pocacito

Biomimicry Youth Design Challenge

2025 awards

Category: Elementary School

SDG 1 - No Poverty

The Hamlin School - California, USA, 4th grade, NO POVERTY

1. What is the problem your team solved for this challenge?

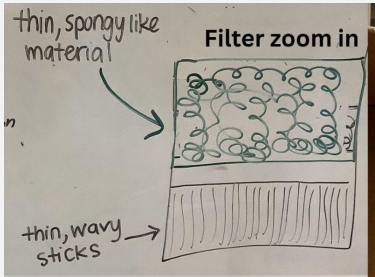
We care about this topic because we have noticed that there is a housing shortage in San Francisco which is stopping people from being able to meet their basic needs. When we explored this topic, we realized that many
office buildings are sitting empty. We wondered what were the biggest challenges to converting these offices into
affordable residences and realized that plumbing is one of the largest costs. We began to work on creating a system
to efficiently use and recycle water to lower bills.

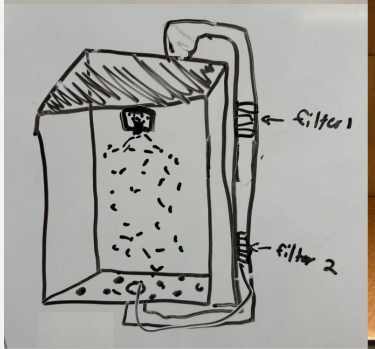
2. How was the solution inspired by nature?

Our filter was inspired by biological models that maintain a strong structure and filter water. We designed a showerhead that would efficiently distribute water by moving quickly back and forth, inspired by African Knifefish's tail. The water would be recycled with filters made of a small, sponge-like material inspired by the glass skeleton of venus flower basket sea sponges and a layer of thin, waxy sticks inspired by fringes of baleen whales. By filtering the water to be recycled and reused and distributing the water efficiently, our shower system design would be affordable and less wasteful.

3. What does your design solution do?

In nature, many organisms work together for the larger whole. We see all people in San Francisco as our community and we believe everyone deserves a home. There are also many examples in the natural world of creative use of water. We looked towards biological models to think about how to make our plumbing system more efficient. With our design, more people could have homes in buildings that are sitting empty and their water bills would be affordable!





SDG 6 - Clean water and sanitation

The Hamlin School - California, USA, 4th grade, WATER CAPTURE / BIOCATCHER

1. What is the problem your team solved for this challenge?

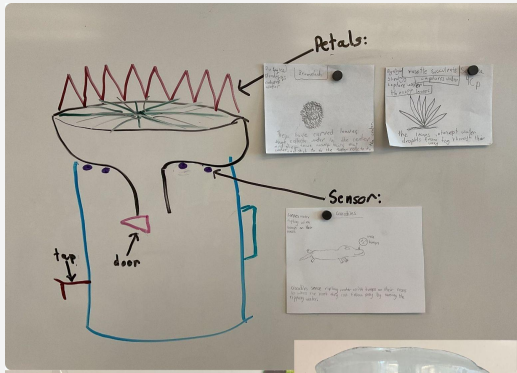
We chose the SDG Clean Water and Sanitation because we believe that all people deserve to have access to clean water. Through talking with a maintenance leader at our school, we learned significant amounts of water is wasted in our garden irrigation system. We noticed that, even in drought years, we still have significant rain but are missing the opportunity to capture that water. We created a design to catch the rain to water the garden!

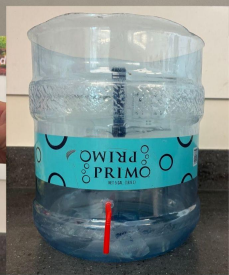
2. How was the solution inspired by nature?

We learned from organisms that can capture, absorb or filter liquids and store liquid. We drew inspiration from how rosette succulents and spider webs collect water from the fog and how spider webs and salps filter water that they collect. After capturing and filtering larger materials the water, we added sensors. Bumps on crocodiles help them sense ripples in the water, our sensors are used to know when the tank is full between waterings.

3. What does your design solution do?

Nature has many ways of collecting water and does not waste their resources or use damaging materials. We were inspired by many biological models to make a water capture device to stop wasting water at our school in our irrigation system by harvesting rain and fog.





SDG 13 - Climate action

The Hamlin School - California, USA, 4th grade,Methane Capture / Hissing Bell Rywort

What is the problem your team solved for this challenge?

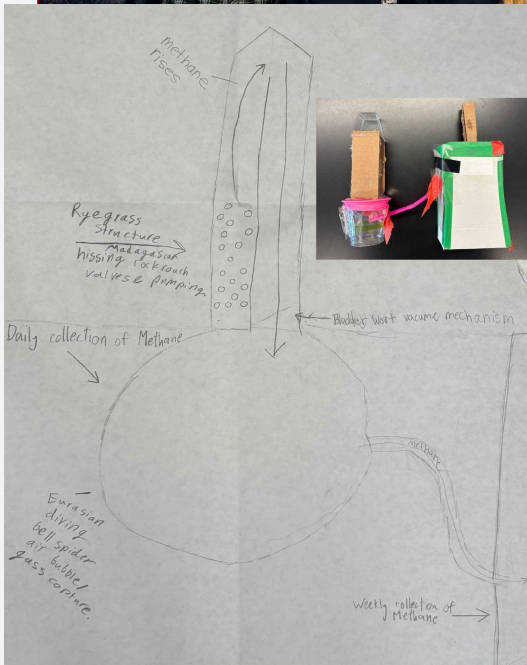
The SDG we are addressing is climate action with a focus specifically on methane capture. We learned methane is 26 times worse for the environment than CO2 and that when greenhouse gases go into the atmosphere they cause it to trap more heat. This contributes to climate change which has impacts we see locally like sea level rise and drought. Our design will help decrease the amount of methane in the atmosphere by capturing it in cow farms or landfills and turning it into fuel for cars.

How was the solution inspired by nature?

We studied organisms in nature that capture, absorb or filter chemicals and detoxify air. We applied the unique adaptations of organisms like ryegrass, hissing cockroaches, bladderworts, and diving bell spiders to design a machine that transforms a harmful gas into usable energy. For example, we drew inspiration from the Bladderwort and rye grass to suck the methane chemicals in and were inspired by the eurasian diving bell to trap it for later use.

What does your design solution do?

Nature never wastes but finds ways to repurpose everything, leaving the world habitable for future generations. Our design captures methane in landfills and in cow stalls before it enters the atmosphere. The methane is meant to be used as an energy source to power cars. Our goal with this design is to slow climate change and to bring awareness to the ways that we produce greenhouse gases through our consumption practices.



SDG 14 - Life below water

The Hamlin School - California, USA, 4th grade DE-PLASTIC THE OCEAN

1. What is the problem your team solved for this challenge?

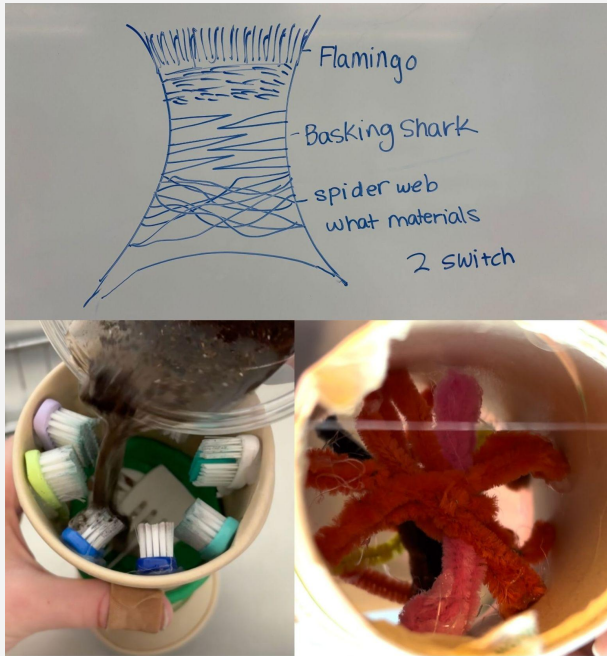
We created a sewage filtration system to help the SDG Life Below Water. We learned that plastic fibers from human trash and clothing can impact habitats in the Bay and Ocean. We learned that large pieces of plastic and synthetic fabrics always break down into microplastics, which are getting into the bodies of animals of all sizes. We made a filter that can be inserted into a storm drain or washing machine and then taken out to be cleaned to hopefully keep plastic from getting into the ocean.

2. How was the solution inspired by nature?

We learned about organisms that are especially good at filtering solids and liquids to inspire our filter design. We based the body of our filter on the hourglass shape of aquaporin. Then we added layers inspired by the basking shark's bristles, hairlike structures on flamingo bills, and a spider's web to catch all of the microplastics possible before the water would reach the Bay.

3. What does your design solution do?

We were surprised by how many ways plastics can enter the water, from laundry machines and even the air. Nature has evolved multiple ways to filter particles out of the water in order to have a healthy ecosystem. Our design is one way that we can catch plastics of all sizes from getting into the Bay. Our goal is to stop plastic before it gets to organisms so that Life Under Water can thrive.



