A creative and convenient invention, found in almost every object and household is killing the most precious thing mankind has ever known — the planet. This traitorous invention is commonly known as plastic. If people remain ignorant about the devastation they are creating in the oceans and continue to “poison themselves out of convenience,” then the resources and beauties this world has to offer will cease to exist within the next fifty years (Wystrach). The monstrous accumulation of plastics in the oceans — most famously seen in the Great Pacific Garbage Patch is rapidly altering the physical and chemical makeup of the planet. The buildup of plastic in the oceans and around the world threatens the wellbeing of nature’s wildlife and future generations. Spreading awareness and implementing plans of prevention on plastic waste usage and management are highly essential if the ocean is to continue to thrive in the years to come. The depleting quantity of the planet’s natural resources will bring forth a paralleled affect in human society.

The exact location of the Great Pacific Garbage Patch, otherwise known as the North Pacific Gyre remains a mystery to a majority of the population. In addition to this uncertainty, most people are unaware that there are five other significant garbage gyres in the world; the North Pacific Gyre being the most polluted of them all (“The Great Pacific Garbage Patch”). It is often thought that the Great Pacific Garbage Patch is a massive island of trash that is growing and swirling in the middle of the ocean. However, the real physical form of the North Pacific Gyre is much worse. As described in Andrew Turgeon’s National Geographic News article “The Great Pacific Garbage Patch,” the makeup of the Great Pacific Garbage Patch is “almost entirely made up of tiny bits of plastic, called micro plastics … the microplastics of the Great Pacific Garbage Patch can simply make the ocean water look like a vast cloudy soup.” Scientists who study the breakdown of synthetic waste “collected up to 750,000 bits of microplastic in a single square kilometer of the Great Pacific Garbage Patch—that’s about 1.9 million bits per square mile” (Turgeon). Within this ocean soup floats larger objects such as: fishing nets—commonly referred to as ghost nets which are known to silently suffocate animals, bulky pieces of plastic containers, abandoned buoys and a multitude of other miscellaneous artificial items. This accumulation of plastic and microplastics spans the entire distance of the two thousand mile gyre. Thus contradicting the previously held belief of a physical island of trash.

The formation of the North Pacific Gyre occurs by means of “the Western Garbage Patch, located near Japan, and the Eastern Garbage Patch, located between the U.S. states of Hawaii and California” (Turgeon). These two ocean vortexes, or gyres, “are linked together by the North Pacific Subtropical Convergence Zone, located a few hundred miles north of Hawaii” (Turgeon). Scientists have realized that the rotating currents of form oceanic vortexes that swirl together, forming the North Pacific Gyre which spans a distance “approximately twice the size of Texas” (“Plastic in the Pacific”). In his article, Turgeon states that “about 80% of the debris in the Great Pacific Garbage Patch comes from land-based activities in North America and Asia”. The remaining 20% of debris derives from “boaters, offshore oil rigs, and large cargo ships that dump or lose debris directly into the water.” Environmentalists are concerned by the North Pacific Gyre’s immeasurable area and mass. The total weight of artificial waste found in the Great Pacific Garbage Patch amounts to roughly 7 million tons (“The Great Pacific Garbage Patch”). According to the United Nations, approximately 640 thousand tons of the debris found in the gyre is solely comprised of immense discarded fishing nets. Only society is to blame for the devastation taking place within the world’s oceans. The longer people support plastic producing companies and carelessly discard their used products, the more immense and deadly the Great Pacific Garbage Patch will become.

Manufacturers all over the world are mass distributing synthetic products that cannot be digested and broken down by nature. Angela Sun, an investigative journalist and the executive producer and narrator of the Netflix documentary “Plastic Paradise,” claims that “the United States alone will produce 115 billion pounds of new plastic this year.” After the plastic products are created, distributed, and purchased, they are either discarded in the environment, in a standard trash can or sometimes, in a recycle bin. A common synthetic waste product found in all three of these throw-away options is the plastic water bottle. An average of “two million plastic beverage bottles are used in the US every 5 minutes” (Moore). In addition to plastic bottles, Americans throw away over 100 billion polyethylene plastic bags each year” (Vice). Sadly, out of all of the plastic products being manufactured in the US each year, only 7 percent is recycled (“The Great Pacific Garbage Patch”). This form of ignorance and indifference toward the purchasing and discarding of plastic products seen in today’s societies contributes to the increasing amount of chemical waste that makes up Great Pacific Garbage Patch’s waters.

Oceanic wildlife and humans are being critically harmed by the toxins released by the plastics and waste accumulating in the North Pacific Gyre. Captain Charles Moore, the man who first discovered the existence of the
North Pacific Gyre in 1997, once said at a conference, “plastic is not purified by the re-melting process like glass and metal. It begins to melt below the boiling point of water and does not drive off oily contaminants for which it is a sponge.” The process of plastic melting into a dangerous mixture of noxious pollution is known as photodegradation. Photodegradation is the process in which the sunlight melts plastic into smaller pieces, or microplastics (Turgeon). These different types of microplastics release incredibly harmful chemicals into the surrounding environment which are then absorbed by other pieces of floating plastic. This regeneration process of releasing, absorbing and mixing toxic chemicals among floating debris creates persistent organic pollution. With the immeasurable amount of microplastic drifting within the North Pacific Gyre comes an even larger number of chemicals that are abusing and killing marine and human life.

