

Chaos 2017



Drawing by: Teena Thomas, '17

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The Pros and Cons *of Veganism*

For many, veganism is a drastic shift that alters the lifestyles and diets of individuals and families. The decision to go vegan, to cut all meat and animal byproduct out of one's diet, can be very easy, or very difficult. There are many positives and negatives to suddenly altering your diet in such a major way. Veganism is a very controversial subject as of late, with many people both avidly supporting it and opposing it.

Pros:

To some, veganism is a no-brainer. For both health reasons and animals rights concerns, veganism seems like a straightforward solution to the problems. By cutting these animal products out of a diet, an overall healthier lifestyle can be achieved. According to nutritionist Jackie Keller, people with Type 2 diabetes who have adopted a vegan diet have experienced an LDL (Low Density Lipoprotein) cholesterol decrease

by about 21% (Bhide). In addition, veganism generally means that the intake of vegetables and fruits increases, and these foods contain high amounts of antioxidants, which are used to fight illness and maintain a healthy immune system. Those who consume a more plant based diet are less prone to heart disease, stroke, diabetes, and even cancer (Vegan Diets). It is also more beneficial to be vegan and not vegetarian because cutting meats out of your diet will not significantly lower saturated fat levels, because of the maintained consumption of milk, eggs, and cheese. Therefore, cutting all animals and animal products out of your diet would allow for the most effective betterment of overall health.

Cons:

On the other side of the spectrum, there are many people who are against veganism based on the effects and their own specific health limitations. Because



By: Ailis Daly, '18

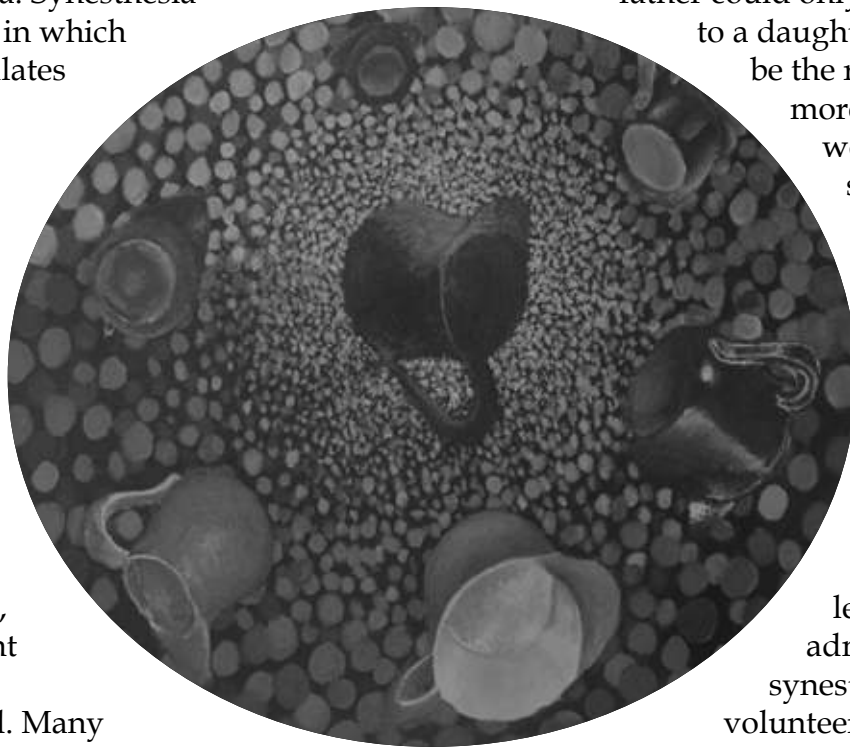
going vegan is such a radical shift, it can disrupt the way that the stomach and digestive tract reacts with some substances that are foreign or new, such as soy. In addition, it has been found that those who are vegan tend to receive less essential nutrients from their diet, such as vitamin B12 and calcium (Bhide). Many in opposition also argue that our ancestors have consumed meat for centuries and were meant to eat protein in this way, and that as long as meat is not processed to be harmful, it is perfectly safe and healthy for human consumption (Gunnars). Especially for those with pre-existing medical conditions, veganism can interfere and make living with the condition or illness much more difficult. For example, people with osteoporosis need a steady intake of calcium to maintain healthy and strong bones to prevent breakage. Many vegan diets would not provide for a large enough intake of calcium to tend to the needs of an individual with osteoporosis. This could result in increased suffering for

the person who isn't intaking the nutrients necessary to lessen the symptoms of their condition. For some, veganism is not the answer, and would cause more harm than good to their body, regardless of animal rights concerns.

For anyone considering a vegan diet, each individual person is different in their medical history and dietary restrictions. Ultimately, going vegan should be a decision based off of research and immense consideration, and should not be on a whim. Everyone has the right to choose whatever diet they feel is best for their health, and should not feel pressure from either side. Veganism has many benefits as well as many negatives; for some, veganism is not an option, and for others, it is the only option. Either way, people have to choose the diet that is most beneficial to them, be it veganism or otherwise.

Synesthesia

Some people are able to taste colors or see sounds. People who experience this phenomenon are called synesthetes and they have synesthesia. Synesthesia is the condition in which one sense stimulates another sense involuntarily. It can be experienced with a combination of any of the senses. There are many forms of synesthesia, but the most common is colored hearing, where one might see color when hearing a sound. Many synesthetes experience more than one form of synesthesia. Studies have shown that many people who have synesthesia are related to another synesthete, typically a female. Some research has shown that synesthesia is inherited through the X chromosome. Women have




two X chromosomes while men only have one, which means that a mother could pass the condition to a son and a daughter, but a father could only pass it down to a daughter. This may

be the reason it is more prominent in women. However, some research suggests the idea that synesthesia could be just as common in men than women. A reason for this is that men could be less likely to admit they have synesthesia and to volunteer for testing.

Since it has been said that synesthesia may be inherited by the X chromosome, it could be a genetic condition. However, not everybody in a family may obtain synesthesia.

The origin of synesthesia and the reason it occurs in some people is uncertain.



By: Angeline Castillo, '20

However, there are many theories that researchers have developed. For example, Daphne Maurer, a psychologist at McMaster University, believes that everybody is born with the connections coded for synesthesia, but most people eventually lose those connections. Researchers believe that synesthetes have more neural connections than people without the condition.

Synesthesia can be tested using positron-emission tomography (PET scan) and functional magnetic resonance imaging (fMRI). PET scans use a radioactive drug to show how tissues and organs function in the body. An fMRI measures the metabolic changes in the brain. It uses a strong magnetic field, radio frequency pulses, as well as a computer to show changes that cannot be identified with other tools. For example, in synesthetes with colored hearing, certain areas in the brain have increased activation when listening to a sound, which, does not occur in those who do have synesthesia.

Although to most, tasting colors and seeing sounds seems cool, synesthesia comes at some costs. It can be uncomfortable for some synesthetes when a word, letter, or number is printed in a different color than they associate it with. Since it is a rare

condition, it may be perceived as absurd to some people and can make a synesthete feel out of place. However, most people with synesthesia wouldn't want to get rid of their condition because of its rarity. Most consider it a gift since it allows them to more easily memorize information and some studies even show a higher amount of creativity in those with synesthesia. People with synesthesia are able to experience something everyday that many may not experience at any point in their life.

Synesthesia is a condition that some people are happy to have, but others may view it as a curse. Either way, it is a unique condition that is more commonly seen in women and is developed and recognized at an early age. Not everybody who has synesthesia sees things the same. For example, one synesthete could associate the letter F with red, while another synesthete would associate F with blue. Although it is rare to come across someone with synesthesia, people who do have it are able to see the world in a different way than anyone else.

Cups painting by: Mona Tong '18
Header painting by: Celestine Castillo '18

Introversion

VS.