Category: Middle School

SDG 2 - Zero hunger

Stratford Blackford Prep, San Jose, CA, USA, Grade 7, THE DECOMPOSTER

Our solution addressed the challenges of food waste and nutrient-depleted soil through natural decomposition

What is the problem your team solved for this challenge?

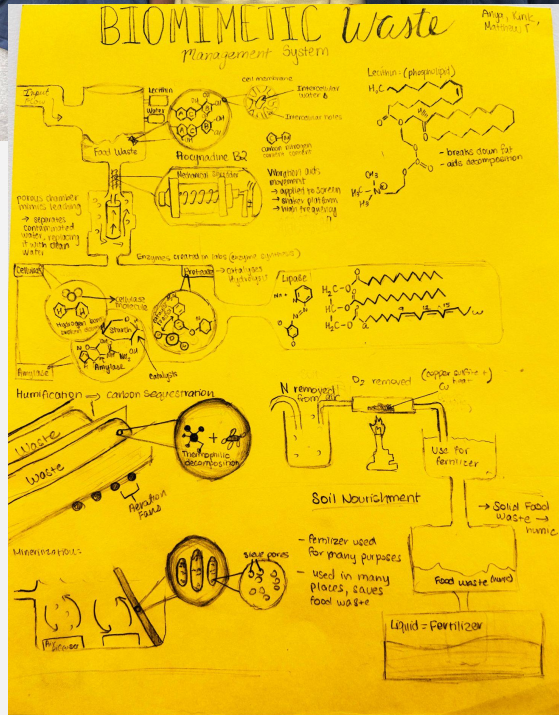
The United States faces critical challenges of food waste and soil depletion. Annually, 27% of food, approximately 61 million tons, is discarded, contributing to environmental harm as it decomposes in landfills. Concurrently, poor agricultural practices are depleting soil nutrients, resulting in diminished crop yields and "hidden hunger" affecting over 2 billion people. If these issues persist, we risk escalating food shortages and long-term environmental and health repercussions.

How was your solution inspired by nature?

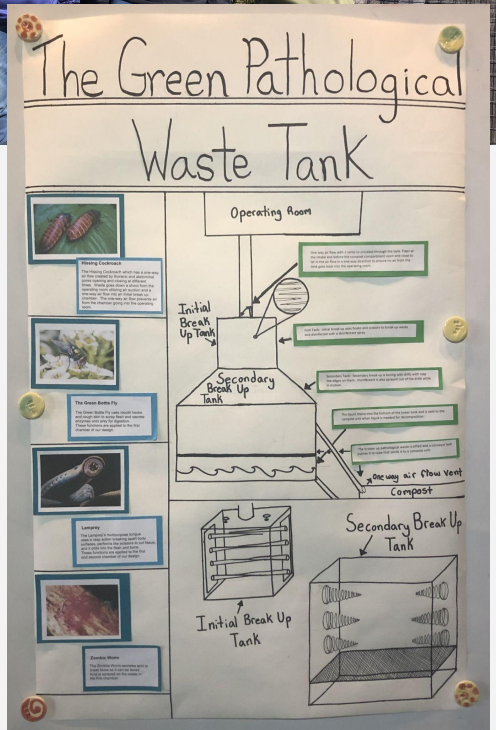
Fungi decompose matter by excreting enzymes and absorbing nutrients through their hyphae. This process releases nitrogen and phosphorus into the soil, boosting plant growth and reducing maturation time by enriching the environment with essential nutrients. Ruminant animals like cows efficiently break down tough matter through chewing, saliva, and digestion across four stomach chambers. Microbes, bile salts, and enzymes help digest fats and proteins, while fibrous matter is regurgitated for further breakdown, and liquids are filtered separately.

What does your design solution do?

Our design solution effectively decomposes organic matter, enriching soil by providing essential nutrients. Waste is transformed into nutrient-rich soil through mechanical and chemical digestion, with extracted nitrogen converted into fertilizer. This approach reduces waste volume and methane emissions while revitalizing unhealthy soil, enhancing crop health, and yield. Our exploration of decomposers and digestive systems informed our design's form and function, demonstrating that nature presents valuable solutions to diverse challenges.



SDG 3 - Good health and wellbeing



Wind Dance Farm & Earth Education Center, Berkeley Springs, West Virginia, USA,
THE GREEN PATHOLOGICAL WASTE TANK

Our design eliminates emissions of harmful pollutants.

What is the problem your team solved for this challenge?

The problem we addressed is harmful pollutants released during incineration of pathological medical waste. There are different kinds of medical waste. We narrowed our focus on pathological medical waste, which is incinerated releasing harmful pollutants into air and water, and toxic ash is sent to landfills, which emits the greenhouse gas, methane. In addition, waste is stored in red plastic bags made with fossil fuels, and transported by trucks, emitting more greenhouse gases.

How was your solution inspired by nature?

Our design models four organisms. Three of them break down their preys' bodies. The Green Bottle Fly uses mouth hooks and rough skin to scrap flesh and secrete enzymes onto prey for digestion. The Zombie Worm secretes acid to break bone so it can be bored. The Lamprey's multipurpose tongue uses a rasp action breaking apart body surfaces, performs like scissors to cut tissue, and it drills into the flesh and bone. Our third iteration of design includes the Hissing Cockroach which has a one-way air flow created by thoracic and abdominal pores opening and closing at different times.

What does your design solution do?

Our design eliminates emissions of harmful pollutants. It is self-contained, breaking up pathological waste into compost, instead of bagging, transporting, incinerating, and sending ash to landfills. Waste goes down a shoot from the operating room utilizing air suction with a one-way air flow system into a break up chamber, where it is sprayed with acid and broken with hook, scissor, and rasp like mechanisms. After initial break up, solids enter a mid-chamber where secondary break up occurs, with drilling and sifting. Liquids drain into a chamber for composting. Both liquids and sifted solids go down shoots to a composting unit.

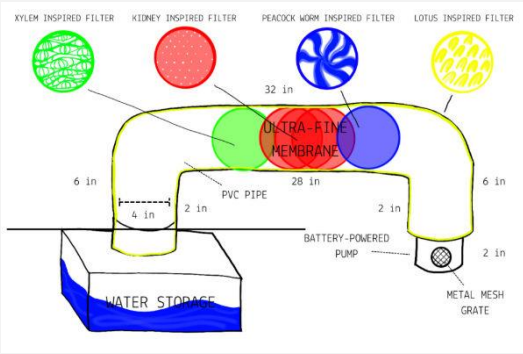
SDG 6 - Clean water and sanitation

1st: Stratford Middle School, San Jose, CA, USA, SALTAWAY

Our nature-inspired filter draws inspiration from peacock worms, human kidneys, xylem tissues, and lotuses to filter water effectively with fewer watts

What is the problem your team solved for this challenge?

We as humans have access to vast amounts of water, but most is rendered undrinkable simply because it contains excess salt. Our goal is to give areas with water scarcity the power to make the ocean, our largest natural resource, drinkable. We target water scarcity in the Maldives due to their strong reliance on unsustainable desalination and rainwater. Our solution combines several processes from xylem roots, human kidneys, peacock worms, and lotus leaves to filter out
contaminants from liquids all while keeping beneficial minerals.



How was your solution inspired by nature?

We researched organisms known for their ability to filter liquids, such as the human kidney, xylem tissue, and peacock worms. Utilizing the membranous system found in kidneys, the sieve-like tissues in xylem tissue, and the filtering capabilities of tentacle filaments from the peacock worm, we designed a filter intended to assist in filtering contaminated water from the ocean or other sources. Our design also uses the hydrophobic properties of the lotus, which will help with keeping the apparatus clean, contaminant-free, and bug-free for long periods of time to prevent the need for constant cleaning.

What does your design solution do?

Our pipe design uses a water pump to push water through 4 inches worth of high-density, ultra-fine filters: synthetic appendages with mucus inspired by peacock worms capture large particles, filters based on kidney membranes separate different-sized contaminants with three layers of differing porosity, and synthetic xylem tissues filter remaining bacteria and molecules. The salinity of ocean water in the Maldives is around 35 ppt; we aim to achieve 1 ppt, which is safe for consumption. Our design lowers salinity by 34 ppt while using 24 watts, which is 36 watts less than the standard reverse osmosis process.

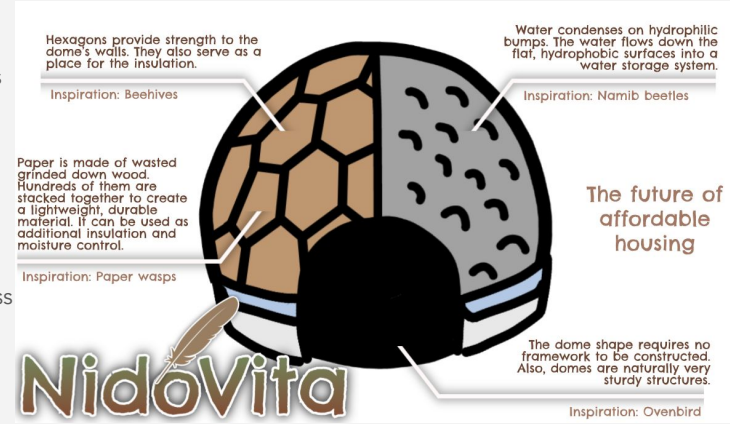
SDG 6 - Clean water and sanitation

2nd: Stratford Middle School, San Jose, CA, USA, NIDOVITA

NidoVita is a smart, self-sustaining dome home that is affordable to build, can harvest water, and is inspired by nature's engineering.

