

Reading Future Change 2

Unit 1. Artificial Limbs

Artificial limbs are designed to help people missing limbs to function normally. They take the place of regular limbs in people who were born without limbs due to genetic defects, or in people who have lost limbs due to illness or injury. The mechanical devices that make it possible for amputees¹ to walk, or have functional tools attached to their arms for grasping, date back to ancient times. They have improved in look and feel to resemble and act more like a part of their actual body.

Recently, Italian and Swiss researchers have succeeded in implanting patients with prosthetic² limbs that give them a better sense of what they can do with their prosthetic hands. When the clinical tests are complete, it is believed that people with disabilities will have better use of their prosthetic devices. Engineered limbs will be able to connect to the users' neurons and transmit messages of movement to the brain, allowing the user to think and the limb to respond, similar to how the body functions naturally.

A team of Korean researchers has also developed a bio-muscle device that works with high-power, lightweight, artificial muscles to implement a sensory piece. This will better allow wearers of prosthetic limbs to respond and move the way they would like. The device is expected to be able to produce greater power than current, motor-mounted³ devices, making it more practical for wearable devices, such as artificial limbs, and for use in artificial intelligence robots.

Recently, an Iceland manufacturer has come up with a new type of prosthetic leg. It features an immediate response to the user's intentions, allowing him to move freely. The reason he can control his prosthetic limbs is because of a new transplant sensor, which immediately detects signals sent from the brain to the muscles, causing the muscles to expand or contract, creating movement. The way sensors are connected to the nerve endings makes the implant surgery very simple.

In the near future, we expect robotic legs and prosthetic limbs that are closer in image and function to actual limbs. These will be of great help to many patients.

¹ amputee: n. a person who has had an arm or leg cut off

² prosthetic: adj. an artificial body part, such as an arm, foot, or tooth, that replaces a missing part

³ mount: v. to get on a horse, bicycle, etc.. in order to ride

Unit 2. Winners Wear Red

We are living under the influence of color unconsciously. If, for instance, you are nervous about a major sports event and don't sleep well, knowing your team wears red uniforms could help. Also, if you want to make more tips while working at a restaurant, studies recommend wearing red.

According to a study by French and German psychologists, players dressed in red sports clothes receive an average of 13 percent more points in the game, and employees wearing red uniforms receive tips totaling an average of 30 percent more.

Color has different meanings and modes of expression. In France, for example, red means "free," but in Germany, it is a symbol of "danger," and in the United States, it represents "anger." In Britain, black means bad luck, but red denotes good luck in China.

The University of Rochester in the United States released a study that said, "When a person sees red, their reactions become both faster and more forceful." For instance, when you raise weights, if you look at red, you can lift more weight than if you don't see red.

It is suspected that this is because the instant response to the color red is based on the human instinct⁴ for fear. Long-term exposure to red can cause anxiety and distraction. In sports games, people are more likely to be overwhelmed by colors when their opponent wears red equipment or clothes, and students' scores are poorer if they are left to take tests in a red room. In other words, red can instantly boost power, but it can also be negatively draining in the long term.

⁴ instinct: n. the way people or animals naturally react or behave, without having to think or learn about it

Unit 3. Noise Pollution

Noise pollution refers to the unpleasant noises made by people or machines, especially when the noise is both offensive and loud. It is also known as environment noise or sound pollution. Examples include traffic noise, factory noise, and aircraft noise. Recently, noise from daily living, such as the noise from homes, businesses, and construction sites, has been increasing.

The European Union has called noise a “silent killer that has a serious impact on the health of the body and mind.” If you continue to be exposed to loud noises for a long time, you may experience poor concentration body aches, and frequent headaches. Acceptable noise levels are 50 to 70 dB (decibels) during the day and 40 to 58 dB at night. If you continue to listen to sounds at higher levels for more than one month, it can cause disabilities such as poor hearing, reduced concentration, and it can disturb your studies and work.

Noise gives people pain, but it also hurts animals. Animals that are very sensitive to sound can experience physical and psychological problems as a result of noise related stress.