Extroversion

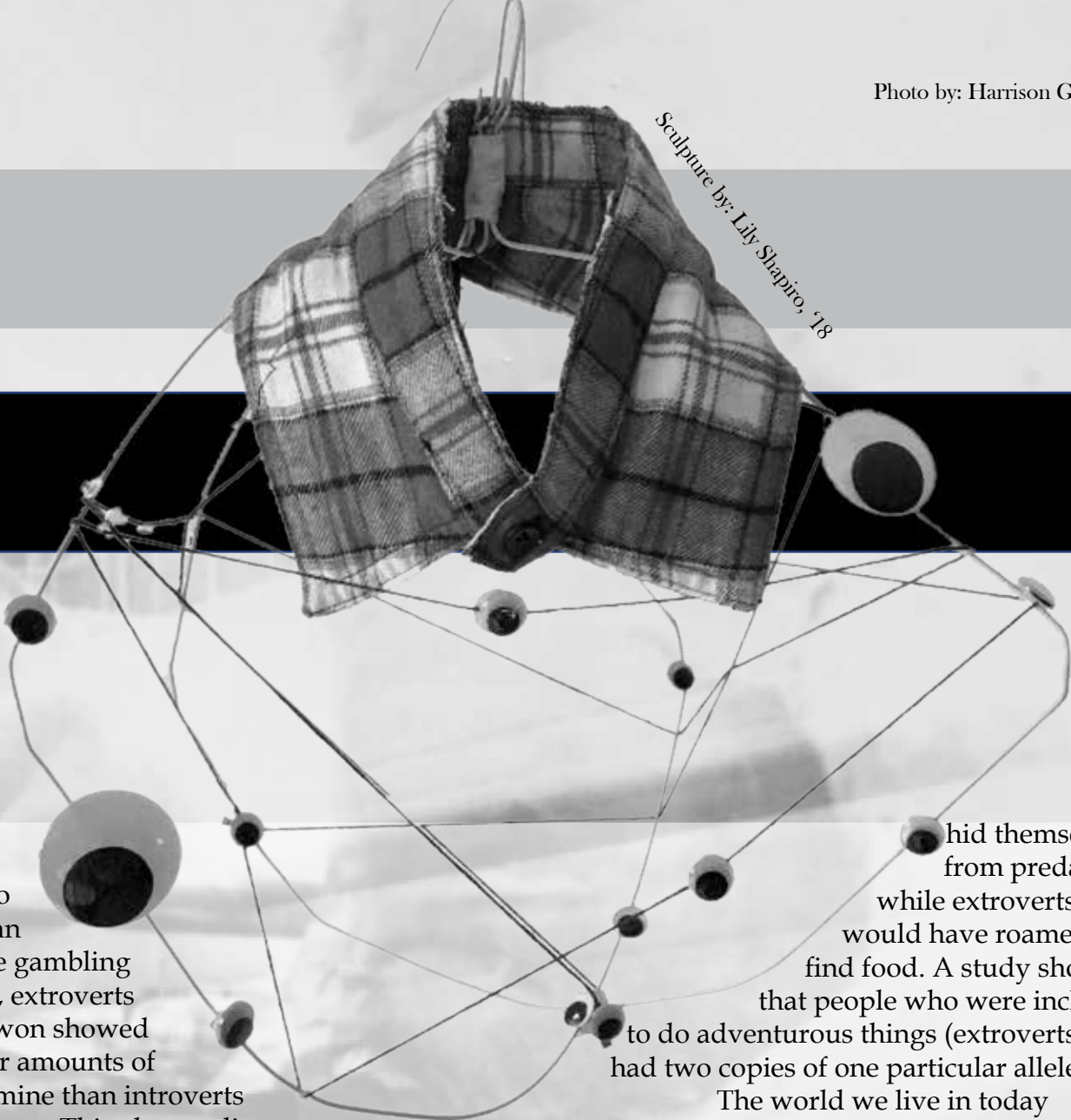
By: Celestine Castillo, '18

Most people can be placed on a spectrum according to how much it takes to satisfy them. According to scientist Hans Eysenck, extroverts are people who need to do more exciting or extreme things to feel satisfied while introverts do not need as much to be happy. This can explain why some people would rather spend time at parties with other people while some would rather stay home and read a book.

Looking into the chemistry and makeup of the brain of the two different minds, there are a few marked differences. The prefrontal cortex tends to be bigger in introverts, which can be linked to deeper thinking and planning, but is more susceptible to anxiety and depression. On the other hand, extroverts tend to be more impulsive and decisive. In terms of the reward system in the brain, the brain releases more dopamine in extroverts. According to an experiment where the subjects

Photo by
Alexis Morgan '17

Sculpture by: Lily Shapiro, '18



were told to play an online gambling game, extroverts who won showed higher amounts of dopamine than introverts who won. This also applies to how extroverts respond to human contact - they release more dopamine. This can explain why extroverts are often perceived to be more social than introverts. Extroverts have a lower level baseline arousal, which means it takes much more for them to be mentally and physically satisfied, while introverts have a high level of baseline arousal which means they are usually mostly content and require less to satisfy themselves. There is evidence that these traits are linked to genetics. Introverts in the early human species may have

hid themselves from predators, while extroverts would have roamed to find food. A study showed that people who were inclined to do adventurous things (extroverts) had two copies of one particular allele.

The world we live in today tends to value extroverts more than introverts. Introverts are often perceived as awkward and antisocial, when in reality they are just more easily satisfied. Extroverts are usually perceived as more friendly, approachable, and confident, all of which are highly valued traits in society. The ability to work in groups is another praised activity that is more easily achieved by extroverts. In many situations, including applying or interviewing for a job, traits more easily shown by extroverts are preferred by the employer. In any case, neither personality is "better" per say, only different.



Why are Teens *More Likely* to Take Risks?

By: Corinne Cunillera, '18

Photo by: Aleyah Aragon, '17

Teenagers are notoriously rebellious, often seeking out thrills that may be dangerous, or acting nonchalantly toward their own safety. Sometimes, teenagers act on such impulse that it may prompt many worried and frustrated parents to ask, "Do teenagers even have brains?" The answer is yes, of course teenagers have brains; they are just wired differently than that of a fully developed adult. Neuroscientists have proved that the teenage brain, teenage being 13 to 17 years of age, are structurally less developed than adult brains. Research from the National Institutes of Health has shown that the prefrontal cortex, a region of the brain associated

with inhibition of risky behavior, doesn't get fully developed until age 25. This means that while teenagers have the same ability to recognize risk as adults, they are simply more drawn to risky-behavior because they lack the brain development that helps them decide to not partake in it. In addition to a

not fully-developed prefrontal cortex, the brain experiences many changing hormones throughout the teenage years, making teenagers more susceptible to heightened emotions, like the feeling of being invincible. For this reason, "teenagers have the double the risk of dying compared to their preteen selves," according to Agnieszka Tymula, a postdoctoral student at New York University.

Teenagers are attracted to risky behavior all on their own, but what makes them so much more likely to take risks when they are around friends? Research shows that teens are more sensitive to rewards than adults are, and when teenagers believe that they will reap some kind of reward for performing a risky stunt, they are more likely to do it. Laurence Steinberg, author and professor of psychology at Temple University has found that when teenagers are surrounded by their peers, the reward system in the brain is triggered, explaining why teens often give into peer pressure. The teenage brain perceives this risky behavior as a chance to receive a reward, that reward often times being acceptance or praise from peers. In short, a teenage brain's desire for reward outweighs a person's "better judgment." Additionally, there is an evolutionary explanation for why teens are more likely to take risks. In most mammals, once adolescence is reached, individuals leave the family and go off into the wilderness on their own. It is innate sensation-seeking that leads pubescent creatures to go find sexual partners and a social structure outside the home environment, and humans are no exception. So the next time you, a teenager, or a teenager that you care about does something risky, remind them to be safe, but also be forgiving: they can't really help it.

Photo by: Daniel Gendy, '19

The Advancement of Holograms

By: Gregory Chang, '18

What makes holograms so unique? A hologram is a three-dimensional image created from light. Holography uses laser lights to record the patterns of light waves reflected from an object onto the emulsion of light sensitive film. When projected, the film shows the object with all its original features, characteristics, and dimensions. These holograms can only be seen and not felt. However, these holograms can lead to a new advancement of technology such as those portrayed in movies and video games. The classic superhero movie "Iron Man" demonstrates a fantastic use of holograms. Tony Stark, or "Iron Man", uses holograms to build, redesign, and fix his robotic suits. Not only is he able to touch and see the holograms, but he is also able to zoom in and out on certain parts of the object depicted in the hologram. Furthermore, the ability to view objects in three dimensions while still being able to view it microscopically can lead to new studies and theories.