What is the problem your team solved for this challenge?

NidoVita aims to resolve an issue many San Joaquin Valley residents face: housing affordability. Over 60% of lower-income households in the Valley are burdened by housing costs. This is partly because the average income in the San Joaquin Valley is ~35% lower than the state average – it is harder for some Valley residents to afford houses. Additionally, the San Joaquin Valley has issues with water scarcity. To solve these problems, our dome-home solution was made to be very cost-effective and able to collect water.



How was your solution inspired by nature?

NidoVita takes inspiration from ovenbirds, beehives, paper wasps, and Namib beetles. The ovenbird creates dome-shaped nests by laying down rows of mud without using a structural framework, and the hexagonal structure of beehives allows for durability and a space-efficient design. Additionally, the paper-making process of paper wasps is used as a lightweight and durable building material, while the hydrophilic bumps and hydrophobic bumps of the Namib beetle's back are used for water collection. All strategies were effectively used in our design, but the ovenbird's strategy was the most useful and impacted the structure/effectiveness of our design immensely.

What does your design solution do?

NidoVita is a groundbreaking solution that reimagines homebuilding for a green future. Designed without a traditional framework, it cuts construction costs by 45% ($300,000 versus $550,000) using durable, low-cost materials. Our new approach to insulation significantly boosts the home's energy efficiency and also finds a new use for waste wood. Its innovative structure also includes a water collection and filtration system, helping with water scarcity. Inspired by biological models, NidoVita is not just affordable—it's resilient, eco-friendly, and scalable. As the global housing crisis deepens, NidoVita offers a revolutionary way to build homes and live sustainably.

SDG 6 - Clean water and sanitation

3rd: Montessori-Tulln Neue Welt, Tulln, Austria, 5th grade, AMASKIS

Kids reimagined skiing for a snow-scarce future—designing adaptive skis inspired by nature to glide without harming the planet.

What is the problem your team solved for this challenge?

Ski tourism in Austria is threatened by climate change and rising temperatures, leading to snow loss. Resorts increasingly rely on artificial snow, which wastes huge amounts of clean water. We wanted to rethink skiing without harming the planet.

How was your solution inspired by nature?

We studied how animals move across different terrains. The armadillo's overlapping scales inspired a surface that flexes and adapts. We're still exploring our second organism, likely one with terrain grip or weight distribution. We mimicked the scale structure to allow the skis to respond to different surfaces like ground, ice, or thin snow. This biological insight helped shape our ski design for both function and flexibility.

What does your design solution do?

Our AmaSkis prototype allows skiing on low-snow or snowless ground. The skis use an adaptive surface that mimics animal scale movement to grip terrain without requiring artificial snow. By using nature's solutions, our design helps reduce freshwater use and enables skiing with less environmental impact. Our learning from biology—how nature adapts and moves—directly shaped the concept and structure of the skis.

SDG 9 - Industry, innovation & infrastructure

Stratford Middle School, Palo Alto, CA, USA, EMBERCLOAKS

EmberCloaks made by Synatura is an infrastructural system and building material that uses natural techniques to fight wildfires. (Southern California)

What is the problem your team solved for this challenge?

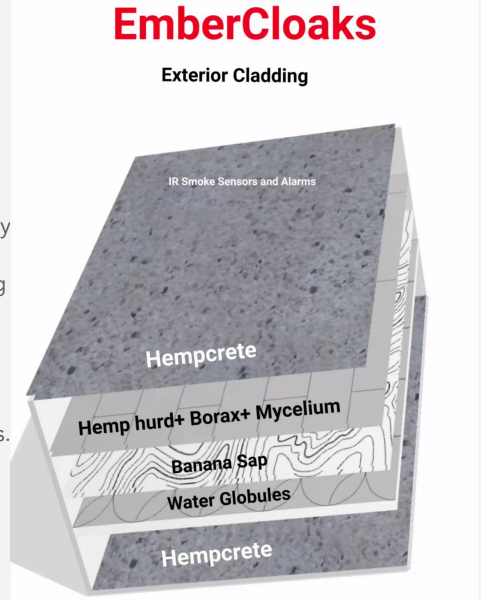
Our team addressed the growing threat of wildfires destroying homes in California's Wildland-Urban Interface, where traditional materials like wood offer little fire resistance and concrete is limited by seismic risks. We designed EmberCloaks, a nature-inspired cladding that resists ember intrusion and flame spread using sustainable materials.

How was your solution inspired by nature?

Our solution was inspired by the fire-resistant traits of the Canary Island pine and the infrared-detecting fire beetle. The pine's thick, layered bark informed our multi-layer cladding design, while the beetle's heat-sensitive sensilla inspired embedded IR sensors for early fire detection. We also incorporated fire-resistant mycelium and hempcrete, mimicking how fungi char and insulate under heat. These strategies were effectively combined into a cohesive, nature-based system that insulates, senses, and resists flame spread—enhancing both safety and sustainability.

What does your design solution do?

Our design, EmberCloaks, is a multi-layered, fire-resistant cladding that protects homes from embers and radiant heat during wildfires. It prevents flame spread by combining insulating mycelium layers, sealing banana sap, and fire-resistant hempcrete. Inspired by nature's strategies—like the Canary pine's bark and the fire beetle's infrared detection—we created a system that senses heat and withstands high temperatures. Learning how these organisms survive fire informed our materials and layering choices, allowing us to engineer a protective barrier that mimics natural resilience while remaining sustainable and effective in wildfire-prone environments.



SDG 12 - Responsible consumption & production

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Folly Quarter Middle School, Dayton, Maryland, USA, HIVEHIDE

What is the problem your team solved for this challenge?

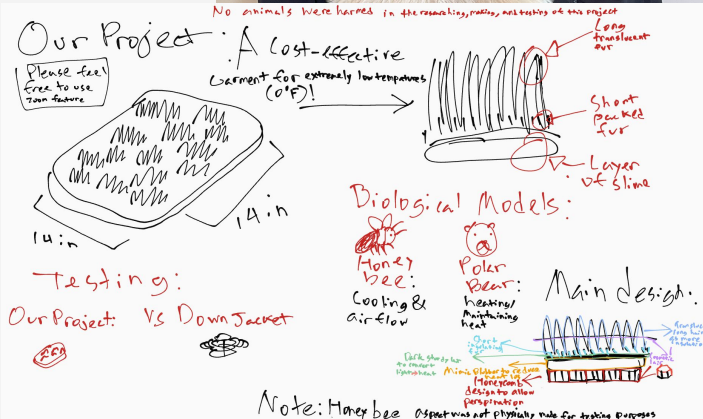
Current insulation design applications such as down jackets rely on goose feathers, posing ethical and environmental concerns, while synthetic alternatives are expensive and lack insulation efficiency.

How was your solution inspired by nature?

Our solution is inspired by the Polar bear and Honey bee hive. 2 organisms are learnt from: 1. the polar bear for layered warmth. 2. The honey bee hive for ventilation. These six layers all inspired by the Polar bear and Honey bee hive:
Long fur-Water resistant layer which traps air which provides a layer of insulation
Short fur-Traps additional air
Skin layer(thicker fabric)-Provides a connection for layer 1 and 2 to 4
Blubber-It is a poor conductor of heat keeping the body warm
HoneyComb layer-Provides circulation to evaporate perspiration
Fabric layer-Keeps the person wearing it comfortable

What does your design solution do?

Our design application is more affordable and far more effective than current insulation design applications. Mimicking the animal's biological functions instead of using the animal product itself would mitigate the ethical concerns. Recycling materials(more specifically the waste from the ocean) for the project would help the environment instead of generating more waste. The polar bear uses its layered natural insulation to stay warm. The Honey bee's honeycombs provide proper circulation to the hive. We mimicked these two organisms in our design.



SDG 13 - Climate Action

1st: Stratford Blackford Preparatory, San Jose, CA, USA, 7th grade, RIPPLE

RIPPLE cleanses water of heavy metals, oils, and other contaminants by harnessing biomimicry and sustainable innovation.

What is the problem your team solved for this challenge?

Pollution from contaminants like PFAS and oil spills leads to the death of millions of marine organisms and humans.

How was your solution inspired by nature?