One of the major issues with noise these days is caused by people living too close to each other, particularly in cities. High-pitched sound pollution that occurs in buildings, such as apartments, is caused by all of the noise from moving furniture, children running, pet sounds, television and radio sounds. This creates a lot of conflicts, distress⁵, and ill effects.

The loudest cities in the world are Guangzhou, in China, Cairo, in Egypt, Paris, in France, and Delhi, in India. In many cities, as the volume of cars increases, noise pollution becomes more severe. Many cities have noise by-laws detailing noise pollution regulations. These bylaws⁶ denote particular, acceptable levels of sound, and breaking these laws can result in high fines⁷.

⁵ distress: n. a feeling of extreme worry, sadness, or pain

⁶ bylaw: n. a law made by local government that only relates to its particular region

⁷ fine: n. an amount of money that has to be paid as a punishment for not obeying a rule or law

Unit 4. Understanding the Heart

The heart is the hub of the circulatory⁸ system, which is responsible for circulating blood. The heart acts as a pump to supply blood to the entire body by regularly contracting and expanding. Each pulsation⁹ of the heart is counted as a 'heartbeat.'

Your heart is a little larger than the size of your fist¹⁰. It is made up of thick muscle, known as cardiac muscle. The heart is comprised¹¹ of four chambers, two upper chambers (the atria¹²), and two lower ones (the ventricles). The atria and ventricles are further divided into left and right chambers. Deoxygenated¹³ blood returning from the circulatory system enters into the right atrium and is pumped into the right ventricle, then out of the heart to the lungs to collect oxygen. Oxygenated blood is then pumped into the left atrium, through the left ventricle and out the aorta¹⁴ to the whole body.

The left ventricle is the strongest, largest chamber; its walls are made up of thicker muscles than the other chambers, giving it the power needed to be able to pump blood throughout the body.

There are also several valves in the heart. Valves act to prevent blood from flowing backward. It is not uncommon for these valves to have defects. When they do, a doctor can hear a sound between heartbeats, like a whooshing or swishing noise; this is called a 'heart murmur.' The swishing sound is caused by some of the blood moving backward due to a faulty valve. Heart murmurs may be harmless or may require surgery to repair.

The heart beats about 72 times a minute, sending about 5 liters of blood all over the body. It beats about 35 million times a year. The heart of a seventy-year-old person has beat about 2.6 billion times in their lifetime, circulating 180 million liters of blood.

British scientists published a study on why women live longer than men; the key to women's longevity lay in the power of their hearts. Women have more of their heart intact¹⁵ at the age of 70, while men of the same age have lost up to 25 percent functionality. The fact that women's hearts are much stronger explains why they live longer. Men's hearts may naturally degrade relatively quickly, but this can be mitigated¹⁶ with a healthy diet and regular exercise.

⁸ circulatory: adj. relating to the system that moves blood through the body and that includes the heart, arteries, and veins

⁹ pulsation: n. to beat or move with a strong, regular rhythm

¹⁰ fist: n. a hand with the fingers and thumb held tightly in

¹¹ comprise: to consist of

¹² atria: n. plural form of atrium; a very large room, often with glass walls or roof, especially in the middle of a large shop or office building

¹³ Deoxygenate: v. to remove oxygen from a substance

¹⁴ aorta: n. the main artery (= thick tube carrying blood from the heart) that takes blood to the other parts of the body

¹⁵ intact: adj. complete and in the original state

¹⁶ mitigate: v. to make something less harmful, unpleasant, or bad

Unit 5. Hypertext Literature

Hypertext storytelling, or hypertext fiction, is found mostly online and in the form of CD-ROMs. This genre is characterized by non-linearity and reader interaction. Hypertext fiction has been compared to *Choose Your Own Adventure* books. The books became popular in the 1980s and the concept is now being revived in tech-savvy¹⁷ formats. A hypertext story is able to immediately engage the reader; they read to a certain point in the story then are offered choices via links. It is a type of interactive fiction.

The word “hypertext” was first used by Ted Nelson in 1963, derived¹⁸ because it combines the word “text” with the word “hyper,” hyper being a common technical term used to describe concepts involving virtual tech.

A typical book or document is a sequence of information, offering one, static¹⁹ storyline; hypertext has many branching²⁰ storylines that change as you follow different sequences using links. Though other, non-static formats of storytelling pre-date the internet, the web has made the process easier to create and navigate.

