natural resources or a scarcity of them, an easy climate or a punishing one, whatever the case may be.

How much and what kinds of ingenuity a society supplies also depends on many factors, such as the nature of human inventiveness and understanding, the rewards an economy gives to the producers of useful knowledge, and the strength of political opposition to social and institutional reforms.

A good supply of the right kind of ingenuity is essential, but it isn’t, of course, enough by itself. We know that the creation of wealth, for example, depends not only on an adequate supply of useful ideas but also on the availability of other, more conventional factors of production, like capital and labor. Similarly, prosperity, stability and justice usually depend on the resolution, or at least the containment, of major political struggles over wealth and power. Yet within our economies ingenuity often supplants labor, and growth in the stock of physical plant is usually accompanied by growth in the stock of ingenuity. And in our political systems, we need great ingenuity to set up institutions that successfully manage struggles over wealth and power. Clearly, our economic and political processes are intimately entangled with the production and use of ingenuity.

The past century’s countless incremental changes in our societies around the planet, in our technologies and our interactions with our surrounding natural environments, have accumulated to create a qualitatively new world. Because these changes have accumulated slowly, it’s often hard for us to recognize how profound and sweeping they’ve been.

They include far larger and denser populations; much higher per capita consumption of natural resources; and far better and more widely available technologies for the movement of people, materials, and especially information.

In combination, these changes have sharply increased the density, intensity, and pace of our interactions with each other; they have greatly increased the burden we place on our natural environment; and they have helped shift power from national and international institutions to individuals in subgroups, such as political special interests and ethnic factions.

As a result, people in all walks of life—from our political and business leaders to all of us in our day-to-day—must cope with much more complex, urgent, and often unpredictable circumstances. The management of our relationship with this new world requires immense and ever-increasing amounts of social and technical ingenuity. As we strive to maintain or increase our prosperity and improve the quality of our lives, we must make far more sophisticated decisions, and in less time, than ever before.

When we enhance the performance of any system, from our cars to the planet's network of financial institutions, we tend to make it more complex. Many of the natural systems critical to our well-being, like the global climate and the oceans, are extraordinarily complex, to begin with. We often can't predict or manage the behavior of complex systems with much precision, because they are often very sensitive to the smallest of changes and perturbations, and their behavior can flip from one mode to another suddenly and dramatically. In general, as the human-made and natural systems, we depend upon becoming more complex, and as our demands on them increase, the institutions and technologies we use to manage them must become more complex too, which further boosts our need for ingenuity.

The good news, though, is that the last century's stunning changes in our societies and technologies have not just increased our need for ingenuity; they have also produced a huge increase in its supply. The growth and urbanization of human populations have combined with astonishing new communication and transportation technologies to expand interactions among people and produce larger, more integrated, and more efficient markets. These changes have, in turn, vastly accelerated the generation and delivery of useful ideas.

But—and this is the critical "but"—we should not jump to the conclusion that the supply of ingenuity always increases in lockstep with our ingenuity requirement: while it's true that necessity is often the mother of invention, we can't always rely on the right kind of ingenuity appearing when and where we need it. In many cases, the complexity and speed of operation of today's vital economic, social, and ecological systems exceed the human brain's grasp. Very few of us have more than a rudimentary understanding of how these systems work. They remain fraught with countless "unknown unknowns," which makes it hard to supply the ingenuity we need to solve problems associated with these systems.

In this book, I explore a wide range of other factors that will limit our ability to supply the ingenuity required in the coming century. For example, many people believe that new communication technologies strengthen democracy and will make it easier to find solutions to our societies' collective problems, but the story is less clear than it seems. The crush of information in our everyday lives is shortening our attention span, limiting the time we have to reflect on critical matters of public policy, and making policy arguments more superficial.

Modern markets and science are an important part of the story of how we supply ingenuity. Markets are critically important because they give entrepreneurs an incentive to produce knowledge. As for science, although it seems to face no theoretical limits, at least in the foreseeable future, practical constraints often slow its progress. The cost of scientific research tends to increase as it delves deeper into nature. And science's rate of advance depends on the characteristic of the natural phenomena it investigates, simply because some phenomena are intrinsically harder to understand than others, so the production of useful new knowledge in these areas can be very slow. Consequently, there is often a critical time lag between the recognition between a problem and the delivery of sufficient ingenuity, in the form of technologies, to solve that problem. Progress in the social sciences is especially slow, for reasons we don't yet understand; but we desperately need better social scientific knowledge to build the sophisticated institutions today's world demands

EASY IELTS

ARTICLE-7

Mind readers

It may one day be possible to eavesdrop on another person's inner voice.

As you begin to read this article and your eyes follow the words across the page, you may be aware of a voice in your head silently muttering along. The very same thing happens when we write: a private, internal narrative shapes the words before we commit them to text.

What if it were possible to tap into this inner voice? Thinking of words does, after all, create characteristic electrical signals in our brains, and decoding them could make it possible to piece together someone's thoughts. Such an ability would have phenomenal prospects, not least for people unable to communicate as a result of brain damage. But it would also carry profoundly worrisome implications for the future of privacy.

The first scribbled records of electrical activity in the human brain were made in 1924 by a German doctor called Hans Berger using his new invention - the electroencephalogram (EEG). This uses electrodes placed on the skull to read the output of the brain's billions of nerve cells or neurons. By the mid-1990s, the ability to translate the brain's activity into readable signals had advanced so far that people could move computer cursors using only the electrical fields created by their thoughts.

The electrical impulses such innovations tap into are produced in a part of the brain called the motor cortex, which is responsible for muscle movement. To move a cursor on a screen, you do not think 'move left' in natural language. Instead, you imagine a specific motion like hitting a ball with a tennis racket. Training the machine to realise which electrical signals correspond to your imagined movements, however, is time consuming and difficult. And while this method works well for directing objects on a screen, its drawbacks become apparent when you try using it to communicate. At best, you can use the cursor to select letters displayed on an on-screen keyboard. Even a practised mind would be lucky to write 15 words per minute with that approach. Speaking, we can manage 150.

Matching the speed at which we can think and talk would lead to devices that could instantly translate the electrical signals of someone's inner voice into sound produced by a speech synthesiser. To do this, it is necessary to focus only on the signals coming from the brain areas that govern speech. However, real mind reading requires some way to intercept those signals before they hit the motor cortex.

The translation of thoughts to language in the brain is an incredibly complex and largely mysterious process, but this much is known: before they end up in the motor cortex, thoughts destined to become spoken words pass through two 'staging areas' associated with the perception and expression of speech.

The first is called Wernicke's area, which deals with semantics - in this case, ideas based in meaning, which can include images, smells or emotional memories. Damage to Wernicke's area can result in the loss of semantic associations: words can't make sense when they are decoupled from their meaning. Suffer a stroke in that region, for example, and you will have trouble understanding not just what others are telling you, but what you yourself are thinking.

The second is called Broca's area, agreed to be the brain's speech-processing centre. Here, semantics are translated into phonetics and ultimately, word components. From here, the assembled sentences take a quick trip to the motor cortex, which activates the muscles that will turn the desired words into speech.

Injure Broca's area, and though you might know what you want to say, you just can't send those impulses.

When you listen to your inner voice, two things are happening. You 'hear' yourself producing language in Wernicke's area as you construct it in Broca's area. The key to mind reading seems to lie in these two areas.

(line 44) The work of Bradley Greger in 2010 broke new ground by marking the first-ever excursion beyond the motor cortex into the brain's language centres. His team used electrodes placed inside the skull to detect the electrical signatures of whole words, such as 'yes', 'no', 'hot', 'cold', 'thirsty', 'hungry', etc. Promising as it is. This approach requires a new signal to be learned for each new word. English contains a quarter of a million distinct words. And though this was the first instance of monitoring Wernicke's area, it still relied largely on the facial motor cortex.

Greger decided there might be another way. The building blocks of language are called phonemes, and the English language has about 40 of them - the 'kuh' sound in 'school', for example, the '$h' in 'shy'. Every English word contains some subset of these components. Decode the brain signals that correspond to the phonemes, and you would have a system to unlock any word at the moment someone thinks it.

In 2011, Eric Leuthardt and his colleague Gerwin Schalk positioned electrodes over the language regions of four fully conscious people and were able to detect the phonemes 'oo', 'ah', 'eh' and 'ee'. What they also discovered was that spoken phonemes activated both the language areas and the motor cortex, while imagined speech - that inner voice - boosted the activity of neurons in Wernike's area. Leuthardt had effectively read his subjects' minds. 'I would call it brain reading,' he says. To arrive at whole words, Leuthardt's next step is to expand his library of sounds and to find out how the production of phonemes translates across different languages.

For now, the research is primarily aimed at improving the lives of people with locked-in syndrome, but the ability to explore the brain's language centres could revolutionise other fields. The consequences of these findings could ripple out to more general audiences who might like to use extreme hands-free mobile communication technologies that can be manipulated by inner voice alone. For linguists, it could provide previously unobtainable insight into the neural origins and structures of language. Knowing what someone is thinking without needing words at all would be functionally indistinguishable from telepathy.

ARTICLE-8

Art to the aid of technology

Our brains are incredibly agile machines, and it is hard to think of anything they do more efficiently than recognize faces. Just hours after birth, the eyes of newborns are drawn to facelike patterns. An adult brain knows it is seeing a face within 100 milliseconds, and it takes just over a second to realize that two different pictures of a face, even if they are lit or rotated in very different ways, belong to the same person.

Perhaps the most vivid illustration of our gift for recognition is the magic of caricature-the fact that the sparest cartoon of a familiar face, even a single line dashed off in two seconds, can be identified by our brains in an instant. It is often said that a good caricature looks more like a person than the person themselves. As it happens, this notion, counterintuitive though it may sound, is actually supported by research. In the field of vision science, there is even a term for this seeming paradox-the caricature effect-a phrase that hints at how our brains misperceive faces as much as perceive them.

Human faces are all built pretty much the same: two eyes above a nose that's above a mouth, the features varying from person to person generally by mere millimetres. So what our brains look for, according to vision scientists, are the outlying features-those characteristics that deviate most from the ideal face we carry around in our heads, the running average of every "visage" we have ever seen. We code each new face we encounter not in absolute terms but in the several ways, it differs markedly from the mean. In other words, we accentuate what is most important for recognition and largely ignore what is not. Our perception fixates on the upturned nose, the sunken eyes or the fleshy cheeks, making them loom larger. To better identify and remember people, we turn them into caricatures.

Ten years ago, we all imagined that as soon as surveillance cameras had been equipped with the appropriate software, the face of a crime suspect would stand out in a crowd. Like a thumbprint, its unique features and configuration would offer a biometric key that could be immediately checked against any database of suspects. But now a decade has passed, and face-recognition systems still perform miserably in real-world conditions. Just recently, a couple who accidentally swapped passports at an airport in England sailed through electronic gates that were supposed to match their faces to file photos.

All this leads to an interesting question. What if, to secure our airports and national landmarks, we need to learn more about caricature? After all, it's the skill of the caricaturist-the uncanny ability to quickly distill faces down to their most salient features-that our computers most desperately need to acquire. Clearly, better cameras and faster computers simply aren't going to be enough.

At the University of Central Lancashire in England, Charlie Frowd, a senior lecturer in psychology, has used insights from caricature to develop a better police-composite generator. His system, called EvoFIT, produces animated caricatures, with each successive frame showing facial features that are more exaggerated than the last. Frowd's research supports the idea that we all store memories as caricatures, but with our own personal degree of amplification. So, as an animated composite depicts faces at varying stages of caricature, viewers respond to the stage that is most recognizable to them. In tests, Frowd's technique has increased positive identifications from as low as 3 percent to upwards of 30 percent.

To achieve similar results in computer face recognition, scientists would need to model the artist’s genius even more closely-a feat that might seem impossible if you listen to some of the artists describe their nearly mystical acquisition of skills. Jason Seiler recounts how he trained his mind for years, beginning in middle school, until he gained what he regards as nothing less than a second sight. ‘A lot of people think that caricature is about picking out someone’s worst feature and exaggerating it as far as you can,' Seiler says. 'That’s wrong. Caricature is basically finding the truth. And then you push the truth.' Capturing a likeness, it seems, has less to do with the depiction of individual features than with their placement in relationship to one another. 'It's how the human brain recognizes a face. When the ratios between the features are correct, you see that face instantly.’

Pawan Sinha. director of MIT's Sinha Laboratory for Vision Research, and one of the nation's most innovative computer-vision researchers, contends that these simple, exaggerated drawings can be objectively and systematically studied and that such work will lead to breakthroughs in our understanding of both human and machine-based vision. His lab at MIT is preparing to computationally analyze hundreds of caricatures this year, from dozens of different artists, with the hope of tapping their intuitive knowledge of what is and isn’t crucial for recognition. He has named this endeavor the Hirschfeld Project, after the famous New York Times caricaturist Al Hirschfeld.

Quite simply, by analyzing sketches, Sinha hopes to pinpoint the recurring exaggerations in the caricatures that most strongly correlate to particular ways that the original faces deviate from the norm. The results, he believes, will ultimately produce a rank-ordered list of the 20 or so facial attributes that are most important for recognition: 'It’s a recipe for how to encode the face,' he says. In preliminary tests, the lab has already isolated important areas-for example, the ratio of the height of the forehead to the distance between the top of the nose and the mouth.

On a given face, four of 20 such Hirschfeld attributes, as Sinha plans to call them, will be several standard deviations greater than the mean; on another face, a different handful of attributes might exceed the norm. But in all cases, it's the exaggerated areas of the face that hold the key. As matters stand today, an automated system must compare its target faces against the millions of continually altering faces it encounters. But so far, the software doesn't know what to look for amid this onslaught of variables. Armed with the Hirschfeld attributes, Sinha hopes that computers can be trained to focus on the features most salient for recognition, tuning out the others. 'Then.' Sinha says, 'the sky is the limit'.

ARTICLE-9

Space: The Final Archaeological Frontier

Space travel may still have a long way to go, but the notion of archaeological research and heritage management in space is already concerning scientists and environmentalists.

In 1993, University of Hawaii's anthropologist Ben Finney, who for much of his career has studied the technology once used by Polynesians to colonize islands in the Pacific, suggested that it would not be premature to begin thinking about the archaeology of Russian and American aerospace sites on the Moon and Mars. Finney pointed out that just as today's scholars use archaeological records to investigate how Polynesians diverged culturally as they explored the Pacific, archaeologists will someday study off-Earth sites to trace the development of humans in space. He realized that it was unlikely anyone would be able to conduct fieldwork in the near future, but he was convinced that one day such work would be done.

There is a growing awareness, however, that it won't be long before both corporate adventurers and space tourists reach the Moon and Mars. There is a wealth of important archaeological sites from the history of space exploration on the Moon and Mars and measures need to be taken to protect these sites. In addition to the threat from profit- seeking corporations, scholars cite other potentially destructive forces such as souvenir hunting and unmonitored scientific sampling, as has already occurred in explorations of remote polar regions. Already in 1999 one company was proposing a robotic lunar rover mission beginning at the site of Tranquility Base and rumbling across the Moon from one archaeological site to another, from the wreck of the Ranger S probe to Apollo 17 s landing site. The mission, which would leave vehicle tyre- marks all over some of the most famous sites on the Moon, was promoted as a form of theme-park entertainment.

According to the vaguely worded United Motions Outer Space Treaty of 1967. what it terms 'space junk' remains the property of the country that sent the craft or probe into space. But the treaty doesn't explicitly address protection of sites like Tranquility Base, and equating the remains of human exploration of the heavens with 'space junk' leaves them vulnerable to scavengers. Another problem arises through other international treaties proclaiming that land in space cannot be owned by any country or individual. This presents some interesting dilemmas for the aspiring manager of extraterrestrial cultural resources. Does the US own Neil Armstrong's famous first footprints on the Moon but not the lunar dust in which they were recorded? Surely those footprints are as important in the story of human development as those left by hominids at Laetoli, Tanzania. But unlike the Laetoli prints, which have survived for 3.5 million years encased in cement-like ash. those at Tranquility Base could be swept away with a casual brush of a space tourist's hand. To deal with problems like these, it may be time to look to innovative international administrative structures for the preservation of historic remains on the new frontier.

The Moon, with its wealth of sites, will surely be the first destination of archaeologists trained to work in space. But any young scholars hoping to claim the mantle of history's first lunar archaeologist will be disappointed. That distinction is already taken.

On November 19. 1969. astronauts Charles Conrad and Alan Bean made a difficult manual landing of the Apollo 12 lunar module in the Moon's Ocean of Storms, just a few hundred feet from an unmanned probe. Surveyor J. that had landed in a crater on April 19. 1967. Unrecognized at the time, this was an important moment in the history of science. Bean and Conrad were about to conduct the first archaeological studies on the Moon.

After the obligatory planting of the American flag and some geological sampling, Conrad and Bean made their way to Surveyor 3. They observed that the probe had bounced after touchdown and carefully photographed the impressions made by its footpads. The whole spacecraft was covered in dust, perhaps kicked up by the landing.

The astronaut-archaeologists carefully removed the probes television camera, remote sampling arm. and pieces of tubing. They bagged and labelled these artefacts, and stowed them on board their lunar module. On their return to Earth, they passed them on to the Daveson Space Center in Houston, Texas, and the Hughes Air and Space Corporation in EI Segundo, California. There, scientists analyzed the changes in these aerospace artefacts.

One result of the analysis astonished them. A fragment of the television camera revealed evidence of the bacteria Streptococcus mitis. I or a moment it was thought Conrad and Bean had discovered evidence for life on the Moon, but after further research the real explanation became apparent. While the camera was being installed in the probe prior to the launch, someone sneezed on it. The resulting bacteria had travelled to the Moon, remained in an alternating freezing.' boiling vacuum for more than two years, and returned promptly to life upon reaching the safety of a laboratory back on Earth.