Inspired by the water hyacinth and giant salvinia, two aquatic plants that absorb heavy metals and oil, respectively, we designed our device to mimic their natural filtration abilities and provide an eco-friendly solution for water purification. The water hyacinth absorbs contaminants through its root system, with ion channels and active transport embedded in the semipermeable membrane. The giant salvinia, covered with hydrophobic (water-repelling) and lipophilic (oil-attracting) trichomes, performs a similar task with oil. We combined these in one design, mimicking the root system of the water hyacinth and the leaves of the giant salvinia, maximizing efficiency and conserving energy.

What does your design solution do?

Our design solution incorporates microarrays, polymers, and other materials to emulate giant salvinia and water hyacinth. The "roots" absorb heavy metals, PFAS, and contaminants, utilizing solar energy to move these pollutants to a collection reservoir for safe disposal. The hexagonal top features valves inspired by giant salvinia, which efficiently absorb oil while repelling water, directing the oil to a separate reservoir for human use. This innovative approach effectively combats water pollution while benefiting marine life and communities, showcasing a design that optimizes performance and mirrors the plants on which it is based.

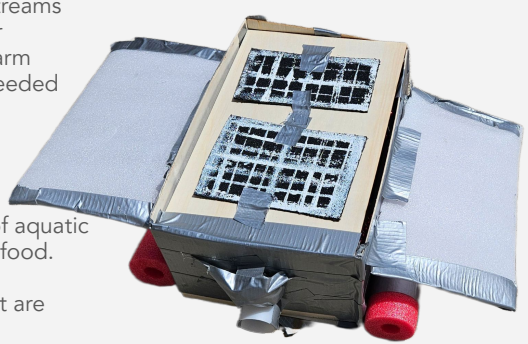
SDG 13 - Climate Action

2nd: Stratford Middle School, San Jose, CA, USA, 7th grade, The Aquatic Recycled Trash Accumulation System (ARTAS)

The ARTAS aims to alleviate the global issue of water pollution by filtering out water using unique traits of organisms, aiding ecosystems worldwide.

What is the problem your team solved for this challenge?

Water pollution is a widespread predicament found in various places around the globe. Much can be traced back to rivers and streams polluted by unsustainable industrial practices or agricultural runoff. This causes many problems, such as fatalities by unsafe water consumption, destruction of aquatic ecosystems, and a disturbed food chain. Sources can be found in industries, urban runoff, farm pollution, sewage/wastewater, and oil spills, to name a few. Pollution in California, especially in the Bay Area, has long since exceeded Water Quality Standards because of these causes.



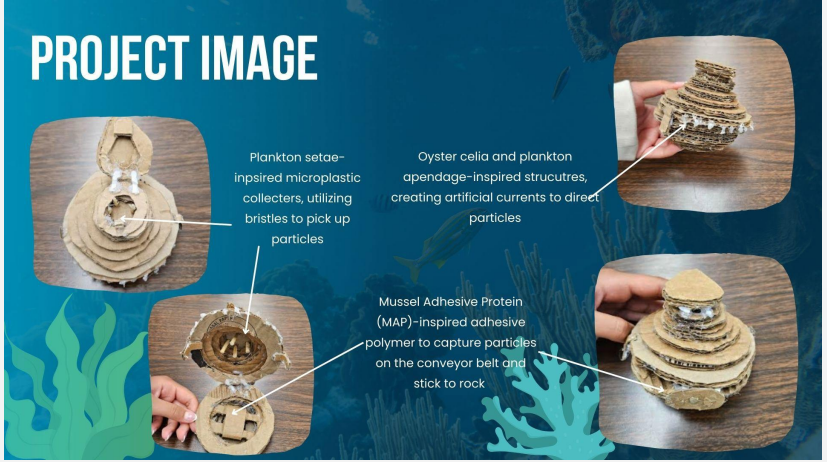
How was your solution inspired by nature?

Our device was inspired by the sea squirt, pufferfish, basking shark, and the compound eyes of insects. Sea squirts are a group of aquatic organisms that let out jets of water when disturbed. Basking sharks also filter feed, swimming with their mouths open to capture food. Pufferfish possess flexible skin “puff up” to, aiding defense. The filter mimics the basking shark to filter water, the sea squirt for propulsion, and imitates the pufferfish to create a pouch for further filtration. Finally, insects possess compound eyes, organs that are made of many different units to provide a wider range of vision.

What does your design solution do?

Our device mitigates water pollution by filtering polluted water. The main part of the filter is based on a basking shark. Its feeding technique is emulated by the device, traveling across and gathering water with its ‘mouth’ wide open. The defense mechanism of the sea squirt provided us with a way of letting out filtered water. The puffer fish's flexible skin inspired our trash-pouches, which expand to hold pollutants. Lastly, the shape and structure of compound eyes give a larger field of vision; we chose cameras similar to them to provide an efficient navigation system. Together, these attributes efficiently filter water.

SDG 14 - Life below water



Stratford Middle School, San Jose, CA, USA, 7th grade, SEAH2

The $SeaH_2$, reduces microplastics in the ocean by incorporating features from plankton, oysters, and mussels into our design.

What is the problem your team solved for this challenge?

Microplastics are highly dangerous to sea life; they can disrupt the chemical balance of an organism and spread toxins. One gallon of seawater contains around 8.3 million microplastic particles, all rooted in industrial materials such as textiles, microbeads, and other items formed from plastic. Currently, traditional methods of filtration are being applied, but they fail to effectively filter microplastics due to their minuscule size. With our device, $SeaH_2$, we hope to drastically reduce the amount of microplastics in the ocean, specifically in the San Francisco Bay(known for its abundance of microplastics).

How was your solution inspired by nature?

Plankton, oysters, and mussels are filter feeders that extract food particles from the water, and it's these very attributes that inspired our innovation. Plankton create currents with their appendages to guide particles to bristle-like setae, which capture them. Oysters use layers of mucus to trap particles, which we have mimicked by taking inspiration from mussel adhesive protein (MAP), which also secures the $SeaH_2$ to the rock. Oysters also use a complex system to organize and carry particles to their mouths, including hair-like cilia, which create artificial currents, and mucus-coated gills to carry food particles, which we encompassed into our design.

What does your design solution do?

A research study conducted in 2019 found that billions of microplastics enter the Bay Area in California every year and disturb the ecosystem. The $SeaH_2$ mitigates this problem, taking inspiration from filter feeders to capture microplastics. Using artificial intelligence (AI) for the sorting process and the features of mussels, plankton, and oysters, we effectively created a microplastic-filtering device. And we can safely reuse these microplastics to create environmentally safe innovations, some of which are already in use. Ten $SeaH_2$'s can remove the same amount of microplastics added into the Bay Area every day. Using biomimicry, we created an impactful, nature-inspired solution.

SDG 15 - Life on land

International School of Arizona, Scottsdale, AZ, USA, 6th-7th grade, SAVE THE SAGUAROS

Biomimicry design to help Saguaros survive climate change

What is the problem your team solved for this challenge?

The saguaro cacti in Arizona have been dying to overheating because of a lack of water, extr
heats and more irregular heat waves. It is connected to life on lands since Saguaros
are a key specie in their ecosystem.

How was your solution inspired by nature?

We discovered the kangaroo rat, the camel, the sponge, the thorny devil and a human creation: the stupa, which is a gigantic artificial ice cone that melts slowly and provides water during the warm season. We combined these strategies into a single water dispenser, working on independent projects and merging them in the end.

What does your design solution do?

Our design solves the problem we've selected by collecting water and hydrating the cacti at just the right time, avoiding overheating and burns by injecting water at the base of the cacti. Nature informed our design by teaching us how to preserve water and how sponges hold water for a long period of time.

Meet the team

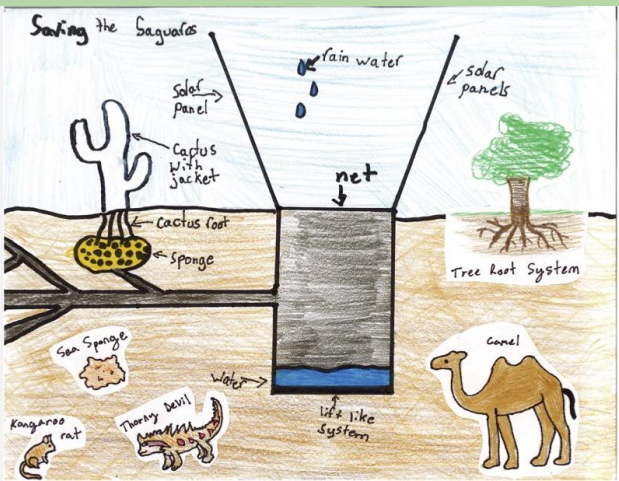
Tara: Age-11 plays volleyball

Henry: Age-12 Swims

Julian: Age-13 plays football

Kaiya: Age-12 Figure Skater

Steven: Age-11 plays Football



Category: High School

SDG 3 - Good health and wellbeing

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1st: International group of students based in India and USA, New Delhi, India, FRIGATEBIRD-INSPIRED GLIDER

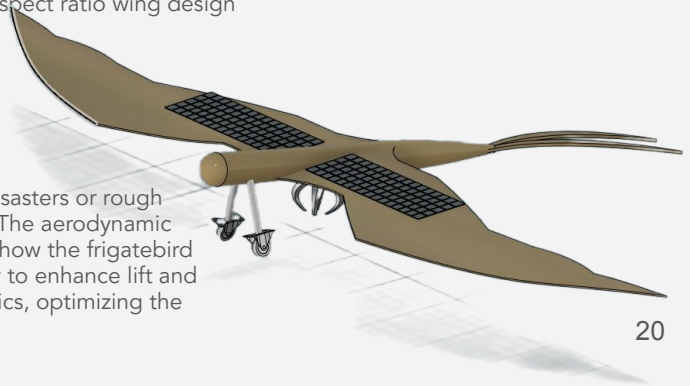
Our team worked on this problem by designing a sustainable, frigatebird-inspired glider that can transport essential items to isolated locations.

