

PERSPECTIVE

Biology & Ecology

Biology is a branch of science that centers on the study of life. The study of biology is found and applied constantly to the world we live in- including the structure, function, growth, origin, evolution and distribution of living organisms. Biologists also study the functions and interactions of living organisms on many levels, or how certain environments affect life. This issue explores topics on biology and ecology from its past history to current cell technologies.

Dux vol.9



CONTENT

01. INTRO TO BIOLOGY

• The Various Uses of Biology _ <i>Nancy Koo</i>	06
• The History of Biology _ <i>Nancy Koo</i>	10
• Who Was Aristotle? _ <i>Sean Koo</i>	12
• What Defines Life? _ <i>Andrew Nam</i>	14

02. ENVIRONMENT

• Our Solution to Climate Change Was Right in Front of Us The Whole Time _ <i>Andrew Kim</i>	18
• Endangered Species: How These Biologists Can Help Save the Global Ecosystem _ <i>Seoyoon Eunie Choi</i>	20
• Leatherback Sea Turtles _ <i>Eric Yoon</i>	24
• Astrobiology: Life Outside Earth _ <i>Seoyoon Eunie Choi</i>	28



03. HUMAN BIOLOGY

- The Cardiovascular System: How it Reacts to Rapid Weight Loss _Grace Yongeun Song 34
- The Dangers of Smoking on Your Body _Sean Koo 38
- Inside the Israeli Fight Against Aging _Jason Shinheng Lee 41
- Therapeutic Cloning: Advantages and Dilemmas _Ashley Kim 44
- Cell Technologies: Genetically Modified Crops _Katherine S. Lee 46
- Fermented Foods: What Are They Made of and Why Are They Good For You? _Jason Shinheng Lee 49
- Genetic Engineering: What is CRISPR? _Grace Yongeun Song 52

04. CORONAVIRUS

- What is the Coronavirus? _Andrew Nam 58
- Reiterating Precautions Necessary Even with Global Vaccination _Katelyn Oh 61
- Will the Coronavirus Ever Disappear? _Andrew Kim 64
- Adapting to the Changing Pandemic Dynamics _Kristin Cho 68



INTRO TO BIOLOGY

The Various Uses of Biology

The History of Biology

Who Was Aristotle?

What Defines Life?



The Various Uses of Biology

By Nancy Koo

Seoul International School

The history of biology traces the study of the living world from ancient to modern times. Although the concept of biology as a single coherent field arose in the 19th century, the biological sciences emerged from traditions of medicine and natural history reaching back to ancient Egyptian medicine and the works of Aristotle and other revered scientists in the ancient Greco-Roman era. Biology is used in all parts of the world and is unknowingly affecting all aspects of life. Many well-known and wanted jobs are from the basic concepts



from biology and these jobs are growing very rapidly. Some of these fields include environmental science, microbiology, and marine biology. If one is into the science of life and is interested in how organisms are living in this fascinating world, it is not a bad idea to try one of these subjects.

Firstly, environmental science is an interdisciplinary academic field that integrates physical, biological, and information sciences to the study of the environment, and the solution of environmental problems. Environmental science emerged from the fields of natural history and medicine during the Enlightenment. Today it provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems. Environmental science incorporates more of the social sciences for understanding human relationships, perceptions, and policies towards the environment. Environmental engineering focuses on design and technology for improving environmental quality in every aspect.

Environmental scientists study subjects like the understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management, and the effects of global climate change. Environmental issues almost always include an interaction of physical, chemical, and biological processes. Environmental scientists bring a systems approach to problems. Key elements of an effective environmental scientist include the ability to relate space, and time relationships as well as quantitative analysis.

Secondly, microbiologists generally work in some way to increase scientific knowledge or to utilize that knowledge in a way that improves outcomes in medicine or some industry. For many microbiologists, this work includes planning



and conducting experimental research projects in some kind of laboratory setting. Others may have a more administrative role, supervising scientists and evaluating their results. Microbiologists working in the medical field, such as clinical microbiologists, may see patients or patient samples and do various tests to detect disease-causing organisms.

Finally, marine biologists study life in the oceans, and sometimes the oceans themselves. They may investigate the behavior and physiological processes of marine species, or the diseases and environmental conditions that affect them. They may also assess the impacts of human activities on marine life. Many marine biologists work under job titles such as wildlife biologist, zoologist, fish and wildlife biologist, fisheries biologist, aquatic biologist, conservation biologist, and biological technician. Marine biologists study marine organisms in their natural habitats. They may investigate a population's behaviors or physiology. Or, they may assess the condition of habitats, and the effects of human activity on those animals and habitats. Their research typically involves conducting species inventories, testing and monitoring sea creatures exposed to pollutants, collecting and testing ocean samples, preserving specimens and samples of unknown species and diseases, and mapping the distribution, ranges, or movements of marine populations.

In conclusion, biology has been and still is going to play a big role in the development of mankind and the advancement of the numerous fields related to science. Thanks to the advancement in the field of biology, there has been an increase in life expectancy and health overall. I hope there is a greater improvement in the field, which can bring numerous benefits to the world as a whole.

Nancy Koo

Seoul International School, 10

Works Cited

- “Biology.” Wikipedia, Wikimedia Foundation, 14 Feb. 2021, en.wikipedia.org/wiki/Biology.
- McKay, Dawn Rosenberg. “Environmental Scientist Job Description: Salary, Skills, & More.” The Balance Careers, www.thebalancecareers.com/what-is-an-environmental-scientist-526015.
- “Microbiologists : Occupational Outlook Handbook.” U.S. Bureau of Labor Statistics, U.S. Bureau of Labor Statistics, 1 Sept. 2020, www.bls.gov/ooh/life-physical-and-social-science/microbiologists.htm.
- Society, Microbiology. “What Microbiologists Do.” Microbiology Society, microbiologysociety.org/careers/what-microbiologists-do.html.
- “What Is a Marine Biologist?” EnvironmentalScience.org, www.environmentalscience.org/career/marine-biologist.



The History of Biology

By Nancy Koo

Seoul International School

The history of biology traces the study of the living world from ancient to modern times. Although the concept of biology as a single coherent field arose in the 19th century, the biological sciences emerged from traditions of medicine and natural history reaching back to ancient Egyptian medicine and the works of Aristotle and other well-known scientists in the ancient Greco-Roman era. This ancient work was further developed in the Middle Ages by Muslim physicians and scholars such as Avicenna, a Persian polymath regarded as one of the most significant physician, astronomer, philosopher, and writer.

During the European Renaissance and early modern period, biological thought was revolutionized in Europe by a renewed interest in empiricism and the discovery of many novel organisms. Prominent in this movement were Vesalius and Harvey, who used experimentation and careful observation in physiology, and naturalists such as Linnaeus and Buffon who began to classify the diversity of life and the fossil record, as well as the development and behavior of organisms. Antonie van Leeuwenhoek revealed by means of microscopy the previously unknown world of microorganisms, laying the groundwork for cell theory. The growing importance of biology and the understanding of life, partly a response to the rise of empirical data and findings, encouraged the growth of the field of biology.

Over the 18th and 19th centuries, biological sciences such as botany and zoology became increasingly professional scientific fields. Lavoisier, a French chemist, and other scientists began to connect the animate and inanimate worlds through physics and chemistry. Biologists began to reject essentialism and consider the importance of extinction and the

mortality of species. The newly discovered cell theory provided a new perspective on the fundamental basis of life. These developments, as well as the results from embryology and paleontology, were synthesized in Charles Darwin's theory of evolution by natural selection. The end of the 19th century saw the rise of the germ theory of disease, which proved to be a crucial discovery for humans.

Because of the rise of the field of biology, the human race has improved and is still improving. If it were not for the enhancement in the field of biology, there would not have been this much progress and development in the manner in which humans live. Thanks to the field of biology, the mortality rate of humans have decreased and there have been many advancements to the quality of life.

Nancy Koo

Seoul International School, 10

Works Cited

- HISTORY OF BIOLOGY, www.historyworld.net/wrldhis/plaintexthistories.asp?historyid=ac22.
- “History of Biology.” Wikipedia, Wikimedia Foundation, 18 Jan. 2021, [en.wikipedia.org/wiki/History_of_biology#:~:text=Although the concept of biology, the ancient Greco-Roman world.](https://en.wikipedia.org/wiki/History_of_biology#:~:text=Although%20the%20concept%20of%20biology,%20the%20ancient%20Greco-Roman%20world)
- Hogben, Lancelot. “A Short History of Biology: a General Introduction to the Study of Living Things.” Nature News, Nature Publishing Group, www.nature.com/articles/128132a0.
- Hubbard, Joshua A., et al. “Journal of the History of Biology.” Springer, www.springer.com/journal/10739.
- “The History of Biology.” Encyclopædia Britannica, Encyclopædia Britannica, Inc., www.britannica.com/science/biology/The-history-of-biology.

Who Was Aristotle?

By Sean Koo

Seoul International School

When thinking of the word biology, many words come flooding one's mind such as DNA, photosynthesis, and many more. However, did you ever wonder who had created biology? That person was

Aristotle. Although you may think that Aristotle does not relate to biology, since he is mostly known as a philosopher and a mathematician, he was the person who laid out the foundation of biology by his zoology and classification of species. So, who is the person called Aristotle?



Aristotle was born in Stagira, Greece in 384BC. Nicomachus, Aristotle's father, was a court physician to Amyntas II, the Macedonian King. Because of this, although his father had died when he was still a child, Aristotle remained closely connected to the Macedonian court. His mother, Phaestis, is not as well known as his father and is assumed to have also died when Aristotle was young. After his father had died Proxenus, married to Phaestis's sister, became Aristotle's guardian. When Aristotle turned 17, he was sent to Athens

ARISTOTLE

and enrolled in Plato's academy. He stayed inside the academy until Plato died and when Plato died, Aristotle's friend Hermias, king of Atarneus and Assos, invited Aristotle to the court.

During his time in the city of Mytilene, he carried out extensive scientific research, mostly on zoology and marine biology. His researches include the classification of more than 500 hundred species with detailed explanations. In 343BC, Aristotle was summoned by Philip II, the king of Macedonia of that time, to teach his son Philip, who would later become known as Alexander the Great. When Alexander the Great went out to conquer the world, Aristotle became 50 years old and established a school in Athens known as the Lyceum. He also built a library and had a group of students to help him with his research: The Peripatetics.

Aristotle's other achievements include dividing science into three kinds: productive, practical, and theoretical, books and theories, and etc. He eventually fled Macedonia saying that he didn't want to be in the city where Socrates was killed and went to Chalcis. He died in Chalcis the following year in 322BC when he was 62 years old. His achievements and philosophies led to the base foundation of biology and are still affecting the world today.

Sean Koo

Seoul International School, 9

What Defines Life?

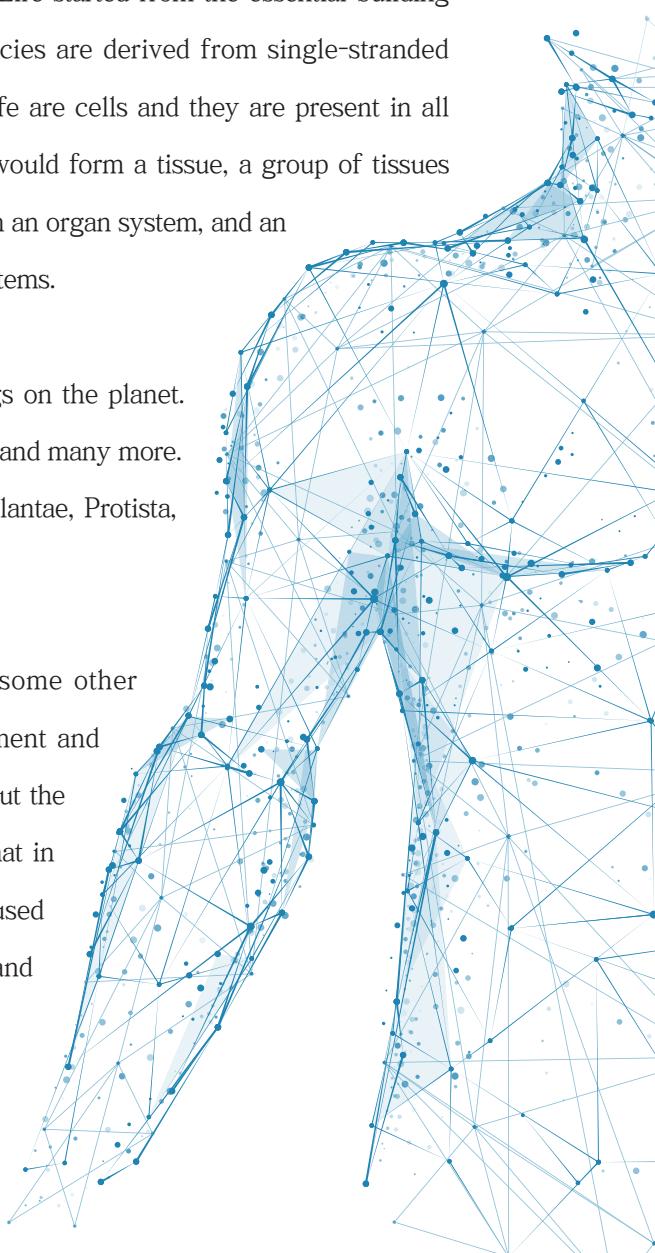
By Andrew Nam

Seoul International School

Life is characterized as an attribute that separates those who have mechanisms of signaling and self-support from those who do not. It is known as a living entity if an organism may perform certain functions, such as breathing, respiration, sensitivity, development, replication, excretion, and nutrition. Life started from the essential building block, called cells, of all living beings. Both species are derived from single-stranded organisms. The fundamental building blocks of life are cells and they are present in all living organisms. A group of cells, for example, would form a tissue, a group of tissues would form an organ, a group of organs would form an organ system, and an organism would be created by a group of organ systems.

