Lesson 1

A study called "Proof By Underpants" is underway in Switzerland, ①where researchers are sending thousands of pairs of white cotton underwear to volunteers, who will ②bury them in their gardens. Actually, it's the latest way to measure soil health.

Researchers will later dig up the buried underwear and examine them. They'll look at ③the extent to which tiny creatures in the earth have ④eaten away at the cloth. The bigger the hole, the better.

"Our test pants are made from 100% organic cotton," says a scientist of the project. "This substance can ⑤serve as a food source for various tiny creatures in the soil. They eat the underpants. ⑥The more active tiny creatures live in the soil, the faster and the more completely the underpants will be eaten up."

Volunteers will receive two pairs of pants. One will be dug up after a month, the other after two months. Researchers will be examining the holes to determine the health of what they call "the jungle beneath our feet." Soils are home to billions of insects, worms, and other creatures, but ⑦little is known about their biological balance and affects things like crop yields or flood protection.

The project is ⑧designed to get people's attention to raise consciousness of global soil pollution. ⑨Increased use of farming chemicals and building construction are thought to be two of the major factors speeding up the loss of rich soils. ⑩This can lead to poorer protection against natural disasters and increased levels of chemicals flowing into rivers.

Lesson 2

Abraham Ortelius (1527–1598) was a native of Antwerp, then a city of the Holy Roman Empire, now a part of modern Belgium. He was not university-educated but became an important influence in the development of modern geographical knowledge, largely by developing and marketing the first modern atlas, or book of maps.

Ortelius went out into the world as a merchant, ①specializing as a map dealer. In the words of historian Daniel Boorstin, he learned

about cartography, or the making of maps, "not through mathematics and astronomy but from handling maps in merchandise." ②With a keen head for business, he naturally noticed that accurate maps were in great demand by traders, who were concerned about wars, bandits, and piracy, and needed to avoid areas ③known to be dangerous. ④Traveling around Europe, he made it his business to purchase and bring together the latest and best maps, and was well-regarded by his customers.

One day, two of Ortelius's merchant friends asked him to print a number of different maps together, on sheets all of the same size, and to bind them together like a book. ⑤He did so, and then decided to produce more of the same, selling them to merchants or anyone else interested in possessing general geographical knowledge in one convenient, affordable package. These were the first modern atlases, and proved highly successful. ⑥Translated into various European languages from the original Latin, the atlases were in such demand that Ortelius was obliged to update them through twenty-eight editions by the time of his death in 1598. Today, ⑧thanks to the work of Abraham Ortelius, the atlas is a common and indispensable element for understanding our world.

Lesson 3

English has always evolved — ①that's what it means to be a living language — and now the internet plays an important role in driving this evolution. It's where we talk most freely and naturally, and where we generally pay little attention to whether or not our grammar is "correct."

②Should we be concerned that, as a consequence, English is deteriorating? Is it changing at such a fast pace that older generations can't keep up? Not quite. At a talk in 2013, linguist David Crystal, author of Internet Linguistics, said: "③The vast majority of English is exactly the same today as it was 20 years ago." And his collected data ④indicated that even e-communication isn't wildly different. "⑤Ninety per cent or so of the language you use in a text is standard English, or at least your local dialect."

However, ⑥the way we communicate — the punctuation, the grammar, the abbreviations we use — is dependent on context and the medium with which we are communicating. ⑦We don't need to reconcile the casual way we talk on social media with the way we string together sentences in a piece of journalism, because they're different animals. On Twitter, emojis and novel uses of punctuation, for instance, open doors to more nuanced casual expression.

Writers and editors, after consulting their house style guide, should ⑧rely on their own judgment ⑨when faced with tricky grammar. ⑩Strictly following the rules has the potential to make a piece of writing seem dated. That doesn't mean writers need to add emojis or every slang word of the moment to their prose. ⑪It means that by observing how people are using words and applying those observations in an orderly manner, writers increase their chances of connecting with their readers.

Lesson 4

In a small town in the north of England there was a big library with a lot of interesting books in it. People in the town could take the books home for four weeks and read them. They could have as many as four books each time — different books about animals, boats, cooking and holidays or love stories, and then they had to take them back to the library.

Every year the library bought more and more books and soon the building was too small for all the books. One morning in early autumn the boss said, "November 28th is a big day for us — we're going to move to a new library building. It's a much bigger and better building but there's one difficult problem… it's going to be very expensive to move all our books to the new building. Where are we going to find the money and the time?" the boss asked.

The people in the library thought about this problem. One evening five weeks before November 28th, a young woman thought of a good plan. She went and talked to the boss about it. He was very interested and together they planned it all carefully. Two weeks later, the boss told the people about the plan: "Between now

and November 28th, everybody can take six books home, not four books as usual… and they can have the books for six weeks, not four."