What is the problem your team solved for this challenge?

In many disaster-hit and remote areas, millions of people struggle to access food, medicine and supplies due to damaged infrastructure and limited transport. Delays in reaching these regions can lead to serious health risks or even death. Our team worked on this problem by designing a sustainable, frigatebird-inspired glider that can transport essential items to isolated locations where conventional transportation cannot reach.

How was your solution inspired by nature?

Our design was inspired by the frigatebird, a seabird that can soar for days without flapping its wings. We studied its long, slender wings and lightweight frame, which allow for low-energy, efficient gliding. These features led us to use a high aspect ratio wing design and lightweight, durable materials in our glider. Just like the bird, our design reduces drag and improves stability, allowing it to glide over long distances with minimal energy use. Biological principles directly shaped our decisions, helping us create a glider that is efficient, sustainable, and highly functional in disaster zones.



What does your design solution do?

Our frigatebird-inspired glider is designed to deliver life-saving supplies to areas that are inaccessible due to disasters or rough terrain. Built from lightweight yet durable materials, it can withstand harsh weather while flying long distances. The aerodynamic shape, mimicking the frigatebird's wings, allows smooth and stable gliding for long-distance flights. Observing how the frigatebird glides efficiently with minimal energy, we incorporated features like long, narrow wings and a streamlined body to enhance lift and reduce drag. These nature-based insights directly guided our decisions on structure, materials, and aerodynamics, optimizing the glider for long-range, stable, and sustainable flight in real-world situations.

SDG 3 - Good health and wellbeing

2nd: East Chapel Hill High School, Chapel Hill, North Carolina, USA, grades 10-12, BIOBLANKET

What is the problem your team solved for this challenge?

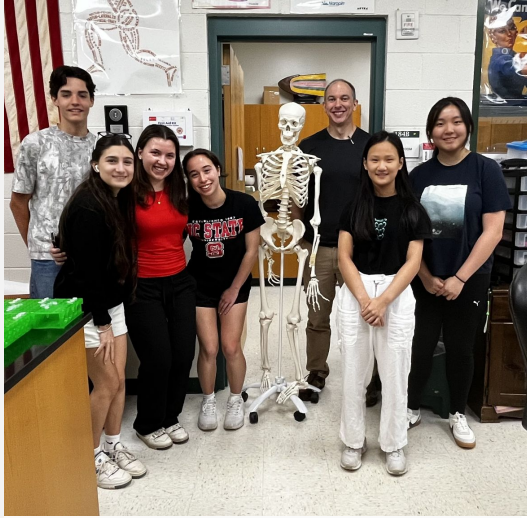
When individuals are stranded or displaced, first aid items like emergency blankets are a vital resource. While conventional emergency blankets offer basic protection, they lack sweat-wicking capabilities; this leads to trapped moisture, decreased body temperature, and even hypothermia. The BioBlanket blends multiple nature-inspired layers into a singular, zipping blanket that preserves body heat while wicking sweat away.

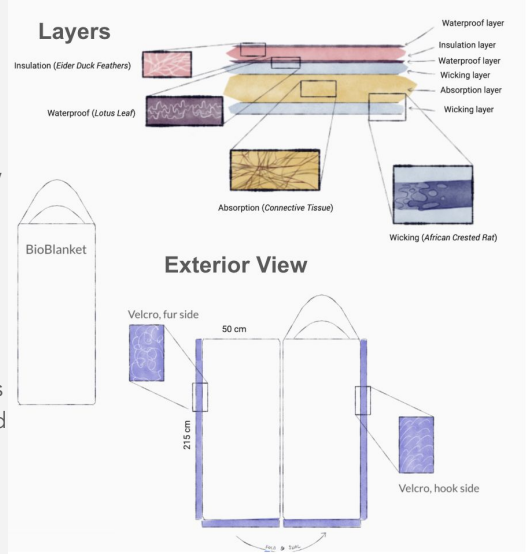
How was your solution inspired by nature?

The BioBlanket utilizes four natural structures to serve individuals in critical conditions. The waterproof layer mimics lotus leaves, whose textured surface repels water. The insulating layer models the fluffy, branching structure of eider duck feathers, reflecting body heat. The wicking layer is mimetic of African crested rat hairs, pulling excess sweat away from the body; this layer is porous, allowing water to move away from the body via capillary action. The absorptive layer mimics connective tissue. The pliable, mesh-like structure of the tissue is implemented into a layer that serves as a reservoir for sweat wicked away from the body.

What does your design solution do?

From refugee camps to forest fire displacement, emergency blankets are critical in protecting against harsh environmental conditions, trapping heat, and preserving human life. But when an individual is wet from water or their own sweat, these blankets can actually counteract their intended function by trapping moisture and making the user even colder. Inspired by African crested rats, lotus leaves, eider ducks, and connective tissues, the BioBlanket preserves body heat and protects from the environment while wicking away and absorbing sweat. This ensures moisture is not trapped and body heat is maintained.





SDG 3 - Good health and wellbeing

3rd: Sanko Private High Schools, Gaziantep, Turkey, PISTACCOOL

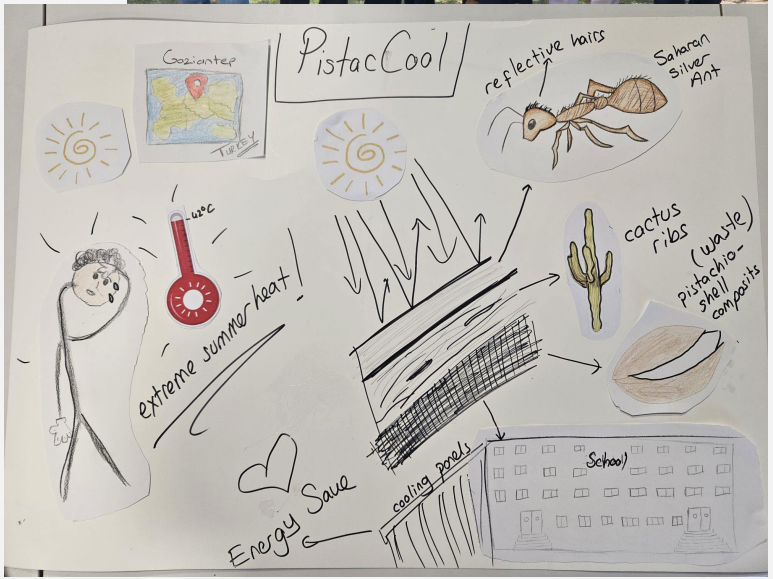
Nature-Inspired Passive Cooling for Schools in Gaziantep

What is the problem your team solved for this challenge?

Gaziantep experiences extreme summer heat and high urban density. Schools and low-income neighborhoods are especially vulnerable. Air conditioning is expensive and unsustainable.

How was your solution inspired by nature?

PistacCool is a passive cooling system made from pistachio shells, inspired by:
Saharan Silver Ants: Their reflective hairs deflect heat.
Cactus Ribs: Their grooves promote natural air flow.
We mold pistachio-shell composites into microgrooved cooling panels



What does your design solution do?

Reflect over 85% of solar heat
Enhance convective cooling with vertical grooves
Require no electricity or maintenance
LOCAL IMPACT
Up to 18°C cooler walls in summer
~22% energy savings per household or school
Upcycles 1,800+ tons of agricultural waste annually
Healthier spaces for children, elderly, and urban communities

SDG 5 - Gender equality

pocacito

Basis International School of Shenzhen, Shenzhen, China, grade 12, SAFETY BRACELET

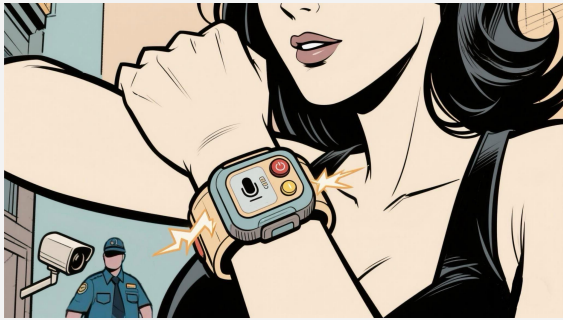
A wearable device that connects marginalized individuals to a network that prevents and fights against sexual harassment.

What is the problem your team solved for this challenge?