Hypertext is a document which consists of a linked web of nodes. A node usually represents a single topic or idea. Hypertext is a collection of nodes organized around a greater theme. Nodes link to other nodes, forming a network. A node is the smallest, most important unit in a hypertext system. The user can only get information by following links from node to node. The beginning node is called a reference node, and the final node is called a referent. Hypertext is a key concept in making the internet work.

To create your own hypertext online, you’ll need to use a webpage markup language called HTML. HTML stands for HyperText Markup Language; it is a series of instructions which specify the color, shape, and size of the text in internet documents. HTML can also be used to insert pictures and hyperlinks. Unlike many programming or scripting languages, HTML is fairly basic, making it easy to learn and write.

¹⁷ tech-savvy: adj. knowing a lot about modern technology, especially computers

¹⁸ derive: v. to get or obtain something

¹⁹ static: adj. staying in one place without moving, or not changing for a long time

²⁰ branch: v. to separate from a main part and go in a new direction

Unit 6. Types of Writing

Writing is a work of art that uses language as a medium²¹ for expression; writing can refer to poems, novels, plays, reviews, essays, and diaries. Let's take a look at some of the different types of writing.

Poetry is a method of expressing oneself by compressing the feelings that come to mind into rhythmic, distilled²² language. It is the oldest form of writing and one of the most popular ways to convey oneself in writing. Poetry has many forms, including the haiku²³, sonnet, ode, and more. Each form of poetry follows different rules; not all poetry must rhythm.

A novel is a lengthy story; it can be based on real-life events, or completely made up. Average novels are between 60,000 and 100,000 words or 200-400 pages. 'Novel' is from the Latin, "novellus," or "novus," meaning "new." Prior to the 18th century, "novel" meant "a novelty," or "a piece of news."

Before the 18th century, writing fantastical love and adventure stories was popular. After the 18th century, naturalism writing—an extreme realism movement—started to take hold. It reflected and focused more on the real-life experiences and environment of the author.

A play is a representation of a character's actions, and circumstances acted out on a stage. It involves an author, or scriptwriter, who writes the play, actors to act out the characters, and set designers to build the backdrops for the stage. There are also stagehands²⁵, light, and sound people. A play is a collaborative work. Whereas a novel describes all of the characters, settings, and events, plays rely heavily on dialog, an exchange of lines, or conversation, between characters.

A news article is a story that delivers true, factual events. As it is strictly a description of the facts, the rule is to write the articles objectively²⁶ rather than to include the writer's own opinions. The content of news articles should be accurate, clear, and impartial²⁷.

A diary is a piece of writing that gives space to write the thoughts and feelings of the everyday life of the author. Anything can be written in any form. Depending on the type of diary, it can cover lighter topics like what the author had to eat, or heavier topics such as their emotional troubles.

²¹ medium: n. a method or way of expressing something

²² distilled: adj. shortened so that only the essential meaning or most important aspects remain

²³ haiku: n. a short Japanese poem with 17 syllables

²⁴ take hold: idiom. to become stronger and difficult to stop

²⁵ stagehand: n. a person who is employed in a theater to move the equipment on the stage

²⁶ objectively: adv. in a way that is not influenced by personal beliefs or feelings; fairly

²⁷ impartial: adj. able to judge or consider something fairly without allowing your own interest to influence you

Unit 7. The Power of Poetry

Early Bird
by Shel Silverstein

Oh, if you're a bird, be an early bird

And catch the worm for your breakfast plate.

If you're a bird, be an early early bird—

But if you're a worm, sleep late.

Shel Silverstein was an American author who wrote songs, cartoons, children's books, and poetry. His best seller is the famous children's book, *The Giving Tree*. His work has sold over 20 million copies, and he has won many awards.

In the poem above, the author is working with the proverb²⁸ "The early bird catches the worm." He is trying to express that we should follow advice only when it makes sense to our circumstances.

In this poem, the author takes a conventional²⁹ saying, "the early bird catches the worm," and makes us think about it in a different way. Though conventional wisdom tells us that one should wake up early to enjoy success, it is clear from this poem that this is not always the case; that is: the early bird may be successful, but the early worm suffers fatal³⁰ consequences.