The finding that not even the vastness of space can stop humans from spreading a sore throat was an unexpected spin-off. But the artefacts brought back by Rean and Conrad have a broader significance. Simple as they may seem, they provide the first example of extraterrestrial archaeology and perhaps more significant for the history of the discipline formational archaeology, the study of environmental and cultural forces upon the life history of human artefacts in space.

ARTICLE-10

Striking the right note

Is perfect pitch a rare talent possessed solely by the likes of Beethoven? Kathryn Brown discusses this much sought-after musical ability.

The uncanny, if sometimes distracting, ability to name a solitary note out of the blue, without any other notes for reference, is a prized musical talent - and a scientific mystery. Musicians with perfect pitch - or, as many researchers prefer to call it, absolute pitch - can often play pieces by ear, and many can transcribe music brilliantly. That's because they perceive the position of a note in the musical stave - its pitch - as clearly as the fact that they heard it. Hearing and naming the pitch go hand in hand.

By contrast, most musicians follow not the notes, but the relationship between them. They may easily recognise two notes as being a certain number of tones apart, but could name the higher note as an E only if they are told the lower one is a C, for example. This is relative pitch. Useful, but much less mysterious.

For centuries, absolute pitch has been thought of as the preserve of the musical elite. Some estimates suggest that maybe fewer than 1 in 2,000 people possess it. But a growing number of studies, from speech experiments to brain scans, are now suggesting that a knack for absolute pitch may be far more common, and more varied, than previously thought. 'Absolute pitch is not an all or nothing feature,' says Marvin, a music theorist at the University of Rochester in New York state. Some researchers even claim that we could all develop the skill, regardless of our musical talent. And their work may finally settle a decades-old debate about whether absolute pitch depends on melodious genes - or early music lessons.

Music psychologist Diana Deutsch at the University of California in San Diego is the leading voice. Last month at the Acoustical Society of America meeting in Columbus, Ohio, Deutsch reported a study that suggests we all have the potential to acquire absolute pitch - and that speakers of tone languages use it every day. A third of the world's population - chiefly people in Asia and Africa - speak tone languages, in which a word's meaning can vary depending on the pitch a speaker uses.

Deutsch and her colleagues asked seven native Vietnamese speakers and 15 native Mandarin speakers to read out lists of words on different days. The chosen words spanned a range of pitches, to force the speakers to raise and lower their voices considerably. By recording these recited lists and taking the average pitch for each whole word, the researchers compared the pitches used by each person to say each word on different days.

Both groups showed strikingly consistent pitch for any given word - often less than a quarter-tone difference between days. 'The similarity,' Deutsch says, 'is mind-boggling.' It's also, she says, a real example of absolute pitch. As babies, the speakers learnt to associate certain pitches with meaningful words - just as a musician labels one tone A and another B - and they demonstrate this precise use of pitch regardless of whether or not they have had any musical training, she adds.

Deutsch isn't the only researcher turning up everyday evidence of absolute pitch. At least three other experiments have found that people can launch into familiar songs at or very near the correct pitches. Some researchers have nicknamed this ability 'absolute memory', and they say it pops up on other senses, too. Given studies like these, the real mystery is why we don't all have absolute pitch, says cognitive psychologist Daniel Levitin of McGill University in Montreal.

Over the past decade, researchers have confirmed that absolute pitch often runs in families. Nelson Freimer of the University of California in San Francisco, for example, is just completing a study that he says strongly suggests the right genes help create this brand of musical genius. Freimer gave tone tests to people with absolute pitch and to their relatives. He also tested several hundred other people who had taken early music lessons. He found that relatives of people with absolute pitch were far more likely to develop the skill than people who simply had the music lessons. There is clearly a familial aggregation of absolute pitch,' Freimer says.

Freimer says some children are probably genetically predisposed toward absolute pitch - and this innate inclination blossoms during childhood music lessons. Indeed, many researchers now point to this harmony of nature and nurture to explain why musicians with absolute pitch show different levels of the talent.

Indeed, researchers are finding more and more evidence suggesting music lessons are critical to the development of absolute pitch. In a survey of 2,700 students in American music conservatories and college programmes, New York University geneticist Peter Gregersen and his colleagues found that a whopping 32 per cent of the Asian students reported having absolute pitch, compared with just 7 per cent of non-Asian students. While that might suggest a genetic tendency towards absolute pitch in the Asian population, Gregersen says that the type and timing of music lessons probably explains much of the difference.

For one thing, those with absolute pitch started lessons, on average, when they were five years old, while those without absolute pitch started around the age of eight. Moreover, adds Gregersen, the type of music lessons favoured in Asia, and by many of the Asian families in his study, such as the Suzuki method, often focus on playing by ear and learning the names of musical notes, while those more commonly used in the US tend to emphasise learning scales in a relative pitch way. In Japanese pre-school music programmes, he says, children often have to listen to notes played on a piano and hold up a coloured flag to signal the pitch. 'There's a distinct cultural difference,' he says.

Deutsch predicts that further studies will reveal absolute pitch - in its imperfect, latent form - inside all of us. The Western emphasis on relative pitch simply obscures it, she contends. 'It's very likely that scientists will end up concluding that we're all born with the potential to acquire very fine-grained absolute pitch. It's really just a matter of life getting in the way.'

ARTICLE-11

Trends in the Indian fashion and textile industries

During the 1950s, the Indian fashion scene was exciting, stylish and very graceful. There were no celebrity designers or models, nor were there any labels that were widely recognised. The value of a garment was judged by its style and fabric rather than by who made it. It was regarded as perfectly acceptable, even for high-society women, to approach an unknown tailor who could make a garment for a few rupees, providing the perfect fit, finish and style. They were proud of getting a bargain, and of giving their own name to the end result.

The 1960s was an era full of mischievousness and celebration in the arts, music and cinema. The period was characterised by freedom from restrictions and, in the fashion world, an acceptance of innovative types of material such as plastic and coated polyester. Tight-fitting kurtas [1] and churidars [2] and high coiffures were a trend among women.

The following decade witnessed an increase in the export of traditional materials, and the arrival in India of international fashion. Synthetics became trendy, and the disco culture affected the fashion scene.

It was in the early 80s when the first fashion store ‘Ravissant’ opened in Mumbai. At that time garments were retailed for a four-figure price tag. American designers like Calvin Klein became popular. In India too, contours became more masculine, and even the salwar kameez [3] was designed with shoulder pads.

With the evolution of designer stores came the culture of designer fashion, along with its hefty price tags. Whatever a garment was like, consumers were convinced that a higher price tag signified elegant designer fashion, so garments were sold at unbelievable prices. Meanwhile, designers decided to get themselves noticed by making showy outfits and associating with the right celebrities. Soon, fashion shows became competitive, each designer attempting to out-do the other in theme, guest list and media coverage.

In the last decade of the millennium, the market shrank and ethnic wear made a comeback. During the recession, there was a push to sell at any cost. With fierce competition, the inevitable occurred: the once hefty price tags began their downward journey, and the fashion-show industry followed suit. However, the liveliness of the Indian fashion scene had not ended - it had merely reached a stable level.

At the beginning of the 21 st century, with new designers and models, and more sensible designs, the fashion industry accelerated once again. As far as the global fashion industry is concerned, Indian ethnic designs and materials are currently in demand from fashion houses and garment manufacturers. India is the third largest producer of cotton, the second largest producer of silk, and the fifth largest producer of man-made fibres in the world.

The Indian garment and fabric industries have many fundamental advantages, in terms of a cheaper, skilled work force, cost-effective production, raw materials, flexibility, and a wide range of designs with sequins, beadwork, and embroidery. In addition, that India provides garments to international fashion houses at competitive prices, with a shorter lead time, and an effective monopoly on certain designs, is accepted the whole world over. India has always been regarded as the default source in the embroidered garments segment, but changes in the rate of exchange between the rupee and the dollar have further depressed prices, thereby attracting more buyers. So the international fashion houses walk away with customised goods, and craftwork is sold at very low rates.

As far as the fabric market is concerned, the range available in India can attract as well as confuse the buyer. Much of the production takes place in the small town of Chapa in the eastern state of Bihar, a name one might never have heard of. Here fabric-making is a family industry; the range and quality of raw silks churned out here belie the crude production methods and equipment. Surat in Gujarat, is the supplier of an amazing set of jacquards, moss crepes and georgette sheers - all fabrics in high demand. Another Indian fabric design that has been adopted by the fashion industry is the ‘Madras check’, originally utilised for the universal lungi, a simple lower-body wrap worn in southern India. This design has now found its way on to bandannas, blouses, home furnishings and almost anything one can think of.

Ethnic Indian designs with batik and hand-embroidered motifs have also become popular across the world. Decorative bead work is another product in demand in the international market. Beads are used to prepare accessory items like belts and bags, and beadwork is now available for haute couture evening wear too.

[1] knee-length tunics
[2] trousers
[3] trouser suit

EASY IELTS

ARTICLE-12

Tackling Obesity in the Western World

Obesity is a huge problem in many Western countries and one which now attracts considerable medical interest as researchers take up the challenge to find a 'cure' for the common condition of being seriously overweight. However, rather than take responsibility for their weight, obese people have often sought solace in the excuse that they have a slow metabolism, a genetic hiccup which sentences more than half the Australian population (63% of men and 47% of women) to a life of battling with their weight. The argument goes like this: it doesn't matter how little they eat, they gain weight because their bodies break down food and turn it into energy more slowly than those with a so-called normal metabolic rate.

. 'This is nonsense,' says Dr Susan Jebb from the Dunn Nutrition Unit at Cambridge in England. Despite the persistence of this metabolism myth, science has known for several years that the exact opposite is in fact true. Fat people have faster metabolisms than thin people. 'What is very clear,' says Dr Jebb, 'is that overweight people actually burn off more energy. They have more cells, bigger hearts, bigger lungs and they all need more energy just to keep going.'

It took only one night, spent in a sealed room at the Dunn Unit to disabuse one of their patients of the beliefs of a lifetime: her metabolism was fast, not slow. By sealing the room and measuring the exact amount of oxygen she used, researchers were able to show her that her metabolism was not the culprit. It wasn't the answer she expected and probably not the one she wanted but she took the news philosophically.

Although the metabolism myth has been completely disproved, science has far from discounted our genes as responsible for making us whatever weight we are, fat or thin. One of the world's leading obesity researchers, geneticist Professor Stephen O'Rahilly, goes so far as to say we are on the threshold of a complete change in the way we view not only morbid obesity, but also everyday overweight. Prof. O'Rahilly's groundbreaking work in Cambridge has proven that obesity can be caused by our genes. 'These people are not weak- willed, slothful or lazy,' says Prof. O'Rahilly, 'They have a medical condition due to a genetic defect and that causes them to be obese.'

In Australia, the University of Sydney's Professor Ian Caterson says while major genetic defects may be rare, many people probably have minor genetic variations that combine to dictate weight and are responsible for things such as how much we eat, the amount of exercise we do and the amount of energy we need. When you add up all these little variations, the result is that some people are genetically predisposed to putting on weight. He says while the fast/slow metabolism debate may have been settled, that doesn't mean some other subtle change in the metabolism gene won't be found in overweight people. He is confident that science will, eventually, be able to 'cure' some forms of obesity but the only effective way for the vast majority of overweight and obese people to lose weight is a change of diet and an increase in exercise.

Despite the $500 million a year Australians spend trying to lose weight and the $830 million it costs the community in health care, obesity is at epidemic proportions here, as it is in all Western nations. Until recently, research and treatment for obesity had concentrated on behaviour modification, drugs to decrease appetite and surgery. How the drugs worked was often not understood and many caused severe side effects and even death in some patients. Surgery for obesity has also claimed many lives.

It has long been known that a part of the brain called the hypothalamus is responsible for regulating hunger, among other things. But it wasn't until 1994 that Professor Jeffery Friedman from Rockefeller University in the US sent science in a new direction by studying an obese mouse. Prof. Friedman found that unlike its thin brothers, the fat mouse did not produce a hitherto unknown hormone called leptin. Manufactured by the fat cells, leptin acts as a messenger, sending signals to the hypothalamus to turn off the appetite. Previously, the fat cells were thought to be responsible simply for storing fat. Prof. Friedman gave the fat mouse leptin and it lost 30% of its body weight in two weeks.

On the other side of the Atlantic, Prof. O'Rahilly read about this research with great excitement. For many months two blood samples had lain in the bottom of his freezer, taken from two extremely obese young cousins. He hired a doctor to develop a test for leptin in human blood, which eventually resulted in the discovery that neither of the children's blood contained the hormone. When one cousin was given leptin, she lost a stone in weight and Prof. O'Rahilly made medical history. Here was the first proof that a genetic defect could cause obesity in humans. But leptin deficiency turned out to be an extremely rare condition and there is a lot more research to be done before the 'magic' cure for obesity is ever found.

ARTICLE-13

EASY IELTS

Green virtues of green sand

Revolution in glass recycling could help keep water clean

For the past 100 years, special high-grade white sand dug from the ground at Leighton Buzzard in the UK has been used to filter tap water to remove bacteria and impurities but this may no longer be necessary. A new factory that turns used wine bottles into green sand could revolutionise the recycling industry and help to filter Britain’s drinking water. Backed by $1.6m from the European Union and the Department for Environment, Food and Rural Affairs (Defra), a company based in Scotland is building the factory, which will turn beverage bottles back into the sand from which they were made in the first place. The green sand has already been successfully tested by water companies and is being used in 50 swimming pools in Scotland to keep the water clean.

The idea is not only to avoid using up an increasingly scarce natural resource, sand but also to solve a crisis in the recycling industry. Britain uses 5.5m tonnes of glass a year, but recycles only 750,000 tonnes of it. The problem is that half the green bottle glass in Britain is originally from imported wine and beer bottles. Because there is so much of it, and it is used less in domestic production than other types, green glass is worth only $25 a tonne. Clear glass, which is melted down and used for whisky bottles, mainly for export, is worth double that amount.

Howard Dryden, a scientist and managing director of the company, Dryden Aqua, of Bonnyrigg, near Edinburgh, has spent six years working on the product he calls Active Filtration Media, or AFM. He concedes that he has given what is basically recycled glass a ‘fancy name' to remove the stigma of what most people would regard as an inferior product. He says he needs bottles that have already contained drinkable liquids to be sure that drinking water filtered through the AFM would not be contaminated. Crushed down beverage glass has fewer impurities than real sand and it performed better in trials. 'The fact is that tests show that AFM does the job better than sand, it is easier to clean and reuse and has all sorts of properties that make it ideal for other applications.' he claimed.

The factory is designed to produce 100 tonnes of AFM a day, although Mr Dryden regards this as a large-scale pilot project rather than full production. Current estimates of the UK market for this glass for filtering drinking water, sewage, industrial water, swimming pools and fish farming are between 175.000 to 217.000 tonnes a year, which w ill use up most of the glass available near the factory. So he intends to build five or six factories in cities where there are large quantities of bottles, in order to cut down on transport costs.

The current factory will be completed this month and is expected to go into full production on January 14th next year. Once it is providing a ‘regular’ product, the government’s drinking water inspectorate will be asked to perform tests and approve it for widespread use by water companies. A Defra spokesman said it was hoped that AFM could meet approval within six months. The only problem that they could foresee was possible contamination if some glass came from sources other than beverage bottles.

Among those who have tested the glass already is Caroline Fitzpatrick of the civil and environmental engineering department of University College London. ‘We have looked at a number of batches and it appears to do the job.' she said. ‘Basically, sand is made of glass and Mr Dryden is turning bottles back into sand. It seems a straightforward idea and there is no reason we can think of why it would not work. Since glass from wine bottles and other beverages has no impurities and clearly did not leach any substances into the contents of the bottles, there was no reason to believe there would be a problem,’ Dr Fitzpatrick added.

Mr Dryden has set up a network of agents round the world to sell AFM. It is already in use in central America to filter water on banana plantations where the fruit has to be washed before being despatched to European markets. It is also in use in sewage works to filter water before it is returned to rivers, something which is becoming legally necessary across the European Union because of tighter regulations on sewage works. So there are a great number of applications involving cleaning up water. Currently, however, AFM costs $670 a tonne, about four times as much as good quality sand. ‘Hut that is because we haven't got large-scale production. Obviously, when we get going it will cost a lot less, and be competitive with sand in price as well.’ Mr Dryden said. ‘I believe it performs better and lasts longer than sand, so it is going to be better valued too.'

If AFM takes off as a product it will be a big boost for the government agency which is charged with finding a market for recycled products. Crushed glass is already being used in road surfacing and in making tiles and bricks. Similarly. AFM could prove to have a widespread use and give green glass a cash value.

ARTICLE-14

Why are so few tigers man-eaters?

As you leave the Bandhavgarh National Park in central India, there is a notice which shows a huge, placid tiger. The notice says, ‘You may not have seen me, but I have seen you.’ There are more than a billion people In India and Indian tigers probably see humans every single day of their lives. Tigers can and do kill almost everything they meet in the jungle, they will kill even attack elephants and rhino. Surely, then, it is a little strange that attacks o humans are not more frequent.

Some people might argue that these attacks were, in fact, common in the past. British writers of adventure stories, such as Jim Corbett, gave the impression that village life in India in the early years of the twentieth century involved a stage of constant siege by man-eating tigers. But they may have overstated the terror spread by tigers. There were also far more tigers around in those days (probably 60.000 in the subcontinent compared to just 3000 today). So in proportion, attacks appear to have been as rare then as they are today.

It is widely assumed that the constraint is fear; but what exactly are tigers afraid of? Can they really know that we may be even better armed than they are? Surely not. Have the species programmed the experiences of all tigers with humans its genes to be inherited as instinct? Perhaps. But I think the explanation may be more simple and, in a way, more intriguing.

Since the growth of ethology in the 1950s. we have tried to understand animal behaviour from the animal's point of view. Until the first elegant experiments by pioneers in the field such as Konrad Lorenz, naturalists wrote about animals as if they were slightly less intelligent humans. Jim Corbett's breathless accounts of his duels with man-eaters in truth tell us more about Jim Corbett than they do about the animals. The principle of ethology, on the other hand, requires us to attempt to think in the same way as the animal we are studying thinks, and to observe every tiny detail of its behaviour without imposing our own human significances on its actions.