There are thousands of manmade, artificial chemicals polluting the oceans, but the places where these toxins are most concentrated are in the ocean’s main gyres. Jeanne Rizzo, President and CEO of the Breast Cancer Research Fund states that one harmful chemical found in persistent organic pollution is Bisphenol A (BPA), which was “originally designed as a hormonal therapy for women.” Dr. Fredrick Vom Saal from the Division of Biological Studies at the University of Missouri-Colombia states that the majority of BPA is found in hard, clear plastics, specifically in an element called polycarbonate. Dr. Vom Saal also mentions that polycarbonate is produced at a rate of over 7 billion pounds per year and is distributed in the form of a non-recyclable plastic. BPA is a known endocrine disruptor and can cause diabetes, brain disorders and cancer within humans. Due to the large demand of plastic products within the US, it is estimated that over 93 percent of the American population already has BPA in their bodies (Sun). Carolyn Barry, a journalist from National Geographic News, mentions that not only is BPA harming the bodies of humans, but it “has been shown to interfere with the reproductive systems of animals,” thus resulting in mutations and death in offspring.

Another unfortunately common chemical found in the Great Pacific Garbage Patch and in other water sources is polychlorinated biphenyl (PBC). Michael Tessmer, from the Chemistry Department at Southwestern College in Kansas, reveals in his case study called “PCBs in the Last Frontier” that PCBs were once “used as insulators in electrical transmission lines and in the production of polymers.” He mentions that “PCB production was halted in 1977 due to their potential toxicity, but the chemicals are still found in the environment due to their stability.” Other common and damaging chemicals often found in oceans and bodies of water include polyhydroxylalkanoate (PHA), polylactic acid (PLA), and dichlorodiphenyltrichloroethane (DDT), which are other forms of highly dangerous cancer causing chemicals that are known to be found in the vast majority of plastic products (North). With the presence of countless toxins swarming within the ocean’s massive trash vortexes, it is no surprise that the food chains, both in and out of the Great Pacific Gyre, are being negatively affected both physically and physiologically.

The food chain spreads plastic toxins to thousands of species, eventually bringing the toxin into the bodies of humans. Chemicals released from melting microplastics can be introduced to the food chain through many different scenarios. One way is through bioaccumulation, which is the “accumulation of a substance such as a toxic chemical in various tissues of a living organism” (Vice). In other words, an organism or animal could be negatively affected by a toxic chemical just by swimming through it, causing the toxin to be absorbed into their body through their skin (Sun). If bioaccumulation occurs in algae and plankton, for example, it will affect most of the species in the ocean as algae and plankton are on the bottom of the food chain serving as a major component of every marine animal’s diet. The species that consume either algae or plankton, such as fish and turtles will also be threatened by the toxins once they pass into their bodies. Not only will the process of bioaccumulation begin to take place within the bodies of the apex predators like dolphins, sharks and whales, but their food sources will begin to dwindle due to the destructive toxins killing off smaller animals lower on the food chain (Turgeon). Since humans are on the top level of the food chain, the amount of fish and marine life people consume will be limited by the increased death rates of fish. Most importantly, the toxins ingested by fish will become present in the bodies of the people who eat them. Marine life in the Great Pacific Garbage Patch is not only dying due to the toxic chemicals released by plastics, but also by the direct consumption of or entanglement within the plastic itself.

Plastic waste in the ocean also causes damage to marine ecosystems when organisms consume or become entrapped in the waste. When animals swim too close to the North Pacific Gyre, they reap the negative physical impacts plastic has to offer. Birds and fish unknowingly “ingest pieces of plastic when they mistake bright colored pieces for food; sea turtles and migrating birds can become entangled in abandoned plastic fishing nets” (KQED Science). Fishing nets that are discarded and free floating in the ocean’s gyres are especially dangerous because they accumulate and pickup other pieces of floating debris which attract more sea life and birds. Most people think fishing nets are made of rope that can eventually decompose, however this is not the case. Fishing nets used to be made from wool or silk, but today they are primarily made out of nylon, which is a strong and cheap form of thermoplastic that floats on the surface and does not breakdown (Sun). Sadly, hundreds of seals, birds and turtles become entangled and trapped within these massive nets and drown. This phenomena inspired the nets to be called “ghost nets”
—because they silently kill curious or hungry animals without direct force or reason.