"Early Bird" is an excellent example of how poetry can make us think about the world, and challenge our ideas or concepts, while also expressing opinions in an aesthetically pleasing way. Many poets are great thinkers: philosophers, theoreticians³¹, and political activists. This is because poetry is a dynamic medium that allows for sweeping connections through sparse³² prose.

²⁸ proverb: n. a short statement, usually known by many people for a long time, that gives advice or expresses some common truth

²⁹ conventional: adj. traditional and ordinary

³⁰ fatal: adj. causing death; very serious and having an important bad effect in the future

³¹ theoretician: n. a theorist; a person who develops or studies theories or ideas about a particular subject

³² sparse: adj. existing in small amounts, or a large distance apart

Unit 8. A Positive Thinker: *Anne of Green Gables*

Anne of Green Gables is a novel written by Canadian author, Lucy Maud Montgomery, who published under the name L.M. Montgomery. She sent the book to a lot of different publishers, but it was rejected many times, and for a while, Montgomery gave up on trying to publish the story and stored it in a hat box. When it was finally accepted for publication, in 1908, it became an immediate success.

The book is composed of 38 chapters and takes place in Avonlea, in the country of Prince Edward Island, which is also the hometown of the author. Green Gables is a real place located in Cavendish, P.E.I., Canada, and thanks to the book it is a popular tourist destination.

The story is about a red-headed, freckly³³ orphan named Anne, who is adopted into a green farmhouse in the town of Avonlea. She is adopted by a brother and sister, Matthew and Marilla Cuthbert. The Cuthbert's had planned to adopt a boy to help with farm work, but a girl was sent to them by mistake. At first they are upset about this mix-up³⁴, however, soon Anne begins to make their lives brighter with her playful attitude.

In the town of Avonlea, Anne experiences a wide range of relationships and learns the power of love. The positive mindset and attitude of Anne moves the hearts of the other characters she interacts with, and the reader, alike.

Anne works hard to repay the kindness of the Cuthbert's, later entering a teacher's school, and then receiving a college scholarship. But after the sudden death of Matthew Cuthbert, Marilla Cuthbert becomes very ill, and Anne decides to return home to care for her.

Growing up at Green Gables, Ann learns to heal the wounds of her early, unhappy childhood as an orphan, and finds her true self with the help of all the people she comes to love and care for.

³³ freckly: adj. covered in freckles

³⁴ mix-up: n. a mistake

Unit 9. Digital Money

Digital currency is a type of money that exists only as computer data. Since the invention of computers, people have been able to store various data in digital files that do not take up³⁵ any physical space. Instead of making paper documents and storing them in filing cabinets, information is recorded digitally, making financial transactions faster and more accurate.

Today, the financial sector actively employs digital technologies such as programs, apps, spreadsheets, and more. Most money exists as digital credit, with numbers assigned to accounts rather than using real bills and coinage. In addition to making financial transactions easier to handle, this lessens the production waste of actual, physical money.

The European Central Bank defined virtual currencies like this:

"It is a type of unconstrained digital currency that is issued by the developer, controlled primarily by the same developer, and recognized, and used, within a particular virtual community."

PayPal is an American company that functions globally. It is an online-only system, sort of like a bank, which serves as a third-party between buyers and sellers. In exchange for a small user fee, online shoppers are protected from fraud³⁶ because PayPal processes payments on their behalf, rather than having the buyer send money directly to the seller. If an online order is not received, or its quality is disputed, PayPal can investigate and issue the purchaser a refund while simultaneously docking that money from the seller's account.

Bitcoin is one of the most popular crypto-currencies, and a good example of how crypto-currency works. Crypto-currency exists as a code, unlike physical money; we cannot touch or hold it, as it exists only online. However, one downside³⁷ is that the only way to convert Bitcoin into actual money is to sell it on a crypto-currency exchange site such as Coinbase or Kraken.

Bitcoin has no owner and is not cash-operated by a particular individual or company. The operating system is distributed over multiple of users' computers in a peer-to-peer fashion. While Bitcoin doesn't have an owner, it does have a creator: Satoshi Nakamoto. He currently owns 980,000 Bitcoins, which translates to approximately 19.4 billion dollars.