I suspect that a tiger's afraid of humans lies not in some pre-programmed ancestral logic but in the way he actually perceives us visually. If you think like a tiger, a human in a car might appear just to be a part of the car, and because tigers don't eat cars the human is safe-unless the car is menacing the tiger or its cubs, in which case a brave or enraged tiger may charge. A human on foot is a different sort of puzzle. Imagine a tiger sees a man who is 1.8m tall. A tigris less than 1m tall but they may be up to 3m long from head to tail. So when a tiger sees the man face on, it might not be unreasonable for him to assume that the man is 6m long. If he meets a deer of this size, he might attack the animal by leaping on its back, but when he looks behind the mind he can't see a back. From the front, the man is huge, but looked at from the side he all but disappears. This must be very disconcerting. A hunter has to be confident that it can tackle its prey, and no one is confident when they are disconcerted. This is especially true of a solitary hunter such as the tiger and may explain why lions-particularly young lionesses who tend to encourage one another to take risks are more dangerous than tigers.

If the theory that a tiger is disconcerted to find that a standing human is both very big and yet somehow invisible is correct, the opposite should be true of a squatting human. A squatting human is half the size and presents twice the spread of back, and more closely resembles a medium-sized deer. If tigers were simply frightened of all humans, then a squatting person would be no more attractive as a target than a standing one. This, however, appears not to be the case. Many incidents of attacks on people involving villagers squatting or bending over to cut grass for fodder or building material.

The fact that humans stand upright may therefore not just be something that distinguishes them from nearly all other species, but also a factor that helped them to survive in a dangerous and unpredictable environment.

ARTICLE-15

The creation of lasting memories

Many studies of the brain processes underlying the creation of memory consolidation (lasting memories) have involved giving various human and animal subjects treatment, while training them to perform a task. These have contributed greatly to our understanding.

In pioneering studies using goldfish, Bernard Agranoff found that protein synthesis inhibitors injected after training caused the goldfish to forget what they had learned. In other experiments, he administered protein synthesis inhibitors immediately before the fish were trained. The remarkable finding was that the fish learned the task completely normally, but forgot it within a few hours - that is, the protein synthesis inhibitors blocked memory consolidation, but did not influence short-term memory.

There is now extensive evidence that short-term memory is spared by many kinds of treatments, including electro-convulsive therapy (ECT), that block memory consolidation. On the other hand, and equally importantly, neuroscientist Ivan Izquierdo found that many drug treatments can block short-term memory without blocking memory consolidation. Contrary to the hypothesis put forward by Canadian psychologist Donald Hebb, in 1949, long-term memory does not require short-term memory, and vice versa.

Such findings suggest that our experiences create parallel, and possibly independent stages of memory, .each with a different life span. All of this evidence from clinical and experimental studies strongly indicates that the brain handles recent and remote memory in different ways; but why does it do that?

We obviously need to have memory that is created rapidly: reacting to an ever and rapidly changing environment requires that. For example, most current building codes require that the heights of all steps in a staircase be equal. After taking a couple of steps, up or down, we implicitly remember the heights of the steps and assume that the others will be the same. If they are not the same, we are very likely to trip and fall. Lack of this kind of rapidly created implicit memory would be bad for us and for insurance companies, but perhaps good for lawyers. It would be of little value to us if we remembered the heights of the steps only after a delay of many hours, when the memory becomes consolidated.

The hypothesis that lasting memory consolidates slowly over time is supported primarily by clinical and experimental evidence that the formation of long-term memory is influenced by treatments and disorders affecting brain functioning. There are also other kinds of evidence indicating more directly that the memories consolidate over time after learning. Avi Kami and Dov Sagi reported that the performance of human subjects trained in a visual skill did not improve until eight hours after the training was completed, and that improvement was even greater the following day. Furthermore, the skill was retained for several years.

Studies using human brain imaging to study changes in neural activity induced by learning have also reported that the changes continue to develop for hours after learning. In an innovative study using functional imaging of the brain, Reza Shadmehr and Henry Holcomb examined brain activity in several brain regions shortly after human subjects were trained in a motor learning task requiring arm and hand movements. They found that while the performance of the subjects remained stable for several hours after completion of the training, their brain activity did not; different regions of the brain were predominantly active at different times over a period of several hours after the training. The activity shifted from the prefrontal cortex to two areas known to be involved in controlling movements, the motor cortex and cerebellar cortex. Consolidation of the motor skill appeared to involve activation of different neural systems that increased the stability of the brain processes underlying the skill.

There is also evidence that learning-induced changes in the activity of neurons in the cerebral cortex continue to increase for many days after the training. In an extensive series of studies using rats with electrodes implanted in the auditory cortex, Norman Weinberger reported that, after a tone of specific frequency was paired a few times with footshock, neurons in the rats' auditory cortex responded more to that specific tone and less to other tones of other frequencies. Even more interestingly, the selectivity of the neurons' response to the specific tone used in training continued to increase for several days after the training was terminated.

It is not intuitively obvious why our lasting memories consolidate slowly. Certainly, one can wonder why we have a form of memory that we have to rely on for many hours, days or a lifetime, that is so susceptible to disruption shortly after it is initiated. Perhaps the brain system that consolidates long-term memory over time was a late development in vertebrate evolution. Moreover, maybe we consolidate memories slowly because our mammalian brains are large and enormously complex. We can readily reject these ideas. All species of animals studied to date have both short and long-term memory; and all are susceptible to retrograde amnesia. Like humans, birds, bees, and molluscs, as well as fish and rats, make long-term memory slowly. Consolidation of memory clearly emerged early in evolution, and was conserved.

Although there seems to be no compelling reason to conclude that a biological system such as a brain could not quickly make a lasting memory, the fact is that animal brains do not. Thus, memory consolidation must serve some very important adaptive function or functions. There is considerable evidence suggesting that the slow consolidation is adaptive because it enables neurobiological processes occurring shortly after learning to influence the strength of memory for experiences. The extensive evidence that memory can be enhanced, as well as impaired, by treatments administered shortly after training, provides intriguing support for this hypothesis.

ARTICLE-16

Language diversity

One of the most influential ideas in the study of languages is that of universal grammar (UG). Put forward by Noam Chomsky in the 1960s, it is widely interpreted as meaning that all languages are basically the same, and that the human brain is born language-ready, with an in-built programme that is able to interpret the common rules underlying any mother tongue. For five decades this idea prevailed, and influenced work in linguistics, psychology and cognitive science. To understand language, it implied, you must sweep aside the huge diversity of languages, and find their common human core.

Since the theory of UG was proposed, linguists have identified many universal language rules. However, there are almost always exceptions. It was once believed, for example, that if a language had syllables [1] that begin with a vowel and end with a consonant (VC), it would also have syllables that begin with a consonant and end with a vowel (CV). This universal lasted until 1999, when linguists showed that Arrernte, spoken by Indigenous Australians from the area around Alice Springs in the Northern Territory, has VC syllables but no CV syllables.

Other non-universal universals describe the basic rules of putting words together. Take the rule that every language contains four basic word classes: nouns, verbs, adjectives and adverbs. Work in the past two decades has shown that several languages lack an open adverb class, which means that new adverbs cannot be readily formed, unlike in English where you can turn any adjective into an adverb, for example, ‘soft’ into ‘softly’. Others, such as Lao, spoken in Laos, have no adjectives at all. More controversially, some linguists argue that a few languages, such as Straits Salish, spoken by indigenous people from north-western regions of North America, do not even have distinct nouns or verbs. Instead, they have a single class of words to include events, objects and qualities.

Even apparently indisputable universals have been found lacking. This includes recursion, or the ability to infinitely place one grammatical unit inside a similar unit, such as ‘Jack thinks that Mary thinks that ... the bus will be on time’. It is widely considered to be the most essential characteristic of human language, one that sets it apart from the communications of all other animals. Yet Dan Everett at Illinois State University recently published controversial work showing that Amazonian Piraha does not have this quality.

But what if the very diversity of languages is the key to understanding human communication? Linguists Nicholas Evans of the Australian National University in Canberra, and Stephen Levinson of the Max Planck Institute for Psycholinguistics in Nijmegen, the Netherlands, believe that languages do not share a common set of rules. Instead, they say, their sheer variety is a defining feature of human communication - something not seen in other animals. While there is no doubt that human thinking influences the form that language takes, if Evans and Levinson are correct, language, in turn, shapes our brains. This suggests that humans are more diverse than we thought, with our brains having differences depending on the language environment in which we grew up. And that leads to a disturbing conclusion: every time a language becomes extinct, humanity loses an important piece of diversity.

If languages do not obey a single set of shared rules, then how are they created? ‘Instead of universals. you get standard engineering solutions that languages adopt again and again, and then you get outliers.' says Evans. He and Levinson argue that this is because any given language is a complex system shaped by many factors, including culture, genetics and history. There- are no absolutely universal traits of language, they say, only tendencies. And it is a mix of strong and weak tendencies that characterises the ‘bio-cultural’ mix that we call language.

According to the two linguists, the strong tendencies explain why many languages display common patterns. A variety of factors tend to push language in a similar direction, such as the structure of the brain, the biology of speech, and the efficiencies of communication. Widely shared linguistic elements may also be ones that build on a particularly human kind of reasoning. For example, the fact that before we learn to speak we perceive the world as a place full of things causing actions (agents) and things having actions done to them (patients) explains why most languages deploy these grammatical categories.

Weak tendencies, in contrast, are explained by the idiosyncrasies of different languages. Evans and Levinson argue that many aspects of the particular natural history of a population may affect its language. For instance, Andy Butcher at Flinders University in Adelaide, South Australia, has observed that indigenous Australian children have by far the highest incidence of chronic middle-ear infection of any population on the planet, and that most indigenous Australian languages lack many sounds that are common in other languages, but which are hard to hear with a middle-ear infection. Whether this condition has shaped the sound systems of these languages is unknown, says Evans, but it is important to consider the idea.

Levinson and Evans are not the first to question the theory of universal grammar, but no one has summarised these ideas quite as persuasively, and given them as much reach. As a result, their arguments have generated widespread enthusiasm, particularly among those linguists who are tired of trying to squeeze their findings into the straitjacket of 'absolute universals'. To some, it is the final nail in UG's coffin. Michael Tomasello, co-director of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, has been a long-standing critic of the idea that all languages conform to a set of rules. 'Universal grammar is dead,' he says.

ARTICLE-17

NATURAL CHOICE

Coffee and chocolate
What's the connection between your morning coffee, wintering North American birds and the cool shade of a tree? Actually, unite a lot, says Simon Birch.

When scientists from London's Natural History Museum descended on the coffee farms of the tiny Central American republic of El Salvador, they were astonished to find such diversity of insect and plant species. During 18 months' work on 12 farms, they found a third more species of parasitic wasp than are known to exist in the whole country of Costa Rica. They described four new species and are aware of a fifth. On 24 farms they found nearly 300 species of tree when they had expected to find about 100.

El Salvador has lost much of its natural forest, with coffee farms covering nearly 10% of the country. Most of them use the 'shade-grown' method of production, which utilises a semi-natural forest ecosystem. Alex Munro, the museum's botanist on the expedition, says: 'Our findings amazed our insect specialist. There's a very sophisticated food web present. The wasps, for instance, may depend on specific species of tree.'

It's the same the world over. Species diversity is much higher where coffee is grown in shade conditions. In addition, coffee (and chocolate) is usually grown in tropical rainforest regions that are biodiversity hotspots. 'These habitats support up to 70% of the planets plant and animal species, and so the production methods of cocoa and coffee can have a hugely significant impact,' explains Dr Paul Donald of the Royal Society for the. Protection of Birds.

So what does 'shade-grown' mean, and why is it good for wildlife? Most of the world's coffee is produced by poor farmers in the developing world. Traditionally they have grown coffee (and cocoa) under the shade of selectively thinned tracts of rain forest in a genuinely sustainable form of farming. Leaf fall from the canopy provides a supply of nutrients and acts as a mulch that suppresses weeds. The insects that live in the canopy pollinate the cocoa and coffee and prey on pests. The trees also provide farmers with fruit and wood for fuel.

Bird diversity in shade-grown coffee plantations rivals that found in natural forests in the same region.' says Robert Rice from the Smithsonian Migratory Bird Center. In Ghana, West Africa. - one of the world's biggest producers of cocoa - 90% of the cocoa is grown under shade, and these forest plantations are a vital habitat for wintering European migrant birds. In the same way. the coffee forests of Central and South America are a refuge for wintering North American migrants.

More recently, a combination of the collapse in the world market for coffee and cocoa and a drive to increase yields by producer countries has led to huge swathes of shade-grown coffee and cocoa being cleared to make way for a highly intensive, monoculture pattern of production known as 'full sun'. But this system not only reduces the diversity of flora and fauna, it also requires huge amounts of pesticides and fertilisers. In Cote d'Ivoire, which produces more than half the world's cocoa, more than a third of the crop is now grown in full-sun conditions.

The loggers have been busy in the Americas too, where nearly 70% of all Colombian coffee is now produced using full-sun production. One study carried out in Colombia and Mexico found that, compared with shade coffee, full-sun plantations have 95% fewer species of birds.

In LI Salvador. Alex Munro says shade-coffee farms have a cultural as well as ecological significance and people are not happy to see them go. But the financial pressures are great, and few of these coffee farms make much money. 'One farm we studied, a cooperative of 100 families, made just S 10,000 a year S100 per family and that's not taking labour costs into account.'

The loss of shade-coffee forests has so alarmed a number of North American wildlife organisations that they 're now harnessing consumer power to help save these threatened habitats. They are promoting a 'certification' system that can indicate to consumers that the beans have been grown on shade plantations. Bird-friendly coffee, for instance, is marketed by the Smithsonian Migratory Bird Center. The idea is that the small extra cost is passed directly on to the coffee farmers as a financial incentive to maintain their shade-coffee farms.

Not all conservationists agree with such measures, however. Some say certification could be leading to the loss not preservation of natural forests. John Rappole of the Smithsonian Conservation and Research Center, for example, argues that shade- grown marketing provides 'an incentive to convert existing areas of primary forest that are too remote or steep to be converted profitably to other forms of cultivation into shade-coffee plantations'.

Other conservationists, such as Stacey Philpott and colleagues, argue the case for shade coffee. But there are different types of shade growing. Those used by subsistence farmers are virtually identical to natural forest (and have a corresponding diversity), while systems that use coffee plants as the understorey and cacao or citrus trees as the overstorey may be no more diverse than full-sun farms. Certification procedures need to distinguish between the two. and Ms Philpott argues that as long as the process is rigorous and offers financial gains to the producers, shade growing does benefit the environment.

ARTICLE-18

The Impact of the Potato

Jeff Chapman relates the story of history the most important vegetable

The potato was first cultivated in South America between three and seven thousand years ago, though scientists believe they may have grown wild in the region as long as 13,000 years ago. The genetic patterns of potato distribution indicate that the potato probably originated in the mountainous west-central region of the continent.

Early Spanish chroniclers who misused the Indian word batata (sweet potato) as the name for the potato noted the importance of the tuber to the Incan Empire. The Incas had learned to preserve the potato for storage by dehydrating and mashing potatoes into a substance called Chuchu could be stored in a room for up to 10 years, providing excellent insurance against possible crop failures. As well as using the food as a staple crop, the Incas thought potatoes made childbirth easier and used it to treat injuries.

The Spanish conquistadors first encountered the potato when they arrived in Peru in 1532 in search of gold, and noted Inca miners eating chuchu. At the time the Spaniards failed to realize that the potato represented a far more important treasure than either silver or gold, but they did gradually begin to use potatoes as basic rations aboard their ships. After the arrival of the potato in Spain in 1570, a few Spanish farmers began to cultivate them on a small scale, mostly as food for livestock.

Throughout Europe, potatoes were regarded with suspicion, distaste and fear. Generally considered to be unfit for human consumption, they were used only as animal fodder and sustenance for the starving. In northern Europe, potatoes were primarily grown in botanical gardens as an exotic novelty. Even peasants refused to eat from a plant that produced ugly, misshapen tubers and that had come from a heathen civilization. Some felt that the potato plant's resemblance to plants in the nightshade family hinted that it was the creation of witches or devils.

In meat-loving England, farmers and urban workers regarded potatoes with extreme distaste. In 1662, the Royal Society recommended the cultivation of the tuber to the English government and the nation, but this recommendation had little impact. Potatoes did not become a staple until, during the food shortages associated with the Revolutionary Wars, the English government began to officially encourage potato cultivation. In 1795, the Board of Agriculture issued a pamphlet entitled "Hints Respecting the Culture and Use of Potatoes"; this was followed shortly by pro-potato editorials and potato recipes in The Times. Gradually, the lower classes began to follow the lead of the upper classes.

A similar pattern emerged across the English Channel in the Netherlands, Belgium and France. While the potato slowly gained ground in eastern France (where it was often the only crop remaining after marauding soldiers plundered wheat fields and vineyards), it did not achieve widespread acceptance until the late 1700s. The peasants remained suspicious, in spite of a 1771 paper from the Facult de Paris testifying that the potato was not harmful but beneficial. The people began to overcome their distaste when the plant received the royal seal of approval: Louis XVI began to sport a potato flower in his buttonhole, and Marie-Antoinette wore the purple potato blossom in her hair.

Frederick the Great of Prussia saw the potato's potential to help feed his nation and lower the price of bread, but faced the challenge of overcoming the people's prejudice against the plant. When he issued a 1774 order for his subjects to grow potatoes as protection against famine, the town of Kolberg replied: "The things have neither smell nor taste, not even the dogs will eat them, so what use are they to us?" Trying a less direct approach to encourage his subjects to begin planting potatoes, Frederick used a bit of reverse psychology: he planted a royal field of potato plants and stationed a heavy guard to protect this field from thieves. Nearby peasants naturally assumed that anything worth guarding was worth stealing, and so snuck into the field and snatched the plants for their home gardens. Of course, this was entirely in line with Frederick's wishes.