There are various ways of life for human beings on the planet. People, such as plants, poultry, bacteria, mammals, and many more. There are classes of these organisms: Animalia, Plantae, Protista, Archaea, Bacteria, and Fungi.

Respiration is the mechanism of glucose or some other organic substance releasing steam. For development and activity, the chemical energy of glucose is used. But the respiration mechanism in plants is distinct from that in animals. In respiratory plants, carbon dioxide is used and sugars created by photosynthesis are burnt and

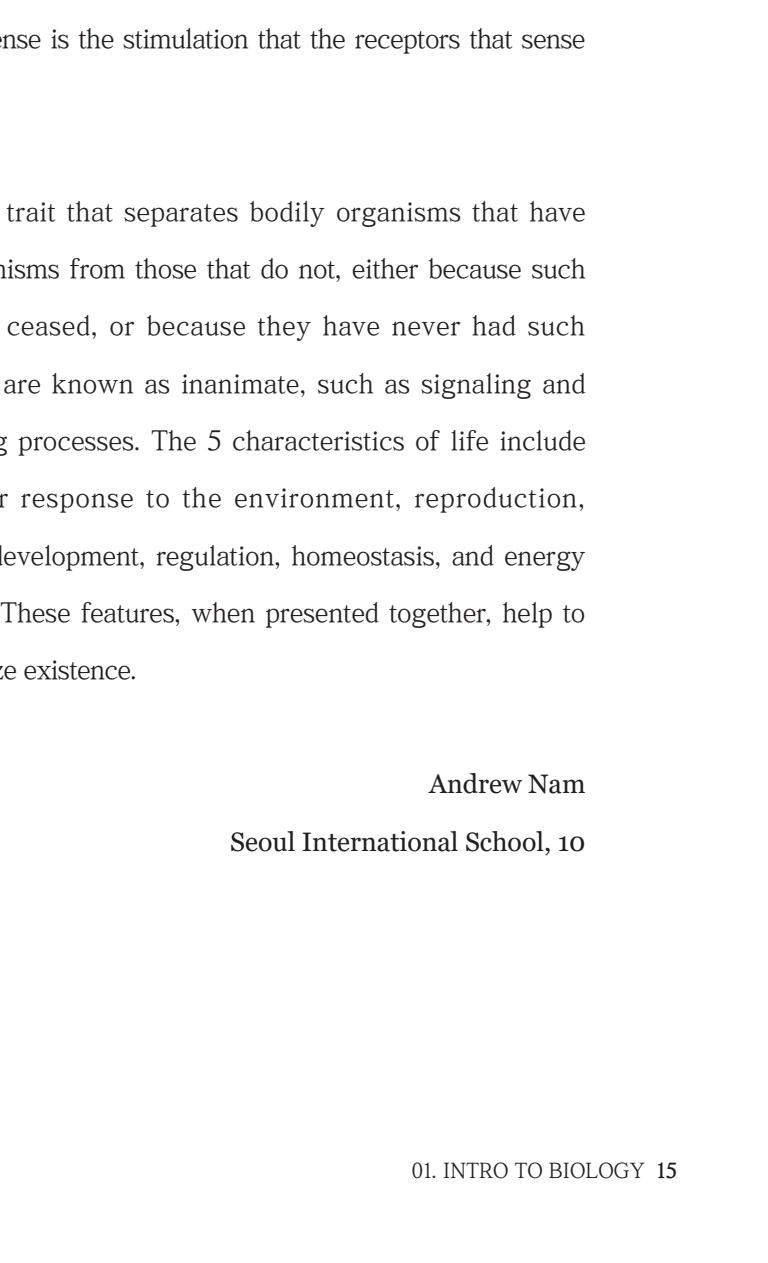




converted back into energy.

Another feature in living beings that is very evident in most animals is movement. Animals walk, for starters. Movement is that. But it is less apparent for certain species, such as plants, to see their functions as a living entity than others. A sunflower plant, for instance, reacts to the stimulus and progresses towards the sunshine.

Stimuli are reacted by a living organism. It is a sensitivity function. For starters, if you touched something that was very hot, your reaction would be to instantly remove your hand. The discomfort or warmth we sense is the stimulation that the receptors that sense pain and temperature in our skin detect.



All in all, life is a trait that separates bodily organisms that have biological mechanisms from those that do not, either because such activities have ceased, or because they have never had such functions and are known as inanimate, such as signaling and self-sustaining processes. The 5 characteristics of life include sensitivity or response to the environment, reproduction, growth and development, regulation, homeostasis, and energy processing. These features, when presented together, help to characterize existence.

Andrew Nam

Seoul International School, 10



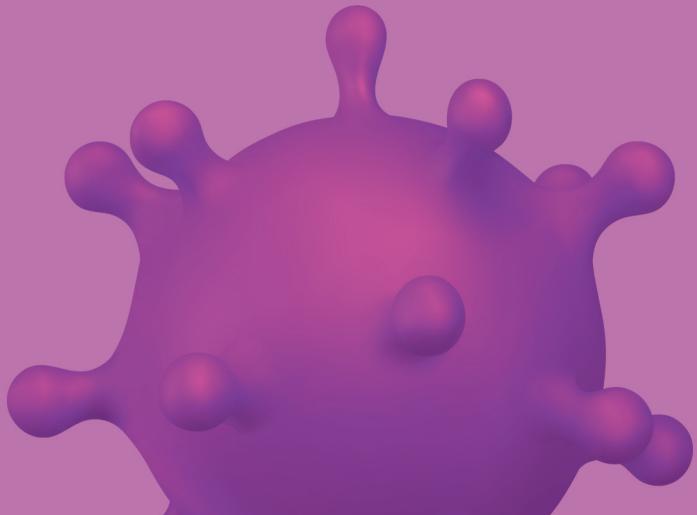
ENVIRONMENT

Our Solution to Climate Change Was Right
in Front of Us The Whole Time

Endangered Species: How These Biologists
Can Help Save the Global Ecosystem

Leatherback Sea Turtles

Astrobiology: Life Outside Earth



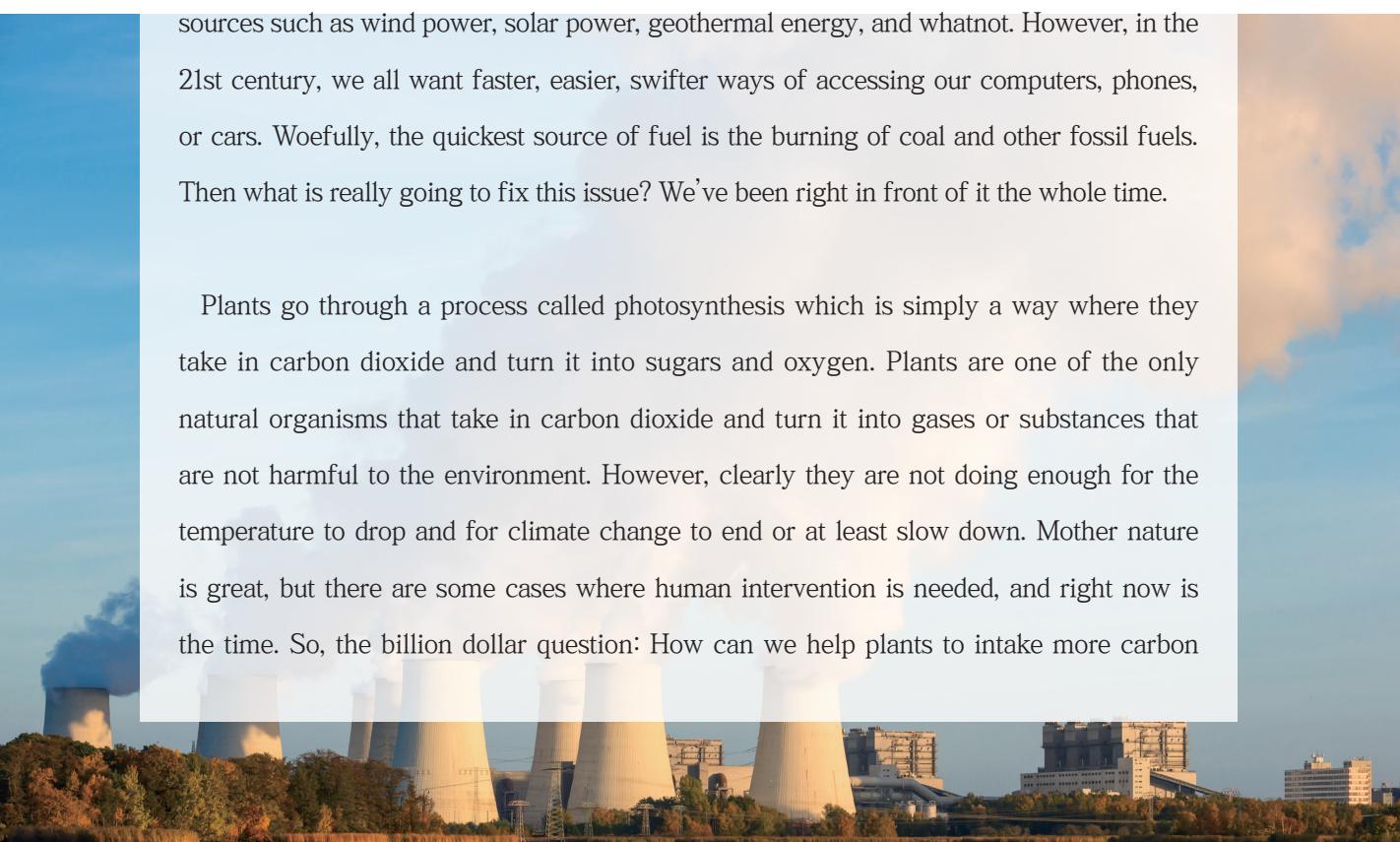
Our Solution to Climate Change Was Right in Front of Us the Whole Time

By Andrew Kim

Seoul International School

Today, I spent hours on the computer, burning lots of power which was probably fueled by the burning of coals or fossil fuels. Majority of the videos on climate change or articles on climate change explain that the best way to solve this issue that we are experiencing right now is to reduce our emissions. In an idealistic world, yes! In a realistic world, unfortunately, no. Ever since the industrial revolution, technology has become such a crucial part of our convenient lifestyle. Cutting emissions will simply not be possible because it is such a habit rooted deep into our system that it is unfeasible to rule it out from our lives. For this reason, many big companies are working on using reusable energy sources such as wind power, solar power, geothermal energy, and whatnot. However, in the 21st century, we all want faster, easier, swifter ways of accessing our computers, phones, or cars. Woefully, the quickest source of fuel is the burning of coal and other fossil fuels. Then what is really going to fix this issue? We've been right in front of it the whole time.

Plants go through a process called photosynthesis which is simply a way where they take in carbon dioxide and turn it into sugars and oxygen. Plants are one of the only natural organisms that take in carbon dioxide and turn it into gases or substances that are not harmful to the environment. However, clearly they are not doing enough for the temperature to drop and for climate change to end or at least slow down. Mother nature is great, but there are some cases where human intervention is needed, and right now is the time. So, the billion dollar question: How can we help plants to intake more carbon



dioxide? Genetic modification. The idea of genetic modification was just a sci-fi idea that only came up in movies and comic books until it came to reality. We figured out a way to manipulate the genetic code of organisms. A vast majority of people discourage this idea and they think that genetic modification is a way of “playing God.” Despite the god-like attributes genetic modification has which should not be exploited, maybe only such power can combat the catastrophic impediment to climate stabilization.