Everybody in the town was very happy and they took five or six books home. After two weeks, most of the books were out of the library and on November 28th the big day arrived, and they moved to the new building. It was quite easy because they had only a small number of books to move there. In the month after the move everybody took their books to the new library. The boss was very happy because it was quite cheap to move and it was quick and easy, too.

Lesson 5

More and more people are using crowdfunding to pay for their projects and create new products. Crowdfunding ①takes place when a person or business gets many small payments from a large number of people. Usually, the way to do this is to use the Internet. ②Instead of trying to get a few people to give thousands of dollars, you get hundreds of people, maybe thousands, to give a few dollars. But this is still not easy. You want people to see the value of your idea. How will you get them to give the dollars they earn to you?

There are websites that ③make this opportunity possible. Kickstarter and GoGetFunding are popular. You create a short video to explain your project. The most important part is getting your message ④across. ⑤Just because you've made your idea known, it doesn't mean you will get the money you need. You still need to sell your idea.

Many people begin by explaining what the product is and then telling why people need it. For example, one of the most popular crowdfunded products is a watch. The Pebble watch connects with information on a smartphone that will send information to the watch. More than 65,000 people gave money for this product. Crowdfunding raised $10.3 million for it. ⑥As a result, it's not just products that people use crowdfunding for. People use it for their music, film, art, or writing projects.

Projects usually get from 25 to 40 percent of their money from crowdfunding sites. Who is giving all the money? When people need money, they often ask their friends and family. ⑦Crowdfunding often works the same way, but once you create your video and message, your friends share it with their friends. ⑧If you've created a message that people can connect to, you get many more people to give. Why do these people give? First, there is the "feel-good" factor. ⑨Giving money makes people feel good. Second, many small businesses offer rewards to people. Third, sometimes the reward is simply getting to use the product. And this is part of the success of crowdfunding. You could ⑩make a difference.

Lesson 6

①Being funny is possibly one of the best things you can do for your health. You can almost ②think of a sense of humor as your mind's immune system. ③People at risk for depression tend to fall into depressive episodes when exposed to some kind of negative stimuli, and afterwards, it becomes easier and easier for them to relapse into depression. ④However, reframing a negative event in a humorous light acts as a kind of emotional filter, preventing the negativity from triggering a depressive episode.

⑤Humor doesn't just guard against depression. It also improves people's overall quality of life. Researchers have found that people who score highly in ⑥certain types of humor have better self-esteem, more positive affect, greater self-competency, more control over anxiety, and better performance in social interactions. ⑦Not all kinds of humor are made equal, however, in the same study, the researchers identified four types of humor: affiliative humor, or humor designed to strengthen social bonds; self-enhancing humor, which is akin to having a humorous view of life in general; aggressive humor, such as mocking others; and self-defeating humor, in which individuals encourage jokes that self-deprecate or have themselves as the target.

The positive contributions ⑧mentioned above only occurred when individuals scored highly in affiliative and self-enhancing

humor, ⑨while aggressive and self-defeating humor was ⑩associated with poorer overall well-being and higher anxiety and depression. So, ⑪when cultivating your sense of humor, it's important to strive for the right kind — besides, it's a crummy thing to make fun of others anyhow.

⑫In addition to working as a mental ⑬immune system, research has shown that humor can actually improve your physical immune system. Laughter can also improve cardiovascular health and lowers heart rates, blood pressure, and muscular tension.

⑭Aside from improving your health, laughter can be a productivity tool as well. ⑮A study from Northeastern University found that volunteers who watched a comedy were measurably better at solving a word association puzzle that relied on creative thinking as compared to control groups that watched horror films or quantum physics lectures.

Lesson 7

Today's beef comes from animals raised on farms. ①So does chicken and pork. Fish? It comes from animals that live in water. But some scientists ②are looking to change this. They would like to grow just the parts we want to eat. Create burgers, for instance, without any cows, or make just the chicken nuggets and forget the rest of the chicken. Opinions differ on how best to do this. Some would start with animal cells, ③while others would reach for parts of plants instead. But ④whatever their source, the goals are the same: tasty meat for more people, less stress on the environment.

⑤Getting people to reach for farm-free meat may take some doing. ⑥But scientists see a wide range of reasons why it is worth trying, since meat production is one of the most important ways in which humanity affects the environment. For example, it is said that greenhouse gases from animal farming ⑦account for more than one-seventh of all gases produced by human activities.

⑧The idea of growing just the beef, not the whole cow, has been around since at least the 1890s. That science fiction fantasy became more real in 2013, when Mark Post introduced his laboratory-grown

hamburger made from what he called "cultured beef" at a public tasting event. But the cost of that first burger was more than $300,000. No one expected anyone to buy a burger that ⑨cost more than a car. Yet the idea was to show that it should be possible to grow real cow cells in a laboratory, without a farm or even a whole cow.