Historians debate whether the potato was primarily a cause or an effect of the huge population boom in industrial-era England and Wales. Prior to 1800, the English diet had consisted primarily of meat, supplemented by bread, butter and cheese. Few vegetables were consumed, most vegetables being regarded as nutritionally worthless and potentially harmful. This view began to change gradually in the late 1700s. The Industrial Revolution was drawing an ever increasing percentage of the populace into crowded cities, where only the richest could afford homes with ovens or coal storage rooms, and people were working 12-16 hour days which left them with little time or energy to prepare food. High yielding, easily prepared potato crops were the obvious solution to England's food problems.

Whereas most of their neighbors regarded the potato with suspicion and had to be persuaded to use it by the upper classes, the Irish peasantry embraced the tuber more passionately than anyone since the Incas. The potato was well suited to the Irish the soil and climate, and its high yield suited the most important concern of most Irish farmers: to feed their families.

The most dramatic example of the potato's potential to alter population patterns occurred in Ireland, where the potato had become a staple by 1800. The Irish population doubled to eight million between 1780 and 1841, this without any significant expansion of industry or reform of agricultural techniques beyond the widespread cultivation of the potato. Though Irish landholding practices were primitive in comparison with those of England, the potato's high yields allowed even the poorest farmers to produce more healthy food than they needed with scarcely any investment or hard labor. Even children could easily plant, harvest and cook potatoes, which of course required no threshing, curing or grinding. The abundance provided by potatoes greatly decreased infant mortality and encouraged early marriage.

ARTICLE-19

Life-Casting and Art

Julian Bames explores the questions posed by Life-Casts, an exhibition of plaster moulds of living people and objects which were originally used for scientific purposes

A. Art changes over time and our idea of what art is changes too. For example, objects originally intended for devotional, ritualistic or re-creational purposes may be recategorised as art by members of other later civilisations, such as our own, which no longer respond to these purposes.

B. What also happens is that techniques and crafts which would have been judged inartistic at the time they were used are reassessed. Life-casting is an interesting example of this. It involved making a plaster mould of a living person or thing. This was complex, technical work, as Benjamin Robert Haydon discovered when he poured 250 litres of plaster over his human model and nearly killed him. At the time, the casts were used for medical research and, consequently, in the nineteenth century life-casting was considered inferior to sculpture in the same way that, more recently, photography was thought to be a lesser art than painting. Both were viewed as unacceptable shortcuts by the 'senior 1 arts. Their virtues of speed and unwavering realism also implied their limitations; they left little or no room for the imagination.

C. For many, life-casting was an insult to the sculptor's creative genius. In an infamous lawsuit of 1834, a moulder whose mask of the dying French emperor Napoleon had been reproduced and sold without his permission was judged to have no rights to the image. In other words, he was specifically held not to be an artist. This judgement reflects the view of established members of the nineteenth-century art world such as Rodin, who commented that life-casting 'happens fast but it doesn't make Art'. Some even feared that 'if too much nature was allowed in, it would lead Art away from its proper course of the Ideal.

D. The painter Gauguin, at the end of the nineteenth century, worried about future developments in photography. If ever the process went into colour, what painter would labour away at a likeness with a brush made from squirrel-tail? But painting has proved robust. Photography has changed it, of course, just as the novel had to reassess narrative after the arrival of the cinema. But the gap between the senior and junior arts was always narrower than the traditionalists implied. Painters have always used technical back-up such as studio assistants to do the boring bits, while apparently lesser crafts involve great skill, thought, preparation and, depending on how we define it, imagination.

E. Time changes our view in another way, too. Each new movement implies a reassessment of what has gone before. What is done now alters what was done before. In some cases, this is merely self-serving, with the new art using the old to justify itself. It seems to be saying, look at how all of that points to this! Aren't we clever to be the culmination of all that has gone before? But usually, it is a matter of re-alerting the sensibility, reminding us not to take things for granted. Take, for example, the cast of the hand of a giant from a circus, made by an anonymous artist around 1889, an item that would now sit happily in any commercial or public gallery. The most significant impact of this piece is on the eye, in the contradiction between unexpected size and verisimilitude. Next, the human element kicks in. you note that the nails are dirt-encrusted, unless this is the caster's decorative addition, and the fingertips extend far beyond them. Then you take in the element of choice, arrangement, art if you like, in the neat, pleated, buttoned sleeve-end that gives the item balance and variation of texture. This is just a moulded hand, yet the part stands utterly for the whole. It reminds us slyly, poignantly, of the full-size original

F. But is it art? And, if so, why? These are old tediously repeated questions to which artists have often responded, 'It is art because I am an artist and therefore what I do is art. However, what doesn't work for literature works much better for art – works of art do float free of their creators' intentions. Over time the "reader" does become more powerful. Few of us can look at a medieval altarpiece as its painter intended. We believe too little and aesthetically know too much, so we recreate and find new fields of pleasure in the work. Equally, the lack of artistic intention of Paul Richer and other forgotten craftsmen who brushed oil onto flesh, who moulded, cast and decorated in the nineteenth century is now irrelevant. What counts is the surviving object and our response to it. The tests are simple: does it interest the eye, excite the brain, move the mind to reflection and involve the heart. It may, to use the old dichotomy, be beautiful but it is rarely true to any significant depth. One of the constant pleasures of art is its ability to come at us from an unexpected angle and stop us short in wonder.

ARTICLE-20

Coastal Archaeology of Britain

The recognition of the wealth and diversity of England's coastal archaeology has been one of the most important developments of recent years. Some elements of this enormous resource have long been known. The so-called 'submerged forests' off the coasts of England, sometimes with clear evidence of the human activity, had attracted the interest of antiquarians since at least the eighteenth century, but serious and systematic attention has been given to the archaeological potential of the coast only since the early 1980s.

It is possible to trace a variety of causes for this concentration of effort and interest. In the 1980s and 1990s scientific research into climate change and its environmental impact spilled over into a much broader public debate as awareness of these issues grew; the prospect of rising sea levels over the next century, and their impact on current coastal environments, has been a particular focus for concern. At the same time, archaeologists were beginning to recognize that the destruction caused by natural processes of coastal erosion and by human activity was having an increasing impact on the archaeological resource of the coast.

The dominant process affecting the physical form of England in the post- glacial period has been rising in the altitude of sea level relative to the land, as the glaciers melted and the landmass readjusted. The encroachment of the sea, the loss of huge areas of land now under the North Sea and the English Channel, and especially the loss of the land bridge between England and France, which finally made Britain an island, must have been immensely significant factors in the lives of our prehistoric ancestors. Yet the way in which prehistoric communities adjusted to these environmental changes has seldom been a major theme in discussions of the period. One factor contributing to this has been that, although the rise in relative sea level is comparatively well documented, we know little about the constant reconfiguration of the coastline. This was affected by many processes, mostly quiet, which have not yet been adequately researched. The detailed reconstruction of coastline histories and the changing environments available for human use will be an important theme for future research.

So great has been the rise in sea level and the consequent regression of the coast that much of the archaeological evidence now exposed in the coastal zone. Whether being eroded or exposed as a buried land surface, is derived from what was originally terrestrial occupation. Its current location in the coastal zone is the product of later unrelated processes, and it can tell us little about past adaptations to the sea. Estimates of its significance will need to be made in the context of other related evidence from dry land sites. Nevertheless, its physical environment means that preservation is often excellent, for example in the case of the Neolithic structure excavated at the Stumble in Essex.

In some cases these buried land surfaces do contain evidence for human exploitation of what was a coastal environment, and elsewhere along the modem coast, there is similar evidence. Where the evidence does relate to past human exploitation of the resources and the opportunities offered by the sea and the coast, it is both diverse and as yet little understood. We are not yet in a position to make even preliminary estimates of answers to such fundamental questions as the extent to which the sea and the coast affected human life in the past, what percentage of the population at any time lived within reach of the sea, or whether human settlements in coastal environments showed a distinct character from those inland.

The most striking evidence for use of the sea is in the form of boats, yet we still have much to learn about their production and use. Most of the known wrecks around our coast are not unexpectedly of post-medieval date, and offer an unparalleled opportunity for research which has yet been little used. The prehistoric sewn-plank boats such as those from the Humber estuary and Dover all seem to belong to the second millennium BC; after this, there is a gap in the record of a millennium, which cannot yet be explained before boats reappear, but it built using a very different technology. Boatbuilding must have been an extremely important activity around much of our coast, yet we know almost nothing about it. Boats were some of the most complex artefacts produced by pre-modem societies, and further research on their production and use make an important contribution to our understanding of past attitudes to technology and technological change.

Boats need landing places, yet here again, our knowledge is very patchy. In many cases the natural shores and beaches would have sufficed, leaving little or no archaeological trace, but especially in later periods, many ports and harbors, as well as smaller facilities such as quays, wharves, and jetties, were built. Despite a growth of interest in the waterfront archaeology of some of our more important Roman and medieval towns, very little attention has been paid to the multitude of smaller landing places. Redevelopment of harbor sites and other development and natural pressures along the coast are subject these important locations to unprecedented threats, yet few surveys of such sites have been undertaken.

One of the most important revelations of recent research has been the extent of industrial activity along the coast. Fishing and salt production are among the better documented activities, but even here our knowledge is patchy. Many forms of fishing will leave a little archaeological trace, and one of the surprises of the recent survey has been the extent of past investment in facilities for procuring fish and shellfish. Elaborate wooden fish weirs, often of considerable extent and responsive to aerial photography in shallow water, have been identified in areas such as Essex and the Severn estuary. The production of salt, especially in the late Iron Age and early Roman periods, has been recognized for some time, especially in the Thames estuary and around the Solent and Poole Harbor, but the reasons for the decline of that industry and the nature of later coastal salt working are much less well understood. Other industries were also located along the coast, either because the raw materials outcropped there or for ease of working and transport: mineral resources such as sand, gravel, stone, coal, ironstone, and alum were all exploited. These industries are poorly documented, but their remains are sometimes extensive and striking.

Some appreciation of the variety and importance of the archaeological remains preserved in the coastal zone, albeit only in preliminary form, can thus be gained from recent work, but the complexity of the problem of managing that resource is also being realized. The problem arises not only from the scale and variety of the archaeological remains, but also from two other sources: the very varied natural and human threats to the resource, and the complex web of organizations with authority over, or interests in, the coastal zone. Human threats include the redevelopment of historic towns and old dockland areas, and the increased importance of the coast for the leisure and tourism industries, resulting in pressure for the increased provision of facilities such as marinas. The larger size of ferries has also caused an increase in the damage caused by their wash to fragile deposits in the intertidal zone. The most significant natural threat is the predicted rise in sea level over the next century especially in the south and east of England. Its impact on archaeology is not easy to predict, and though it is likely to be highly localized, it will be at a scale much larger than that of most archaeological sites. Thus protecting one site may simply result in transposing the threat to a point further along the coast. The management of the archaeological remains will have to be considered in a much longer time scale and a much wider geographical scale than is common in the case of dry land sites, and this will pose a serious challenge for archaeologists.

EASY IELTS

ARTICLE-21

Last man standing

Some 50,000 years ago, Homo sapiens beat other hominids to become the only surviving species. Kate Ravilious reveals how we did it.

Today, there are over seven billion people living on Earth. No other species has exerted as much influence over the planet as us. But turn the clock back 80,000 years and we were one of a number of species roaming the Earth. Our own species. Homo sapiens (Latin for ’wise man'), was most successful in Africa. In western Eurasia, the Neanderthals dominated, while Homo erectus may have lived in Indonesia. Meanwhile, an unusual finger bone and tooth, discovered in Denisova cave in Siberia in 2008, have led scientists to believe that yet another human population - the Denisovans - may also have been widespread across Asia. Somewhere along the line, these other human species died out, leaving Homo sapiens as the sole survivor. So what made us the winners in the battle for survival?

Some 74.000 years ago, the Toba ‘supervolcano' on the Indonesian island of Sumatra erupted. The scale of the event was so great that ash from the eruption was flung as far as eastern India, more than 2,000 kilometres away. Oxford archaeologist Mike Petraglia and his team have uncovered thousands of stone tools buried underneath the Toba ash. The mix of hand axes and spear tips have led Petraglia to speculate that Homo sapiens and Homo erectus were both living in eastern India prior to the Toba eruption. Based on careful examination of the tools and dating of the sediment layers where they were found. Petraglia and his team suggest that Homo sapiens arrived in eastern India around 78.000 years ago. migrating out of Africa and across Arabia during a favourable climate period. After their arrival, the simple tools belonging to Homo erectus seemed to lessen in number and eventually disappear completely. 'We think that Homo sapiens had a more efficient hunting technology, which could have given them the edge.' says Petraglia. 'Whether the eruption of Toba also played a role in the extinction of the Homo erectus-like species is unclear to us.'

Some 45,000 years later, another fight for survival took place. This time, the location was Europe and the protagonists were another species, the Neanderthals. They were a highly successful species that dominated the European landscape for 300.000 years. Yet within just a few thousand years of the arrival of Homo sapiens, their numbers plummeted. They eventually disappeared from the landscape around 30.000 years ago. with their last known refuge being southern Iberia, including Gibraltar. Initially. Homo sapiens and Neanderthals lived alongside each other and had no reason to compete. But then Europe’s climate swung into a cold, inhospitable, dry phase. ‘Neanderthal and Homo sapiens populations had to retreat to refugia (pockets of habitable land). This heightened competition between the two groups,’ explains Chris Stringer, an anthropologist at the Natural History Museum in London.

Both species were strong and stockier than the average human today, but Neanderthals were particularly robust. ‘Their skeletons show that they had broad shoulders and thick necks,' says Stringer. ‘Homo sapiens, on the other hand, had longer forearms, which undoubtedly enabled them to throw a spear from some distance, with less danger and using relatively little energy,’ explains Stringer. This long-range ability may have given Homo sapiens an advantage in hunting. When it came to keeping warm. Homo sapiens had another skill: weaving and sewing. Archaeologists have uncovered simple needles fashioned from ivory and bone alongside Homo sapiens, dating as far back as 35,000 years ago. ‘Using this technology, we could use animal skins to make ourselves tents, warm clothes and fur boots,’ says

Stringer. In contrast. Neanderthals never seemed to master sewing skills, instead relying on pinning skins together with thorns.

A thirst for exploration provided Homo sapiens with another significant advantage over Neanderthals. Objects such as shell beads and flint tools, discovered many miles from their source, show that our ancestors travelled over large distances, in order to barter and exchange useful materials, and share ideas and knowledge. By contrast. Neanderthals tended to keep themselves to themselves, living in small groups. They misdirected their energies by only gathering resources from their immediate surroundings and perhaps failing to discover new technologies outside their territory.

Some of these differences in behaviour may have emerged because the two species thought in different ways. By comparing skull shapes, archaeologists have shown that Homo sapiens had a more developed temporal lobe - the regions at the side of the brain, associated with listening, language and long-term memory. 'We think that Homo sapiens had a significantly more complex language than Neanderthals and were able to comprehend and discuss concepts such as the distant past and future.' says Stringer. Penny Spikins, an archaeologist at the University of York, has recently suggested that Homo sapiens may also have had a greater diversity of brain types than Neanderthals.

‘Our research indicates that high-precision tools, new hunting technologies and the development of symbolic communication may all have come about because they were willing to include people with "different" minds and specialised roles in their society,’ she explains. 'We see similar kinds of injuries on male and female Neanderthal skeletons, implying there was no such division of labour,' says Spikins.

Thus by around 30,000 years ago. many talents and traits were well established in Homo sapiens societies but still absent from Neanderthal communities. Stringer thinks that the Neanderthals were just living in the wrong place at the wrong time. 'They had to compete with Homo sapiens during a phase of very unstable climate across Europe. During each rapid climate fluctuation, they may have suffered greater losses of people than Homo sapiens, and thus were slowly worn down,’ he says. ‘If the climate had remained stable throughout, they might still be here.’

ARTICLE-22

Music and the emotions

Neuroscientist Jonah Lehrer considers the emotional power of music

Why does music make us feel? On the one hand, music is a purely abstract art form, devoid of language or explicit ideas. And yet, even though music says little, it still manages to touch us deeply. When listening to our favourite songs, our body betrays all the symptoms of emotional arousal. The pupils in our eyes dilate, our pulse and blood pressure rise, the electrical conductance of our skin is lowered, and the cerebellum, a brain region associated with bodily movement, becomes strangely active. Blood is even re-directed to the muscles in our legs. In other words, sound stirs us at our biological roots.

A recent paper in Neuroscience by a research team in Montreal, Canada, marks an important step in repealing the precise underpinnings of ‘the potent pleasurable stimulus’ that is music. Although the study involves plenty of fancy technology, including functional magnetic resonance imaging (fMRI) and ligand-based positron emission tomography (PET) scanning, the experiment itself was rather straightforward. After screening 217 individuals who responded to advertisements requesting people who experience ‘chills’ to instrumental music, the scientists narrowed down the subject pool to ten. They then asked the subjects to bring in their playlist of favourite songs - virtually every genre was represented, from techno to tango - and played them the music while their brain activity was monitored. Because the scientists were combining methodologies (PET and fMRI), they were able to obtain an impressively exact and detailed portrait of music in the brain. The first thing they discovered is that music triggers the production of dopamine - a chemical with a key role in setting people’s moods - by the neurons (nerve cells) in both the dorsal and ventral regions of the brain. As these two regions have long been linked with the experience of pleasure, this finding isn't particularly surprising.

What is rather more significant is the finding that the dopamine neurons in the caudate - a region of the brain involved in learning stimulus-response associations, and in anticipating food and other 'reward' stimuli - were at their most active around 15 seconds before the participants' favourite moments in the music. The researchers call this the 'anticipatory phase' and argue that the purpose of this activity is to help us predict the arrival of our favourite part. The question, of course, is what all these dopamine neurons are up to. Why are they so active in the period preceding the acoustic climax? After all, we typically associate surges of dopamine with pleasure, with the processing of actual rewards. And yet, this cluster of cells is most active when the 'chills' have yet to arrive, when the melodic pattern is still unresolved.