In the roots of a plant, there is a substance called Suberin which contains a lot of CO₂ and most of the CO₂ absorbed by the plant lives there. How can we use this substance to our advantage? Joanne Chory, a plant biologist and geneticist who is also the director of the Plant Molecular and Cellular Biology Laboratory, at the Salk Institute for Biological Studies explained in her TED talk that through genetic engineering, we can increase the number of Suberin in plants. This means that by making roots of plants longer and by increasing the number of Suberin in the roots of plants, we can allow plants to absorb more and more carbon dioxide.

Although humans emit more and more greenhouse gases every day, using these so called “supercharged plants,” climate change can be slowed. It is very uncertain what would happen to the future of our planet and our climate, but realistically, this is the very best solution. You and I can do very little to help this cause except for spreading the word of this notion. I’m not saying that you should overuse fossil fuels, but instead of putting all of your effort into a solution with a blind future, let’s rely on what is right in front of us.

Andrew Kim

Seoul International School, 8

Endangered Species: How These Biologists Can Help Save the Global Ecosystem

By Seoyoon Eunie Choi

Seoul International School

Pandas. Fennec foxes. Black-footed ferrets. Sea otters. These cuddly animals are well known for being endangered, whether they're at risk of endangerment or are severely endangered. But it isn't just the cute, fluffy animals that are going extinct. It's also the smaller, nearly unseen animals that are crucial to the survival of our ecosystem, as well as the "ugly" animals that are facing the same kind of endangerment with the same underlying causes: habitat loss, hunting, or poaching - generally by humans.

All organisms are sorted into seven general categories - least concern, near threatened, vulnerable, endangered, critically endangered, extinct in the wild, and extinct. Humans, as well as domestic cats and dogs, for example, are of least concern, for they do not seem to be facing extinction any time soon. Near threatened species are species whose populations are abundant but habitats or food sources are decreasing, meaning they could be endangered, but are not yet so. The rest of the categories describe species that are at different levels of endangerment, with extinct being the most severe category in which the species is not existent even in captivity or cultivation.

These endangered plants or animals that are going extinct or are in danger of extinction are studied by endangered species biologists. These biologists can focus on a vast range of



different organisms, from the tiniest insects to the largest plants and animals. An estimated 8,700 different animal species go extinct every year, which means that the biggest mass extinction since the dinosaurs' could happen within our lifetimes, proving that endangered species biology is more important than ever.

This importance also comes from the fact that all of Earth is interconnected, meaning

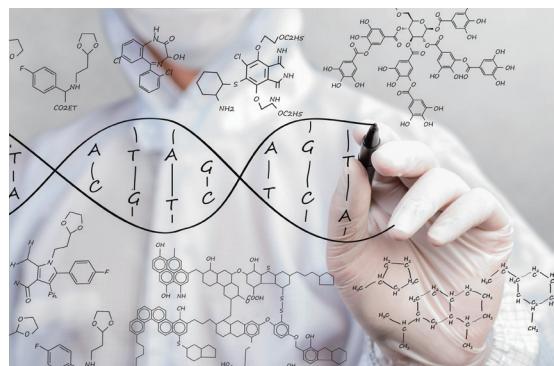


that if one species goes extinct, it will leave a huge, lasting impact on the food chain or ecosystem it was a part of – and usually, that impact isn't positive. This impact could be on a global scale, with some organisms losing population because of the certain species' extinction and other organisms increasing exponentially in population. Because so many species are going extinct due to human actions, it is the humans' responsibility to make up for their negative impacts and take the right measures to limit the effects of the extinctions and prevent further endangerment. The study of not only why these animals are endangered but also what we can do to prevent them from going extinct forever is crucial to saving our ecosystems, and endangered species biologists are at the forefront of the movement to conserve these organisms.

So what exactly do endangered species biologists do?



Endangered species biology, like any other sector of biology or even science in general, has biologists who study different sectors of the ecosystem or different organisms depending on their specialty and job roles. Some endangered species biologists review literature about individual species in order to know more about the details of that organism, some research animal behavior, some research human behavior and environment in order to know more about how that affects plant and animal life, and some collect data in order to study the extinction or endangerment of certain species. Aside from these, there are countless other things that endangered species biologists do: all of which are extremely important to the preservation and analysis of extinct or endangered species.



These biologists work with a massive array of different species, studying the tiniest of organisms and their impact on the larger ecosystem because every single organism on Earth takes part in a food web and has a role in the dramatic play that is the beautiful ecosystem of our planet. The species are the actors, the humans the audience, and the endangered species biologists the pit orchestra, moving everything along and ensuring that the play has all of its essential parts.

Seoyoon Eunie Choi

Seoul International School, 10

Works Cited

- National Geographic Society. "Endangered Species." National Geographic Society, 9 Oct. 2012, www.nationalgeographic.org/encyclopedia/endangered-species/#:~:text=An endangered species is a, and loss of genetic variation.&text=A loss of habitat can, about 65 million years ago.
- "What Is an Endangered Species Biologist?" UKBAP, www.ukbap.org.uk/what-is-an-endangered-species-biologist/.

Leatherback Sea Turtles

By Eric Yoon

Thornhill Secondary School

Among the seven kinds of sea turtles, the unique characteristics and evolutionary history of the Leatherback sea turtles have received much attention from zoologists. If we briefly



look at the evolution history of the leatherback sea turtle, between 200 to 260 million years ago, we can see that the evolution of all sea turtles started from a small reptile called *Eunotosaurus africanus* which started to look like modern turtles by the shell that started to evolve. 120 million years ago, *Desmatochelys padillai*

had evolved. Paleontologists say that *Desmatochelys padillai* were the first and the oldest sea turtle. As they no longer need to walk, their clawed limbs evolved into flippers to help them swim under water. 30 million years later, the giant shallow sea turtle called *Archelon (Dermochelod)* had evolved. They are the ancient leatherback sea turtle. It is recorded as the largest turtle species on Earth. The length of the site was about 4m, and its flipper length was near to 5m long. Also, with their large body size and strong neck muscles, they expanded their living territory and became the dominant large animal of the ocean. However, 70 million years later, whales, dolphins, and other marine mammals had started to evolve. As mammals stronger than the Dermocheloid turtles came to exist,

most of them were hunted which led to their extinction. However, there was one that had survived, and that was the leatherback sea turtle (*dermochelys cariacea*), which still exists today. The reason why leatherback sea turtles were able to survive from strong mammals was because of their unique lifestyle. Their main food is jellyfish, so there was less competition to survive and they had a wide global distribution. Furthermore, with their unique lifestyle, leatherback sea turtles have separated from other sea turtles over 30 to 20 million years ago. Marine turtles can be classified into two families. One is Dermochelyidae and the other one is Cheloniidae. Dermochelyidae has only one extant species, the leatherback sea turtle, while other six types of sea turtles are included in Cheloniidae. With respect to their characteristics, outstanding body size, and the flexible and rubbery texture of the shell it has been classified as having the most unique characteristics compared to other sea turtles. Leatherback sea turtles are not the only largest turtle on Earth, but

also one of the largest reptiles on Earth. It is outstandingly larger than other sea turtles and can grow up to 2m and weigh about 700kg. With their large body size, they also have strong and large flippers which helps them to swim long distances. Furthermore, as mentioned before, leatherback sea turtles are developed to swim long distance which is why they have a wide global distribution and can be found almost everywhere, specifically in the Atlantic, Pacific, and Indian ocean. In fact, there was even an event where





a leatherback sea turtle was first found in Nova Scotia, and appeared in Trinidad and 4 months later which is clear evidence that leatherbacks are fast and powerful swimmers (the distance between Nova Scotia to Trinidad is 3,785km). In addition, interestingly, one fact that most people misunderstand about sea turtles is that they all have hard and bony shells. However, leatherback sea turtles have a flexible and rubbery shell texture. This characteristic gives them hydrodynamic sturutle. The leatherback can dive to a depth of more than 1,000m while other hard shell sea turtles can only dive about 170 to 200 meters underwater. Scientists concluded that leatherback sea turtles not having hard shells gives them the ability to dive deep into the water. Research suggests that leatherbacks lack a rigid breastbone leading them to adapt into deep water. Also, their flexible, leathery shell texture absorbs nitrogen, which helps them to reduce problems arising from decompression



during deep dives. In addition to these features, leatherback sea turtle have other special and interesting characteristics. Unfortunately, leatherback sea turtles are one of the species that is listed on the endangered species lists in Canada and America. Today, there are estimated to be between 24,000 to 36,000 nesting female leatherbacks on Earth. Compared to 1980, just about 40 years ago, there were about 115,000 nesting females. It is a significant decrease in number, and there must be a movement to stop the decreasing number of leatherback sea turtles and protect this fascinating species.

Eric Yoon

Thornhill Secondary School, 11

Works Cited

- A., Cordero Gerardo, et al. "Delayed Trait Development and the Convergent Evolution of Shell Kinesis in Turtles." *Proceedings of the Royal Society B*, 3 Oct. 2018, royalsocietypublishing.org/doi/10.1098/rspb.2018.1585.
- Classification, bioweb.uwlax.edu/bio203/s2007/martinel_meli/Classification.htm.
- Fisheries, NOAA. "Leatherback Turtle." NOAA, www.fisheries.noaa.gov/species/leatherback-turtle.
- "Information About Sea Turtles: Leatherback Sea Turtle." Sea Turtle Conservancy, conserveturtles.org/information-about-sea-turtles-leatherback-sea-turtle/.
- Molfetti, Erica, et al. "Recent Demographic History and Present Fine-Scale Structure in the Northwest Atlantic Leatherback (*Dermochelys Coriacea*) Turtle Population." *PloS One*, Public Library of Science, 2013, www.ncbi.nlm.nih.gov/pmc/articles/PMC3596356/.
- "Part 3: Natural Selection and Evolution." Leatherback Sea Turtles - Home, leatherbackseaturtleevolution.weebly.com/part-3-natural-selection-and-evolution.html.