Most researchers and scientists use microscopes to view microscopic objects. However, the flaw in using microscopes

is that you don't know the true shape and all of the features or characteristics that the entire object represents. Experimenting with an electron microscope to improve the resolution, Dennis Gabor, a British scientist, created the theory of holography. With advanced holograms, scientists would be able to make new discoveries about diseases, which can eventually lead to cures. For example, Elchanan Bruckheimer, RealView's medical director, adopted a system that allows his surgeons to use holograms in the medical field. This system features holograms that depict an actual procedure going on for others to see and help. As described by Dr. Bruckheimer, "what that does is that gives you the patient's anatomy, the real patient's anatomy in a position where it's hyper realistic, you can see all of it, you can intuitively know where you are or what's going on inside that anatomy in real time. So you can use that to guide procedures, you can use that to understand better the anatomy that you want to deal with. So I think that because we deal with 3D patients, having their 3D imaging in 3D,



or 4D because it works with real time, is a great advantage because we can see what's happening with the anatomy while we're doing the actual procedure." Therefore, this system of using holograms will increase the survival rate of people with both internal and external problems because of its ability to allow people to literally see what is happening to that patient.

Ultimately, holograms are a futuristic way to view objects in three dimensions. Researchers such as Dennis Gaber and Emmett Leith have created holograms that are able to see, but not feel or touch. Over time, however, science has finally figured out a way to feel holograms. Researchers created a new method of holograms that uses ultrasound, which creates 3D haptic shapes in mid-air that can be seen and felt. With some time, researchers will find a way to zoom in and out of objects depicted in the holograms, just like in "Iron Man". People today will just have to wait for these futuristic holograms, but can play with the ones available to them now.



Drawing by: Brittney Hahn, '18

Journey to Mars

By: Jessica Luu, '20



Sculpture by: Olivia Hernandez, '18

Mars: our solar system's fellow red planet. It has been 41 years since our first probe successfully landed on Mars. How long until we send our first humans on a mission to Mars? It may be sooner than you think. NASA is planning to send the first people to an asteroid by 2025, and the first to orbit Mars in the early 2030s, provided that they are able to acquire the right technology, enough money, and decide what they deem a reasonable risk. The steps leading up to the journey consists of three stages: Earth Reliant,

Proving Ground and Earth Independent.

At this point, NASA is still in the "Earth Reliant" stage of the journey to Mars, which is expected to continue until the mid 2020s. In Earth Reliant exploration, NASA will concentrate on the operation of the International Space Station through 2024. In this time, astronauts aboard will study how to live and work in space and also how living in space for extended periods of time will affect the body. The development of commercial low-earth orbit, deep space,

and life support systems is occurring at this point. A communications system for deep space is being established upon the space station, and NASA is working with their commercial crew and cargo partners to allow low-earth orbit, and motivate new economic activity so NASA can sustain their usage of the station. Because the astronauts are living on the space station, they will learn more about how the body changes, as mentioned, and how to protect their health using life support systems.

The next part of the journey is "Proving Ground", which will take place from 2018 to 2030, and will include a series of missions near the moon; or "cislunar space", as NASA calls it. Cislunar space takes a few days to travel to, as compared to the space station, which is only a few hours away from earth. Mars is a few months away from earth, so living in cislunar space is a stage of progress in the journey. There, astronauts will be sent on space walks and will also be sent on a yearlong mission to test habitation & readiness for Mars. Additionally, the Asteroid Redirect Mission will be taking place in this stage, in which a robotic vessel will be sent to redirect the orbit of an asteroid to the moon, where people will be sent to the asteroid to take samples. This mission will test a new system called Solar Electric Propulsion needed to send cargo on the mission to Mars, and human operations as well.

The final phase, "Earth Independent", will continue through 2030 and beyond, and will use the knowledge attained from the previous research. NASA will be analyzing the entry, descent, and landing methods necessary to travel to Mars. Some missions are already in the Earth Independent phase, including a new rover to launch in 2020. The Mars

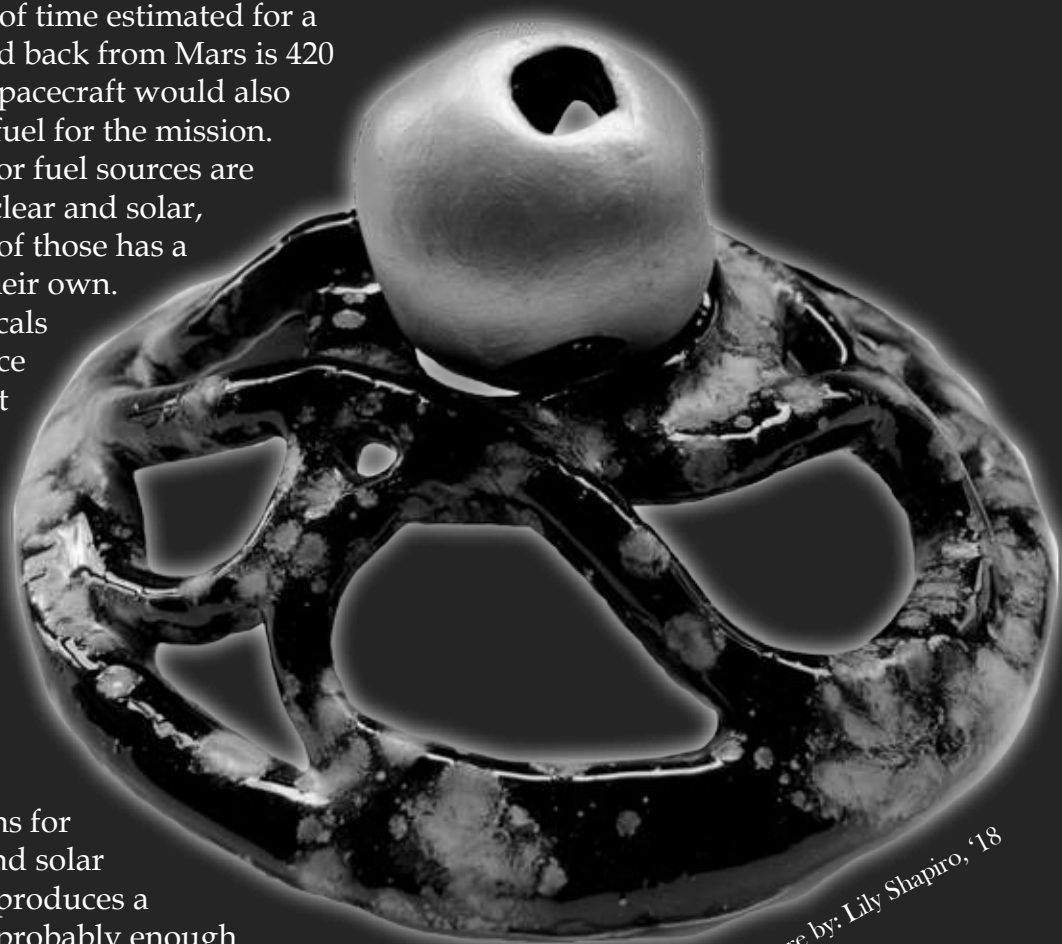
2020 Rover will be similar to living beings, with parts that are able to keep it "alive". It has a neck and head, which is a mast with cameras that allows the rover to see like humans, a body, which protects its "vital organs", and arms and hands, which allow the rover to collect rock samples to be studied. "Legs" and wheels permit the rover to move around, and it's brains are a set of computers. The rover's prospective mission will be to carry out a round trip and take samples. Lastly, humans will be sent to orbit Mars in the early 2030s.

Even though the journey to Mars is scheduled to take place in the early 2030s, many factors have to be taken into account before the mission is finalized. Some challenges that have been posed for the journey are zero gravity, radiation, and supplies, and even more problems will arise once the astronauts arrive there. Being in zero gravity for an extended amount of time can have a dramatic effect of the human body, including bones and muscles. One's muscles become weak after a long time in zero gravity, and bones will waste away in the form of about one percent of bone mass per month. Vision impairment has also been reported by astronauts, because of the fluid which collects in their brain and presses on to their eyeballs. Here on Earth and on the space station, we are shielded from the solar flares and cosmic rays, but on a mission to Mars, astronauts would be exposed to these radiation waves, which can damage DNA and brain cells. This would not be ideal for the astronauts, as they could arrive on Mars with brittle bones which could break easily, blurry vision, and decreased intellect due to brain damage.