One way to answer the question is to look at the music and not the neurons. While music can often seem (at least to the outsider) like a labyrinth of intricate patterns, it turns out that the most important part of every song or symphony is when the patterns break down, when the sound becomes unpredictable. If the music is too obvious, it is annoyingly boring, like an alarm clock. Numerous studies, after all, have demonstrated that dopamine neurons quickly adapt to predictable rewards. If we know what's going to happen next, then we don't get excited. This is why composers often introduce a key note in the beginning of a song, spend most of the rest of the piece in the studious avoidance of the pattern, and then finally repeat it only at the end. The longer we are denied the pattern we expect, the greater the emotional release when the pattern returns, safe and sound.

To demonstrate this psychological principle, the musicologist Leonard Meyer, in his classic book Emotion and Meaning in Music (1956), analysed the 5th movement of Beethoven's String Quartet in C-sharp minor, Op. 131. Meyer wanted to show how music is defined by its flirtation with - but not submission to - our expectations of order. Meyer dissected 50 measures (bars) of the masterpiece, showing how Beethoven begins with the clear statement of a rhythmic and harmonic pattern and then, in an ingenious tonal dance, carefully holds off repeating it. What Beethoven does instead suggest variations of the pattern. I want to preserve an element of uncertainty in his music, making our brains beg for the one chord he refuses to give us. Beethoven saves that chord for the end.

According to Meyer, it is the suspenseful tension of music, arising out of our unfulfilled expectations, that is the source of the music's feeling. While earlier theories of music focused on the way a sound can refer to the real world of images and experiences - its 'connotative' meaning - Meyer argued that the emotions we find in music come from the unfolding events of the music itself. This 'embodied meaning' arises from the patterns the symphony invokes and then ignores. It is this uncertainty that triggers the surge of dopamine in the caudate, as we struggle to figure out what will happen next. We can predict some of the notes, but we can't predict them all, and that is what keeps us listening, waiting expectantly for our reward, for the pattern to be completed.

ARTICLE-23

Learning color words

Young children struggle with color concepts, and the reason for this may have something to do with how we use the words that describe them.

In the course of the first few years of their lives, children who are brought up in English- speaking homes successfully master the use of hundreds of words. Words for objects, actions, emotions, and many other aspects of the physical world quickly become part of their infant repertoire. For some reason, however, when it comes to learning color words, the same children perform very badly. At the age of four months, babies can distinguish between basic color categories. Yet it turns out they do this in much the same way as blind children. "Blue" and "yellow" appear in older children's expressive language in answer to questions such as "What color is this?", but their mapping of objects to individual colors is haphazard and interchangeable. If shown a blue cup and asked about its color, typical two-year-olds seem as likely to come up with "red" as "blue." Even after hundreds of training trials, children as old as four may still end up being unable to accurately sort objects by color.

In an effort to work out why this is, cognitive scientists at Stanford University in California hypothesized that children's incompetence at color-word learning may be directly linked to the way these words are used in English. While word order for color adjectives varies, they are used overwhelmingly in pre-nominal position (e.g. "blue cup"); in other words, the adjective comes before the noun it is describing. This is in contrast to post-nominal position (e.g. "The cup is blue") where the adjective comes after the noun. It seems that the difficulty children have may not be caused by any unique property of color, or indeed, of the world. Rather, it may simply come down to the challenge of having to make predictions from color words to the objects they refer to, instead of being able to make predictions from the world of objects to the color words.

To illustrate, the word "chair" has a meaning that applies to the somewhat varied set of entities in the world that people use for sitting on. Chairs have features, such as arms and legs and backs, that are combined to some degree in a systematic way; they turn up in a range of chairs of different shapes, sizes, and ages. It could be said that children learn to narrow down the set of cues that make up a chair and in this way they learn the concept associated with that word. On the other hand, color words tend to be unique and not bound to other specific co-occurring features; there is nothing systematic about color words to help cue their meaning. In the speech that adults direct at children, color adjectives occur pre-nominally ("blue cup") around 70 percent of the time. This suggests that most of what children hear from adults will, in fact, be unhelpful in learning what color words refer to.

To explore this idea further, the research team recruited 41 English children aged between 23 and 29 months and carried out a three- phase experiment. It consisted of a pre-test, followed by training in the use of color words, and finally a post-test that was identical to the pre-test. The pre- and post-test materials comprised six objects that were novel to the children. There were three examples of each object in each of three colors—red, yellow, and blue. The objects were presented on trays, and in both tests, the children were asked to pick out objects in response to requests in which the color word was either a prenominal ("Which is the red one?") or a post-nominal ("Which one is red?").

In the training, the children were introduced to a "magic bucket" containing five sets of items familiar to 26-month-olds (balls, cups, crayons, glasses, and toy bears) in each of the three colors. The training was set up so that half the children were presented with the items one by one and heard them labelled with color words used pre-nominally ("This is a red crayon"), while the other half were introduced to the same items described with a post-nominal color word ("This crayon is red"). After the training, the children repeated the selection task on the unknown items in the post-test. To assess the quality of children's understanding of the color words, and the effect of each type of training, correct choices on items that were consistent across the pre- and post-tests were used to measure children's color knowledge.

Individual analysis of pre- and post-test data, which confirmed parental vocabulary reports, showed the children had at least some knowledge of the three colour words: they averaged two out of three correct choices in response to both pre- and post-nominal question types, which, it has been pointed out, is better than chance. When children's responses to the question types were assessed independently, performance was at its most consistent when children were both trained and tested on post-nominal adjectives, and worst when trained on pre-nominal adjectives and tested on post-nominal adjectives. Only children who had been trained with post- nominal color-word presentation and then tested with post-nominal question types were significantly more accurate than chance. Comparing the pre- and post-test scores across each condition revealed a significant decline in performance when children were both pre- and post-tested with questions that placed the color words pre-nominally.

As predicted, when children are exposed to color adjectives in post-nominal position, they learn them rapidly (after just five training trials per color); when they are presented with them pre-nominally, as English overwhelmingly tends to do, children show no signs of learning.

ARTICLE-24

Flying Tortoises

An airborne reintroduction programme has helped conservationists take significant steps to protect the endangered Galapagos tortoise.

Forests of spiny cacti cover much of the uneven lava plains that separate the interior of the Galapagos island of Isabela from the Pacific Ocean. With its five distinct volcanoes, the island resembles a lunar landscape. Only the thick vegetation at the skirt of the often cloud-covered peak of Sierra Negra offers respite from the barren terrain below.

This inhospitable environment is home to the giant Galapagos tortoise. Some time after the Galapagos's birth, around five million years ago, the islands were colonised by one or more tortoises from mainland South America. As these ancestral tortoises settled on the individual islands, the different populations adapted to their unique environments, giving rise to at least 14 different subspecies. Island life agreed with them. In the absence of significant predators, they grew to become the largest and longest-living tortoises on the planet, weighing more than 400 kilograms, occasionally exceeding 1,8 metres in length and living for more than a century.

Before human arrival, the archipelago's tortoises numbered in the hundreds of thousands. From the 17th century onwards, pirates took a few on board for food, but the arrival of whaling ships in the 1790s saw this exploitation grow exponentially. Relatively immobile and capable of surviving for months without food or water, the tortoises were taken on board these ships to act as food supplies during long ocean passages. Sometimes, their bodies were processed into high- grade oil.

In total, an estimated 200,000 animals were taken from the archipelago before the 20th century. This historical exploitation was then exacerbated when settlers came to the islands. They hunted the tortoises and destroyed their habitat to clear land for agriculture. They also introduced alien species - ranging from cattle, pigs, goats, rats and dogs to plants and ants - that either prey on the eggs and young tortoises or damage or destroy their habitat.

Today, only 11 of the original subspecies survive and of these, several are highly endangered. In 1989, work began on a tortoise-breeding centre just outside the town of Puerto Villamil on Isabela, dedicated to protecting the island's tortoise populations. The centre's captive-breeding programme proved to be extremely successful, and it eventually had to deal with an overpopulation problem.

The problem was also a pressing one. Captive-bred tortoises can't be reintroduced into the wild until they're at least five years old and weigh at least 4,5 kilograms, at which point their size and weight - and their hardened shells - are sufficient to protect them from predators. But if people wait too long after that point, the tortoises eventually become too large to transport.

For years, repatriation efforts were carried out in small numbers, with the tortoises carried on the backs of men over weeks of long, treacherous hikes along narrow trails. But in November 2010, the environmentalist and Galapagos National Park liaison officer Godfrey Merlin, a visiting private motor yacht captain and a helicopter pilot gathered around a table in a small cafe in Puerto Ayora on the island of Santa Cruz to work out more ambitious reintroduction. The aim was to use a helicopter to move 300 of the breeding centre's tortoises to various locations close to Sierra Negra.

This unprecedented effort was made possible by the owners of the 67-metre yacht White Cloud, who provided the Galapagos National Park with free use of their helicopter and its experienced pilot, as well as the logistical support of the yacht, its captain and crew. Originally an air ambulance, the yacht's helicopter has a rear double door and a large internal space that's well suited for cargo, so a custom crate was designed to hold up to 33 tortoises with a total weight of about 150 kilograms. This weight, together with that of the fuel, pilot and four crew, approached the helicopter's maximum payload, and there were times when it was clearly right on the edge of the helicopter's capabilities. During a period of three days, a group of volunteers from the breeding centre worked around the clock to prepare the young tortoises for transport. Meanwhile, park wardens, dropped off ahead of time in remote locations, cleared landing sites within the thick brush, cacti and lava rocks.

Upon their release, the juvenile tortoises quickly spread out over their ancestral territory, investigating their new surroundings and feeding on the vegetation. Eventually, one tiny tortoise came across a fully grown giant who had been lumbering around the island for around a hundred years. The two stood side by side, a powerful symbol of the regeneration of an ancient species.

ARTICLE-25

The Return of Artificial Intelligence

After years in the wilderness, the term 'artificial intelligence' (AI) seems poised to make a comeback. AI was big in the 1980s but vanished in the 1990s. It re-entered public consciousness with the release of Al, a movie about a robot boy. This has ignited a public debate about AI, but the term is also being used once more within the computer industry. Researchers, executives and marketing people are now using the expression without irony or inverted commas. And it is not always hype. The term is being applied, with some justification, to products that depend on technology that was originally developed by AI researchers. Admittedly, the rehabilitation of the term has a long way to go, and some firms still prefer to avoid using it. But the fact that others are starting to use it again suggests that AI has moved on from being seen as an over-ambitious and under-achieving field of research.

The field was launched, and the term 'artificial intelligence' coined, at a conference in 1956 by a group of researchers that included Marvin Minsky, John McCarthy, Herbert Simon and Alan Newell, all of whom went on to become leading figures in the field. The expression provided an attractive but informative name for a research programme that encompassed such previously disparate fields as operations research, cybernetics, logic and computer science. The goal they shared was an attempt to capture or mimic human abilities using machines. That said, different groups of researchers attacked different problems, from speech recognition to chess playing, in different ways; AI unified the field in name only. But it was a term that captured the public imagination.

Most researchers agree that AI peaked around 1985. A public reared on science-fiction movies and excited by the growing power of computers had high expectations. For years, AI researchers had implied that a breakthrough was just around the corner. Marvin Minsky said in 1967 that within a generation the problem of creating'artificial intelligence' would be substantially solved. Prototypes of medical-diagnosis programs and speech recognition software appeared to be making progress. It proved to be a false dawn. Thinking computers and household robots failed to materialise, and a backlash ensued. `There was undue optimism in the early 1980s; says David Leaky, a researcher at Indiana University. 'Then when people realised these were hard problems, there was retrenchment. By the late 1980s, the term AI was being avoided by many researchers, who opted instead to align themselves with specific sub-disciplines such as neural networks, agent technology, case-based reasoning, and so on

Ironically, in some ways AI was a victim of its own success. Whenever an apparently mundane problem was solved, such as building a system that could land an aircraft unattended, the problem was deemed not to have been AI in the first plate. 'If it works, it can't be AI; as Dr Leaky characterises it. The effect of repeatedly moving the goal-posts in this way was that AI came to refer to 'blue-sky' research that was still years away from commercialisation. Researchers joked that AI stood for `almost implemented'. Meanwhile, the technologies that made it onto the market, such as speech recognition, language translation and decision-support software, were no longer regarded as AI. Yet all three once fell well within the umbrella of AI research.

But the tide may now be turning, according to Dr Leake. HNC Software of San Diego, backed by a government agency, reckon that their new approach to artificial intelligence is the most powerful and promising approach ever discovered. HNC claim that their system, based on a cluster of 30 processors, could be used to spot camouflaged vehicles on a battlefield or extract a voice signal from a noisy background - tasks humans can do well, but computers cannot. 'Whether or not their technology lives up to the claims made for it, the fact that HNC are emphasising the use of AI is itself an interesting development; says Dr Leaky.

Another factor that may boost the prospects for AI in the near future is that investors are now looking for firms using clever technology, rather than just a clever business model, to differentiate themselves. In particular, the problem of information overload, exacerbated by the growth of e-mail and the explosion in the number of web pages, means there are plenty of opportunities for new technologies to help filter and categorise information - classic AI problems. That may mean that more artificial intelligence companies will start to emerge to meet this challenge.

The 1969 film, 2001: A Space Odyssey, featured an intelligent computer called HAL 9000. As well as understanding and speaking English, HAL could play chess and even learned to lipread. HAL thus encapsulated the optimism of the 1960s that intelligent computers would be widespread by 2001. But 2001 has been and gone, and there is still no sign of a HAL-like computer. Individual systems can play chess or transcribe speech, but a general theory of machine intelligence still remains elusive. It may be, however, that the comparison with HAL no longer seems quite so important, and AI can now be judged by what it can do, rather than by how well it matches up to a 30-year-old science-fiction film. 'People are beginning to realise that there are impressive things that these systems can do; says Dr Leake hopefully.

EASY IELTS

ARTICLE-26

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ARTICLE-27

EASY IELTS

Early Childhood Education

'Education To Be More' was published last August. It was the report of the New Zealand Government's Early Childhood Care and Education Working Group. The report argued for enhanced equity of access and better funding for childcare and early childhood education institutions. Unquestionably, that's a real need; but since parents don't normally send children to pre-schools until the age of three, are we missing out on the most important years of all?

A 13-year study of early childhood development at Harvard University has shown that, by the age of three, most children have the potential to understand about 1000 words - most of the language they will use in ordinary conversation for the rest of their lives.
Furthermore, research has shown that while every child is born with a natural curiosity, it can be suppressed dramatically during the second and third years of life. Researchers claim that the human personality is formed during the first two years of life, and during the first three years children learn the basic skills they will use in all their later learning both at home and at school. Once over the age of three, children continue to expand on existing knowledge of the world.

It is generally acknowledged that young people from poorer socio-economic backgrounds tend to do less well in our education system. That's observed not just in New Zealand, but also in Australia, Britain and America. In an attempt to overcome that educational under-achievement, a nationwide programme called 'Headstart' was launched in the United States in 1965. A lot of money was poured into it. It took children into pre-school institutions at the age of three and was supposed to help the children of poorer families succeed in school.
Despite substantial funding, results have been disappointing. It is thought that there are two explanations for this. First, the programme began too late. Many children who entered it at the age of three were already behind their peers in language and measurable intelligence. Second, the parents were not involved. At the end of each day, 'Headstart' children returned to the same disadvantaged home environment.

As a result of the growing research evidence of the importance of the first three years of a child's life and the disappointing results from 'Headstart', a pilot programme was launched in Missouri in the US that focused on parents as the child's first teachers. The 'Missouri' programme was predicated on research showing that working with the family, rather than bypassing the parents, is the most effective way of helping children get off to the best possible start in life. The four-year pilot study included 380 families who were about to have their first child and who represented a cross-section of socio-economic status, age and family configurations. They included single-parent and two-parent families, families in which both parents worked, and families with either the mother or father at home.

The programme involved trained parent-educators visiting the parents' home and working with the parent, or parents, and the child. Information on child development, and guidance on things to look for and expect as the child grows were provided, plus guidance in fostering the child's intellectual, language, social and motor-skill development. Periodic check-ups of the child's educational and sensory development (hearing and vision) were made to detect possible handicaps that interfere with growth and development. Medical problems were referred to professionals.
Parent-educators made personal visits to homes and monthly group meetings were held with other new parents to share experience and discuss topics of interest. Parent resource centres, Located in school buildings, offered learning materials for families and facilitators for child care.

At the age of three, the children who had been involved in the 'Missouri' programme were evaluated alongside a cross-section of children selected from the same range of socio-economic backgrounds and Family situations, and also a random sample of children that age. The results were phenomenal.
By the age of three, the children in the programme were significantly more advanced in language development than their peers, had made greater strides in problem solving and other intellectual skills, and were Further along in social development. In fact, the average child on the programme was performing at the level of the top 15 to 20 per cent of their peers in such things as auditory comprehension, verbal ability and language ability.
Most important of all, the traditional measures of 'risk', such as parents' age and education, or whether they were a single parent, bore little or no relationship to the measures of achievement and language development. Children in the programme performed equally well regardless of scio-economic disadvantages.
Child abuse was virtually eliminated. The one factor that was found to affect the child's development was family stress leading to a poor quality of parent-child interaction. That interaction was not necessarily bad in poorer families.

These research findings are exciting. There is growing evidence in New Zealand that children from poorer socio-economic backgrounds are arriving at school less well developed and that our school system tends to perpetuate that disadvantage.
The initiative outlined above could break that cycle of disadvantage.
The concept of working with parents in their homes, or at their place of work, contrasts quite markedly with the report of the Early Childhood Care and Education Working Group. Their focus is on getting children and mothers access to childcare and institutionalised early childhood education.
Education from the age of three to five is undoubtedly vital, but without a similar Focus on parent education and on the vital importance of the first three years, some evidence indicates that it will not be enough to overcome educational inequity.