Astrobiology: Life Outside Earth

By Seoyoon Eunie Choi

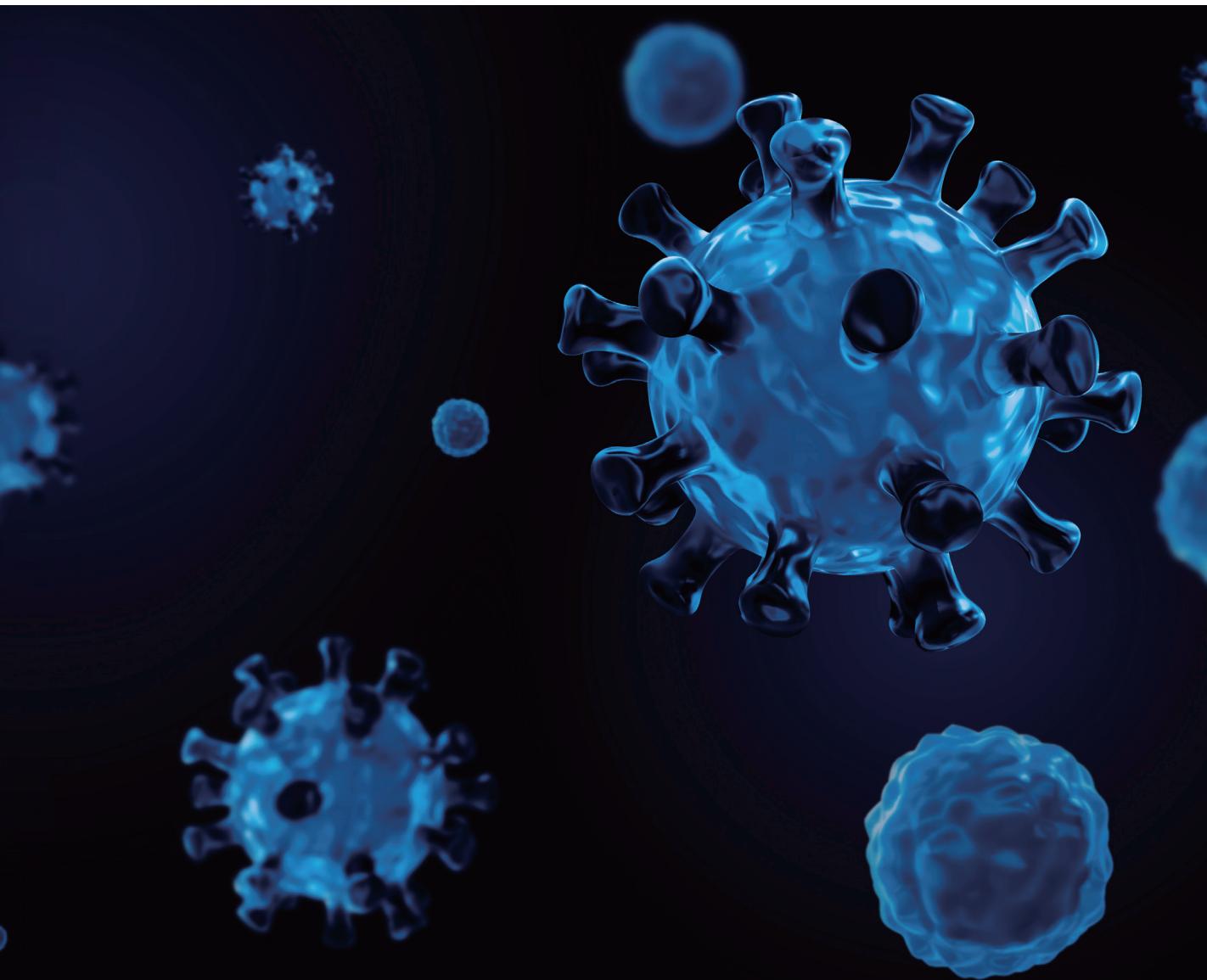
Seoul International School

Astrobiology, formerly titled exobiology, is the study of the origins, early evolution, and future of life in the universe, including the study of potential extraterrestrial life and how to detect it. Extraterrestrial life has long fascinated humans on Earth, as the immediate surroundings seem to point to there being no life outside of planet Earth. Ancient Greeks believed that there was extraterrestrial life, but didn't have the technology to prove it. This fundamental, long-asked question is one of the most foundational questions astrobiologists study, and it is one that if it is answered, will change the history of not only this planet but the entire universe altogether. The human race has been curious about life outside planet Earth long before the required technology was fully developed, and even now, the resources and machinery Earth has are primitive compared to what is needed to fully explore life in the rest of the universe. But humans have never been as close to finding life outside of Earth as right now, and astrobiology is the leading field at the dawn of this breaking discovery.

In 1984, the National Science Foundation's Antarctic Meteorite program discovered a meteorite, now called ALH84001, in Allan Hills, Antarctica. The meteorite was preserved until 1993, when scientists began to take interest in it after it showed signs of being of Martian origin. The meteorite is nearly 3 times as old as the 11 other meteorites on Earth determined to be of Martian origin, and many of the findings made by the team that discovered this origin was possible because of the technology that has been developed over the years as astrobiology expanded as a scientific domain, from a fledgling field of study

to one of the most important areas that are at the forefront of evolutionary development for humans. The reason why this meteorite, ALH84001, was so important to astrobiologists, when they had 11 others: this one was able to be analyzed thoroughly, with the use of high-resolution scanning electron microscopy and laser mass spectrometry, the makeup of the meteorite, and declared that there was evidence of past life on Mars, if only in the bacterial form.

This finding was extremely crucial to astrobiology, as it probed at a question that had



only ever been a vague curious question – whether or not there was life outside of Earth. The fact that this Martian meteorite had potential evidence of past life opened so many new doors, as Mars, until then, was just seen as a dry, red planet absolutely void of life. Past life, even if it was in the most microscopic of forms, could also insinuate that there is much more to look for outside of our solar system as well as inside, as the lush conditions on Earth may not be the only things living organisms need to survive.

Technology, hand-in-hand with astrobiology, was able to discover, from a much finer-scale of research, signs of nano-bacterial life. This discovery is revolutionary, and there is only more to look forward to when anticipating extraterrestrial life. Of course, life outside of Earth may not look exactly as the media draws it out to be. There may not be green aliens speaking a gibberish language (though if they were, the language would likely not be gibberish – it would likely be an extremely complex linguistic system that humans are not able to comprehend), and there may not be UFO's circling in our near vicinity, waiting for human victims. But there may be proof that planets outside of Earth have, or once had, the conditions to promote life, and that is much more progress than any conspiracy theory about aliens has brought us – all thanks to the

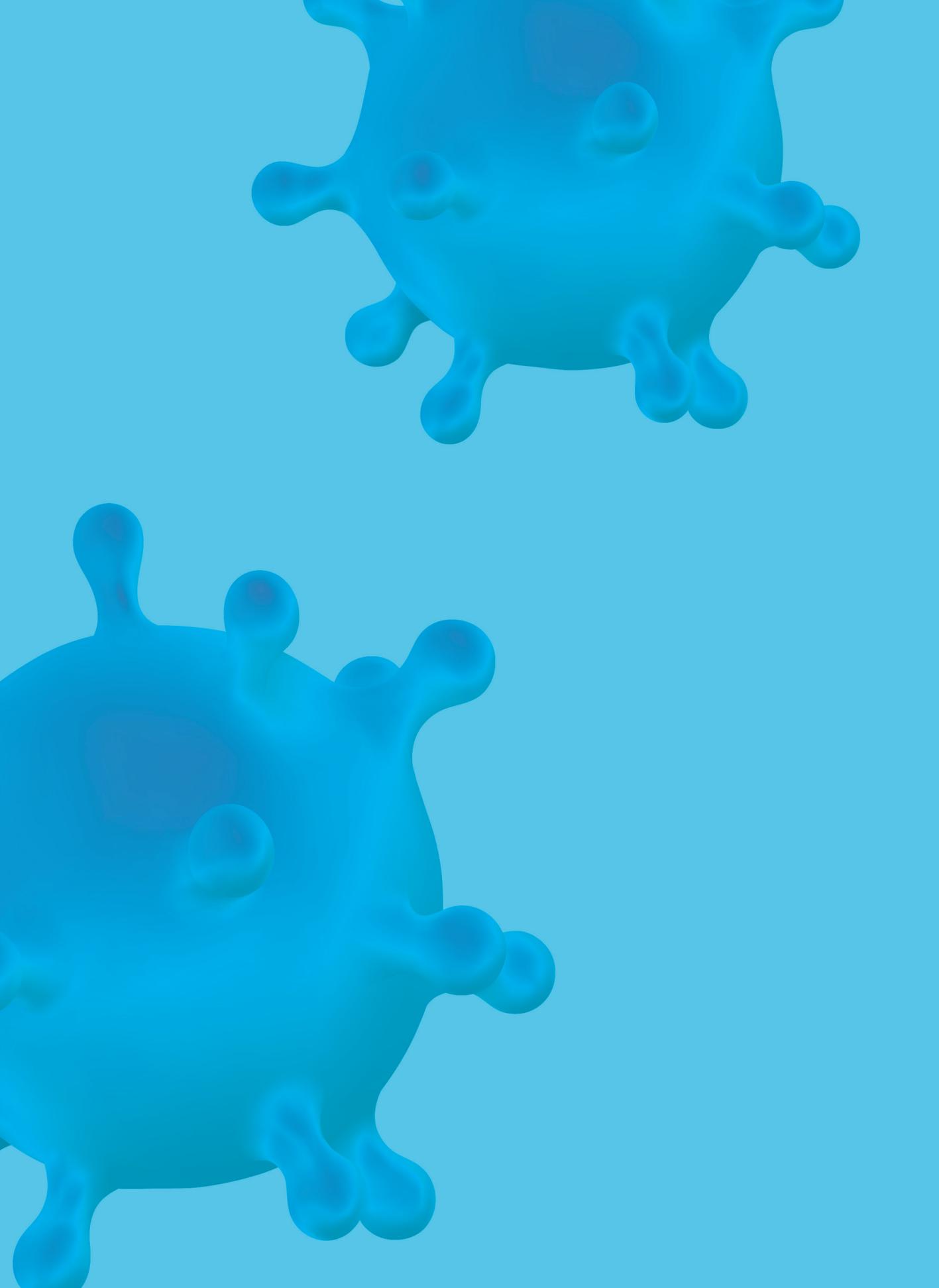
novel, but extremely innovative and revolutionary, field of astrobiology.

Seoyoon Eunie Choi

Seoul International School, 10

Works Cited

- Savage, Donald L., et al. "Evidence for Microbial Life on Mars: Fossilized Bacteria?: AMNH." American Museum of Natural History, www.amnh.org/learn-teach/curriculum-collections/cosmic-horizons-book/fossil-microbes-mars.
- "What is Astrobiology?" University of Washington, <https://depts.washington.edu/astrobio/wordpress/about-us/what-is-astrobiology/>



HUMAN BIOLOGY

The Cardiovascular System: How it Reacts to Rapid Weight Loss

The Dangers of Smoking on Your Body

Inside the Israeli Fight Against Aging

Therapeutic Cloning: Advantages and Dilemmas

Cell Technologies: Genetically Modified Crops

Fermented Foods: What Are They Made of and
Why Are They Good For You?

Genetic Engineering: What is CRISPR?



The Cardiovascular System: How it Reacts to Rapid Weight Loss

By Grace Yongeun Song

Seoul International School

Manifold platforms of media and broadcast networks have established a seemingly riveted depiction of anorexia. Based on diagnostic interview data from the National Comorbidity Survey Replication (NCS-R), median age of onset was 18 years-old for anorexia nervosa. It is also imperative to recognize the different varieties of eating disorders. Common types of eating disorders include, but are not limited to, Binge-eating, Bulimia nervosa, and Anorexia nervosa. Binge-eating refers to “out-of-control eating”. This often leads to obesity and weight gain and people who suffer from this disorder experience feelings of guilt and shame. Similarly, people with Bulimia nervosa also experience periods of binge-eating, but afterwards, they force themselves to throw up with the use of laxatives. Lastly, Anorexia nervosa is when people avoid and restrict food consumption and may consider themselves overweight even when they are dangerously underweight. While it is the least common, it has the highest fatality rate.



In order to discuss the effects that Anorexia has on the heart, it is imperative to understand the rudimentary functions and mechanisms of the heart. Simply, the heart consists of arteries, veins, and muscles. The flux of blood through the heart is also quite straightforward. In essence, blood must enter the heart in order to be pumped out through the body. Because of this, two different veins called the Superior

Vena Cava and the Inferior Vena Cava provide an entrance into the heart for blood to enter. Through these veins, deoxygenated blood enters into the Right Atrium, which is one of four main “rooms” within the heart. From this chamber, blood is pumped down through the Tricuspid Valve, a membranous structure consisting of three flaps, which ensures that blood flows in the correct direction. Blood then enters the Right Ventricle, from where the blood is then pumped out through the Pulmonary Valve towards the Pulmonary Artery. Whereas veins lead blood towards the heart, arteries send blood away from the heart. Accordingly, the Pulmonary Artery sends blood away from the heart to the lungs. A vital process termed Pulmonary circulation occurs at this stage, when the deoxygenated blood becomes oxygenated as the lungs supply it with oxygen and drain the carbon dioxide. The oxygenated blood then re-enters the heart through the Pulmonary Veins, and into the Left Atrium. The Mitral Valve then pumps the oxygenated blood down into the last chamber called the Left Ventricle. From the Left Ventricle, the Aortic Valve leads the blood towards the Aorta, which is an essential organ which supplies our entire body with oxygenated blood from the heart.

Anorexia plays a significant impact on an individual's heart and is often the driving force behind several heart diseases. Slow heart rate commonly leads to low blood pressure and deteriorating muscles of the heart as a result of rapid weight loss creates larger chambers and weaker walls. Subsequently, pumping blood becomes more difficult for an individual. Another complication induced by Anorexia is the loss of reflexes to constrict blood vessels and the increased risk



of heart failure. A few other side effects worth noting include osteoporosis, muscle loss, fatigue and weakness, etc.

Anorexia Nervosa is not simply a disease that “dries up the body”; the disease is profoundly complex and its effects on the body surpasses well over what scientists and researchers confidently know of. Foremost is the pathophysiology of Anorexia. While it is ambiguously known, an intricate interaction of various factors is most likely the leading agent behind this eating disorder. Another important point to establish is the many forms of eating disorders. The diagnosis includes close observation of the patient including behavioral and physical symptoms. With details of the diagnosis and varieties thus far established in the paper, it is necessary to reinstate a few cardio symptoms often prompted by anorexia. To briefly summarize, rapid weight loss subsequently results in larger chambers and weaker walls of the heart. In other words, individuals with Anorexia Nervosa find it difficult to pump blood normally throughout the body. Slow heart rate, weak constriction of blood vessels, osteoporosis, and muscle loss are a few of many complications accompanied with anorexia. Anorexia is commonly distorted in the media through misleading depictions.