A lack of resources in outer space pose an issue as well. Water and air are

resources not easily obtainable out in space. Water is usually recycled from urine and sweat through filtering, and the filtered water can get contaminated by microbes. Filters can get clogged by calcium as well, which come from the bones of astronauts. The rate at which calcium is absorbed from bones in increased in space, which leads to a bone mass loss of 10 times that of osteoporosis, a disease which makes bones weak. The calcium is then excreted through urination, which clogs the filters. Limited space and the fuel resources would also be a problem. The shuttle would need enough space to allow the astronauts to live comfortably together for a long period of time. The total amount of time estimated for a journey to and back from Mars is 420 days, so the spacecraft would also need a lot of fuel for the mission. Possibilities for fuel sources are chemical, nuclear and solar, but each one of those has a problem of their own. Using chemicals as a fuel source would at least be needed for takeoff, but it is inefficient. Nuclear fuel would be efficient, but having a reactor on a spaceship raises concerns for astronauts, and solar energy only produces a weak thrust, probably enough for a slow cargo ship.

When the astronauts arrive on Mars, some of the problems they will have to face are dangers to their health, as discussed, and a lack of resources. Mars has a thin atmosphere, which will not protect the astronauts. We don't know what resources are out there, other than an abundance of rocks and ice that isn't useful unless thawed, and there is not as much oxygen on Mars as there is on Earth. Most of the resources will have to be sent in another craft ahead of the crew that's headed for Mars. The journey to Mars will give us more insight on the universe. It will be a rigorous one, but many believe that if we can achieve this, we can achieve anything.



Sculpture by: Lily Shapiro, '18

“A Feeling in My Gut”

By: Lior Zweig, '18

The human brain is notoriously the most complex part of the human body. It serves as the center of your nervous system, sending out billions of electrical signals every moment to control your mood, speech, and thoughts. What if there was another part of you that could control your mood levels, your anxiety, and your depression? What if it was a part of you that you could actively control and maintain?

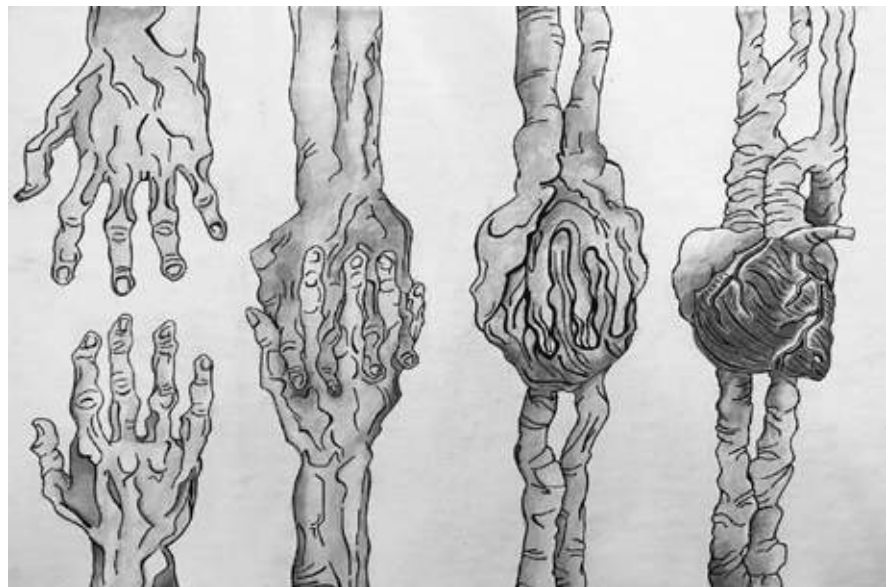
The vagus nerve connects the human brain to the heart, lungs, and gut. This nerve is related to your fight or flight mechanism—the knot in your stomach that many people get when they are upset. This is because roughly 80% of nerve signals go from the digestive tract to the brain, telling us how to feel or what to think. Around 90% of human cells are bacterial, outnumbering human genes, 99 to 1. This bacteria was acquired overtime based on factors such as the human diet, a mother’s vaginal microbes, and even kisses from a family member.

In a study led by John Cryan, a neuroscientist at University of Cork in Ireland, it was concluded that anxious mice dosed with the probiotic bacterium *Lactobacillus rhamnosus* (JB-1) revealed lower anxiety, decreased cortisol and other stress hormones. The mice also exhibited an increase in brain receptors for neurotransmitters known for curbing negative feelings such as fear and anxiety.

A study in 2011 from McMaster University tested the behaviors of normal 8 week old mice compared to 8 week old

mice stripped of their gut microbiomes. Those not containing bacteria illustrated higher cortisol (stress) and depression rates, altering the level of BDNF in the brain, which plays a large role in mood regulation. Researchers from McMaster University also transplanted microbiomes from groups of timid mice with groups of outgoing mice. The outgoing mice became more timid when stripped of their normal bacteria, and vice versa.

The nerves that line the digestive tract from the esophagus to the anus, called the enteric nervous system, do not even require the brain at all, because when the vagus nerve is broken, the enteric nervous system can still continue digestion due to the complexity of its neurons. The gut and the brain are connected for a time back when humans needed to know what kind of food to eat in order to detect what is most beneficial for survival, as it tells the brain to release dopamine when we eat palatable foods high in fats/sugars. The microbes in your gut however, produce 50% of your dopamine and 90% of your serotonin, causing that familiar “feeling in your gut.”



Drawing by: Teena Thomas, '17

What is Addiction?

By: Maya Reddy, '18

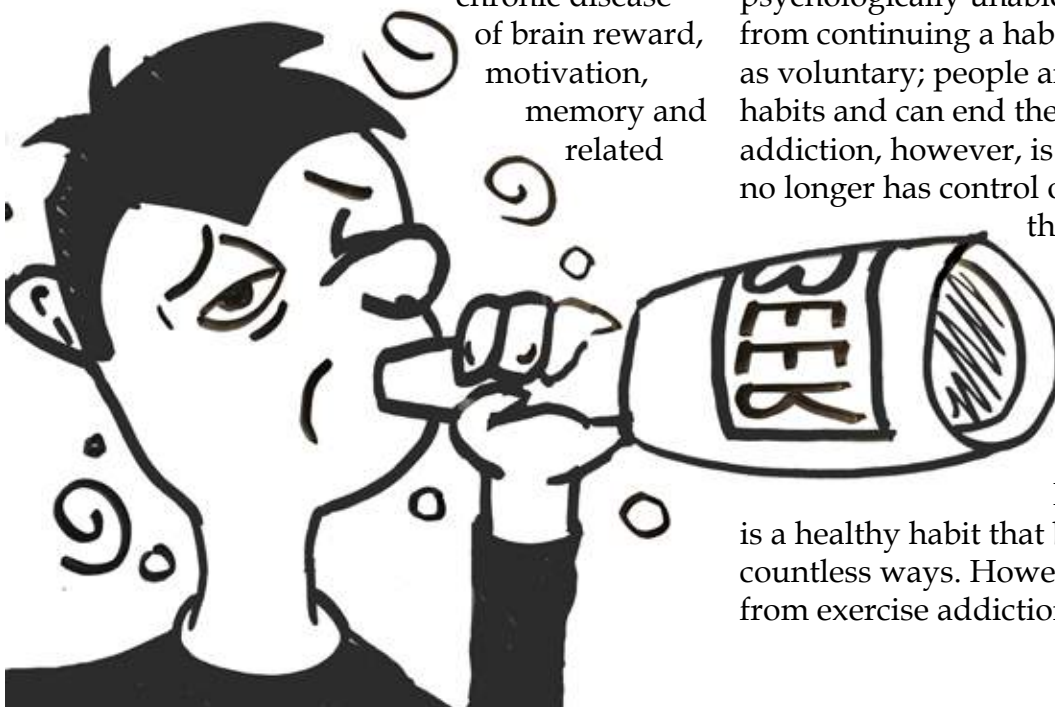
Whether it be nicotine, alcohol, gambling, shopping or even binge-eating, all addictions develop due to the existence of similar psychological conditions. According to the American Society of Addiction Medicine, addiction is broadly defined as a “primary, chronic disease

of brain reward, motivation, memory and related

circuitry that lead to characteristic biological, psychological, social and spiritual manifestations.” This is reflected in an individual consistently craving relief by substance use and other behaviors. Addictions develop when a person becomes psychologically unable to stop themselves from continuing a habit. Habits always begin as voluntary; people are in control of their habits and can end them at any time. An addiction, however, is when an individual no longer has control over a habit due to the mental and physical dependencies that have developed.