³⁵ take up: phrasal v. to fill an amount of space or time

³⁶ fraud: n. the crime of obtaining money or property by deceiving people

³⁷ downside: n. the negative part of a situation

Unit 10. The History of Money

Money consists of coinage and banknotes. Each denomination (bill or coin) has a fixed value. Money is exchanged between people to purchase goods and/or services. Long ago, there was no money, and bartering—a system of direct exchange of goods and services -- was the only method of trade.

Bartering was a lot of trouble, though; it was difficult to carry items for trade around, especially having to travel with them from seller to seller. Additionally, it was difficult to find the right items on offer; and also difficult finding a seller who wanted to trade what you had to offer.

Also, due to the fact that different things have different values, depending on who was doing the trading, bartering would often involve a lot of time-consuming haggling—negotiating the exchange. Things could get pretty complicated pretty quickly. For example: Person A would like to exchange one cow for ten sacks of rice. Person B would like to exchange one cow for four bags of rice and thirteen jars of beans.

Money is used to remove these inconveniences.

Money was first used by merchants for trading goods such as rice, salt, and fish, but it was so comfortable to carry around, and easy to use, that governments began creating metal coins using gold and silver. Money had to be easily accessible, plentiful, and durable. It also had to be easy to carry and have a standard value; metals such as gold, silver, and bronze met all these criteria and made the materials ideal for use for thousands of years.

Nowadays, the world is dependent on coins, bills, checks, credit cards, and e-money. Credit cards and electronic money are used more often than coins and bills. It is predicted that by 2020, we are likely to become a "coinless society."

Unit 11. The Stock Market

A certain equity stake or securities in which a shareholder invests in a corporation is called a stock. It takes a lot of money to make a company or a factory, so as an owner, you can issue stocks to attract investors to the build, grow, and expand your company. People who buy stocks are called shareholders. When someone buys stocks, they become an investor—a partial owner of the company and therefore have the right to exercise some control within the company. They usually have the right to vote on major issues affecting the company.

An owner then runs the company with the money they have collected from the stockholders and later shares the profits with the shareholders. However, if the company doesn't manage properly and loses money, the value of the stocks goes down, and shareholders may not be able to get back any money. So you have to be careful when investing in stocks.

Children can also make stock investments. Minors should go to securities companies with their parents and research the companies and markets they are investing in. Recently, parents have begun training their children in investment-making by giving them stock purchases to 'play with' and letting them experience the gains and consequences of holding stocks.

In the past, shareholders had to order stocks by directly contacting the market, or go to special offices and professionals to complete their transactions, but now it is possible to invest directly using the internet. While this method of investing is much more convenient, it can often lead to hasty decisions and poor decisions, so make sure you are well informed before beginning to invest through online stock trading.

Unit 12. Credit Cards

A credit card is a type of loan issued by a bank or credit card company to people with good credit. Credit is issued to people with a history of paying their bills on time. All financial information about an individual is recorded, and banks and companies can run checks to see if your credit score is good or bad. If you request a credit card, and your credit score is good enough, a credit card will be issued.

A credit card holder may make purchases without having any money in the bank. Since cash can be easily lost and inconvenient to carry around, it is convenient to carry a card, and you can have your card reissued even if you lose it. On top of³⁸ that, credit cards offer various rewards programs, such as points earned for certain purchases, which can later be traded in for special goods and services, or even cash.

Credit cards were first introduced to the public by the Diners Club, which was established in 1950 by Frank McNamara of New York. With Diners Club cards, you could buy food, gas, pay for hotel rooms, and purchase other services at franchises across the United States.

In 1958, the Bank of America introduced a general-use credit card, the BankAmericard. Unique in the industry, it could be used for any type of purchase at participating merchants. It was the first credit card program to offer revolving credit, allowing customers to pay down their balances over time. The card also established many of the standards for credit cards to follow, including a 25-day grace period, credit limits and floor limits. BankAmericard was first tested in Fresno, California with an initial 60,000 customers who received ready-to-use cards. The pilot program was a huge success and in 1959, the program was rolled out statewide in California. By the end of 1960, almost a million BankAmericards were in circulation and nearly 30,000 merchants were accepting them for payment.