We are going to address the problem of sexual harassment in this project. Sexual harassment is any unwelcome or inappropriate behavior of a sexual nature that creates a hostile, intimidating, or offensive environment. According to a report by the U.S. EEOC, nearly 1 in 3 women (32%) report experiencing sexual harassment in the workplace. Sexual harassment is a kind of gender-based violence that can happen in workplaces, schools, public spaces, and online. This creates inequality and must be addressed.

How was your solution inspired by nature?

Our idea takes inspiration from three animals: meerkats, electric eels, and ants. Meerkats stay safe by taking turns keeping watch, which inspired the concept of a system where people can monitor each other's safety in turns. Electric eels defend themselves by releasing electric shocks, so we thought of a device that could emit a harmless electric pulse to deter threats. Ants use chemical signals to alert their colony, and similarly, we could create a tool that sends an instant alert when someone feels unsafe. These animals inspired different features in our design to help prevent sexual harassment.



What does your design solution do?

Our design is a bracelet that combines three functions into one button. When pressed, it delivers a non-lethal electric pulse, sends a GPS distress signal to trusted contacts and authorities, and automatically starts audio and video recording. It also triggers nearby AI cameras to detect harassment and sound an alarm. Inspired by nature: meerkats' guard behavior informs the camera system, electric eels inspire the electric defense pulse, and ants' pheromones resemble the distress signal. This wearable design provides self-protection, evidence collection, and immediate response to harassment in public or private spaces.

SDG 6 - Clean water and sanitation

1st: Jakarta Intercultural School, Jakarta, Indonesia, 11th grade, SCALOR

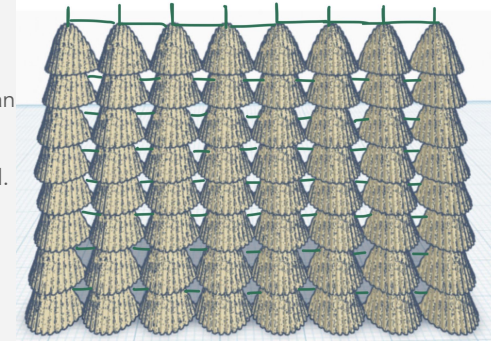
SCALOR is a pangolin-inspired mat that slows water flow to reduce erosion, tackling a normalized crisis in Indonesian agriculture.

What is the problem your team solved for this challenge?

Soil erosion has become one of the most pressing threats to global food security and environmental stability. In recent years, climate change has exacerbated this issue, especially in agricultural nations. Indonesia ranks as the third most affected country, losing around 220 tons of soil-per-hectare each year. This loss strips farmland of its most fertile layer, weakening crop yields and livelihoods. It also causes nutrient runoff, contaminating rivers and lakes with fertilizers and pesticides.

How was your solution inspired by nature?

Like a pangolin's armor, SCALOR's surface is made up of overlapping, raised plates that absorb the impact of falling water. Rather than allowing water to flow freely, each plate deflects the water flow force sideways, spreading the energy across nearby plates and preventing runoff. Beneath this, the surface of each plate is lined with fine grooves inspired by the common cockle seashell. These grooves channel the redirected water into narrow, controlled streams, breaking up turbulent flow and guiding it gently across the soil. This dual mechanism reduces erosion pressure while encouraging steady infiltration, minimizing sediment loss and improving water absorption.



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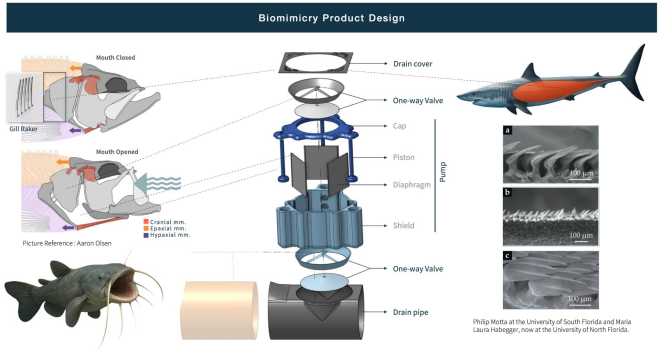
SDG 6 - Clean water and sanitation

2nd: Wen Hua High School, Taichung, Taiwan, 11th grade, Catfish Active Drainage Module (CADM)

Reimagine urban drainage by mimicking catfish oral and shark scales, sucking rainfall, filtering debris, and integrating seamlessly beneath sidewalks.

What is the problem your team solved for this challenge?

We address the inefficiency of urban drainage systems in managing short-term heavy rain due to gravity-limited flow, lack of filtration, and infrastructure overload. These cause flooding, mobility disruption, and increased urban risk. Our solution, CADM, introduces a bio-inspired active drainage system that enhances adaptability, flow acceleration, and debris filtration.



How was your solution inspired by nature?

CADM integrates three biological strategies into one system. Catfish suction inspired the active drainage pump using negative pressure to accelerate intake. Its gill rakers informed the internal filtration grid that prevents clogging. Additionally, shark skin microstructures inspired surface textures that guide flow and reduce drag. These features were effectively combined into a modular unit that draws in water rapidly, filters debris, and maintains flow efficiency. By layering functions from two aquatic species, the design enhances adaptability and resilience under extreme rainfall—achieving natural efficiency through engineering.

What does your design solution do?

CADM addresses the limitations of conventional urban drainage by introducing a biomimetic system that enhances flow intake and debris filtration during short-term heavy rainfall. Its structure, inspired by catfish suction and gill rakers, guides runoff into subsurface modules while minimizing clogging. This improves hydraulic efficiency, reduces surface water accumulation, and mitigates flooding-related risks. Installed flush with sidewalks, CADM preserves pedestrian space while increasing system adaptability. Insights from hydrological failures and biological flow regulation informed a structural solution that integrates filtration, flow control, and modularity to strengthen urban infrastructure against climate-induced precipitation extremes.

SDG 6 - Clean water and sanitation

3rd: Binus School Bekasi, Indonesia, 11th grade, H2GO

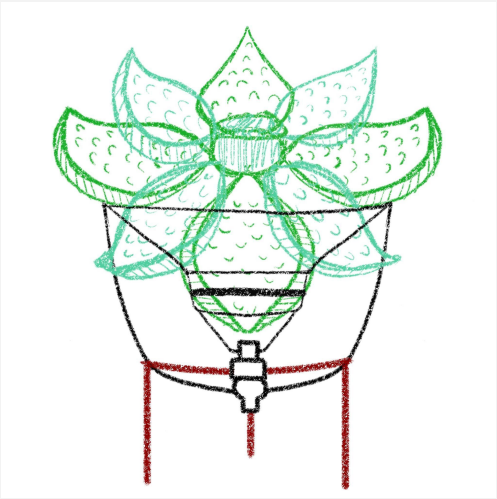
Introducing H2GO: a portable rainwater dispenser inspired by nature, filtering rain into safe drinking water for communities faced by unsafe rain!

What is the problem your team solved for this challenge?

Our team's solution, H2GO, addresses the pressing issue of unsafe rainwater in Indonesia, particularly in regions where access to clean drinking water is severely limited. Many communities rely on rainwater, which can often be contaminated due to pollution or improper collection methods. This not only poses health risks but also exacerbates the water scarcity problem.

How was your solution inspired by nature?

Our solution, H2GO, was inspired by nature's ingenious methods of water collection and filtration. We drew key insights from the Alcantarea imperialis, which features leaves that effectively channel rainwater to its center, and the skin of the Phrynosoma cornutum, known for its ability to capture moisture through superhydrophobic surfaces. In our final design, we effectively combined these biological strategies by implementing angled leaves for optimal water capture and a filtration system mimicking the ultrafiltration process found in shark gills (specifically whale sharks, Rhincodon typus) . This filtration system is designed to remove impurities including sediment, bacteria, viruses, and harmful chemicals, ensuring that the collected rainwater is purified and safe for consumption. Lastly, we were able to devise a closing mechanism that enhances portability from the orientation of Alcantarea imperialis leaves.



What does your design solution do?

Our design solution, H2GO, is a portable rainwater dispenser that directly addresses the critical issue of unsafe drinking water in underserved communities. By utilizing nature-inspired strategies, it effectively captures and purifies rainwater, providing a sustainable source of clean drinking water. The angled leaves of H2GO, modeled after the Alcantarea imperialis, efficiently channel rainwater into a central collection tank. This design not only enhances water flow but also optimizes the capture of rainwater, ensuring that users can gather water without the need for long-distance travel to a clean source. Upon collection, the water passes through an advanced ultrafiltration system inspired by the Phrynosoma cornutum. This system effectively removes impurities such as sediment, bacteria, viruses, and harmful chemicals, guaranteeing the safety of the water for consumption. By integrating these biological insights, H2GO not only collects and purifies rainwater but also accommodates unideal conditions, making it accessible for communities that face challenges in accessing clean water sources. In this way, our design provides a comprehensive and sustainable solution to water scarcity while enhancing health and well-being in vulnerable populations.