Routine habits do not always impact an individual’s health adversely.

For example, exercise is a healthy habit that benefits the body in countless ways. However, those who suffer from exercise addictions put themselves



Drawing by: Hannah Kim, '18



Drawing by: Danielle Russo, '18

in danger, as their compulsive need to exercise continues despite the dangerous and potentially fatal consequences to their bodies, such as severe injury and heart problems. Individuals suffering from addictions often seek the pleasure that the brain experiences in regard to a specific action. For example, those with exercise addictions become hooked on the positive way endorphins make them feel, just as substances such as alcohol and drugs can cause chemical changes within neurons that release a euphoric and pleasant feeling. Neurons release neurotransmitters into the synapses between nerve cells, which are received by receptors in other neurons. Eventually, those aware of their addiction no longer desire the substance or action that brought them pleasure, but they are unable to live without it because of the grueling process of withdrawal. As receptors in the brain get used to external chemicals brought in by addictive behavior, the natural production of those chemicals in the body decreases, making

an individual unable to function and feel as well as they once did before developing an addiction. In many cases of substance abuse, withdrawal can cause more suffering than the substance itself. Patients addicted to depressants may experience hallucinations, anxiety, seizures and, in extreme cases, delirium, while those addicted to stimulants may undergo depression, fatigue, and lack of enthusiasm. Symptoms of physical withdrawal are most evident in substance abuse cases.

Addiction is a disease that can turn a person's life upside down in every aspect; physically, psychologically, socially and financially. An illness that affects the brain, it requires more than medicine to treat. For example, psychotherapy, support groups, rehabilitation centers, extreme willpower, and determination are additionally required to overcome one's debilitating addiction.

Sequence Skill Learning & Automaticity: Stutterers vs. Nonstutterers

review of literature

By: Mona Tong, '18

Recent literature on stuttering focuses on analyzing the differences between stutterers (PWS) and nonstutterers (PNS) in automaticity levels, to show whether or not PWS have a sequence learning deficit. Skill learning refers to the continuing process of improvement in practiced performance; since it cannot be directly observed, it must be inferred by measuring variable changes. For example, increased automaticity over practice is a crucial indicator of effective skill learning. Automaticity is the amount of attention required for task performance; well-

practiced tasks are typically performed with higher levels of automaticity, since relatively less attentional resources are needed for the execution of the task, and can be directed elsewhere.

According to Smits-Bandstra, De Nil & Rochon (2006), PWS had more difficulty transitioning to increased automaticity during finger tapping tasks than PNS. Increased automaticity is characterized by quicker, less variable performance with less attention required. In analyzing single-task finger tapping reaction times (RT), PWS performance curves were much shallower than PNS curves, indicating that PNS improved their RTs more rapidly over practice than PWS. PWS also had shallower variability performance curves than PNS especially during the single task condition, showing PWS had a higher degree of variability over practice than PNS, and thus perhaps inefficient automatization and motor learning. While PNS showed substantial improvement in single-tasks, PWS showed shallower improvement in dual-tasks, or, when they were asked to perform two tasks simultaneously. Meanwhile, PWS showed shallow improvement across both single and dual task conditions, proving that even single-tasks for PWS required the same amount of

Drawing by: Teena Thomas, '17



attentional resources normally reserved for dual tasks in PNS, which suggests a blatant automaticity and thus, skill learning, deficit in PWS. In addition, according to a similar study measuring syllable reading tasks by Smits-Bandstra & De Nil (2009), PWS were more susceptible to dual-task interference effects than PNS, even after practice. Interference effects are present in dual-tasks, in which simultaneous, competing tasks cause delays in mental processing, in this case, measured in reaction time (RT). Whereas PNS decreased their RT and thus their dual-task interference effects over practice, PWS's RTs were consistently slow across both single and dual task conditions, so therefore PWS were still susceptible to interference even after practice. These results further prove that PWS are unable to transition to a more relatively efficient, automated mode of speech, in comparison to PNS.

Another study conducted by Smits-Bandstra & De Nil (2013) came to similar conclusions as the previous two studies, in the context of early-stage chunking, which is defined as the immediate tendency to organize a long sequence into shorter components. After chunking, performance should become more automatic and immune to interference. There are two independent chunking processes: INT, which is responsible for automatization of/retrieval of chunks from memory and can be inferred from reduced within-chunk intervals (WCI), and SEQ, which can be inferred from between movement chunks (BCI). It was found that PWS had longer WCIs than PNS, suggesting their INT processes have more difficulty retrieving/developing automatized motor plans from memory, forcing them to rely on consciously-controlled SEQ processing, rather than shifting to more automatized



INT processing circuits. This causes PWS to take longer/use more attentional resources to automatize sequence elements, and to be more susceptible to interfering tasks. Moreover, since PWS had longer RTs than PNS but the same BCI durations, the SEQ process in PWS is functional, but significantly delayed.

Thus, increased automaticity over practice, a clear indicator of successful sequence skill learning over practice, was not visible in PWS to the same extent as it was in PNS (Smits-Bandstra, De Nil, & Rochon, 2006; Smits-Bandstra & De Nil, 2009). This difference between PWS and PNS in their extent of automatization is possibly caused a difficulty of PWS's INT processes in retrieving automatized motor plans from memory, forcing PWS to rely more heavily on their consciously-controlled, functional, but significantly delayed SEQ processing (Smits-Bandstra & De Nil, 2013).



Procrastination

By: Priyanka Ramanathan, '19

Procrastination. It's something that most people, especially teenagers, know all too well. People often can not stop procrastinating. Telling us to "plan better" will not solve the problem, and is just as effective as telling a depressed person to "cheer up" So then what's the real issue, and how do we solve it?

Many times, we procrastinate because we're just "not in the mood", and we'll complete the task when the right time comes. Except clearly, as many of us have experienced, that doesn't work most of the time. Chances are if you're not interested now, you won't be later, and you will never get whatever you need to get done, done. In addition, we tend to miscalculate our time. We think that we'll have enough time to finish a task so we can afford to slack off a little. Or often, we don't always know how to tackle an assignment, so we end up putting it off and doing things we know how to do and feel comfortable

with. For example, you may have to work on your english paper, but you'd prefer to work on your math homework instead because it's your strength, while English makes you feel lost. This is the most interesting justification, as there is a theorized correlation between lack of self confidence and procrastination.

Procrastination is way to avoid facing things that you are not good at. Procrastinators may be perfectionists in disguise, as perhaps they're so afraid of failing that they avoid the task altogether. Maybe procrastination helps maintain your public image. People may be concerned about what others think or they think to harshly of themselves. A lack of confidence will lead you to put off thing you think you're bad at, even if you're good at them. It will cause you to make decisions in order to appeal to people's perception of you, rather than make logical choices. Not doing something adds to the negative thoughts that we can't do it, and

will make it difficult to rebuild confidence in that area. This is a common phenomenon and yet a paradox as well: low self-esteem leads to procrastination, but procrastinating tends to lead to lower self esteem as well. Whatever the case may be, lack of self esteem goes beyond procrastination and can lead to depression if not resolved.

Moreover, the frontal systems of the brain are involved with self-regulation, such as tasks including problem solving, or self control. These tasks fall under executive functioning, which seems to have a direct correlation to academic procrastination. The nine parts of executive functioning are impulsivity, self-monitoring, planning and organization, activity shifting, task initiation, task monitoring, emotional control, working memory, and general orderliness. Procrastinators show a link with all 9 of these. This suggests that procrastinators have subtle executive dysfunction while otherwise remaining neurologically healthy. The amygdala is another region of the brain that goes under stimulation during procrastination, as it establishes the “fight

or flight” instinct in your mind. While mainly used for survival, this instinct is also a plausible neurological explanation as to why you procrastinate. If you have work that seems to hard, or an overwhelming amount of homework, then your brain protects you from feeling doubtful and hopeless, causing you to procrastinate because you believe your work “isn’t a big deal” and can be done later. You then proceed to take up your time doing something else, anything that seems more rewarding to your brain. By doing something else that is less stressful and more enjoyable, you cause your brain to release more and more dopamine, in time making you more and more happy for short period of time before you get back to work. Dopamine is a compound present in the body as a neurotransmitter and is released when good things happen. When you procrastinate, dopamine is released as you avoid tasks that make you upset and take part in activities that make you happy. This dopamine release and the feeling it produces make you more likely to continue procrastinating, not only within the same day, but also in the future.