Other scientists want to make "meat" from plants. They are not looking to create a better "vegetable burger." Indeed, one of these scientists, Patrick O. Brown, doesn't like that term at all. Vegetable burgers are made from plants and just have the shape of a burger. The taste is often quite different from true meat. ⑩Brown's company instead wants to make plant burgers so delicious that passionate meat eaters will sigh happily and take another bite.

These burgers of the future, if they ever become a reality, may spread throughout the world ⑪as an environmentally-friendly alternative.

Lesson 8

The world faces a shortage of sand. Can we really be ①running out of sand? Well, we use more of this natural resource than all others ②except for water and air. Sand is necessary to make glass and electronics. Large amounts of sand are necessary for extracting oil using hydraulic fracturing[1] technology. It is also necessary to make concrete and asphalt for buildings and roads. ③It takes almost 100 tons of sand to build a single house and over 50,000 tons to build one kilometer of road. Between 2011 and 2014, 32.3 million houses and 4.5 million kilometers of road were built in Asia, mostly in China and India.

Huge amounts of sand are also ④dumped into the sea for land reclamation[2] projects in places such as Tokyo Bay and Singapore, which has expanded its territory by 20% since the 1960s. China has ⑤poured large quantities of sand onto ocean reefs[3] to create new islands in the South China Sea. Dubai, one of the world's fastest-growing cities, imports sand even though it is surrounded by desert. Sand for the concrete used to construct Dubai's Burj Khalifa, the

world's tallest building, came from Australia. ⑥Desert sand, as it turns out, is unsuitable for most human needs because it is too smooth. Smooth sand grains make weak concrete and asphalt, and cannot be used for things like electronics or glass. So, the world is not running out of sand, per se[4], but of the type of sand that makes much of our modern life possible.

⑦Approximately 40 billion tons of sand and gravel[5] are mined annually, and the environmental costs have been high. Islands have disappeared in Indonesia because of sand mining. Forests have been cut down in Vietnam to get the sand beneath them. Coral reefs in Kenya have been damaged by mining, and beaches in the U.S. have ⑧eroded[6] ⑨due to it.

Concrete and asphalt, and other housing materials, can however be recycled. Mud can be used for reclamation. The government of Singapore is working with Dutch experts to reclaim land using dikes[7], ⑩instead of pouring sand into the sea. ⑪So, the good news is as it turns out.

Lesson 9

Scientists have proposed ①more than a dozen ideas to explain why zebras developed stripes. Some say the distinctive patterns ②confuse their predators[1], or that they keep the animals cool. But all of these ideas have been shown to be false or to lack strong evidence.

In 2014, researchers showed that the principal species of horsefly[2] and tsetse fly[3] are found in almost exactly ③the same areas as the main species of striped equids[4]. ④This finding led scientists to argue that zebras developed the stripes to avoid these insects, which often carry fatal diseases. ⑤Now, they are back with more proof.

The researchers recorded data from three captured zebras and nine single-colored horses in neighboring fields in the United Kingdom where European horseflies naturally occur. They also covered the horses with three different coats, one black, one white, and one striped much like a zebra.

The zebra stripes did not prevent flies from approaching; both zebras and domestic horses experienced the same rate of circling flies. But ⑥a close analysis of the flies' final approach to the striped animals revealed that the insects failed to reduce their speed, and instead flew over the stripes or crashed into them, the team reports in an online journal.

⑦Indeed, the flies landed on the zebras at an average of one-fourth of the frequency at which they landed on the horses. ⑧What is more, the scientists did not see a single horsefly bite into a zebra's skin during 5.3 hours of direct observation, ⑨whereas the flies successfully did so 239 times on the horses with single-colored coats during eleven hours of observation. Only five flies landed on the dressed-in-zebra-coats during a 30-minute period, whereas more than sixty touched down on those in pure black and pure white coats in the same time period. The flies attacked all the horses' uncovered heads at the same rate.

⑩It seems the stripes affect the insects only at very close range, the scientists say, and they suggest zebra-striped coats may be a simple way to protect domestic horses from biting flies.

Lesson 10

The "global village" is an idealistic[1] phrase①meaning that all human beings are ②like members of one big village living peacefully on the planet Earth. ③The fact is, however, that the surface of the Earth is divided into some 200 nations by mostly unseen borders. Business activities between nations can be either difficult or easy ④depending on these borders.