With the transition into the tech-savvy generations, younger children become increasingly exposed to such distortions. With the threatening consequences on the cardiovascular system in mind, researchers and experts must be significantly more attentive with what is put out into the media. The medical field must also consider expanding the media coverage

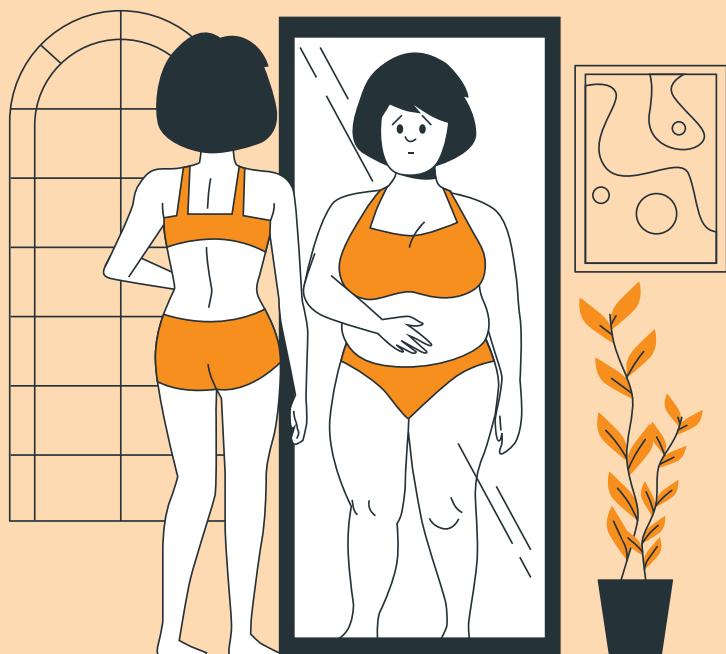
Works Cited

Staff, Mayo Clinic. “Anorexia Nervosa.” Mayo Clinic, Mayo Foundation for Medical Education and Research, 20 Feb. 2018,
www.mayoclinic.org/diseases-conditions/anorexia-nervosa/symptoms-causes/syc-20353591.

of symptoms associated with anorexia in order to impel earlier and prompt hospital visits. Moreover, to alleviate mental symptoms of patients, it is crucial for deeply trust-dependent relationships to be established between patients and doctors. Ultimately, the society must carefully construct an environment in which patients can easily recognize their symptoms and reach medical care.

Grace Yongeun Song

Seoul International School, 10



The Dangers of Smoking on Your Body

By Sean Koo

Seoul International School



According to WHO, over 8 million people each year die because of smoking. Over the years, other researches showed how detrimental smoking is. However, many people still don't realize how dangerous smoking is. Smoking is lethal and affects all of the body such as mental diseases and the decaying of the body. Other effects that can happen when you smoke are cancer,

The most widely known and deadliest effect of smoking is cancer. Cancer is a group of diseases going through abnormal cell growth with the potential to spread out or invade other parts of the body. When smoking a cigarette, the cancer causes substances to travel



through the body and the lungs, resulting in lung cancer. According to mayoclinic.org, when cancer is caused by smoking, lung cancer is the most common but deadly disease. There are many other dangers caused by smoking; however, cancer is the most detrimental.

The second effect when smoking is mental health. Smokers often say that they smoke

because it helps relieve their stress. However, according to [mentalhealth.org.uk](https://www.mentalhealth.org.uk), smoking actually is the cause of mental health. Smoking causes depression, anxiety, schizophrenia, and etc. Because of these depressions, suicide rates are steadily increasing. Though smokers may think that smoking relieves stress, it actually may be the cause of stress.

The third effect that affects you when smoking is your relationship with people.

When you smoke, people around you may not like it. This results in, unless you quit it, a



distance between you and the person you knew. If it was a person who you relied on or was a family member, you would feel depressed and empty. Even though losing a person may not seem to effect your body physically, once you experience it, you will feel your mental health deteriorating.

The world has different groups of people and tribes each differing from the other not only because of their appearance but also because of their cultures. Though cultures may be beautiful and meaningful such as making a baby pick an object at the age of one to determine what he or she might be in the future, also known as dol jab yi. However, there

are many unique cultures in the world such as the Sateré-Mawés' coming of age tradition, the Toraja people's living with the dead, and the Mursi woman lip plating. Though it may seem unusual and mystifying, it is still meaningful to those people.



Worldwide, tobacco use causes more than 7 million deaths per year. If this pattern of smoking doesn't change all over the world, more than 8 million people a year will die from tobacco-related diseases by 2030. Smoking has many dangers that are both physical and

mental such as cancer, depression, losing the people you love, and etc. Though it smoking may seem to relieve your stress and help you go through your day, overall, it's detrimental to your health.

Sean Koo

Seoul International School, 9

Works Cited

- Lindberg, Sara. "What You Need to Know About Smoking and Your Brain." Healthline, Healthline Media, 23 Aug. 2019, www.healthline.com/health/smoking/smoking-effects-on-brain#nicotine-effects.
- "Fast Facts." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 21 May 2020, www.cdc.gov/tobacco/data_statistics/fact_sheets/fast_facts/index.htm#:~:text=Worldwide,tobacco%20use%20causes%20more%20than%207%20million%20deaths%20per%20year.&text=If%20the%20pattern%20of%20smoking,to%20tobacco%20use%20by%202030.
- "Tobacco." World Health Organization, World Health Organization, www.who.int/news-room/fact-sheets/detail/tobacco.

Inside the Israeli Fight Against Aging

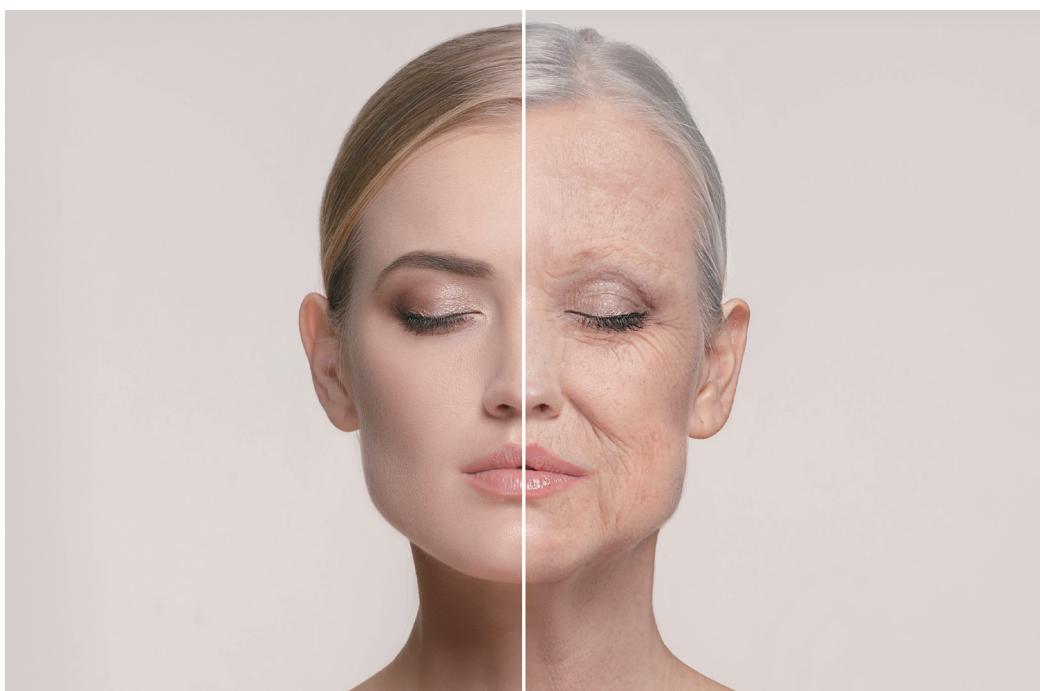
By Jason Shinheng Lee

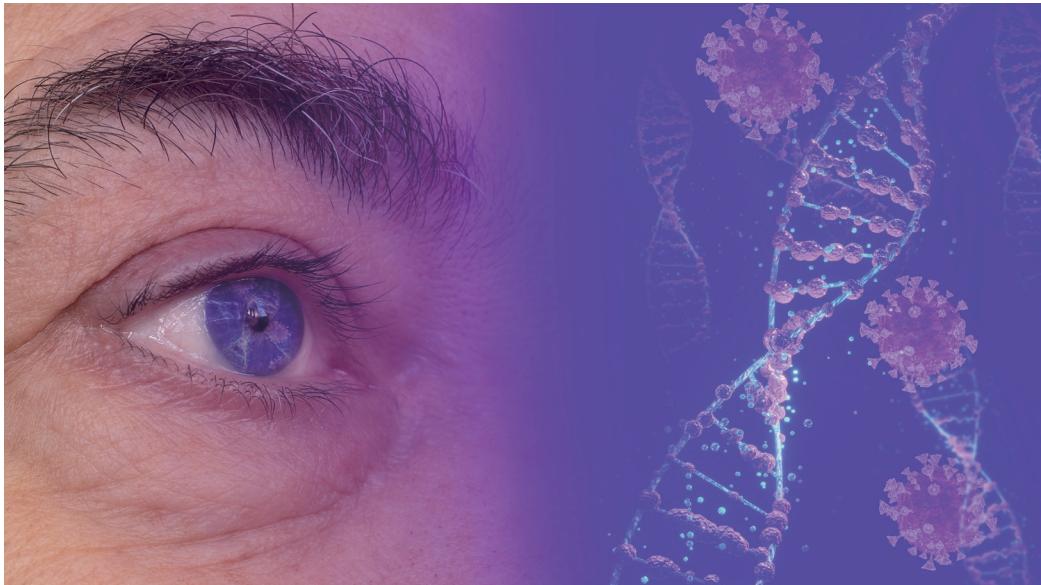
Seoul International School

A concept as old as the dawn of humankind is that as one spends more time alive, like a rose, they slowly start to age and wilt until at last, the final petal floats morosely to the ground, and the individual passes on. However, an Israeli scientist is challenging this concept with his groundbreaking discoveries. For the first

time in history, humankind is landing some blows on the grim reaper.

Using just oxygen and a bit of time, professor Shai Efrati and his team have seemingly seemed to reverse not only the physical but also biological effects of aging. To elaborate, over 60 days, Efrati and his team conducted oxygen therapy





(hyperbaric oxygen treatments), where they essentially found that when healthy adults over the age of sixty-four were placed in a pressurized chamber and given pure oxygen for ninety minutes a day, five days a week for three months, the aging process within the individuals was not only slowed, but the aging process also seemed to have been reversed. Without getting into the super complex, nitty-gritty science of the findings, essentially, what the team discovered was twofold. First of all, they found that this treatment reversed a natural effect of aging, which was the shortening of protective ends on one's chromosomes. The importance of these ends, also known as telomeres, is that they are needed for a cell to copy itself properly. Each time a cell does copy itself, though, the telomeres become shorter. Because of this, the reversal of the shortening of telomeres would serve to allow humans to live for far longer than usual, as their cells could continue to copy. Secondly, the oxygen therapy seemed to reverse the accumulation of old and malfunctioning cells within the body. These malfunctioning cells can be detrimental to humans' livelihood, as, quite obviously, they don't work as intended, so the reversal of these cells' accumulation could also serve to extend the lives of many significantly.

However, these discoveries have not been universally accepted. Top geriatrician (a professional who studies and cares for the diseases and conditions elderly people endure) Yoram Maaravi has openly doubted the effectiveness and legitimacy of the study, stating, "I'm skeptical that one manipulation can reverse aging, a complicated process with many factors."

In the end, it is still far too early, as Maaravi pointed out, to be able to properly and fairly judge the effectiveness and safety of this oxygen treatment. However, the treatment does show high amounts of potential compared to anything else to quench humanity's thirst for immortality. Only time will tell if we humans can effectively, truly knock out the grim reaper.