Procrastinators can take many measures to end the vicious cycle, however there are few that are proven to work. For one, procrastinators need to self-evaluate and come to terms with whatever fears prevent us from getting tasks done. We can provide rewards for ourselves in order to associate more positive connections with tasks we typically dislike, thereby not only boosting our productivity, but also our self-confidence. In addition, you can learn to pre-commit. If you set a time and place where you'll do your work, you're far more likely to complete your task than if you just set vague parameters. Set big goals and little goals, because it's easier to break down a big task into little pieces rather than face it all at once. Your little goals for writing that dreaded paper should be setting personal deadlines for each part of the process you need to complete. Maybe give yourself two hours for each paragraph, and reward yourself after each mini task to keep yourself engaged. Your big goal would be to complete the entire essay in two days. Remember to

give yourself enough time to reach your goals, but don't give too much time as that will encourage more procrastination. This mentioned goals and rewards system is critical in the process in order to associate more positive feelings and dopamine release with tasks you typically don't enjoy such as work and homework. You can give yourself candy for every 5 pages you read, or maybe take a quick BuzzFeed quiz if you finish your math homework. If you can motivate yourself with rewards for doing work, your brain will release more dopamine, in turn making you happier and more inclined to working rather than procrastinating.

Procrastination is scary to think about, but eventually we have to break down and evaluate how it affects us and how to stop it. It's beyond just laziness; it's something much greater. But if we break it down to its core and understand it piece by piece, we can eventually understand our behavioral response towards getting tasks done, and then get the actual work done efficiently.

When *you sleep . . .*

By: Simona Kobryn, '20

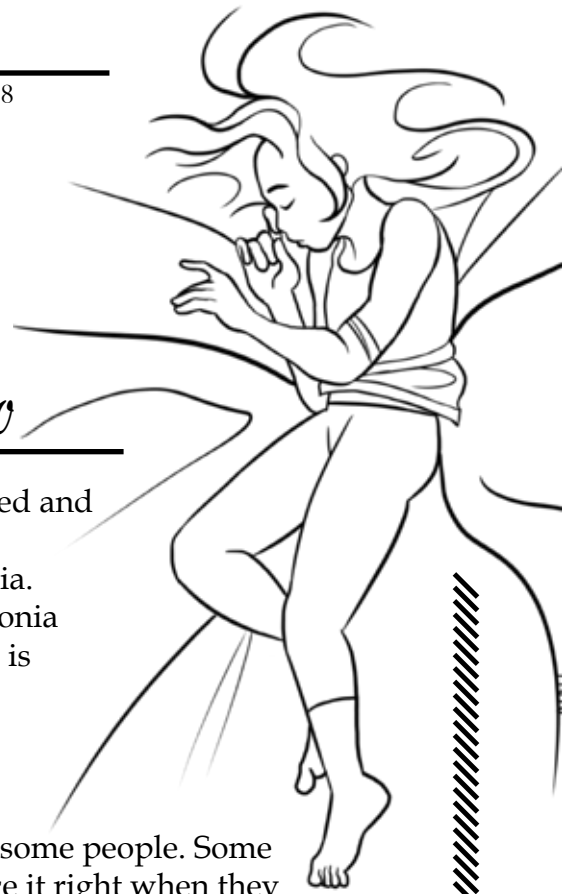
Sleep is such a desired essential in today's world that many of us don't get enough of. And frankly, many don't seem to question it. Sleep is just... sleep. However, what happens during sleep is phenomenal.

When we sleep, we enter different stages depending on where you are in your cycle. When you are in the middle of falling asleep, you enter stage one, which is simply a light sleep. After about 5-10 minutes, you enter stage two, which is a slightly heavier sleep. During stage two, you begin to become unaware of your surroundings and it is also when your body temperature drops and your heart rate begins to level. At this point your body is preparing for deep sleep. After about 60 minutes or so, you enter stages three and four. During these stages, you fall into a deep NREM sleep. REM and NREM sleep are two stages of sleep that your body can fall into. REM sleep stands for Rapid Eye Movement sleep, and NREM sleep stands for Non-Rapid Eye Movement sleep. During NREM sleep, your body goes into its deepest sleep, where you not only get the most rest, but your body grows and repairs tissues, restores energy, and releases hormones. After about 90 minutes of falling asleep, you fall into REM sleep, which then occurs after every 90 minutes. During REM sleep, your brain becomes more active, causing you to start vividly dreaming. Also, during REM, your eyes tend to dart back and forth, thus giving it the name Rapid Eye Movement sleep. Another fascinating thing that happens during REM is that our body, to prevent us from hurting ourselves, turns off our voluntary muscles and we become

completely relaxed and immobile. This is known as atonia. In some cases, atonia occurs when one is awake, causing sleep paralysis.

Sleep paralysis can be a scary thing for some people. Some people experience it right when they are falling asleep (hypnagogic or predormital sleep paralysis) or right before they wake up (hypnopompic or postdormital sleep paralysis). Those who do experience sleep paralysis are unable to move or speak for a short period of time. Not only that, but some people experience hallucinations, some of which might be horrifying. Just imagine- you wake up and you find that you are completely unable to move or speak, and then, suddenly, you see your worst fear right in front of you. Some reasons that one might experience sleep paralysis would be due to stress, lack of sleep, use of medication, substance abuse, narcolepsy, or things as simple as sleeping on your back or night-time leg cramps.

If one experiences sleep paralysis often, it can be diagnosed as a sleep disorder. But if you have experienced it only once or twice, then there is nothing to worry about; it's just another one of those crazy life experiences. It is said that every four out of ten people will experience sleep paralysis, so it is possible that you might have or will experience it - maybe even tonight!



How are Brown-headed Cowbirds and Cuckoo Birds Nest Parasites?

By: Sophie Tatar, '20

Early one morning, a cuckoo bird swoops into a bluebird's small nest as she is gone collecting worms. Upon the bluebird's return, she finds an egg that does not seem to be hers. Even though this is not her egg, she raises the egg as her own, due to the birth mother's abandonment. Cuckoo birds (*Cuculus canorus*) and other types of birds such as Brown-headed Cowbirds (*Molothrus ater*) are considered brood parasites, commonly known as nest parasites. They lay their eggs in other birds' nests, and then leave. The Cuckoo bird and the Brown-headed Cowbird "infest" as many as 220 different species of birds.

Miraculously, the host bird is able to accept the new egg as one of its own. According to an article titled, "Of Cuckoos, Cowbirds, and Other Parasitic Birds", Cuckoo birds are able to choose host species with eggs similar to their own egg shape, size and color. Also, in order to make the host accept the parasitic egg, the mother Brown-headed Cowbird pushes one of the original eggs

out of the nest. This way, the original number of eggs remains, and the host bird does not reject the parasitic egg.