ARTICLE-28

THE TRUTH ABOUT THE ENVIRONMENT

For many environmentalists, the world seems to be getting worse. They have developed a hit-list of our main fears: that natural resources are running out, that the population is ever growing, leaving less and less to eat, that species are becoming extinct in vast numbers, and that the planet's air and water are becoming ever more polluted.

But a quick look at the facts shows a different picture. First, energy and other natural resources have become more abundant, not less so, since the book 'The Limits to Growth' was published in 1972 by a group of scientists. Second, more food is now produced per head of the world's population than at any time in history. Fewer people are starving. Third, although species are indeed becoming extinct, only about 0.7% of them are expelled to disappear in the next 50 years, not 25-50%, as has so often been predicted. And finally, most forms of environmental pollution either appear to have been exaggerated, or are transient - associated with the early phases of industrialisation and therefore best cured not by restricting economic growth, but by accelerating it. One form of pollution - the release of greenhouse gases that causes global warming - does appear to be a phenomenon that is going to extend well into our future, but its total impact is unlikely to pose a devastating problem. A bigger problem may well turn out to be an inappropriate response to it.

Yet opinion polls suggest that many people nurture the belief that environmental standards are declining and four factors seem to cause this disjunction between perception and reality.

One is the lopsidedness built into scientific research. Scientific funding goes mainly to areas with many problems. That may be wise policy but it will also create an impression that many more potential problems exist than is the case.

Secondly, environmental groups need to be noticed by the mass media. They also need to keep the money rolling in. Understandably, perhaps, they sometimes overstate their arguments. In 1997, for example, the World Wide Fund for Nature issued a press release entitled: 'Two-thirds of the world's forests lost forever'. The truth turns out to be nearer 20%.

Though these groups are run overwhelmingly by selfless folk, they nevertheless share many of the characteristics of other lobby groups. That would matter less if people applied the same degree of skepticism to environmental lobbying as they do to lobby groups in other fields. A trade organisation arguing for, say, weaker pollution control is instantly seen as self-interested. Yet a green organisation opposing such a weakening is seen as altruistic, even if an impartial view of the controls in question might suggest they are doing more harm than good.

A third source of confusion is the attitude of the media. People are dearly more curious about bad news than good. Newspapers and broadcasters are there to provide what the public wants: That, however, can lead to significant distortions of perception. An example was America's encounter with EI Nino in 1997 and 1998. This climatic phenomenon was accused of wrecking tourism, causing allergies, melting the ski-slopes, and causing 22 deaths. However, according to an article in the Bulletin of the American Meteorological Society, the damage it did was estimated at US$4 billion but the benefits amounted to some US$19 billion. These came from higher winter temperatures (which saved an estimated 850 lives, reduced heating costs and diminished spring floods caused by melt waters).

The fourth factor is poor individual perception. People worry that the endless rise in the amount of stuff everyone throws away will cause the world to run out of places to dispose of waste. Yet, even if America's trash output continues to rise as it has done in the past, and even if the American population doubles by 2100, all the rubbish America produces through the entire 21st century will still take up only one-12,000th of the area of the entire United States.

So what of global warming? As we know, carbon dioxide emissions are causing the planet to warm. The best estimates are that the temperatures will rise by 2-3°C in this century, causing considerable problems, at a total cost of US$5,000 billion.

Despite the intuition that something drastic needs to be done about such a costly problem, economic analyses dearly show it will be far more expensive to cut carbon dioxide emissions radically than to pay the costs of adaptation to the increased temperatures. A model by one of the main authors of the United Nations Climate Change Panel shows how an expected temperature increase of 2.1 degrees in 2100 would only be diminished to an increase of 1.9 degrees. Or to put it another way, the temperature increase that the planet would have experienced in 2094 would be postponed to 2100.

So this does not prevent global warming, but merely buys the world six years. Yet the cost of reducing carbon dioxide emissions, for the United States alone, will be higher than the cost of solving the world's single, most pressing health problem: providing universal access to clean drinking water and sanitation. Such measures would avoid 2 million deaths every year, and prevent half a billion people from becoming seriously ill.

It is crucial that we look at the facts if we want to make the best possible decisions for the future. It may be costly to be overly optimistic - but more costly still to be too pessimistic.

ARTICLE-29

The Birth of Scientific English

World science is dominated today by a small number of languages, including Japanese, German and French, but it is English which is probably the most popular global language of science. This is not just because of the importance of English-speaking countries such as the USA in scientific research; the scientists of many non-English-speaking countries find that they need to write their research papers in English to reach a wide international audience. Given the prominence of scientific English today, it may seem surprising that no one really knew how to write science in English before the 17th century. Before that, Latin was regarded as the lingua franca for European intellectuals.

The European Renaissance (c. 14th-16th century) is sometimes called the 'revival of learning', a time of renewed interest in the 'lost knowledge' of classical times. At the same time, however, scholars also began to test and extend this knowledge. The emergent nation states of Europe developed competitive interests in world exploration and the development of trade. Such expansion, which was to take the English language west to America and east to India, was supported by scientific developments such as the discovery of magnetism (and hence the invention of the compass), improvements in cartography and - perhaps the most important scientific revolution of them all - the new theories of astronomy and the movement of the Earth in relation to the planets and stars, developed by Copernicus (1473-1543).

England was one of the first countries where scientists adopted and publicised Copernican ideas with enthusiasm. Some of these scholars, including two with interests in language -John Wall's and John Wilkins - helped found the Royal Society in 1660 in order to promote empirical scientific research.

Across Europe similar academies and societies arose, creating new national traditions of science. In the initial stages of the scientific revolution, most publications in the national languages were popular works, encyclopaedias, educational textbooks and translations.

Original science was not done in English until the second half of the 17th century. For example, Newton published his mathematical treatise, known as the Principia, in Latin, but published his later work on the properties of light - Opticks - in English.

There were several reasons why original science continued to be written in Latin. The first was simply a matter of audience. Latin was suitable for an international audience of scholars, whereas English reached a socially wider, but more local, audience. Hence, popular science was written in English.

A second reason for writing in Latin may, perversely, have been a concern for secrecy. Open publication had dangers in putting into the public domain preliminary ideas which had not yet been fully exploited by their 'author'. This growing concern about intellectual properly rights was a feature of the period - it reflected both the humanist notion of the individual, rational scientist who invents and discovers through private intellectual labour, and the growing connection between original science and commercial exploitation. There was something of a social distinction between 'scholars and gentlemen' who understood Latin, and men of trade who lacked a classical education. And in the mid-17th century it was common practice for mathematicians to keep their discoveries and proofs secret, by writing them in cipher, in obscure languages, or in private messages deposited in a sealed box with the Royal Society. Some scientists might have felt more comfortable with Latin precisely because its audience, though in national, was socially restricted. Doctors clung the most keenly to Latin as an 'insider language'.

A third reason why the writing of original science in English was delayed may have been to do with the linguistic inadequacy of English in the early modern period. English was not well equipped to deal with the scientific argument. First, it lacked the necessary technical vocabulary. Second, it lacked the grammatical resources required to represent the world in an objective and impersonal way, and to discuss the relations, such as cause and effect, that might hold between complex and hypothetical entities.

Fortunately, several members of the Royal Society possessed an interest in language and became engaged in various linguistic projects. Although a proposal in 1664 to establish a committee for improving the English language came to little, the society's members did a great deal to foster the publication of science in English and to encourage the development of a suitable writing style. Many members of the Royal Society also published monographs in English. One of the first was by Robert Hooke, the society's first curator of experiments, who described his experiments with microscopes in Micrographia (1665). This work is largely narrative in style, based on a transcript of oral demonstrations and lectures.

In 1665 a new scientific journal, Philosophical Transactions, was inaugurated. Perhaps the first international English-language scientific journal, it encouraged a new genre of scientific writing, that of short, focused accounts of particular experiments.

The 17th century was thus a formative period in the establishment of scientific English. In the following century, much of this momentum was lost as German established itself as the leading European language of science. It is estimated that by the end of the 18th century 401 German scientific journals had been established as opposed to 96 in France and 50 in England. However, in the 19th century, scientific English again enjoyed substantial lexical growth as the industrial revolution created the need for new technical vocabulary, and new, specialised, professional societies were instituted to promote and publish in the new disciplines.

*** lingua franca: a language which is used for communication between groups of people who speak different languages.

ARTICLE-30

Johnson's Dictionary

For the century before Johnson's Dictionary was published in 1775, there had been concern about the state of the English language. There was no standard way of speaking or writing and no agreement as to the best way of bringing some order to the chaos of English spelling. Dr Johnson provided the solution.

There had, of course, been dictionaries in the past, the first of these being a little book of some 120 pages, compiled by a certain Robert Cawdray, published in 1604 under the title A Table Alphabeticall of hard usually English words. Like the various dictionaries that came after it during the seventeenth century, Cawdray's tended to concentrate on 'scholarly' words; one function of the dictionary was to enable its student to convey an impression of fine learning.

Beyond the practical need to make order out of chaos, the rise of dictionaries is associated with the rise of the English middle class, who were anxious to define and circumscribe the various worlds to conquer -lexical as well as social and commercial. It is highly appropriate that Dr Samuel Johnson, the very model of an eighteenth-century literary man, as famous in his own time as in ours, should have published his Dictionary at the very beginning of the heydey of the middle class.

Johnson was a poet and critic who raised common sense to the heights of genius. His approach to the problems that had worried writers throughout the late seventeenth and early eighteenth centuries was intensely practical. Up until his time, the task of producing a dictionary on such a large scale had seemed impossible without the establishment of an academy to make decisions about right and wrong usage. Johnson decided he did not need an academy to settle arguments about language; he would write a dictionary himself; and he would do it single-handed. Johnson signed the contract for the Dictionary with the bookseller Robert Dosley at a breakfast held at the Golden Anchor Inn near Holborn Bar on 18 June 1764. He was to be paid £1,575 in instalments, and from this, he took money to rent 17 Gough Square, in which he set up his 'dictionary workshop'.

James Boswell, his biographer described the garret where Johnson worked as 'fitted up like a counting house' with a long desk running down the middle at which the copying clerks would work standing up.

Johnson himself was stationed on a rickety chair at an 'old crazy deal table' surrounded by a chaos of borrowed books. He was also helped by six assistants, two of whom died whilst the Dictionary was still in preparation.

The work was immense; filing about eighty large notebooks (and without a library to hand), Johnson wrote the definitions of over 40,000 words, and illustrated their many meanings with some 114,000 quotations drawn from English writing on every subject, from the Elizabethans to his own time. He did not expel to achieve complete originality. Working to a deadline, he had to draw on the best of all previous dictionaries, and to make his work one of heroic synthesis. In fact, it was very much more.

Unlike his predecessors, Johnson treated English very practically, as a living language, with many different shades of meaning. He adopted his definitions on the principle of English common law - according to precedent. After its publication, his Dictionary was not seriously rivalled for over a century.

After many vicissitudes, the Dictionary was finally published on 15 April 1775. It was instantly recognised as a landmark throughout Europe. 'This very noble work;' wrote the leading Italian lexicographer, will be a perpetual monument of Fame to the Author, an Honour to his own Country in particular, and a general Benefit to the Republic of Letters throughout Europe. The fact that Johnson had taken on the Academies of Europe and matched them (everyone knew that forty French academics had taken forty years to produce the first French national dictionary) was cause for much English celebration.

Johnson had worked for nine years, 'with little assistance of the learned, and without any patronage of the great; not in the soft obscurities of retirement, or under the shelter of academic bowers, but amidst inconvenience and distraction, in sickness and in sorrow'. For all its faults and eccentricities his two-volume work is a masterpiece and a landmark, in his own words, 'setting the orthography, displaying the analogy, regulating the structures, and ascertaining the significations of English words'. It is the cornerstone of Standard English, an achievement which, in James Boswell's words, 'conferred stability on the language of his country'.

The Dictionary, together with his other writing, made Johnson famous and so well esteemed that his friends were able to prevail upon King George III to offer him a pension. From then on, he was to become the Johnson of folklore.

ARTICLE-31

THE KEYLESS SOCIETY

Students who want to enter the University of Montreal's Athletic Complex need more than just a conventional ID card - their identities must be authenticated by an electronic hand scanner. In some California housing estates, a key alone is insufficient to get someone in the door; his or her /Voiceprinfmust also be verified. And soon, customers at some Japanese banks will have to present their faces for scanning before they can enter the building and withdraw their money.

All of these are applications of biometrics, a little-known but fast-growing technology that involves the use of physical or biological characteristics to identify individuals. In use for more than a decade at some high-security government institutions in the United States and Canada, biometrics are now rapidly popping up in the everyday world. Already, more than 10,000 facilities, from prisons to day-care centres, monitor people's fingerprints or other physical parts to ensure that they are who they claim to be. Some 60 biometric companies around the world pulled in at least $22 million last year and that grand total is expected to mushroom to at least $50 million by 1999.

Biometric security systems operate by storing a digitised record of some unique human feature. When an authorised user wishes to enter or use the facility, the system scans the person's corresponding characteristics and attempts to match them against those on record. Systems using fingerprints, hands, voices, irises, retinas and faces are already on the market. Others using typing patterns and even body odours are in various stages of development.

Fingerprint scanners are currently the most widely deployed type of biometric application, thanks to their growing use over the last 20 years by law-enforcement agencies. Sixteen American states now use biometric fingerprint verification systems to check that people claiming welfare payments are genuine. In June, politicians in Toronto voted to do the same, with a pilot project beginning next year.

To date, the most widely used commercial biometric system is the handkey, a type of hand scanner which reads the unique shape, size and irregularities of people's hands. Originally developed for nuclear power plants, the handkey received its big break when it was used to control access to the Olympic Village in Atlanta by more than 65,000 athletes, trainers and support staff. Now there are scores of other applications.

Around the world, the market is growing rapidly. Malaysia, for example, is preparing to equip all of its airports with biometric face scanners to match passengers with luggage. And Japan's largest maker of cash dispensers is developing new machines that incorporate iris scanner~. The first commercial biometric, a hand reader used by an American firm to monitor employee attendance, was introduced in 1974. But only in the past few years has the technology improved enough for the prices to drop sufficiently to make them commercially viable. 'When we started four years ago, I had to explain to everyone what a biometric is,' says one marketing expert. 'Now, there's much more awareness out there.'

Not surprisingly, biometrics raise thorny questions about privacy and the potential for abuse. Some worry that governments and industry will be tempted to use the technology to monitor individual behaviour. 'If someone used your fingerprints to match your health-insurance records with a credit-card record showing you regularly bought lots of cigarettes and fatty foods,' says one policy analyst, 'you would see your insurance payments go through the roof.' In Toronto, critics of the welfare fingerprint plan complained that it would stigmatise recipients by forcing them to submit to a procedure widely identified with criminals.

Nonetheless, support for biometrics is growing in Toronto as it is in many other communities. In an increasingly crowded and complicated world, biometrics may well be a technology whose time has come.

EASY IELTS

ARTICLE-32

MAKING EVERY DROP COUNT

The history of human civilization is entwined with the history of ways we have learned to manipulate water resources. As towns gradually expanded, water was brought from increasingly remote sources, leading to sophisticated engineering efforts such as dams and aqueducts. At the height of the Roman Empire, nine major systems, with an innovative layout of pipes and well-built sewers, supplied the occupants of Rome with as much water per person as is provided in many parts of the industrial world today.

During the industrial revolution and population explosion of the 19th and 20th centuries, the demand for water rose dramatically. Unprecedented construction of tens of thousands of monumental engineering projects designed to control floods, protect clean water supplies, and provide water for irrigation and hydropower brought great benefits to hundreds of millions of people. Food production has kept pace with soaring populations mainly because of the expansion of artificial irrigation system that makes possible the growth of 40% of the world's food. Nearly one-fifth of all the electricity generated worldwide is produced by turbines spun by the power of falling water.

Yet there is a dark side to this picture: despite our progress, half of the world's population till suffers, with water services inferior to those available to the ancient Greeks and Romans. As the United Nations report on access to water reiterated in November 2001, more than one billion people lack access to clean drinking water: some two and half billion do not have adequate sanitation services. Preventable water-related diseases kill an estimated 10,000 to 20,000 children every day, and the latest evidence suggests that we are falling behind in efforts to solve their problems.

The consequences of our water policies extend beyond jeopardizing human health. Tens of millions of people have been forced to move from their homes - often with little warning or compensation - to make way for the reservoirs behind dams. More than 20% of all freshwater fish species are now threatened or endangered because dams and water withdrawals have destroyed the free-flowing river ecosystems where they thrive. Certain irrigation practices degrade soil quality and reduce agricultural productivity. Groundwater aquifers* are being pumped down faster than they are naturally replenished in part of India, China, the USA and elsewhere. And disputes over shared water resources have led to violence and continue to raise local, national and even international tensions.

At the outset of the new millennium, however, the way resource planners think about water is beginning to change. The focus is slowly shifting back to the provision of basic human and environmental needs as a top priority - ensuring 'some for all,' instead of 'more for some'. Some water experts are now demanding that existing infrastructure be used in smarter ways rather than building new facilities, which is increasingly considered the option of last, not first, resort. This shift in philosophy has not been universally accepted, and it comes with strong opposition from some established water organizations. Nevertheless, it may be the only way to address successfully the pressing problems of providing everyone with clean water to drink, adequate water to grow food and a life free from preventable water-related illness.

Fortunately - and unexpectedly - the demand for water is not rising as rapidly as some predicted. As a result, the pressure to build now water infrastructures has diminished over the past two decades. Although population, industrial output and economic productivity have continued to soar in developed nations, the rate at which people withdraw water from aquifers, rivers and lacks has slowed. And in a few parts of the world, demand has actually fallen.