Within the North Pacific Gyre animals consume the waste, it is especially common for birds to mistake red or pink colored pieces of microplastics for shrimp, krill or plankton. For example, Midway Atoll a secluded island directly in the middle of the Pacific Ocean is a breeding and nesting sanctuary for Albatross birds. However, “hundreds of thousands of the goose-like Albatross chicks are dying with stomachs full of bottle caps and other rubbish” that are fed to them by their parents who retrieve the mistaken plastic from the North Pacific Ocean (Moore). It is disheartening to witness the depletion and suffering of the planet’s marine creatures as a result of humanity’s selfishness and indifference. Many people are fearful that several oceanic species will become extinct within the next few years due to the relentless plastic pollution problem that has taken the Pacific Ocean by storm. However, hope for the ocean’s wellbeing is on the horizon, as a possible cleanup solution begins to take action and awareness starts to spread.

The previous generation’s scientific discoveries have made a mess of the environment, especially in the Pacific Ocean. Now it is up to the present-day and future generations to decontaminate the oceans and learn from the mistakes of the past. Experts on the oceanic pollution problem have stated that cleaning up all of the trash and plastic from the Great Pacific Garbage Patch is impossible, claiming that it would take hundreds of thousands of years to completely de-litter the ocean’s waters. The National Ocean and Atmospheric Administration’s Marine Debris Program has “estimated that it would take 67 ships one year to clean up less than one percent of the North Pacific Ocean” (Turgeon). But, in 2013, a brilliant Danish boy named Boyan Slat came up with a new and effective way to clean up trash out of the ocean. It is what he calls “The Ocean Cleanup.”

Instead of going after the plastic using boats and nets, The Ocean Cleanup envisions a network of long floating barriers, which would allow the ocean currents to passively gather the plastic. Once the plastic is concentrated at a central point, it can be collected for recycling. The Ocean Cleanup’s feasibility study indicates that a single 100 kilometer-long cleanup array could remove 42% of the Great Pacific Garbage Patch over a period of 10 years. [The] most conservative estimate this amounts to over 154 million pounds of plastic, at a cleanup cost of 4.53 Euro per pound. (The Ocean Cleanup.com)

This cost-efficient, quick, and, most importantly, effective invention may just be the answer environmentalists and the world needs for a better future. It is the first of its kind and will be used to filter trash and plastics out of the ocean’s garbage patches. It is on track to be officially implemented by 2020, but, in the meantime, more tests, adjustments, financial funding, and public support will be sought after to ensure that Slat’s eco-friendly machines work just as they should (Ocean Cleanup.com). The National Ocean and Atmospheric Administration (NOAA) are also doing their part to clean up beaches and waterways and to spread awareness. The Marine Debris Act of 2006 was amended in 2012 and is used to assist the wellbeing of the ocean in the following ways:

The Marine Debris Research, Prevention, and Reduction Act of 2006 require the program (NOAA Marine Debris Program) to identify, determine sources of, assess, prevent, reduce, and remove marine debris and address the adverse impacts of marine debris on the economy of the United States, marine environment, and navigation safety. (Callender)

NOAA is also contributing to the problem of the North Pacific Gyre by implementing an action plan for the course of the 2016 year called the NOAA Marine Debris Program Strategic Plan 2016–2020. This plan focuses on five key areas within multiple designated communities in need of environmental support and change. These areas of change include communication, emergency response and preparedness, removal, prevention and research and assessment of trash pollution (Callender). In addition to this, schools, universities and communities are beginning to notice the plastic problem in the oceans, especially in the Great Pacific Garbage Patch.

Stanford University is doing their part in environmental cleanup and prevention by experimenting with “new ways to create an eco-friendly, biodegradable plastic” (KQED Science). “They’re using bacteria that can eat methane, a potent greenhouse gas to produce plastic that is sustainable, biodegradable, and nontoxic” (KQED Science). In the event this new-and-improved plastic does get thrown into the ocean or any kind of natural environment, it can easily break down as a natural element without leaving behind microplastic particles. It is encouraging to see the amount of support and publicity the Great Pacific Gyre is receiving. It is also relieving to know that more and more people are doing their part and changing their old habits in order to protect the oceans. For example, reusable water bottles are becoming a popular product and accessory in today’s society that is most commonly seen in the hands of young adults across the nation. Kids are also being encouraged to contribute and volunteer at their local recycling facilities, allowing them to learn about eco-friendly and easy ways to dispose trash.

The Great Pacific Garbage Patch is the cause of a staggering number of serious environmental and health related issues that are depleting the overall quality of the ocean and threatening the lives of marine animals and people. The harmful effects of plastic and trash within the massive North Pacific Gyre are chemically and physically altering the natural and necessary characteristics of the
ocean. The wellbeing of society parallels that of the ocean; if the ocean beings to deteriorate, humanity will do the same. The sole existence of human existence relies on the strength and quality of its natural resources. Once those resources deplete to the point where they are permanently gone, the balance, order, and luxuries of daily life will change forever. In order to avoid this catastrophic mistake, corporations, scientists and everyday people need to learn the art of biomimicry, respecting the wisdom of all species (Jones). The thriving existence of the oceans, and the geographical chemistry of the planet all depend on humankind’s willingness to accept, respect and appreciate all that dwell within it.

Works Cited