Jason Shinheng Lee

Seoul International School, 8

Works Cited

- Al Jazeera. "'Backward in Time': Israeli Scientists Claim to Reverse Ageing." Health News | Al Jazeera, Al Jazeera, 22 Nov. 2020, www.aljazeera.com/news/2020/11/22/israeli-scientists-claim-new-study-reverses-aging-process.
- Efrati, Shai. Aging, 18 Nov. 2020, www.ageing-us.com/article/202188/text.
- "Israeli Scientists Claim to Reverse Aging Process." The Jerusalem Post | JPost.com, www.jpost.com/health-science/israeli-scientists-say-they-found-a-way-to-reverse-the-human-aging-process-649798.
- Jeffay, Nathan, et al. "Israeli Scientist Claims to 'Reverse' Aging in Blood Cells." The Times of Israel, 22 Nov. 2020, www.timesofisrael.com/israeli-scientists-claim-to-reverse-aging-in-blood-cells-with-pressure-chamber/.

Therapeutic Cloning: Advantages and Dilemmas

By Ashley Kim

Seoul International School

Therapeutic cloning is a procedure of harvesting specific types of cells to treat diseases through the use of stem cells. Although it is not yet a procedure used often, it shows a lot of promise for gene therapy, as well as reproductive and regenerative treatments.

Therapeutic cloning is oftentimes used to potentially treat and hopefully cure diseases by generating patient-specific cells through stem cell differentiation. The process starts with a somatic cell from the patient. The nucleus of the somatic cell, which holds the genetic material and information, is extracted. The nucleus of the egg cell, donated by an egg donor, is extracted then discarded. The previously extracted nucleus from the somatic cell is then placed into the empty egg cell. This becomes the stem cell embryo. The embryo is incubated and special signaling molecules are added so that the stem cell embryo can differentiate into the specific type of cells specific to the desired treatment. The cells are given nutrients to grow and they are then harvested for therapeutic usage. Finally, these specialized cells are then transplanted into the patient to hopefully help cure for the respective disease or illness.

- This method of treatment offers a myriad of benefits. Therapeutic cloning is a patient-specific method, meaning that treatments customized to the patient's needs. This suggests that there will be no overproduction of treatments, which is often the case in other methods of treatment. This also ensures that the patient is receiving the highest quality of treatment possible, as each aspect of the treatment is catered to the patient's individual needs. Therapeutic cloning could also allow an individual's own cells to be used to treat or cure

that person's disease, without the risk of introducing foreign cells that may be rejected by the body. Another advantage of therapeutic cloning is that it can treat diseases regarding any body organ or tissue. Because therapeutic cloning is a method that is further developed on the fly and according to patients' individual needs, it is not limited to only a few areas of treatment, much like many other methods. In addition, therapeutic cloning furthers medicinal understanding by enhancing the understanding of stem cells. This can hopefully give way to new treatments for common diseases

- However, there are also downsides to this treatment. Given the complicated nature of the procedure, there is only a slim chance of the treatment being successful. In addition, there is a potential threat to the egg donor, in that the donated eggs could be damaged. There are also moral dilemmas regarding this method of treatment. The procedure requires the destruction of an embryo, which many pro-life advocates have argued as the destruction of potential life.

Regardless of the possible disadvantages, the therapeutic cloning method is quite arguably a very progressive and advantageous method of treatment. It opens many gateways in science and has much potential to be the new ordinary in medicine.

Ashley Kim

Seoul International School, 11

Cell Technologies: Genetically Modified Crops

By Katherine S. Lee

Seoul International School

You've probably heard of certain foods, such as soy or potatoes, being produced from genetically altered processes in recent years. A GMO stands for a genetically modified organism, usually a plant or animal whose genes have been altered through technology and genetic engineering. Most crops receive a donor cell from another organism to achieve a desired trait that the traditional organism originally did not have. Scientists have been experimenting with GMOs for years, and corn is one of the most common and successfully commercialized GMO.





So where do genetically modified organisms, particularly corn, get their traits? GMO corn can be found in many different versions, like herbicide-tolerant corn, more nutritional corn, and even drought/insect resistant corn. A common donor cell for GMO corn, especially the herbicide resistant plant, is a natural soil bacterium (*Bacillus Thuringiensis*) that produces a protein that is able to kill insects such as the European corn borer, which destroys corn crops.

Although the general public knows what GMOs are, not too many know how these engineered organisms work. When it comes to GMOs, the process of creating it first starts with identifying a desirable characteristic and then searching for it in other organisms. When an organism with the trait is found, the gene containing the trait inside the donor organism is isolated. Through a series of testing, the gene from the donor cell is able to be

copied and transferred into another organism.

Although it does offer a host of benefits and innovative features, GMO crops are also surrounded with a fair share of controversy. For years, heated debate has circulated the topic of GMO crops and whether it is morally beneficial or even safe for crops to be genetically modified. There are a few terms that skeptics have raised concerns regarding the processes and industry that genetically modified organisms are produced in. Gene flow is a common objection that GMO crops could mix with traditional crops and bring unwanted new characteristics into them, and many also believe GMO crops are unsafe for one's health. However, studies by the National Academies of Sciences, Engineering, and Medicine have reported that GMOs are actually safer than often depicted to be due to its improvement in technological innovations, constant safety assessments, and steady increase in regulatory clarity.

Katherine S. Lee

Seoul International School, 11

Works Cited

- “What Is a GMO?” Non-GMO Project, www.nongmoproject.org/gmo-facts/what-is-gmo/.
- “Corn.” Non-GMO Project, www.nongmoproject.org/high-risk/corn/.
- “Bt-Corn: What It Is and How It Works.” Recognizing Insect Larval Types | Entomology, entomology.ca.uky.edu/ef130.
- Britannica, The Editors of Encyclopædia. “Gene Flow.” Encyclopædia Britannica, Encyclopædia Britannica, Inc., 15 Dec. 2017, www.britannica.com/science/gene-flow.
- “Read ‘Genetically Engineered Crops: Experiences and Prospects’ at NAP.edu.” National Academies Press: OpenBook, www.nap.edu/read/23395/chapter/1.

Fermented Foods: What Are They Made of and Why Are They Good For You?

By Jason Shinheng Lee

Seoul International School

We've all heard it before, whether it be from a teacher, family member, or that one friend who's a bit too adamant about their diet- "You should start eating fermented foods. They're good for you!" Are they really good for you, though, and if they are, why?

Marina L. Ritchie of the National Library of Medicine writes in one of her studies that the probiotics produced during fermentation can help restore the balance of friendly bacteria in one's gut and may alleviate some digestive problems. So, how does the fermentation process create these beneficial probiotics? Well, it doesn't. Without getting too deep into the science of it, simply put, probiotics already exist before fermentation, for example, in the skin of some fruit. However, the environment that fermentation creates vastly increases the rate at which these beneficial probiotics multiply within the foods. According to the BBC, these probiotics in one's gut are beneficial to one's health, as they can promote its ability to manufacture B vitamins and synthesize vitamin K.

Additionally, these probiotics can help alleviate gastrointestinal ailments and conditions. A 6-week study including two-hundred and seventy-two adults with Irritable Bowel Syndrome (IBS) conducted by researchers at the National Library of Medicine found that by consuming 125 grams of fermented milk that resembled yogurt every day, all adults' IBS symptoms such as bloating and stool infrequency were improved, proving the health effect of fermented foods.

Even discounting the fact that fermented foods are good for your gut because it's jam-

packed with probiotics, it's still beneficial for one's health in general if they eat fermented foods. It would still be beneficial because of two main reasons, the first of which being that fermented foods are easier to digest. According to the BBC, fermented foods are easier on the stomach in terms of digesting and absorbing the food that one eats, as the process of fermentation breaks down certain parts of whatever is being fermented, namely starches and sugars. For example, in milk, fermentation breaks down lactose compounds into simpler sugars, making fermented dairy products such as yogurt or cheese easier on one's stomach, which can be especially beneficial for lactose-intolerant people. Additionally, the BBC also states that fermenting foods can increase the amount of vitamins and minerals one's body absorbs from said food.

In the end, eating fermented foods is not only a quick and easy way to stay healthy but a pretty tasty way to stay healthy as well, so the next time you feel bloated, eat some kimchi!

Jason Shinheng Lee

Seoul International School, 8



Works Cited

- Berman, Gavin. "How To Maximize Probiotics In Your Ferment." Nourished Essentials, Nourished Essentials, 23 Mar. 2020, nourishedessentials.com/blogs/food/how-to-maximize-probiotics-in-your-ferment.
- Guyonnet D, Chassany O, Ducrotte P, Picard C, Mouret M, Mercier CH, Matuchansky C. Effect of a fermented milk containing *Bifidobacterium animalis* DN-173 010 on the health-related quality of life and symptoms in irritable bowel syndrome in adults in primary care: a multicentre, randomized, double-blind, controlled trial. *Aliment Pharmacol Ther.* 2007 Aug 1;26(3):475-86. doi: 10.1111/j.1365-2036.2007.03362.x. PMID: 17635382.
- Heart Foundation NZ. "What Are the Benefits of Fermented Foods?" Heart Foundation NZ, Heart Foundation NZ, 20 Aug. 2018, www.heartfoundation.org.nz/about-us/news/blogs/fermented-foods-the-latest-trend#:~:text=Fermented%20foods%20are%20foods%20and,acids%2C%20gases%20or%20alcohol).
- Hoveyda N, Heneghan C, Mahtani KR, Perera R, Roberts N, Glasziou P. A systematic review and meta-analysis: probiotics in the treatment of irritable bowel syndrome. *BMC Gastroenterol.* 2009 Feb 16;9:15. doi: 10.1186/1471-230X-9-15. PMID: 19220890; PMCID: PMC2656520.
- Lewin, Jo. "The Health Benefits of Fermenting." BBC Good Food, www.bbcgoodfood.com/howto/guide/health-benefits-of-fermenting#:~:text=Nutritional%20Highlights, and%20enhancing%20the%20immune%20system.
- O'Brien, Kyle. "Probiotic Fermentation Explained - UAS Labs' Probiotic Blog." UAS Labs, 3 Dec. 2019, uaslabs.com/probiotic-fermentation-explained/#:~:text=Different%20from%20other%20food%20fermentation,into%20a%20tank%20of%20nutrients.
- Ritchie ML, Romanuk TN. A meta-analysis of probiotic efficacy for gastrointestinal diseases. *PLoS One.* 2012;7(4):e34938. doi: 10.1371/journal.pone.0034938. Epub 2012 Apr 18. PMID: 22529959; PMCID: PMC3329544.
- Team, Digestive Health. "5 Reasons You Should Add More Fermented Foods to Your Diet." Health Essentials from Cleveland Clinic, Health Essentials from Cleveland Clinic, 2 Oct. 2020, health.clevelandclinic.org/5-reasons-you-should-add-more-fermented-foods-to-your-diet-infographic/.

Genetic Engineering: What is CRISPR?

By Grace Yongeun Song

Seoul International School

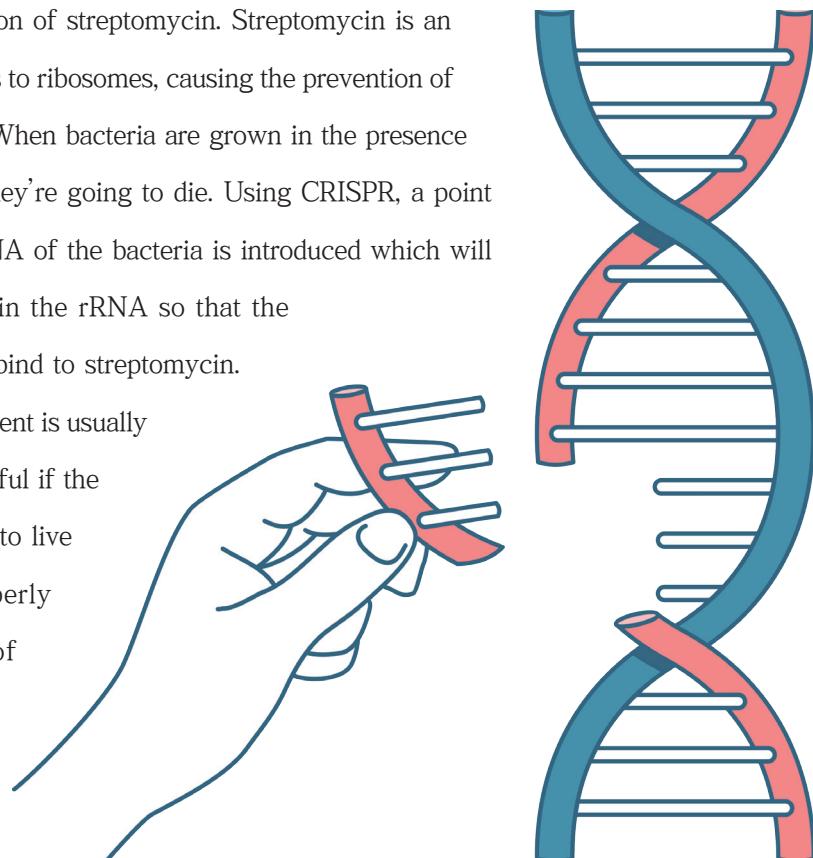
The Clusters of Regularly Interspaced Short Palindromic Repeat (CRISPR) system was first discovered in archaea and later in bacteria. It is known to serve as a part of the bacterial immune system, which defends against invading viruses. When the presence of viral DNA is detected inside a cell, it is incorporated into the CRISPR region of the bacterial DNA. The next time, it is encountered, two short strands of RNA, called the spacer RNA and crRNA, together called gRNA, are produced. In the spacer RNA, a sequence is contained which matches that of the viral DNA. The RNA strands then create a complex with an enzyme called the CAS9. This causes a conformational change that allows the complex to bind to the matching sequence in the viral DNA. The CAS9 contains tiny molecular scissors that are capable of cutting strands of DNA. The complex attaches to the viral DNA at the target sequence, and disables its functions by causing a Double Stranded Break (DSB).