One problem with the cards was the inconvenience of having to call the bank and talk to the teller in order for them to approve credit card transactions. However, with the invention of a new technology, a magnetic stripe was installed on cards, so that a store could swipe the card, digitally transmit the information to the bank, and receive a near-instant message of the transactions approval.

If you use a credit card, you don't have to pay the money immediately, but you will have to pay it back later, along with a fee, called interest, which is a percentage of the amount you have charged. If you can't pay your credit card, you'll be labeled as a credit delinquent³⁹. When you become a credit delinquent, it is difficult to borrow money, get a job, and to travel to other countries.

³⁸ on top of (something): phrase. in addition to

³⁹ delinquent: adj. late in paying money owed

Unit 13. The Math of Faces

Face recognition systems are one of the most commonly seen pieces of tech in SF films. Put your face in front of the robot or scanner, and the door opens. But it is no longer limited to science fiction, many phones and computers today have face recognition software for enhanced security, better photography functions, and more.

Face recognition is divided into two major stages. It first extracts the face from the background, and then analyzes and identifies the face that was found.

Isolating the face from the background is essential. It is done using information such as brightness, movement, color, and the location of the eyes. The computer rapidly collects data using many variables⁴⁰ to contrast and compare, looking for information it is programmed with about human features, in order to isolate and extract the image of the face.

The face recognition function of digital cameras and phones automatically locates the face of the subject and displays this by forming a rectangle around the area.

A variety of studies are being conducted in the second step of the face recognition process, after face-area extraction, where it is necessary to determine a face based on the distance and shape of its eyes, nose, and mouth. Some of the difficulties being tackled are issues of glasses, hats, or hair covering the face.

The most common method in use is the “primary component analysis (PCA) method,” in which mathematical techniques are used. In PCA, images are reduced to a set number of variables and weighed against possibilities. An example of PCA in action is commonly portrayed⁴¹ in fictional settings, where a picture of someone, perhaps wearing glasses and a hat, is ‘run’ against possible matches. The picture of the person in question is shown, while flashes of photos of the people it could potentially be are shown next to them. The computer is taking a set number of measurements, such as nose, eyes, etc. and checking them against these potential, known persons.

The application of face recognition software can be utilized in a variety of real-life applications, such as identification for replacing passports, credit cards, and other important documents, and for security reasons such as password substitution. Recently, many mobile phones and laptops have been equipped with face recognition features instead of entering passwords.

⁴⁰ variable: n. something that can change, esp. in a way that cannot be known in advance

⁴¹ portray: v. to represent or describe someone or something in a book, movie, etc.

Unit 14. Cooking with Math

Math is used a lot in everyday life; cooking is considered both an art and a science—the science part of cooking is mathematical.

It is important, particularly in baking, to use exact measurements, exact temperatures, and exact cooking times. If you look at recipes, you will see that they rely heavily on fractions such as $\frac{1}{3}$ of a cup or $\frac{1}{4}$ of a teaspoon. Recipes also give a 'serving size.' The serving size indicates⁴² how many people that particular recipe will feed. If you would like to feed more people, then you will have to increase the size of the recipe by increasing the ingredients. You must increase all the ingredients at the correct increments. This is where math comes into play.

It is important to understand addition, multiplication, division, and fractions to be able to adjust a recipe.

For example, a simple recipe for pancakes is as follows: $\frac{1}{2}$ cup of flour, 1 tablespoon of sugar, 1 teaspoon of baking powder, $\frac{1}{4}$ teaspoon of salt, $\frac{1}{2}$ egg, $\frac{1}{2}$ cup of milk, 1 tablespoon of vegetable oil. This makes enough pancakes to feed, or "serve," 2 people.

If you would like to feed 4 people pancakes, you must multiply all the ingredients by 2. This is also known as 'doubling' the recipe.