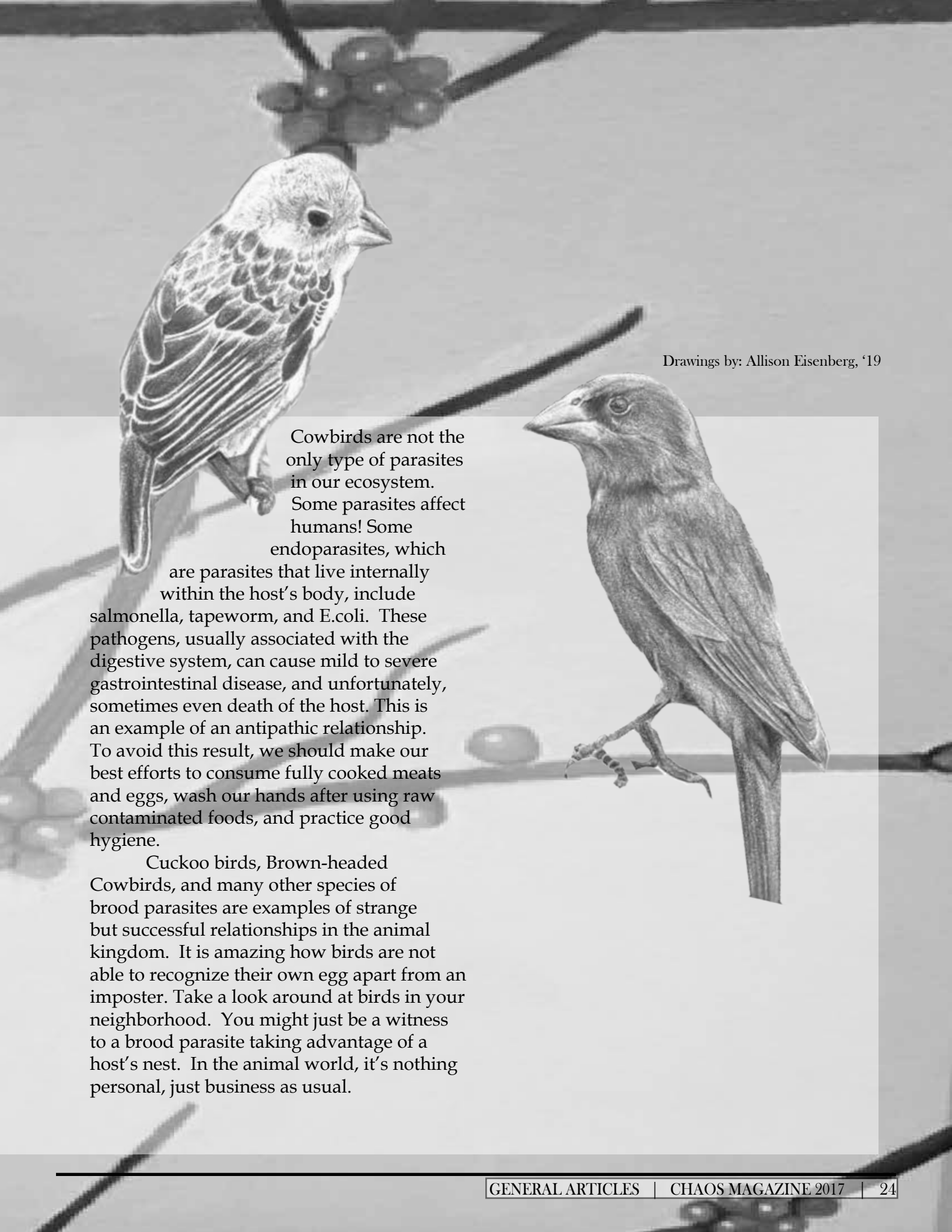
Despite being raised by a different species than their own, the young Cowbirds show characteristics of their own species as young as one month old. At about 20-25 days old, a Cowbird's first instinct is to roost, or settle, in a field for the night, only to return to the host's nest the next day. This field is where most of the other Cowbirds live. This allows the bird to mingle and learn the behaviors of its own species.

This cycle of life is a major advantage for the brood parasites because they don't have to invest any energy and time into raising their young. However, this also takes a toll on the host species. Since the Brown-headed Cowbirds are not native to North

America, the birds native to our continent are disappearing.

Possibly due to their larger size, the parasitic birds require more food and space than the host species do. Therefore, the Brown-headed cowbird risks killing off some of the young of its host species. If the species slowly dies out, then the parasitic bird will have no foster nest to lay its egg, creating an unbalance in nature.

Cuckoo birds and Brown-headed



Drawings by: Allison Eisenberg, '19

Cowbirds are not the only type of parasites in our ecosystem. Some parasites affect humans! Some endoparasites, which are parasites that live internally within the host's body, include salmonella, tapeworm, and E.coli. These pathogens, usually associated with the digestive system, can cause mild to severe gastrointestinal disease, and unfortunately, sometimes even death of the host. This is an example of an antipathic relationship. To avoid this result, we should make our best efforts to consume fully cooked meats and eggs, wash our hands after using raw contaminated foods, and practice good hygiene.

Cuckoo birds, Brown-headed Cowbirds, and many other species of brood parasites are examples of strange but successful relationships in the animal kingdom. It is amazing how birds are not able to recognize their own egg apart from an imposter. Take a look around at birds in your neighborhood. You might just be a witness to a brood parasite taking advantage of a host's nest. In the animal world, it's nothing personal, just business as usual.

What Climate Change Means

What images arise when we think of destruction caused by climate change? Perhaps large floods, extreme seasonal changes, or storms? What doesn't come to mind as often is the threat of disease. There is a lack of attention being brought to a very serious issue, the urgency of which is demonstrated by countless scientific studies. As early as 1996, environmental scientists were projecting the increasing influence of dangerous infectious diseases as a result of climate change.

Malaria is a life-threatening disease carried by the *Anopheles* mosquito, affecting over 650,000 people every year. The infected mosquito, which would be identified as a vector for this disease, carries the plasmodium parasite and flourishes in tropical environments. As warm and humid temperatures become more widespread, the area of potential impact of these mosquitoes

widens. Over time, a larger number of people are susceptible to the disease and the transmission cycle can even gain speed. This means that the process of the vector spreading a pathogen to a host and thus infecting it can occur at quicker rates where conditions are favorable. Although resistance to diseases can evolve fairly quickly, that makes said diseases less of an acute risk, but does not eliminate them. That phenomenon applies to many infectious diseases, but Malaria seems to be the most affected specifically by the changing climate.

For example, in India, the risk of Malaria was shown to increase by five times its former amount in the year following an El Niño event. Such an event brings large amounts of rainfall and an increase in temperature, so especially in the river-abundant Punjab region, the link between climate and malaria

for Human Health

By: Eve Murphy, '18

is distinctly evident. Dengue Fever is another disease transmitted by mosquitoes which was eradicated in the Florida Keys decades ago. However a surge was seen in 2013, as warming has already allowed the disease to renew its existence in the area. Modelling methods have been utilized by scientists to exhibit that global temperature increases by 2-3°C will put 3-5% more people at risk for these diseases which translates to several hundred million more people.

A new report by the International Union for Conservation of Nature has garnered attention as of October of 2016. The report discusses the increase of ocean temperatures leading to a spread of marine-related diseases and harmful algae blooms to the poles. There is a bacteria called *Vibrio vulnificus* that was previously an issue in the Gulf of Mexico because of its warm temperatures. It

is incurred through the ingestion of infected oysters 89% of the time with often fatal effects. New outbreaks in Alaska and the Baltic Sea have been uncovered in recent years far north from its initial range. Ciguatera, a bearer of critical gastric and neurological damage, has grown as algae blooms contaminate seafood with the toxins to cause it and several other diseases.

The spread of these diseases are a subset of scientists' predictions of climate change repercussions which are already showing themselves to be true. Many point out that the stamina of different regions in competing with these complications will be largely dependent on economic capabilities. The impacts on health and biodiversity for countless organisms will be many.

Photo by: Mona Tong, '18



Save the Bees: An Environmental Necessity

There is a huge threat looming over our ecosystem today, and it may not be what you expect. The population of bees in the United States is falling at an unprecedented rate. These seemingly insignificant creatures hold the fate of our entire ecosystem in their antennas. Without them, the environment as we know it may cease to exist.

What makes bees so ecologically significant? Bees belong to a group of animals known as pollinators. These animals transfer pollen and seeds among different plants, fertilizing them as they travel and allowing them to grow and reproduce. Without these pollinators, we wouldn't be able to bring as much food to the table as we are today. According to the National Resource Defense Council, cross-pollination is responsible for the growth of 30% of all crops around the world and 90% of wild crops. If the current decline of the bee population were to continue, we may soon lose numerous valuable crops such as apples, mangoes,

strawberries, onions, and celery.

The leading cause of the decline in the bee population is a phenomenon known as Colony Collapse Disorder. This is when a large majority of bees in a colony leave their hives for an unknown reason without returning, resulting in the destruction of numerous beehives across the world. Farmers have been aware of this occurrence since 2006, and the situation has only grown worse since then. Although there is not one definitive cause of Colony Collapse Disorder, the Environmental Protective Agency has named many factors that lead to its occurrence, including an increase in the use of pesticides, inadequate nutrition, global warming, an influx in invasive species, etc. The use of pesticides harm the habitat of the bees and can negatively impact the nervous system of bees that are exposed to them, leading to their death. Likewise, the use of herbicides has resulted in the reduction of noncrop plant diversity and abundance, hindering the availability of foods



By: Joseph Vayalumkal, '18

that are essential to the bee diet. Climate change, especially increasing weathers, also damage bee habitat, thus leading to greater extinction rates among bee populations. Lastly, invasive species increase competition, making it more difficult for bees to perform their duty as pollinators and to obtain the resources necessary for their survival. Since the discovery of Colony Collapse Disorder in 2006, there has been a 40% decrease in the commercial honeybee population in the United States alone. This is clearly not a problem that can be ignored.