What explains this remarkable turn of events? Two factors: people have figured out how to use water more efficiently, and communities are rethinking their priorities for water use. Throughout the first three-quarters of the 20th century, the quantity of freshwater consumed per person doubled on average; in the USA, water withdrawals increased tenfold while the population quadrupled. But since 1980, the amount of water consumed per person has actually decreased, thanks to a range of new technologies that help to conserve water in homes and industry. In 1965, for instance, Japan used approximately 13 million gallons* of water to produce $1 million of commercial output; by 1989 this had dropped to 3.5 million gallons (even accounting for inflation) - almost a quadrupling of water productivity. In the USA, water withdrawals have fallen by more than 20% from their peak in 1980.

On the other hand, dams, aqueducts and other kinds of infrastructure will still have to be built, particularly in developing countries where basic human needs have not been met. But such projects must be built to higher specifications and with more accountability to local people and their environment than in the past. And even in regions where new projects seem warranted, we must find ways to meet demands with fewer resources, respecting ecological criteria and to smaller budget.

ARTICLE-33

AIR TRAFFIC CONTROL IN THE USA

An accident that occurred in the skies over the Grand Canyon in 1956 resulted in the establishment of the Federal Aviation Administration (FAA) to regulate and oversee the operation of aircraft in the skies over the United States, which were becoming quite congested. The resulting structure of air traffic control has greatly increased the safety of flight in the United States, and similar air traffic control procedures are also in place over much of the rest of the world.

Rudimentary air traffic control (ATC) existed well before the Grand Canyon disaster. As early as the 1920s, the earliest air traffic controllers manually guided aircraft in the vicinity of the airports, using lights and flags, while beacons and flashing lights were placed along cross-country routes to establish the earliest airways. However, this purely visual system was useless in bad weather, and, by the 1930s, radio communication was coming into use for ATC. The first region to have something approximating today's ATC was New York City, with other major metropolitan areas following soon after.

In the 1940s, ATC centres could and did take advantage of the newly developed radar and improved radio communication brought about by the Second World War, but the system remained rudimentary. It was only after the creation of the FAA that full-scale regulation of America's airspace took place, and this was fortuitous, for the advent of the jet engine suddenly resulted in a large number of very fast planes, reducing pilots' margin of error and practically demanding some set of rules to keep everyone well separated and operating safely in the air.

Many people think that ATC consists of a row of controllers sitting in front of their radar screens at the nation's airports, telling arriving and departing traffic what to do. This is a very incomplete part of the picture. The FAA realised that the airspace over the United States would at any time have many different kinds of planes, flying for many different purposes, in a variety of weather conditions, and the same kind of structure was needed to accommodate all of them.

To meet this challenge, the following elements were put into effect. First, ATC extends over virtually the entire United States. In general, from 365m above the ground and higher, the entire country is blanketed by controlled airspace. In certain areas, mainly near airports, controlled airspace extends down to 215m above the ground, and, in the immediate vicinity of an airport, all the way down to the surface. Controlled airspace is that airspace in which FAA regulations apply. Elsewhere, in uncontrolled airspace, pilots are bound by fewer regulations. In this way, the recreational pilot who simply wishes to go flying for a while without all the restrictions imposed by the FAA has only to stay in uncontrolled airspace, below 365m, while the pilot who does want the protection afforded by ATC can easily enter the controlled airspace.

The FAA then recognised two types of operating environments. In good meteorological conditions, flying would be permitted under Visual Flight Rules (VFR), which suggests a strong reliance on visual cues to maintain an acceptable level of safety. Poor visibility necessitated a set of Instrumental Flight Rules (IFR), under which the pilot relied on altitude and navigational information provided by the plane's instrument panel to fly safely. On a clear day, a pilot in controlled airspace can choose a VFR or IFR flight plan, and the FAA regulations were devised in a way which accommodates both VFR and IFR operations in the same airspace. However, a pilot can only choose to fly IFR if they possess an instrument rating which is above and beyond the basic pilot's license that must also be held.

Controlled airspace is divided into several different types, designated by letters of the alphabet. Uncontrolled airspace is designated Class F, while controlled airspace below 5,490m above sea level and not in the vicinity of an airport is Class

All airspace above 5,490m is designated Class A. The reason for the division of Class E and Class A airspace stems from the type of planes operating in them. Generally, Class E airspace is where one finds general aviation aircraft (few of which can climb above 5,490m anyway), and commercial turboprop aircraft. Above 5,490m is the realm of the heavy jets, since jet engines operate more efficiently at higher altitudes. The difference between Class E and A airspace is that in Class A, all operations are IFR, and pilots must be instrument-rated, that is, skilled and licensed in aircraft instrumentation. This is because ATC control of the entire space is essential. Three other types of airspace, Classes D, C and B, govern the vicinity of airports. These correspond roughly to small municipal, medium-sized metropolitan and major metropolitan airports respectively, and encompass an increasingly rigorous set of regulations. For example, all a VFR pilot has to do to enter Class C airspace is establish two-way radio contact with ATC. No explicit permission from ATC to enter is needed, although the pilot must continue to obey all regulations governing VFR flight. To enter Class B airspace, such as on approach to a major metropolitan airport, an explicit ATC clearance is required. The private pilot who cruises without permission into this airspace risks losing their license.

ARTICLE-34

Volcanoes – earth-shattering news

When Mount Pinatubo suddenly erupted on 9 June 1991, the power of volcanoes past and present again hit the headlines

A Volcanoes are the ultimate earth-moving machinery. A violent eruption can blow the top few kilometres off a mountain, scatter fine ash practically all over the globe and hurt rock fragments into the stratosphere to darken the skies a continent away.

Earth shattering news But the classic eruption – cone-shaped mountain, big bang, mushroom cloud and surges of molten lava – is only a tiny part of a   global story. Volcanism, the name given to volcanic processes, really has shaped the world. Eruptions have rifted continents, raised mountain chains, constructed islands and shaped the topography of the earth. The entire ocean floor has a basement of volcanic basalt.

Volcanoes have not only made the continents, they are also thought to have made the world’s first stable atmosphere and provided all the water for the oceans, rivers and ice-caps. There are now about 600 active volcanoes. Every year they add two or three cubic kilometres of rock to the continents. Imagine a similar number of volcanoes smoking away for the last 3,500 million years. That is enough rock to explain the continental crust.

What comes out of volcanic craters is mostly gas. More than 90% of this gas is water vapour from the deep earth: enough to explain, over 3,500 million years, the water in the oceans. The rest of the gas is nitrogen, carbon dioxide, sulphur dioxide, methane, ammonia and hydrogen. The quantity of these gases, again multiplied over 3,500 million years, is enough to explain the mass of the world’s atmosphere. We are alive because volcanoes provided the soil, air and water we need.

B Geologists consider the earth as having a molten core, surrounded by a semi-molten mantle and a brittle, outer skin. It helps to think of a soft-boiled egg with a runny yolk, a firm but squishy white and a hard shell. If the shell is even slightly cracked during boiling, the white material bubbles out and sets like a tiny mountain chain over the crack – like an archipelago of volcanic islands such as the Hawaiian Islands. But the earth is so much bigger and the mantle below is so much halter.

Even though the mantle rocks are kept solid by overlying pressure, they can still slowly ‘flow’ like thick treacle. The flow, thought to be in the form of convection currents, is powerful enough to fracture the ‘eggshell’ of the crust into plates, and keep them bumping and grinding against each other, or even overlapping, at the rate of a few centimetres a year. These fracture zones, where the collisions occur, are where earthquakes happen. And, very often, volcanoes.

C These zones are lines of weakness, or hot spots. Every eruption is different, but put at its simplest, where there are weaknesses, rocks deep in the mantle, heated to 1,350oC, will start to expand and rise. As they do so, the pressure drops, and they expand and become liquid and rise more swiftly.

Sometimes it is slow: vast bubbles of magma – molten rock from the mantle – inch towards the surface, cooling slowly, to show through as granite extrusions (as on Skye, or the Great Whin Sill, the lava dyke squeezed out like toothpaste that carries part of Hadrian's Wall in northern England). Sometimes – as in Northern Ireland, Wales and the Karoo in South Africa – the magma rose faster, and then flowed out horizontally on to the surface in vast thick sheets. In the Deccan plateau in western India, there are more than two million cubic kilometres of lava, some of it 2,400 metres thick, formed over 500,000 years of slurping eruption.

Sometimes the magma moves very swiftly indeed. It does not have time to cool as it surges upwards. The gases trapped inside the boiling rock expand suddenly, the lava glows with heat, it begins to froth, and it explodes with tremendous force. Then the slightly cooler lava following it begins to flow over the lip of the crater. It happens on Mars, it happened on the moon, it even happens on some of the moons of Jupiter and Uranus. By studying the evidence, vulcanologists can read the force of the great blasts of the past. Is the pumice light and full of holes? The explosion was tremendous. Are the rocks heavy, with huge crystalline basalt shapes, like the Giant's Causeway in Northern Ireland? It was a slow, gentle eruption.

The biggest eruptions are deep on the mid-ocean floor, where new lava is forcing the continents apart and widening the Atlantic by perhaps five centimetres a year. Look at maps of volcanoes, earthquakes and island chains like the Philippines and Japan, and you can see the rough outlines of what are called tectonic plates – the plates which make up the earth's crust and mantle. The most dramatic of these is the Pacific 'ring of fire' where there have the most violent explosions – Mount Pinatubo near Manila, Mount St Helen's in the Rockies and El Chichón in Mexico about a decade ago, not to mention world-shaking blasts like Krakatoa in the Sunda Straits in 1883.

But volcanoes are not very predictable. That is because geological time is not like human time. During quiet periods, volcanoes cap themselves with their own lava by forming a powerful cone from the molten rocks slopping over the rim of the crater; later the lava cools slowly into a huge, hard, stable plug which blocks any further eruption until the pressure below becomes irresistible. In the case of Mount Pinatubo, this took 600 years.

Then, sometimes, with only a small warning, the mountain blows its top. It did this at Mont Pelée in Martinique at 7.49 a.m. on 8 May, 1902. Of a town of 28,000, only two people survived. In 1815, a sudden blast removed the top 1,280 metres of Mount Tambora in Indonesia. The eruption was so fierce that dust thrown into the stratosphere darkened the skies, canceling the following summer in Europe and North America. Thousands starved as the harvest failed, after snow in June and frosts in August. Volcanoes are potentially world news, especially the quiet ones.

ARTICLE-35

EFFECTS of Noise

In general, it is plausible to suppose that we should prefer peace and quiet to noise. And yet most of us have had the experience of having to adjust to sleeping in the mountains or the countryside because it was initially too quiet. Van experience that suggests that humans are capable of adapting to a wide range of noise levels. Research supports this view. For example, Glass and Singer (1972) exposed people to short bursts of very loud noise and then measured their ability to work out problems and their physiological reactions to the noise. The noise was quite disruptive at first, but after about four minutes the subjects were doing just as well on their tasks as control subjects who were not exposed to noise. Their physiological arousal also declined quickly to the same levels as those of the control subjects.

But there are limits to adaptation and loud noise becomes more troublesome if the person is required to concentrate on more than one task. For example, high noise levels interfered with the performance of subjects who were required to monitor three dials at a time, a task not unlike that of an aeroplane pilot or an air-traffic controller (Broadbent, 1957). Similarly, noise did not affect a subject's ability to track a moving line with a steering wheel, but it did interfere with the subject's ability to repeat numbers while tracking (Finke man and Glass 1970).

Probably the most significant finding from research on noise is that its predictability is more important than how loud it is. We are much more able to 'tune out' chronic, background noise, even if it is quite loud than to work under circumstances with unexpected intrusions of noise. In the Glass and Singer study, in which subjects were exposed to bursts of noise as they worked on a task, some subjects heard loud bursts and others heard soft bursts. For some subjects, the bursts were spaced exactly one minute apart (predictable noise); others heard the same amount of noise overall, but the bursts occurred at random intervals (unpredictable noise).

Subjects reported finding the predictable and unpredictable noise equally annoying, and all subjects performed at about the same level during the noise portion of the experiment- But the different noise conditions had quite different after-effects when the subjects were required to proofread written material under conditions of no noise. As shown in Table 1 the unpredictable noise produced more errors in the later proofreading task than predictable noise; and soft, unpredictable noise actually produced slightly more errors on this task than the loud, predictable noise.

Apparently, unpredictable noise produces more fatigue than predictable noise, but it takes a while for this fatigue to take its toll on performance.

Predictability is not the only variable that reduces or eliminates the negative effects of noise. Another is "control". If the individual knows that he or she can control the noise, this seems to eliminate both its negative effects at the time and its after-effects. This is true even if the individual never actually exercises his or her option to turn the noise off (Glass and-Singer, 1972). Just the knowledge that one has control is sufficient.

The studies discussed so far exposed people lo noise for only short periods and only transient effects were studied. But the major worry about noisy environments is that living day after day with chronic noise may produce serious, lasting effects. One study, suggesting that this worry is a realistic one, compared elementary school pupils who attended schools - near Los Angeles's busiest airport with students who attended schools in quiet neighborhoods (Cohen et al., 1980). It was found that children from the noisy schools -had higher blood pressure and were more easily distracted than those who attended the quiet schools. Moreover, there was no evidence of adaptability to the noise. In fact, the longer the children had attended the noisy schools, the more distractible they became. The effects also seem to be long-lasting. A follow-up study showed that children who were moved to less noisy classrooms still showed greater distractibility one year later than students who had always been in the quiet schools (Cohen et al, 1981). It should be noted that the two groups of children had been carefully matched by the investigators so that they were comparable in age, ethnicity, race, and social class.

ARTICLE-36

EASY IELTS

Ant Intelligence

When we think of intelligent members of the animal kingdom, the creatures that spring immediately to mind are apes and monkeys. But in fact, the social lives of some members of the insect kingdom are sufficiently complex to suggest more than a hint of intelligence. Among these, the world of the ant has come in for considerable scrutiny lately, and the idea that ants demonstrate sparks of cognition has certainly not been rejected by those involved in these investigations.

Ants store food, repel attackers and use chemical signals to contact one another in case of attack. Such chemical communication can be compared to the human use of visual and auditory channels (as in religious chants, advertising images and jingles, political slogans and martial music) to arouse and propagate moods and attitudes. The biologist Lewis Thomas wrote Ants are so much like human beings as to be an embarrassment. They farm fungi, raise aphids as livestock, launch armies to war, use chemical sprays to alarm and confuse enemies, capture slaves, engage in child labour, exchange information ceaselessly. They do everything but watch television.

* aphids: small insects of a different species from ants

However, in ants there is no cultural transmission - everything must be encoded in the genes - whereas In humans the opposite is true. Only basic instincts are carried in the genes of a newborn baby, other skills being learned from others in the community as the child grows up. It may seem that this cultural continuity gives us a huge advantage over ants. They have never mastered fire nor progressed. Their fungus farming and aphid herding crafts are sophisticated when compared to the agricultural skills of humans five thousand years ago but have been totally overtaken by modem human agribusiness.

Or have they? The farming methods of ants are at least sustainable. They do not ruin environments or use enormous amounts of energy. Moreover, recent evidence suggests that the crop farming of ants may be more sophisticated and adaptable than was thought.

Ants were farmers fifty million years before humans were. Ants can't digest the cellulose in leaves - but some fungi can. The ants, therefore, cultivate these fungi in their nests, bringing them leaves to feed on, and then use them as a source of food. Farmer ants secrete antibiotics to control other fungi that might act as 'weeds', and spread waste to fertilise the crop.

It was once thought that the fungus that ants cultivate was a single type that they had propagated, essentially unchanged from the distant past. Not so. Ulrich Mueller of Maryland and his colleagues genetically screened 862 different types of fungi taken from ants' nests. These turned out to be highly diverse: it seems that ants are continually domesticating new species. Even more impressively, DNA analysis of the fungi suggests that the ants improve or modify the fungi by regularly swapping and sharing strains with neighboring ant colonies.

Whereas prehistoric man had no exposure to urban lifestyles - the forcing house, of intelligence - the evidence suggests that ants have lived in urban settings for close on a hundred million years, developing and maintaining underground cities of specialised chambers and tunnels.

When we survey Mexico City, Tokyo, Los Angeles, we are amazed at what has been accomplished by humans. Yet Hoelldobler and Wilson's magnificent work for ant lovers, the Ants, describes a supercolony of the ant Formica yessensis on the Ishikari Coast of Hokkaido. This 'megalopolis' was reported to be composed of 360 million workers and a million queens living in 4,500 interconnected nests across a territory of 2.7 square kilometers.

Such enduring and intricately meshed levels of technical achievement outstrip by far anything achieved by our distant ancestors. We hail as masterpieces the cave paintings in southern France and elsewhere, dating back some 20,000 years. Ant societies existed in something like their present form more than seventy million years ago. Beside this, prehistoric man looks technologically primitive. Is this then some kind of intelligence, albeit of a different kind?

Research conducted at Oxford, Sussex and Zurich Universities has shown that when; desert ants return from a foraging trip, they navigate by integrating bearings and distances, which they continuously update their heads. They combine the evidence of visual landmarks with a mental library of local directions, all within a framework which is consulted and updated. So ants can learn too.

And in a twelve-year programme of work, Ryabko and Reznikova have found evidence that ants can transmit very complex messages. Scouts who had located food in a maze returned to mobilise their foraging teams. They engaged in contact sessions, at the end of which the scout was removed in order to observe what her team might do. Often the foragers proceeded to the exact spot in the maze where the food had been Elaborate precautions were taken to prevent the foraging team using odour clues. Discussion now centers on whether the route through the maze is communicated as a 'left- right sequence of turns or as a 'compass bearing and distance' message.

During the course of this exhaustive study, Reznikova has grown so attached to her laboratory ants that she feels she knows them as individuals - even without the paint spots used to mark them. It's no surprise that Edward Wilson, in his essay, 'In the company of ants', advises readers who ask what to do with the ants in their kitchen to: 'Watch where you step. Be careful of little lives.'\

<u>ARTICLE-37</u>

Literate women make better mothers?

Children in developing countries are healthier and more likely to survive past the age of five when their mothers can read and write. Experts in public health accepted this idea decades ago, but until now no one has been able to show that a woman's ability to read in itself improves her children's chances of survival.