SDG 7 - Affordable and clean energy

1st: Eastlake High School, Sammamish, Washington, USA, HAMMER: Hammerhead-Adapted Modifications for Maximizing Energy Retrieval

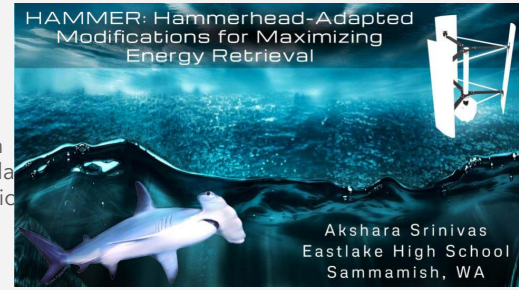
Bio-inspired turbine blades modeled after hammerhead sharks to improve wind energy efficiency through drag reduction and lift enhancement.

What is the problem your team solved for this challenge?

Our project addresses the inefficiency of current wind turbine designs, especially in low or variable wind conditions common in urban and semi-urban areas. We aimed to improve the aerodynamic performance of vertical axis wind turbines by using biomimicry, specifically, tubercle structures inspired by hammerhead sharks. These modifications reduce drag and enhance lift, leading to higher energy output.

How was your solution inspired by nature?

Our solution was inspired by the hammerhead shark and the humpback whale. The hammerhead's cephalofoil uses tubercles to manipulate water flow, reducing drag and improving maneuverability. Similarly, humpback whales have leading-edge tubercles on their flippers that enhance lift and delay flow separation. We combined these strategies by extending tubercles along the entire bla surface of a vertical axis wind turbine, creating aerodynamic channels that accelerate airflow and increase lift. This fusion of biologic insights resulted in a blade design that performs more efficiently across a range of wind speeds, showcasing nature's solutions to complex engineering challenges.



What does your design solution do?

Our design improves wind turbine efficiency by mimicking tubercle structures from marine animals. By adding these ridges along the blades of a vertical axis wind turbine, the design reduces aerodynamic drag and increases lift, even in low or variable wind conditions. This boosts energy output and makes small-scale wind systems more viable in cities and remote areas. Studying how hammerhead sharks control flow and how humpback whales enhance lift helped us shape the blade geometry to channel air more effectively. The result is a more stable, high-performance turbine aligned with clean energy and sustainable city goals.

SDG 7 - Affordable and clean energy

2nd: Stanford Online High School, Redwood City, CA, USA, WINGLIGHT

A biomimetic streetlight inspired by plants and insects that captures solar energy and controls light to reduce pollution & save power.

What is the problem your team solved for this challenge?

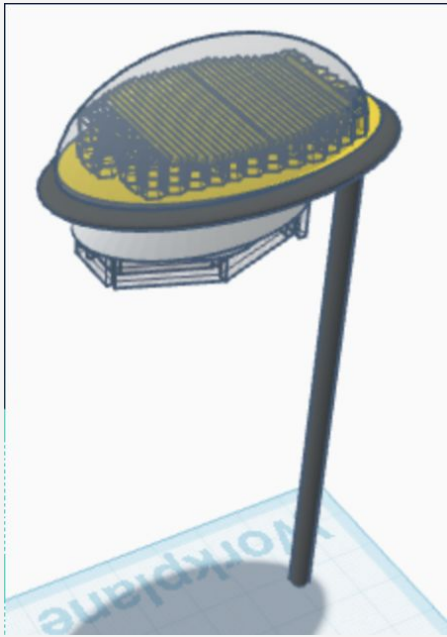
The problem we addressed is the high energy consumption and environmental impact of traditional street lighting, which contributes significantly to global electricity use and urban light pollution. It uses inefficient means to collect and distribute the light, harming both human and animal life alike.

How was your solution inspired by nature?

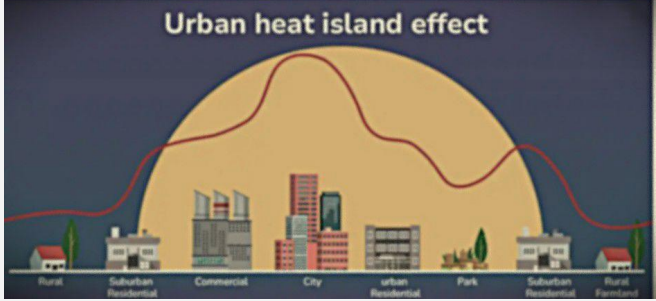
We took inspiration from Fenestraria, a type of window plant whose curved design helps optimize its energy collection, oriental hornet pigments, which allow for it to effectively absorb light, and Cabbage White Butterflies, which directs solar energy through reflective nanostructures inside its wings. Each organism that we learned from contributes to a different aspect of the design, ensuring that every feature of our streetlight is optimized to its fullest extent. The Fenestraria is the main inspiration for the shape of our streetlight– the clear curved dome on its top allows it to maximize the energy absorbed from the sun in tandem with the oriental hornet pigment inspired solar panels on the top of our streetlight. To ensure none of this collected energy gets wasted, the underside of our streetlight has a reflective nanostructure coating inspired by that of cabbage white butterflies, which will direct energy only to where it is needed.

What does your design solution do?

Our streetlight reduces unclean energy consumption by harvesting solar energy using natural light-capturing strategies, and it minimizes light pollution by directing light only where needed. By mimicking nature's efficient light absorption and distribution systems, it reduces reliance on the grid, lowers carbon emissions, and minimizes skyglow that disrupts ecosystems and pollutes cities. In nature, light is precious, and essential to life. The design of our streetlight is informed by the idea that no essential resource should be wasted or go unused. The organisms we learned from are all excellent at using the power of light to its full capacity. We designed our streetlight to do the same, and to help cities find greater harmony with their natural surroundings in the same way that these organisms do.



SDG 7 - Affordable and clean energy



3rd: CS Academy International, Coimbatore, India

This system absorbs heat from the sun, circulates water with a solar-powered pump inspired from transpiration in plants

What is the problem your team solved for this challenge?

Using recycled HDPE pipes and solar energy, this system absorbs heat from the sun, circulates water with a solar-powered pump, and stores thermal energy in an insulated tank and PCM (bio-based stearic acid). The setup powers restroom cleaning and irrigates a green roof, which also serves as a learning space to explore sustainability and photosynthesis.

How was your solution inspired by nature?

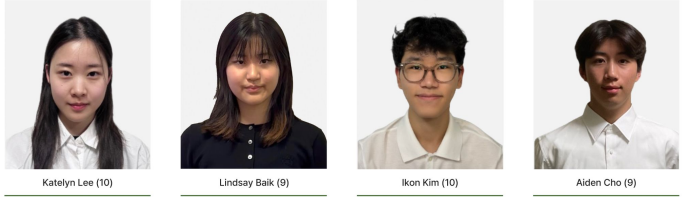
The pipes will have a hydrophilic inner micro-textured surface - hydrogel or cellulose materials (inspired by osmosis in plants); Incorporating phase change materials (inspired by camel humps)

What does your design solution do?

Reducing the heat island effect created in schools during the hot months and re-using the solar energy trapped into other processes like water for handwashing and in restrooms, watering plants (green roof); Added benefit: Green roofs can also educate children more about photosynthesis, and how it's an endothermic reaction.

SDG 9 - Industry, innovation and infrastructure

pocacito



1st: Seoul, South Korea, BEETLESHIELD

BeetleShield is a biomimetic solution combining impact absorption and fire suppression for EVs and electronics using nature-inspired design.

What is the problem your team solved for this challenge?

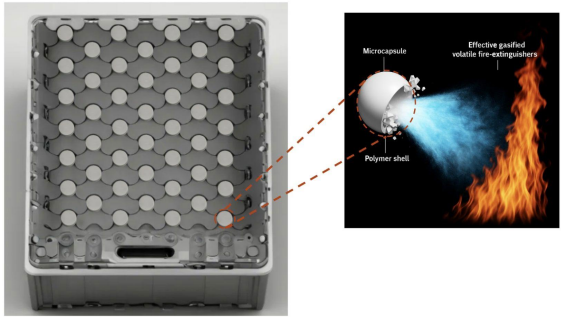
We addressed the growing risk of battery fires and mechanical damage in electric vehicles and electronic devices. Lithium-ion batteries are vulnerable to impact and heat, leading to short circuits or thermal runaway. Our solution, BeetleShield, reduces these risks using a bio-inspired shell and fire-suppressing microcapsules.

How was your solution inspired by nature?

Our solution was inspired by two remarkable beetles. The Diabolical Ironclad Beetle survives extreme pressure through interlocking, layered exoskeletal structures, which we mimicked to create an impact-resistant battery shell. The Fire Beetle senses heat using specialized infrared receptors, inspiring our use of thermally activated microcapsules that release fire-suppressant agents during thermal runaway. By combining these biological strategies, we developed a lightweight, multifunctional system that protects batteries from both mechanical shock and overheating—effectively translating nature's structural strength and thermal sensitivity into an innovative safety solution for electric vehicles and devices.

What does your design solution do?