Since eukaryotic cells have the natural ability to repair DNA, scientists take advantage of this nature to purposely create mutations and observe specific functions of DNA. Eukaryotic cells can repair their DNA through two general pathways: the Non Homologous End Joining (NHEJ) and Homology Directed Repair (HDR). The NHEJ frequently causes deletions or insertions at the DSB, but is more active in the cell and efficient, whereas the HDR is more desirable for controlled mutations, since errors are minimum and results are more accurate and specific. However, HDR has lower efficiency than NHEJ. Scientists often use the NHEJ when turning off a gene or to prevent a certain gene from functioning. The HDR is implemented when specific mutations are desired.

Though an uncertain fact, PEG8000 is thought to play several functions in transformation. DNA and cell walls are both negatively charged, and naturally repel each other. In theory, PEG8000 shields the negative charge of the DNA in order to make it easier to permeate the cell wall. Moreover, PEG8000 is believed to help transport DNA into the cell and make the cell membrane more porous. Similarly, it is often perceived that CaCl₂ shields and neutralizes the negative charge of DNA.

CRISPR also involves a combination of other materials and methods. Agar is a jelly-like substance used to feed and grow bacteria; agar is usually indigestible to microorganisms. In CRISPR, agarose gel is put to use in order to create a substance called LB agar media. LB media is an imperative factor of CRISPR since it is a nutritionally rich medium in which bacteria are able to grow. Most importantly is the mechanism of action of streptomycin. Streptomycin is an antibiotic that binds to ribosomes, causing the prevention of protein synthesis. When bacteria are grown in the presence of streptomycin, they're going to die. Using CRISPR, a point mutation in the DNA of the bacteria is introduced which will cause a mutation in the rRNA so that the ribosomes cannot bind to streptomycin.

A CRISPR experiment is usually considered successful if the bacteria continues to live and function properly in the presence of streptomycin.



There are also several possible errors to be mindful of during CRISPR. Some errors which can be avoided with meticulous attention include too much/little cooling, not consistent heating, death of bacteria from aggressive mixing, reuse of pipettes, and careless streaking. There are also some errors that may be difficult to avoid with the extent of human prowess. These include differences in temperature, and approximative timing. CRISPR demonstrates that genetic engineering can be exploited for countless purposes which can possibly benefit humans. Genetic engineering offers the possibility of alleviating diseases such as cystic fibrosis, sickle cell disease, hemophilia and many other likewise. Subsequently, thorough discussion is required among those who have expertise in the field of genetic engineering in order to clearly differentiate between where genetic engineering can be applied and not.

Grace Yongeun Song

Seoul International School, 10

Works Cited

Vidyasagar, Aparna. "What Is CRISPR?" LiveScience, Purch, 21 Apr. 2018,
www.livescience.com/58790-crispr-explained.html.





• **CORONAVIRUS**

What is the Coronavirus?

Reiterating Precautions Necessary Even with Global Vaccination

Will the Coronavirus Ever Disappear?

Adapting to the Changing Pandemic Dynamics



What is the Coronavirus?

By Andrew Nam

Seoul International School

A coronavirus is a form of the common virus in your nose, sinuses, or upper throat that triggers an infection. There aren't most coronaviruses harmful. The World Health Organization (WHO) described SARS-CoV-2 as a new form of coronavirus in early 2020, following a December 2019 outbreak in China. The epidemic spread across the world rapidly. To give a more scientific analysis, two strains, called L and S, were present in a Chinese study of 103 COVID-19 cases. The S type is older, but in the early stages of the epidemic, the L type was more prevalent. They agree that one may cause more cases than the other of the disease, but they are still focusing on what it all entails. When it infects humans, it is also common for a virus to modify or mutate, and this virus has done so. There are many versions named for the regions they first encountered, but now they have spread to other areas and nations.





COVID-19 is a condition that can induce what physicians call a respiratory tract infection triggered by SARS-CoV-2. It travels the same way other coronaviruses do, mostly through contact from person to person. Infections vary from moderate to lethal infections. The upper respiratory tract (sinuses, nose, and throat) or lower respiratory tract may be affected (windpipe and lungs). Pneumonia, respiratory failure, cardiac disease, liver problems, septic shock, and death may result from the infection. A disorder known as cytokine release syndrome or a cytokine storm can cause several COVID-19 complications. This is because an infection allows the immune system to fill with inflammatory proteins called cytokines in your bloodstream. They're able to burn tissue and destroy the organs.

In addition to being potentially deadly and lethal, this virus is fatal in that the rate of transmission is comparatively high. Early research has estimated that it can be distributed to between 2 and 3.5 others by one person who has it. One analysis showed that, with one case extending to between 4.7 and 6.6 other individuals, the prevalence was higher. By contrast, it would be transmitted to between 1.1 and 2.3 others by one person who has the seasonal flu. The CDC states that there is evidence that if you come within 6 feet of someone who is contagious for a total of 15 minutes during a day, it can be spread.

Previously, it was assumed that the exposure had to be 15 minutes at a time. By washing hands regularly, keeping common surfaces sterile, minimizing interaction with other persons, and using fabric face masks, individuals can lower the transmission rate.

This virus ranges from individual to individual. For a couple of days after exposure, one may have slight flu-like symptoms, and get stronger. But certain cases can be fatal or serious. Any of the symptoms, even though they are mild, can also last for weeks. According to a CDC study, more than a third of people older than 18 who have symptoms of the virus do not fully recover 2 or 3 weeks after. The signs that were most likely to persist were fatigue and cough. Some of the symptoms can be focused on an individual's brain. They may have brain fog, extreme exhaustion, pain, dizziness, or difficulty concentrating. All in all, this disease has swept the entire world and everyone in the world should come together to solve this alarming issue.

Andrew Nam

Seoul International School, 10



Reiterating Precautions Necessary Even with Global Vaccination

By Katelyn Oh

Seoul International School

With the COVID-19 pandemic having affected our lives for over a year, the entire world is constantly searching for solutions to the global crisis. After all, vaccinations are the ultimate answer, and reaching 100 percent vaccine protection in the population would be

ideal. However, with vaccines just beginning distribution, we should not become complacent by relying too heavily on this wishful scenario. Fighting the virus is the public's collective responsibility, and remembering basic precautions will always be necessary to protect



ourselves and others. So, what are some precautions and why are they important?

As scientists, governments, and international bodies have emphasized, wearing a mask is crucial to containing the spread of COVID-19. The Centers for Disease Control and Prevention (CDC) recommended that all people over the age of two should wear perfectly fitting masks over their noses and mouths at all times in public. COVID-19 mainly spreads

from person to person through respiratory droplets, travelling through the air when you talk, shout, sing, cough, and sneeze. With masks, we can add another simple layer of protection to help prevent your own respiratory droplets from contacting other people, and this applies to every single person - regardless of symptoms.

Cleaning your hands often is one of the most basic and obvious precautions and has been viewed as extremely effective since the beginning of the pandemic. Whether you are at home, at work, at school, or out in public, handwashing with soap and water can remove germs and prevent the spread of them to others. Germs can spread from people when you touch your eyes, nose, and mouth and also when eating and preparing food, and these germs can enter our bodies and cause infections. Thus, to prevent this spread, it is recommended that you implement frequent handwashing in your lifestyle and make sure you wash your hands before and after meals, after using the toilet, and at every other time possible. If soap and water are not readily available, you can use hand sanitizers that quickly reduce the number of germs on your hands. However, sanitizers are often unable to eliminate all types of germs, and they may not be as effective when your hands are greasy or notably dirty.

Also, when it comes to reducing the spread of the virus, the importance of social distancing cannot be ignored. Social distancing, also referred to as 'physical distancing,' requires you to stay at least two meters away from other people in both outdoor and indoor spaces. Practicing this precaution has proven to help limit the chances of spread when coming in contact with infected people for a prolonged period. In addition, this practice also reduces the spread from contaminated surfaces that have also been known to pass on the virus.

Although the risk of suffering a severe infection may be different for everyone, anyone can contract the COVID-19 virus and spread it to others. Our battle against the pandemic will not be over, even with the implementation of global vaccinations, and thus the

importance of these simple precautions cannot be stressed enough.

Katelyn Oh

Seoul International School, 9



Works Cited

“Advice for the Public on COVID-19.” World Health Organization, World Health Organization, 16 Feb. 2021, www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public.

“Prevent Getting Sick.” Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 7 Jan. 2021, www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/index.html.

Will the Coronavirus Ever Disappear?

By Andrew Kim

Seoul International School

It all started with a couple of cases and developed to a whole year of imprisonment and torture being stuck at home. My school closed, my academies closed, and I was more than scared to go outside. If I had to go outside for a special occasion, I always had the feeling of guilt in my head. What if I have the virus and I brought it to my family? Like many people at my age, I spent most of my time calling and texting with my friends to at least get a hold of them somehow. What is this thing causing billions of people to stay locked up in their homes?

The Coronavirus is a group of types or a family of viruses. MERS-CoV, SARS-CoV, and SARS-CoV-2 are all examples of the Coronavirus. Although they are all shaped differently,



most viruses use the same method of injecting a chunk of DNA into a human cell (often cells that exist in the air holes of the body). The injected chunk of DNA tricks the human cell to create a virus cell, and this replication cycle creates exponentially increasing amounts of virus cells. However, when the human body keeps duplicating this strand of DNA, a mistake can occur. A mutation.

A mutation can be either a positive or negative change in a DNA sequence during cell division. This can change a virus's physical appearance, method of spreading the virus, and symptoms of the virus. For example, the SARS-CoV virus developed a mutation which slowed its spreading, and therefore we were able to see the "end" of the SARS pandemic. Or have we seen the end? Will the COVID-19 virus ever come to an end?

There are many different expert opinions on this debate as the Coronavirus is the hot issue right now. Here is fortunate news: The COVID-19 virus is going to "end" as our systems become immune to it, like any other virus we have seen before. However, here is the unfortunate news: It will come back. Although nothing is completely guaranteed, my



stance on this debate that the Coronavirus will return pretty soon with a new and evolved strand.

Firstly, the virus will go away. There are many people who think that this virus will not go away, firstly because it just has been going on for so long. The SARS virus continued for about 8 months, which is still shorter than what we are facing now. However, take The Black Death for example. It lasted a whole four years, so in the grand scheme of viruses, what we have been going through is not that devastating.

Secondly, the virus will come back. I believe so because of how different this strand we have encountered is from the other Coronaviruses. There are three things that are in need of inspection. Starting with reinfection data. You can get infected with the COVID-19 virus twice or more. What does this mean? This proves that if COVID-19 really “disappears like magic” and vaccines are no longer needed to be distributed, people who already got the virus may get it again if it comes back. It also means that this Coronavirus strand is good at fighting our system, and is good at beating it multiple times with the same maneuver. Next, the mutations. This virus strand has mutated multiple times, and although we have not seen a devastating result, the strand may find a way to defeat our systems once again. The amount of times that this virus has mutated over such a short time means that it can always come back; And when it comes back, we will not be ready for it. Finally, we need to change the way that the whole world dealt with this. A certain limit of tolerance can be given especially during such epidemics where no one expected such an issue. However, hospitals were running out of oxygen chambers, masks, tools, doctors, and there were no places to even put the bodies. Health care needs to advance before this second wave of the virus strikes. Otherwise, we will be more doomed than we were and are now.