So, to feed 4 people pancakes, the recipe is as follows: $\frac{1}{2} + \frac{1}{2}$ cup of flour = 1 cup of flour, 1+1 tablespoon of sugar = 2 tablespoons of sugar, 1+1 teaspoon of baking powder = 2 teaspoons of baking powder, $\frac{1}{4} + \frac{1}{4}$ teaspoon of salt = $\frac{1}{2}$ teaspoon of salt, $\frac{1}{2} + \frac{1}{2}$ egg = 1 egg, $\frac{1}{2} + \frac{1}{2}$ cup of milk = 1 cup of milk, 1+1 tablespoon of vegetable oil = 2 tablespoons of vegetable oil. This recipe now serves 4 people.

In order to serve six people, take the original recipe and multiply it by 3. Similarly, if you want to make the recipe serving smaller, you can use division in order to figure it out in the reverse. For example, in order to make one serving of pancakes, take the original recipe and divide it by 2.

Note that cooking times remain the same regardless of serving size.

⁴² indicate: v. to show or signal a direction or warning, or to make something clear

Unit 15. Measurement Systems

Methods used to communicate lengths, volumes, and weights are called measurement systems. Currently, 95 percent of the world is using the metric system as a standard method of measurement. There are a few exceptions, though, such as the United States, Myanmar, and Liberia, which still use the ancient, imperial system.

The Metric system is a decimal system of weights and measures based on meters (m) for distances, liters (l) for volumes of liquids, and grams (g) for weights.

During the French Revolution, in the late 18th century, the new French government sought to overhaul⁴³ their old measurement system, which had similar characteristics to an imperial system. Prior to the metric system being adopted, there were about 800 weights and measures being used in France at the time, and the French Academy of Sciences proposed a simpler, more universally applicable method: the metric system, which measures a meter at "one-tenth of the Earth's meridian⁴⁴ length."

In 1790, France's politicians proposed the metric system for the greater unification of the European Union. It was hoped to ease communication among nations and assist in furthering global economics. The widespread adoption of the metric system made trade and communication easier and was far superior to prior systems in place. In the year 1875, an international conference met and signed "The Treaty of the Metre," which promised to solidify⁴⁵ and promote the definition and use of the system.

There are events that demonstrate why it is important to unify the weights and measures globally. NASA's unmanned Mars probe exploded in the atmosphere because of the different measurement systems used by the different companies that made it.

As Korea has long followed the Joseon Dynasty's metric-and-scale method, it took some time for the metric system to be accepted. In 1876, with the influx of Western cultures and commercial activities by foreigners, it was suggested that the more internationally utilized metric system should be adopted, and in 1961, the basic unit of legal measurement in Korea was changed to the metric system.

⁴³ overhaul: v. to repair or improve something so it works well

⁴⁴ meridian: n. an imaginary line that passes from the North Pole to the South Pole through any place on the surface of the earth, used to show the position of places on a map

⁴⁵ solidify: v. to make something firm, or to become firm

Unit 16. Measuring Big Animals in the Wild

There are many large animals in the wild. It is important for scientists to know their sizes for reasons such as calculating mating habits, estimating ages based on growth, tracking an animal's health status, and predicting a species' evolutionary path.

One interesting fact is that the elephants' tusks have been shortening over time, the animals are evolving toward having shorter tusks due to the fact that the larger-tusked animals are hunted for their ivory⁴⁶. The average elephant tusk-size has halved since the mid-19th century.

In order to measure large animals in the wild, scientists must take a variety of approaches. One method used to weigh elephants is to put them in a large boat and mark the difference in water level on the hull⁴⁷. They then take the elephant out and place weights in the boat until the water level reaches the mark; the amount of weight needed to sink the boat to reach the mark is equivalent to the weight of the elephant.

After measuring many animals of the same species, scientists can then take an average of the data gathered to calculate the approximate weight of similar animals in the wild.

Another technique used to measure large animals is called "photogrammetry." Photogrammetry is the process of taking clear, precisely measured pictures using laser pointers. Researchers aim the cameras at a distance no more than 100 meters away from the animals, line up the cameras using the lasers, and take multiple photographs of the animal. Using various reference points and calculations, they can work out the size of the animal. This method works even if they can only see a small fraction of the animal's body.

⁴⁶ ivory: n. the hard yellowish-white substance that forms the tusks of some animals such as elephants, used especially in the past to make decorative objects

⁴⁷ hull: n. the body or frame of a ship, most of which goes under the water