Most literate women learnt to read in primary school, and the fact that a woman has had an education may simply indicate her family's wealth or that it values its children more highly. Now a long-term study carried out in Nicaragua has eliminated these factors by showing that teaching reading to poor adult women, who would otherwise have remained illiterate, has a direct effect on their children's health and survival.

In 1979, the government of Nicaragua established a number of social programmes, including a National Literacy Crusade. By 1985, about 300,000 illiterate adults from all over the country, many of whom had never attended primary school, had learnt how to read, write and use numbers.

During this period, researchers from the Liverpool School of Tropical Medicine, the Central American Institute of Health in Nicaragua, the National Autonomous University of Nicaragua and the Costa Rican Institute of Health interviewed nearly 3,000 women, some of whom had learnt to read as children, some during the literacy crusade and some who had never learnt at all. The women were asked how many children they had given birth to and how many of them had died in infancy. The research teams also examined the surviving children to find out how well-nourished they were.

The investigators' findings were striking. In the late 1970s, the infant mortality rate for the children of illiterate mothers was around 110 deaths per thousand live births. At this point in their lives, Those mothers who later went on to learn to read had a similar level of child mortality(105/1000).For women educated in primary school, however, the infant mortality rate was significantly lower, at 80 per thousand.

In 1985, after the National Literacy Crusade had ended, the infant mortality figures for those who remained illiterate and for those educated in primary school remained more or less unchanged. For those women who learnt to read through the campaign, the infant mortality rate was 84 per thousand, an impressive 21 points lower than for those women who were still illiterate. The children of the newly-literate mothers were also better nourished than those of women who could not read.

Why are the children of literate mothers better off? According to Peter Sandiford of the Liverpool School of Tropical Medicine, no one knows for certain. Child health was not on the curriculum during the women's lessons, so he and his colleagues are looking at other factors. They are working with the same group of 3,000 women, to try to find out whether reading mothers make better use of hospitals and clinics, opt for smaller families, exert more control at home, learn modem childcare techniques more quickly, or whether they merely have more respect for themselves and their children.

The Nicaraguan study may have important implications for governments and aid agencies that need to know where to direct their resources. Sandiford says that there is increasing evidence that female education, at any age, is 'an important health intervention in its own right' .The results of the study lend support to the World Bank's recommendation that education budgets in developing countries should be increased, not just to help their economies, but also to improve child health. 'We've known for a long time that maternal education is important,' says John Cleland of the London School of Hygiene and Tropical Medicine. 'But we thought that even if we started educating girls today, we'd have to wait a generation for the pay-off. The Nicaraguan study suggests we may be able to bypass that.'

Cleland warns that the Nicaraguan crusade was special in many ways, and similar campaigns elsewhere might not work as well. It is notoriously difficult to teach adults skills that do not have an immediate impact on their everyday lives, and many literacy campaigns in other countries have been much less successful. 'The crusade was part of a larger effort to bring a better life to the people,' says Cleland. Replicating these conditions in other countries will be a major challenge for development workers.

ARTICLE-38

Motivating Employees under Adverse Condition

THE CHALLENGE

It is a great deal easier to motivate employees in a growing organisation than a declining one. When organisations are expanding and adding personnel, promotional opportunities, pay rises, and the excitement of being associated with a dynamic organisation create Slings of optimism. Management is able ta use the growth to entice and encourage employees. When an organisation is shrinking, the best and most mobile workers are prone to leave voluntarily. Unfortunately, they are the ones the organisation can least afford to lose- those with me highest skills and experience. The minor employees remain because their job options are limited.

Morale also surfers during decline. People fear they may be the next to be made redundant. Productivity often suffers, as employees spend their time sharing rumours and providing one another with moral support rather than focusing on their jobs. For those whose jobs are secure, pay increases are rarely possible. Pay cuts, unheard of during times of growth, may even be imposed. The challenge to management is how to motivate employees under such retrenchment conditions. The ways of meeting this challenge can be broadly divided into six Key Points, which are outlined below.

KEY POINT ONE

There is an abundance of evidence to support the motivational benefits that result from carefully matching people to jobs. For example, if the job is running a small business or an autonomous unit within a larger business, high achievers should be sought. However, if the job to be filled is a managerial post in a large bureaucratic organisation, a candidate who has a high need for power and a low need for affiliation should be selected. Accordingly, high achievers should not be put into jobs that are inconsistent with their needs. High achievers will do best when the job provides moderately challenging goals and where there is independence and feedback. However, it should be remembered that not everybody is motivated by jobs that are high in independence, variety and responsibility.

KEY POINT TWO

The literature on goal-setting theory suggests that managers should ensure that all employees have specific goals and receive comments on how well they are doing in those goals. For those with high achievement needs, typically a minority in any organisation, the existence of external goals is less important because high achievers are already internally motivated. The next factor to be determined is whether the goals should be assigned by a manager or collectively set in conjunction with the employees. The answer to that depends on perceptions the culture, however, goals should be assigned. If participation and the culture are incongruous, employees are likely to perceive the participation process as manipulative and be negatively affected by it.

KEY POINT THREE

Regardless of whether goals are achievable or well within management's perceptions of the employee's ability, if employees see them as unachievable they will reduce their effort. Managers must be sure, therefore, that employees feel confident that their efforts can lead to performance goals. For managers, this means that employees must have the capability of doing the job and must regard the appraisal process as valid.

EASY IELTS

KEY POINT FOUR

Since employees have different needs, what acts as a reinforcement far one may not for another. Managers could use their knowledge of each employee to personalise the rewards over which they have control. Some of the more obvious rewards that managers allocate include pay, promotions, autonomy, job scope and depth, and the opportunity lo participate in goal-setting and decision-making.

KEY POINT FIVE

Managers need to make rewards contingent on performance. To reward factors other than performance will only reinforce those other factors. Key rewards such as pay increases and promotions or advancements should be allocated for the attainment of the employee's specific goals. Consistent with maximising the impact of rewards, managers should look for ways to increase their visibility. Eliminating the secrecy surrounding pay by openly communicating everyone's remuneration, publicising performance bonuses and allocating annual salary increases in a lump sum rather than spreading them out over an entire year are examples of actions that will make rewards more visible and potentially more motivating.

KEY POINT SIX

The way rewards ore distributed should be transparent so that employees perceive that rewards or outcomes are equitable and equal to the inputs given. On a simplistic level, experience, abilities, effort and other obvious inputs should explain differences in pay, responsibility and other obvious outcomes. The problem, however, is complicated by the existence of dozens of inputs and outcomes and by the Fact that employee groups place different degrees of importance on them. For instance, a study comparing clerical and production workers identified nearly twenty inputs and outcomes. The clerical workers considered factors such as quality of work performed and job knowledge near the top of their list, but these were at the bottom of the production workers' list. Similarly, production workers thought that the most important inputs were intelligence and personal involvement with task accomplishment, two factors that were quite low in the importance ratings of the clerks. There were also important, though less dramatic, differences on the outcome side. For example, production workers rated advancement very highly, whereas clerical workers rated advancement in the lower third of their list. Such findings suggest that one person's equity is another's inequity, so an ideal should probably weigh different inputs and outcomes according to employee group.

ARTICLE-39

Climate change and the Inuit

The threat posed by climate change in the Arctic and the problems faced by Canada's Inuit people

Unusual incidents are being reported across the Arctic. Inuit families going off on snowmobiles to prepare their summer hunting camps have found themselves cut off from home by a sea of mud, following early thaws. There are reports of igloos losing their insulating properties as the snow drips and refreezes, of lakes draining into the sea as permafrost melts, and sea ice breaking up earlier than usual, carrying seals beyond the reach of hunters. Climate change may still be a rather abstract idea to most of us, but in the Arctic, it is already having dramatic effects - if summertime ice continues to shrink at its present rate, the Arctic Ocean could soon become virtually ice-free in summer. The knock-on effects are likely to include more warming, cloudier skies, increased precipitation and higher sea levels. Scientists are increasingly keen to find out what's going on because they consider the Arctic the 'canary in the mine' for global warming - a warning of what's in store for the rest of the world.

For the Inuit the problem is urgent. They live in precarious balance with one of the toughest environments on earth. Climate change, whatever its causes, is a direct threat to their way of life. Nobody knows the Arctic as well as the locals, which is why they are not content simply to stand back and let outside experts tell them what's happening. In Canada, where the Inuit people are jealously guarding their hard-won autonomy in the country's newest territory, Nunavut, they believe their best hope of survival in this changing environment lies in combining their ancestral knowledge with the best of modern science. This is a challenge in itself.

The Canadian Arctic is a vast, treeless polar desert that's covered with snow for most of the year. Venture into this terrain and you get some idea of the hardships facing anyone who calls this home. Farming is out of the question and nature offers meagre pickings. Humans first settled in the Arctic a mere 4,500 years ago, surviving by exploiting sea mammals and fish. The environment tested them to the limits: sometimes the colonists were successful, sometimes they failed and vanished. But around a thousand years ago, one group emerged that was uniquely well adapted to cope with the Arctic environment. These Thule people moved in from Alaska, bringing kayaks, sleds, dogs, pottery and iron tools. They are the ancestors of today's Inuit people.

Life for the descendants of the Thule people is still harsh. Nunavut is 1.9 million square kilometres of rock and ice, and a handful of islands around the North Pole. It's currently home to 2,500 people, all but a handful of them indigenous Inuit. Over the past 40 years, most have abandoned their nomadic ways and settled in the territory's 28 isolated communities, but they still rely heavily on nature to provide food and clothing. Provisions available in local shops have to be flown into Nunavut on one of the most costly air networks in the world, or brought by supply ship during the few ice-free weeks of summer. It would cost a family around £7,000 a year to replace meat they obtained themselves through hunting with imported meat. Economic opportunities are scarce, and for many people state benefits are their only income.

While the Inuit may not actually starve if hunting and trapping are curtailed by climate change, there has certainly been an impact on people's health. Obesity, heart disease and diabetes are beginning to appear in a people for whom these have never before been problems. There has been a crisis of identity as the traditional skills of hunting, trapping and preparing skins have begun to disappear. In Nunavut's 'igloo and email' society, where adults who were born in igloos have children who may never have been out on the land, there's a high incidence of depression.

With so much at stake, the Inuit are determined to play a key role in teasing out the mysteries of climate change in the Arctic. Having survived there for centuries, they believe their wealth of traditional knowledge is vital to the task. And Western scientists are starting to draw on this wisdom, increasingly referred to as 'Inuit Qaujimajatugangit', or IQ. 'In the early days, scientists ignored us when they came up here to study anything. They just figured these people don't know very much so we won't ask them,' says John Amagoalik, an Inuit leader and politician. 'But in recent years IQ has had much more credibility and weight.' In fact it is now a requirement for anyone hoping to get permission to do research that they consult the communities, who are helping to set the research agenda to reflect their most important concerns. They can turn down applications from scientists they believe will work against their interests or research projects that will impinge too much on their daily lives and traditional activities.

Some scientists doubt the value of traditional knowledge because the occupation of the Arctic doesn't go back far enough. Others, however, point out that the first weather stations in the far north date back just 50 years. There are still huge gaps in our environmental knowledge, and despite the scientific onslaught, many predictions are no more than best guesses. IQ could help to bridge the gap and resolve the tremendous uncertainty about how much of what we're seeing is natural capriciousness and how much is the consequence of human activity.

ARTICLE-40

What is music?

Music has probably existed for as long as man has been human, and it certainly predates civilization by tens of millennia. Yet even today there is no clear definition of exactly what music is. For example, birdsong is certainly melodic, but it is not tuneful, and it is not created with the intention of being musical (in fact it is sometimes meant to sound threatening) - therefore does it count as music?

On the other hand, some modern composers have been challenging the idea that music should be arranged in a pleasant manner with the notes falling in an orderly succession. Others, famously the avant-garde composer John Cage have even used silence and called the result music. As a result, there is no one definition of music. Perhaps it should be said that music, like beauty, is what the person who sees or hears it believes it to be.

Music is divided in many ways. Music itself is split into notes, clefts, quavers, and semi-demi quavers. Ancient and medieval musicologists believed that these notes could be arranged 'horizontally' into melody (making notes that match on the same scale) and 'vertically' (going up and down the scales to create harmony). Another very basic measurement of music is the 'pulse'. This is present in almost all forms of music, and is particularly strong in modern popular music. The pulse is the regular beat which runs through a tune. When you tap your foot or clap your hands in time to a song, you are beating out the pulse of that song.

Another way of dividing music is by genre. Even a child who does not know that (for example) rock and roll and classical music are different genres will be instantly aware that these are very different sounds; though he will not be aware that one is a percussion-led melody while the other emphasizes harmony over rhythm and timbre. Each genre of music has numerous sub-divisions. Classical music is divided by type - for example, symphonies, concertos and operas, and by sub-genre, for example, baroque and Gregorian chant. Just to make it more fun, modern musicians have also been experimenting with crossover music, so that we get Beatles tunes played by classical orchestras, and groups like Queen using operatic themes in songs such as 'Bohemian rhapsody'.

Almost all music is a collaboration between the composer, and the performer, while song requires a lyricist to write the words as well. Sometimes old tunes are adapted for new lyrics - for example, the song 'Happy Birthday' is based on a tune originally called 'Have a nice Day'. At other times a performer might produce a song in a manner which the original composer would not recognize. (A famous example is the punk rock band the Sex Pistols performing the British national anthem 'God save the Queen'.)

This is because the composer and lyricist have to leave the performer some freedom to perform in the way that suits him or her best. While many classical compositions have notes stressing how a piece should be performed (for example a piece played 'con brio' should be light and lively) in the end, what the listener hears is the work of the performer. Jazz music has fully accepted this, and jazz performers are not only expected to put their own interpretation on a piece, but are expected to play even the same piece with some variation every time.

Many studies of music do not take into account where the music is to be played and who the audience will be. This is a major mistake, as the audience is very much a part of the musical experience. Any jazz fan will tell you that jazz is best experienced in small smoky bars sometime after midnight, while a classical fan will spend time and money making sure that the music on his stereo comes as close as possible to the sound in a large concert hall. Some music, such as dance music, is designed to be interactive, while other music is designed to remain in the background, smoothing out harsh sounds and creating a mood. This is often the case with cinema music - this powerfully changes the mood of the audience, yet remains so much in the background that many cinema goers are unaware that the music is actually playing.

Music is very much a part of human existence, and we are fortunate today in having music of whatever kind we choose instantly available at the touch of a button. Yet spare a thought for those who still cannot take advantage of this bounty. This includes not only the deaf, but those people who are somehow unable to understand or recognize music when they hear it. A famous example is United President Ulysses Grant, who famously said 'I can recognise two tunes. One is 'Yankee doodle' and the other one isn't.'

ARTICLE-41

What’s the purpose of gaining knowledge?

‘I would found an institution where any person can find instruction in any subject' That was the founder's motto for Cornell University, and it seems an apt characterization of the different university, also in the USA, where I currently teach philosophy. A student can prepare for a career in resort management, engineering, interior design, accounting, music, law enforcement, you name it. But what would the founders of these two institutions have thought of a course called Arson for Profit’? I kid you not: we have it on the books. Any undergraduates who have met the academic requirements can sign up for the course in our program in 'fire science’.

Naturally, the course is intended for prospective arson investigators, who can learn all the tricks of the trade for detecting whether a fire was deliberately set, discovering who did it, and establishing a chain of evidence for effective prosecution in a court of law. But wouldn’t this also be the perfect course for prospective arsonists to sign up for? My point is not to criticize academic programs in fire science: they are highly welcome as part of the increasing professionalization of this and many other occupations. However, it’s not unknown for a firefighter to torch a building. This example suggests how dishonest and illegal behavior, with the help of higher education, can creep into every aspect of public and business life.

I realized this anew when I was invited to speak before a class in marketing, which is another of our degree programs. The regular instructor is a colleague who appreciates the kind of ethical perspective I can bring as a philosopher. There are endless ways I could have approached this assignment, but I took my cue from the title of the course: 'Principles of Marketing’. It made me think to ask the students, 'Is marketing principled?’ After all, a subject matter can have principles in the sense of being codified, having rules, as with football or chess, without being principled in the sense of being ethical. Many of the students immediately assumed that the answer to my question about marketing principles was obvious: no. Just look at the ways in which everything under the sun has been marketed; obviously, it need not be done in a principled (=ethical) fashion.

Is that obvious? I made the suggestion, which may sound downright crazy in light of the evidence, that perhaps marketing is by definition principled. My inspiration for this judgement is the philosopher Immanuel Kant, who argued that any body of knowledge consists of an end (or purpose) and a means.

Let us apply both the terms 'means' and ‘end' to marketing. The students have signed up for a course in order to learn how to market effectively. But to what end? There seem to be two main attitudes toward that question. One is that the answer is obvious: the purpose of marketing is to sell things and to make money. The other attitude is that the purpose of marketing is irrelevant: Each person comes to the program and course with his or her own plans, and these need not even concern the acquisition of marketing expertise as such. My proposal, which I believe would also be Kant's, is that neither of these attitudes captures the significance of the end to the means for marketing. A field of knowledge or a professional endeavor is defined by both the means and the end; hence both deserve scrutiny. Students need to study both how to achieve X, and also what X is.

It is at this point that ‘Arson for Profit’ becomes supremely relevant. That course is presumably all about means: how to detect and prosecute criminal activity. It is therefore assumed that the end is good in an ethical sense. When I ask fire science students to articulate the end, or purpose, of their field, they eventually generalize to something like, ‘The safety and welfare of society,’ which seems right. As we have seen, someone could use the very same knowledge of means to achieve a much less noble end, such as personal profit via destructive, dangerous, reckless activity. But we would not call that firefighting. We have a separate word for it: arson. Similarly, if you employed the ‘principles of marketing’ in an unprincipled way, you would not be doing marketing. We have another term for it: fraud. Kant gives the example of a doctor and a poisoner, who use the identical knowledge to achieve their divergent ends. We would say that one is practicing medicine, the other, murder.

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