Andrew Kim

Seoul International School, 8

Works Cited

- Callaway, Ewen. "The Coronavirus Is Mutating - Does It Matter?" *Nature News*, Nature Publishing Group, 8 Sept. 2020, www.nature.com/articles/d41586-020-02544-6.
- "Coronavirus." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, 15 Feb. 2020, www.cdc.gov/coronavirus/types.html.
- "Kenyan Scientists Discover New Coronavirus Mutation." Voice of America, www.voanews.com/covid-19-pandemic/kenyan-scientists-discover-new-coronavirus-mutation.
- Reardon, Sara. "The U.K. Coronavirus Mutation Is Worrying but Not Terrifying." *Scientific American*, Scientific American, 24 Dec. 2020, www.scientificamerican.com/article/the-u-k-coronavirus-mutation-is-worrying-but-not-terrifying/.
- "What New Covid-19 Variants Mean for Our Fight with the Virus." BBC Future, BBC, www.bbc.com/future/article/20210119-covid-19-variants-how-the-virus-will-mutate-in-the-future.



Adapting to the Changing Pandemic Dynamics

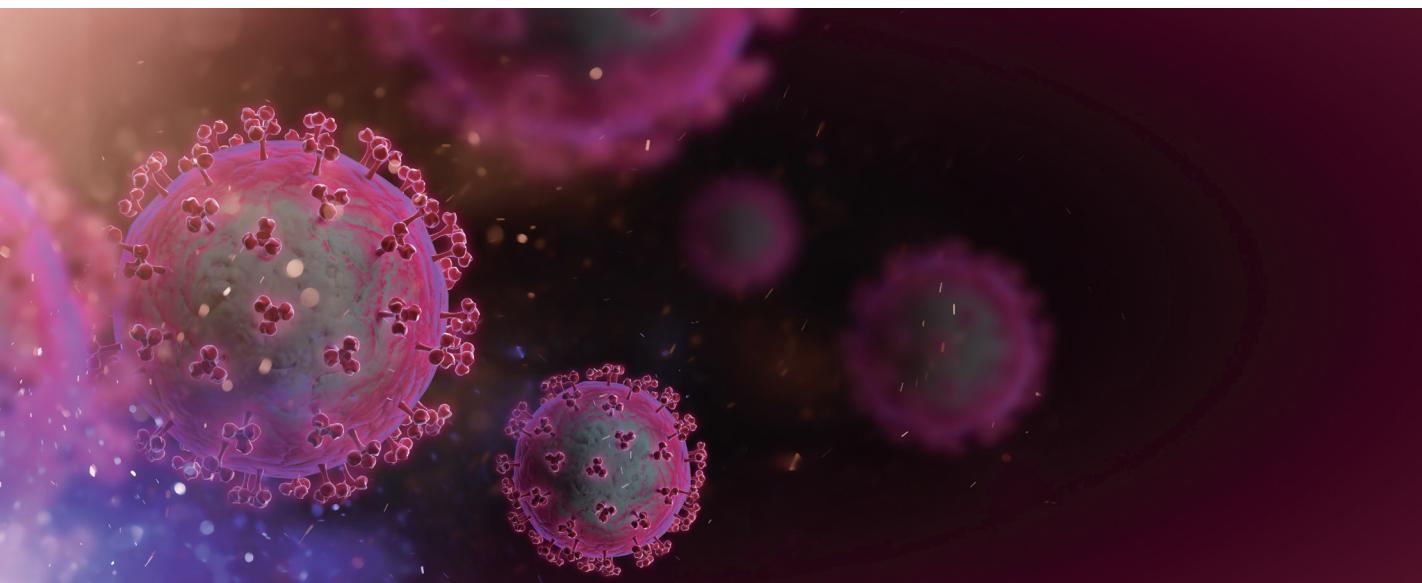
By Kristin Cho

Havergal College

Since the rise of coronavirus, scientists' greatest fear was the possibility that the virus would go through inevitable evolution in its life cycle-learning to adapt and find better ways to enter into the human body. The new variant found in U.K. last December, was only the first of multiple variants that are now circulating worldwide. As of January 29th, a total of

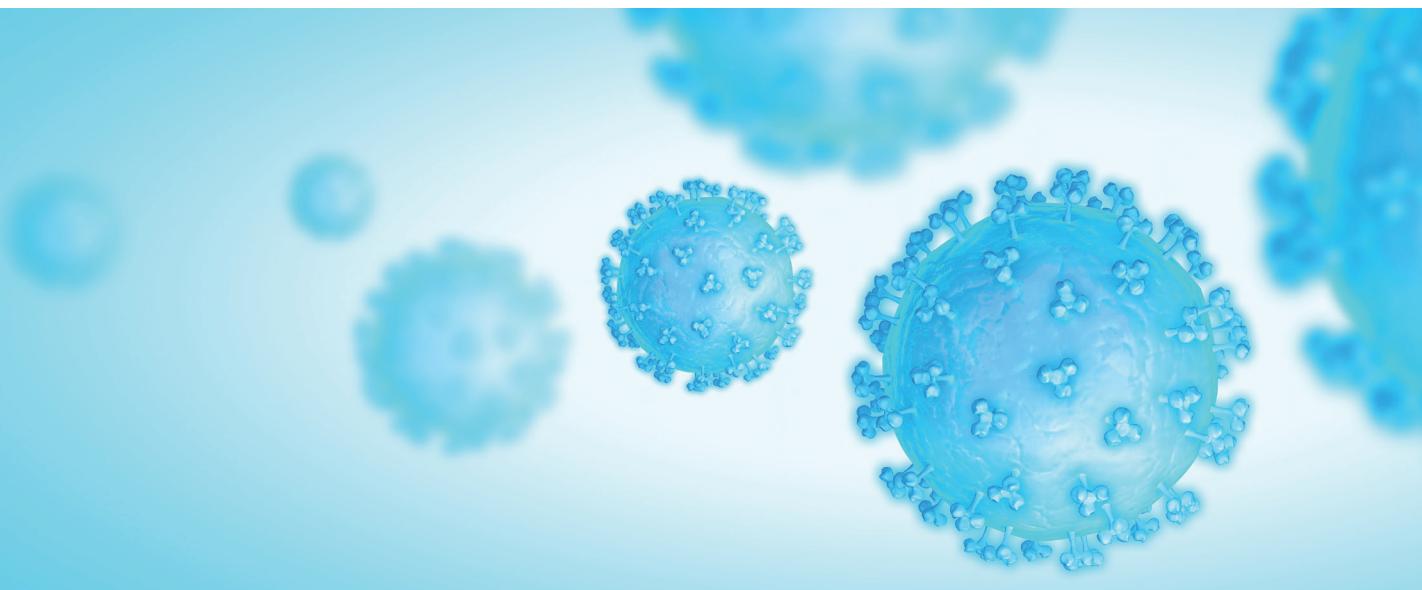
51 cases have been confirmed in Ontario, and evidence shows that the variant could be up to 56% more transmissible than the original virus. Under higher risks of getting the virus, how will we have to prepare to mitigate the worse possible impacts of the changed dynamics of the pandemic?

Dr. Patrick Soon-Shiong, the Executive



Chairman for Los Angeles Times, states that the virus has protein on its surface with a receptor binding domain that hits the human body: this part is going through mutation. As the virus mutates, the antibodies will not recognize and neutralize the mutated variants, thus making it easier for the virus to attack cells. The virus, an intelligent machine with the ability to penetrate further into our internal systems, has figured out to latch on stronger and increase speed and infectivity. As these variants appear to transmit more readily and evade the immune system, scientists are working to learn how variants differ and how the variants would affect vaccination and testing. Dr. Adalsteinn Brown stated that "The new [variants] will likely be the dominant version of the virus by March [2021]." What scientists most fear now is that the virus will mutate to the point that it will bypass the ability of tests to detect it. These variants which cannot be mitigated by current vaccines, through natural selection, will have more opportunity to replicate and overtake more people.

Virus mutation as a natural process is difficult to predict and even harder to prevent with the human aspects of the pandemic. Social and cultural influences on behavior, decision-making, and stress and coping are exhibited well in many ways. For example, the value



of expressing oneself (through hugging, direct argumentation, etc.) is a reason why interpersonal transmission is more likely in independent cultures. In addition, the need for tighter reinforcements is needed for cultures that prioritize freedom. Although Canada's society is based on collectivist values, it also has been profoundly impacted by many individualist principles built in.

Despite Dr. Bonnie Henry being 'confident' that variant transmission isn't widespread and the fact that the Canadian government is taking immediate and decisive action, including mandatory testing of incoming international travelers and providing additional layers of protection, citizens must not lower their guard. High rates of infection lead to higher risk that new and more harmful variants will emerge. As lockdowns come to an end and in person learning starts to open once again in Canada, stronger regulations are important. For the new, stronger variants, will our preparations be enough?

Kristin Cho

Havergal College, 10



Works Cited

- Bavel, J., Baicker, K., Boggio, P., Capraro, V., Cichocka, A., Cikara, M., . . . Willer, R. (2020, April 30). Using social and behavioural science to support COVID-19 pandemic response. Retrieved January 30, 2021, from <https://www.nature.com/articles/s41562-020-0884-z>
- Davidson, S. (2021, January 28). Highly-contagious U.K. COVID-19 variant will likely be dominant strain in Ontario by MARCH, Modelling suggests. Retrieved January 30, 2021, from <https://toronto.ctvnews.ca/highly-contagious-u-k-covid-19-variant-will-likely-be-dominant-strain-in-ontario-by-march-modelling-suggests-1.5285610>
- Herhalt, C. (2021, January 28). Highly-contagious UK COVID-19 variant will become dominant in Ontario by March. Retrieved January 30, 2021, from <https://www.cp24.com/news/highly-contagious-uk-covid-19-variant-will-become-dominant-in-ontario-by-march-1.5286476>
- Pelley, L. (2021, January 19). Scientists racing to understand new COVID-19 variants and whether they will Derail vaccination EFFORTS | CBC News. Retrieved January 30, 2021, from <https://www.cbc.ca/news/health/virus-variants-vaccination-scientists-1.5878145>
- Salle de presse de l'Ontario. (2021, January 29). Retrieved January 30, 2021, from <https://news.ontario.ca/en/release/60176/ontario-takes-immediate-action-to-stop-the-spread-of-covid-19-variants-1>
- The science behind the coronavirus, series iii: Mutations. (2021, January 20). Retrieved January 29, 2021, from <https://www.latimes.com/science/jltxz3shsze-123>
- Toy, S. (2021, January 28). New covid-19 strains: What scientists know about coronavirus variants. Retrieved January 30, 2021, from <https://www.wsj.com/articles/new-covid-19-strains-what-scientists-know-about-coronavirus-variants-11609466017>

자문위원

재무/경영 박진관, 고려대학교 재무금융학과 교수

Bryan Song, Bank of America 대표

김상일, 아주대학교 경영학과 교수

법학 이주서, 배김리 합동법률사무소 변호사

William Y Kim, Managing Partner, Ropes&Gray LLP. Korea Office

공학 여준한, Applied Materials, Product Line Management, Ph. D

이명훈, 한양대학교 도시대학원 교수

홍경구, 단국대학교 건축학과 교수

의학 고재성, 서울대학교 의과대학 소아과 교수

김충종, 이화여자대학교 간염내과 교수

이경태, 이경태정형외과 원장

언론 최우석, 조선일보 편집국 미래기획부 편집위원

Wu Nan, Founder and Editor in Chief of All Tech Asia

예술 안현경, 성균관대학교 겸임교수 및 학예사

체육 허진무, 연세대학교 스포츠응용산업학과 교수

PERSPECTIVE Dux vol.9

초판 1쇄 인쇄 2021년 04월 09일

초판 1쇄 발행 2021년 04월 19일

지은이 DUX

펴낸이 김지홍

편집 김지홍

디자인 이미리

펴낸곳 도서출판 북트리

주소 서울시 금천구 서부샛길 606 30층

등록 2016년 10월 24일 제2016-000071호

전화 0505-300-3158 | 팩스 0303-3445-3158

이메일 booktree11@naver.com

홈페이지 <http://blog.naver.com/booktree77>

값 12,000원

ISBN 979-11-6467-071-0 03810

• 이 책은 저작권법에 따라 보호를 받는 저작물이므로 무단전재 및 복제를 금지합니다.

• 이 책 내용의 전부 및 일부를 이용하려면 저작권자와 도서출판 북트리의 서면동의를 받아야 합니다.

• 잘못된 책은 구입하신 서점에서 바꾸어 드립니다.