There are many things you can do to help save the bees. By decreasing the use of pesticides in your garden and advising others to be pesticide-free, you can save numerous bees and help prevent Colony Collapse Disorder from occurring in your community. Even purchasing organic fruits and vegetables from your local farmers helps promote pesticide-free farming. On top of that, you can become a beekeeper

yourself! In fact, many people today practice beekeeping as a hobby. It is easier than many would think to obtain a local source of bees and harvest a colony of your own. To impact bee protection on an administrative level, you can contact your local government officials to encourage them to establish laws protecting the environment of bee colonies and limit the abuse to these colonies. Additionally, you can donate to The Pollinator Partnership, which is the world's largest nonprofit organization dedicated to the protection of pollinators such as bees.

A world without bees would be completely different than the world we know today. Without these insects, many of the plants we depend on would not be able to grow or reproduce, and we could potentially find ourselves in the midst of a famine. It is our duty to protect the world we live in and preserve our environment so that future generations will be able to live as bountifully as we do.

Photo by: Zack Kraushaar, '17

The Effects of a Mimicked Underwater Ecosystem on Hydroponics



Experimental Design Photo by: Claire Downes, '18

By: Claire Downes and Hannah Kim, '18

INTRODUCTION :

Hydroponics and Aquaponics have been used for many years as ways to effectively grow food and recreational plants. Aquaponics “utilizes natural nutrients found in fish poop, which is supplied by an integral part of the system, the aquarium full of fish” (Scully). In other words, Aquaponics, a popular water-based growing system, is the use of transferring water formerly inhabited by fish into another container/trough in which plants are grown. It uses the natural nutrients found in fish feces to provide life to plants. In contrast, a hydroponic ecosystem does not contain fish. “Hydroponics describes all methods used to grow plants without soil using nutrients supplied in a water solution” (McIntosh). Thus, hydroponics is another type of water-based growing system, just without the use of fish.

MATERIALS & METHODS:

In the experiment, both hydroponics and aquaponics will be used but the question being tested is, which one works better? Is growth dependent on the presence of fish? The aquaponics element in this experiment is slightly different, only because the resources needed would be too expensive to obtain. Therefore, instead of having fish and plants in separate tanks and then transferring, they will be in the same tank, creating a *mimicked*

ecosystem. The variable in this experiment is the plant *Lactuca sativa*, more commonly known as lettuce. “The range of food crops grown hydroponically is diverse. Lettuce and other leafy green salad vegetables are the easiest crops to produce and can be grown to market-ready size in as little as six to eight weeks” (McIntosh pg 480). The control group in this experiment will be two lettuce plants grown in the traditional hydroponic-style. On the other hand, the experimental group will consist of two lettuce plants grown in a mimicked aquaponics ecosystem, where *Paracheirodon innesi* (tetras), *Poecilia reticulata* (guppies), and *Danio rerio* (danios) will reside and produce the necessary nutrients for the lettuce to live off of. Both of these groups will be in separate 10 gallon tanks that both have thermometers, air pumps and fresh water.

HYPOTHESIS:

If fish affects plant growth and lettuce plants are grown in an aquaponic and hydroponic ecosystem, then the lettuce plants in the aquaponic mimicked ecosystem will grow wider/longer than the those grown in a hydroponic environment.

DISCUSSION & RESULTS:

The purpose of this study was to find out which water based system, hydroponics or aquaponics, was more successful in producing

Time (weeks)	Aquaponic Tank Lettuce Plants (cm)	Hydroponic Tank Lettuce Plants (cm)
Week 1	seeds have not changed	seeds have not changed
Week 2	0.3 cm	0.5 cm
Week 3	0.9 cm	1.3 cm
Week 4	2.2 cm	2.2 cm
Week 5	4.2 cm	3.8 cm
Week 6	5.6 cm	5.2 cm
Week 7	6.0 cm	5.8 cm
Week 8	7.3 cm	6.7 cm
Week 9	8.2 cm	7.6 cm
Week 10	9.1 cm	7.6 cm

(Figure 1)

the greatest lettuce growth. The results of the experiment, shown in Figure 1, confirm the hypothesis. Based on this data, the plants within the aquaponics tank were more successful because they were significantly greater in length than the plants located in the hydroponics tank by the end of week ten. The aquaponics system was likely more effective due to the involvement of the fish. The guppies, tetras, and danios excrete feces that consists of extra nutrients for the plants. These waste containing nutrients act as fertilizers for the plant, thus stimulating the growth of the plant. On the other hand, the hydroponics tank did not contain anything providing the plants with natural fertilizer. Similar experiments relating to hydroponics and aquaponics turned out to have similar results. For example, in the 2002 Kamehameha Aquaponics vs. Hydroponics experiment, it was shown that aquaponic-based growing systems had greater success than hydroponic-based systems. "Overall growing plants in an aquaponic medium does show success in plant growth, healthier appearance, and a viable alternative to growing food" (Dunn 2012).

CONCLUSION:

After completing the study of hydroponics vs aquaponics, the original

hypothesis stating that aquaponics would have more success over hydroponics was supported by the data collected. The data was collected over a ten week period by measuring the lettuce plant's height in centimeters once a week. Then, the heights collected from the plants would be averaged. After the first week, there were no results, due to the fact that the plants were still germinating and thus the lettuce seedlings had not yet made an appearance. From the second week, the data collected seemed to point to the success of hydroponics, due to the fact that hydroponics

plant average was 0.5 cm while the aquaponics plant average was 0.3 cm. The lead that the hydroponics plant average produced continued until the fourth week of the study when both plant averages reached 2.2 cm. For the next six weeks, the hydroponics average fell behind the aquaponics average and the final height averages collected from this study would be a final 9.1 cm for aquaponics and 8.5 cm for hydroponics. Thus, it was clear that the plants grown in the aquaponic mimicked ecosystem were larger and more successful than those grown in with hydroponics.



Sculpture by: Olivia Hernandez, '18

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to submit to chaos 2017-18, visit our club website at chaosmagazinechn.weebly.com or email us at chaosmagazinechn@gmail.com!

science at north high school...

Congratulations to the Clarkstown North's first-year Robotics Team, the "8-Bit Rams" for winning the Rookie All-Stars Award at the "World Cup of Robotics" and for their impressive performance at the international St. Louis Robotics competition!



Photo by: Eddie Kim, '19

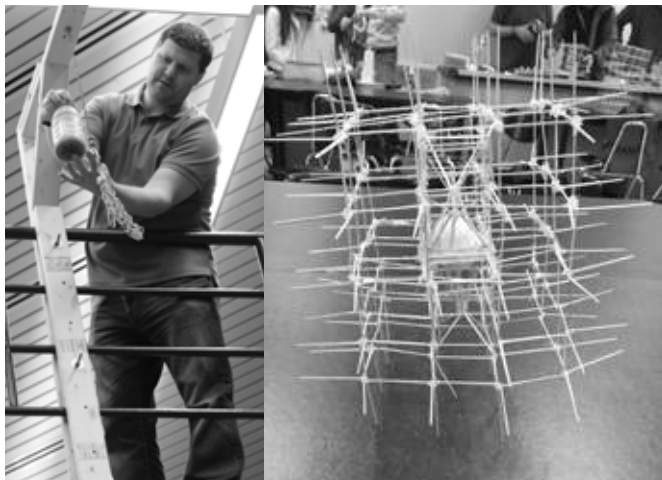


Photo by: Aleyah Aragon, '17

Photo by: Ailis Daly, '18

Each year, the Clarkstown North Physics Department participates in a Bungee and Egg Drop contest. For the bungee contest, students must design an experiment to make predictions on the appropriate mass for the falling height of the bungee. In the Egg Drop contest, students design a structure in which the egg is enclosed in with the objective of protecting the egg so that it does not crack. Not only are these contests incredibly fun, but they also teach students valuable physics principles.