⑤Only a few countries could survive without trading with other countries. Most countries depend on each other. Japan especially ⑥could not survive even one year if it were isolated[2] from the rest of the world. Japan's large economy is totally supported by many other nations. ⑦To maintain their healthy economy, Japanese people should always be alert to what is going on in the world. A small incident in one corner of the world can affect Japan's economy drastically.

News articles are sent from every corner of the world by worldwide news agencies. These big news agencies send hundreds of reporters and photographers all over the world, and they send back reports and pictures day and night.

Japanese news crews are also active in many places, but quite often Japanese newspapers and TV stations buy reports and pictures from major news agencies abroad to ⑧put together their news articles and programs. If you read or listen to English news, you may be able to ⑨get in touch directly with news sources from abroad. (⑩The fresher the news is, the more valuable it may be in helping to make business decisions.)

A piece of good political news from the United States may lift the Japanese stock market. News of bad weather off the coast of Peru may have unfavorable effects on the Japanese fish market. News about Arab oil prices can give a particularly big shock to the Japanese economic and political situation.

⑪The Internet, linked by satellites and parabolic antennas[3], enables us to get in touch with the world directly. Raw news flies all over the world and breaks down national borders. ⑫No nation can hide its own domestic events from the rest of the world or keep unfavorable international news from its people. Therefore, we should learn to ⑬adapt to the present borderless century.

Lesson 11

The voices of the animal world are ①full of exaggerations about size, which animals use to ②scare off rivals and attract mates. ③For example, bats have evolved to create calls with deep tones that sound as if they come from a much larger animal.

Now scientists have proposed this same survival technique to ④exaggerate size might be linked to an even deeper mystery. ⑤It could have pushed animals toward developing the ability to make a wider variety of possible calls, to copy sounds after hearing them and maybe even to form speech speech. This is what scientists call “vocal learning.”

"We are offering one possible way for vocal learning to have evolved," says Maxime Garcia, a biologist in Switzerland, who suggested this idea with his colleague, Andrea Ravignani.

Their idea builds on previous studies on vocal learning in humans. Beyond just opera singers and voice actors, we all have some level of control over the frequencies of our voices. ⑥But this power to voluntarily deceive seems to make us unique among our closest relatives. Even captive apes seem to have only very limited control over their voices. "You can't tell apes to do this," he says.

Traditionally, scientists have ⑦reasoned that the vocal control of humans was a step on the ladder of our evolution of speech. ⑧But in 2016, biologist David Reby and others argued that humans learned to change their voices because of evolutionary pressures to sound bigger and more masculine.

Now Dr. Garcia has applied the same idea to the animal world. Among many species that change their voices to sound different, previous experiments show a similarity: many can also imitate sounds. Elephants, for example, can make sounds through their mouths or their long trunks. ⑨"Going through one way or the other, the characteristics will change significantly, and change the impression of body size," Dr. Garcia says." And ⑩it happens they are vocal learners, too."

One of the best examples may be Hoover, a seal who spent much of his life ⑪making sounds at visitors at the New England Aquarium in a thick, almost human accent. Hoover died in 1985, but ⑫scientists confirmed last year that all seals — even much less talented ones — really could learn to change their voices to make them sound like they are bigger animals.

Lesson 12

Can you really know yourself? The Ancient philosophers believed that you ①could. But what if they were wrong? ②What if there are parts of your mind that you can never reach directly, like rooms that are permanently locked so that you can never enter them?

Appearances can be deceptive. When you watch the sun in the early morning it seems to come up from beyond the horizon. During the day it moves across the sky and then finally sets. ③It is tempting to think that it travels around the earth. ④For many centuries people were convinced it did. ⑤But it doesn't. In the sixteenth century the astronomer Nicolaus Copernicus realized this, though other astronomers had their suspicions before him. ⑥The Copernican revolution, the idea that our planet was not at the heart of the solar system, came as a shock.

The mid-nineteenth century brought another surprise. ⑦Until then it had seemed likely that human beings were completely different from animals and had been designed by God. ⑧But Charles Darwin's theory of evolution by natural selection showed that human beings share common ancestors with apes and that there was no need to suppose that God had designed us. An ⑨impersonal process alone was responsible. Darwin's theory explained how we had descended from ape-like creatures and ⑩how similar we were to them. The effects of the Darwinian revolution are still being felt.

According to Sigmund Freud (1856-1939), the third great revolution in human thought was ⑪brought about by his own discovery: the unconscious. He realized that much of what we do is driven by wishes that are hidden from us. We can't get at them directly. ⑫But that doesn't stop them affecting what we do. ⑬There are things we want to do that we don't realize we want to do. ⑭These unconscious desires have a deep influence on all our lives and on the way we organize society. They are the source of the best and worst aspects of human civilization. Freud was ⑮responsible for this discovery, though a similar idea can be found in some of Friedrich Nietzsche's writing