Our design, BeetleShield, protects lithium-ion batteries in electric vehicles and devices from mechanical impact and thermal runaway. Inspired by the Diabolical Ironclad Beetle, we designed a durable, layered battery shell with interlocking structures that absorb shock and prevent deformation. From the Fire Beetle, we developed heat-sensitive microcapsules that burst at high temperatures, releasing fire-suppressant agents to stop battery fires. These biological insights guided a multifunctional solution that mitigates two major risks—impact damage and overheating—while remaining lightweight and scalable. BeetleShield makes battery systems safer, longer-lasting, and more sustainable for modern electric technologies.



SDG 9 - Industry, innovation and infrastructure

2nd: Methodist Girls' School, Singapore, 10th grade, COOLONISE BY FUNGIRLS

Inspired by fungi and sea sponges, "French Fries 2.0" cools passively—cutting temps by 12.2% and saving energy in daily cooling applications.

What is the problem your team solved for this challenge?

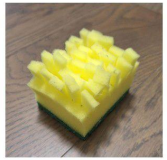
Singapore faces increasingly severe impacts from climate change, with projected temperature rises of 0.6°C to 5°C by 2100. These rising temperatures threaten public health—leading to heat-related illnesses—and strain infrastructure. The challenge lies in developing sustainable, energy-efficient cooling solutions to mitigate these effects. Existing methods often rely on electricity-intensive systems, which are not environmentally sustainable. To address this, we explored passive evaporative cooling inspired by nature's adaptive strategies. Our research focused on biomimicry, using fungi and sea sponges as models, to create innovative cooling structures that reduce temperatures without relying on traditional energy sources—offering a promising solution to this growing problem.

How was your solution inspired by nature?

Our solution was inspired by the adaptive strategies of the lion's mane mushroom and sea sponges. We studied the mushroom's teeth-like structure, which proved highly effective for evaporative cooling, reducing temperature by 21.2% and relative humidity by 21.5%. Sea sponges, known for their porous forms, also influenced our design. By combining these biological strategies, we created a biomimetic prototype, "French Fries 2.0," which lowered temperature by 16.3% and RH by 24.3%. Applied as "Padded Walls," it cooled enclosed spaces by 12.2%. This effective integration of natural designs offers a sustainable approach to passive cooling in everyday technologies.

What does your design solution do?

Our design, "French Fries 2.0," passively cools spaces by mimicking the structures of lion's mane mushrooms and sea sponges. Inspired by their natural ability to enhance evaporative cooling, we created a prototype that lowered temperature by 16.3% and RH by 24.3%. When used as "Padded Walls," it reduced internal temperatures by 12.2%. This helps mitigate rising heat in Singapore caused by climate change, offering an energy-efficient alternative to conventional cooling. Insights from fungal structures guided the form, while the porous design of sea sponges informed airflow and water retention—together enhancing cooling without electricity.



SDG 9 - Industry, innovation and infrastructure

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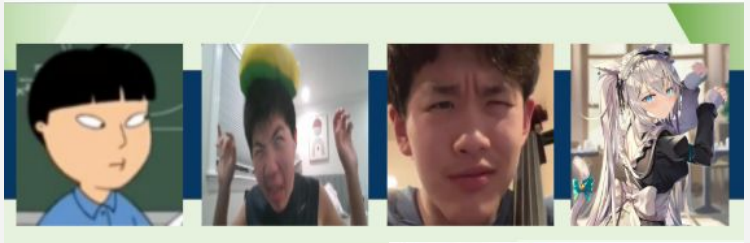


3rd: Herricks High School, New Hyde Park, NY, USA, TERMITE ARCHITECTURE COOLING

We take advantage of termites architecture to cool buildings.

What is the problem your team solved for this challenge?

Our team solved/contributed to the following problems: Climate Change and poverty. Climate changes resulting in increased temperatures can be too harmful, especially homeless people who can't afford suitable air conditioning. By using our solution, we can limit the use of supplies, which powers ACs, that release carbon dioxide, further contributing to climate change.

How was your solution inspired by nature?

Termites and plants in general contribute to the usage of less energy, therefore, decreasing the usage of supplies that release carbon dioxide. By mimicking the air regulation system and the convection system that termites use, we were able to design buildings that follow the same rule. By doing that, we can maintain suitable temperatures for the well being of people that aren't able to afford ACs.

What does your design solution do?

Our design uses the concept of convection and the design of the termite's homes in order to create a building that is able to withstand hot environments while also providing suitable air conditioning without using ACs or anything like that. By using our design, we can limit the use of ACs, therefore, limiting the use of supplies that release carbon dioxide which can worsen climate change. These buildings can also be used as refugees for the less fortunate who aren't able to afford air conditioners.

SDG 11- Sustainable cities and communities

1st: Karunia Global School,Kota Jambi, Indonesia, 9th grade, BIOINSPIRED QUAKE DESIGN

A nature-inspired, earthquake-resistant house for Indonesia, using bamboo and spring isolators to protect vulnerable communities.

What is the problem your team solved for this challenge?

Indonesia's location within a triple plate boundary, where the Indo-Australian, Eurasian, and Pacific plates meet, is the driving source for its seismic and volcanic activity. Indonesia faces 2,042 earthquakes yearly, destroying homes and burdening communities with costly repairs.

How was your solution inspired by nature?

Cats' spines: Spring-marble base isolators absorb vertical shocks, and bamboo: X-braced frames and hollow walls replicate its flexibility and root resilience.

What does your design solution do?

Our earthquake-resistant design combines nature-inspired X-braced bamboo frames and spring-marble isolators to withstand seismic forces. Rigorous testing demonstrated superior performance: 11cm displacement reduction (versus 4cm without springs), 1,350g load capacity, and 50cm impact resistance. This SDG 11-aligned solution, validated by NGSS HS-LS4-2 principles, provides scalable seismic protection for Indonesia's vulnerable communities.

SDG 11- Sustainable cities and communities

2nd: Binus School, Bekasi, Indonesia, grades 9+10, TURBO BREAKER

Turbo Breaker, inspired by turbo snails, brain corals, & mangrove roots, dissipate water energy in rivers to protect communities and ecosystems.

What is the problem your team solved for this challenge?

Our team focused the issue of high-energy waves in meandering rivers. A major flood damaged a 7-meter section, which destroyed the bridge in Kemang Pratama, Indonesia, this March, creating a 4-5-meter-deep chasm. This emphasizes the severe impact of river erosion, which significantly affects ecosystems and locals living near riverbanks. By mitigating with Turbo Breaker, we can preserve vital habitats, support diverse plant and animal life, and maintain stable riverbanks, all crucial for biodiversity conservation efforts.

How was your solution inspired by nature?

Our solution draws inspiration from nature's ingenuity. We mimicked turbo snails to redirect water flow and brain corals for turbulence to dissipate energy, reducing force on riverbanks. Additionally, Bruguiera and Rhizophora mangroves guided our design's placement on the riverbed. This biomimicry approach creates a durable wave breaker. It aims to reduce erosion, enhance sediment deposition, and promote ecosystem resilience in vulnerable river regions, aligning with the Sustainable Development Goals by addressing challenges from meandering rivers.

What does your design solution do?

Our innovative solution is a biomimetic design inspired by turbo snail, brain corals and mangrove fringe, an interlocking riverbank protection network. After team brainstorming and an insightful discussion with a researcher and a professional in industrial engineering from BINUS University, we settled on emulating the brain coral’s structure for its brain-maze-like complex surface, effectively scattering the wave energy across a larger area, leading to reduced erosive forces. Turbo snail inspired enhanced durability against high velocities while improving river functions and stability. Mangrove fringe inspired our optimal placement on the river bed. The dimensions of Turbo Breaker have also been settled for its optimum effectiveness.

SDG 11- Sustainable cities and communities

3rd: British American School, Tecamachalco, Estado de México, Mexico, 9th grade, ECO THERM

This project aims to create a cooling system by cacti and Pompeii worm to reduce energy use and support climate-friendly sustainable housing.

What is the problem your team solved for this challenge?

In communities and cities worldwide, thousands of buildings rely on various heating and cooling systems, but none are sustainable, and most are highly polluting. The most common cooling system is the air conditioner, which we focus on. The issue is the significant environmental impact of cooling systems, particularly air conditioners. In some urban areas, thousands of buildings depend on systems that consume excessive energy and release pollutants and greenhouse gases. These emissions contribute to climate change and environmental degradation, making it crucial to find sustainable alternatives that reduce energy consumption and pollution while maintaining indoor comfort efficiently.

How was your solution inspired by nature?

We draw inspiration from bacteria, which regulate their temperature to survive, and from cactus ribs, which help them stay cool in harsh desert climates. By applying these biological principles, we seek to develop an eco-friendly and efficient system. Our approach combines sustainability and innovation to reduce environmental impact while ensuring effective temperature control for communities facing climate challenges and sustainability problems.

What does your design solution do?

To combat the pollution created by air conditioning, we have decided to observe cacti and how they manage to conserve a cool temperature. You see, cacti live in the harsh conditions of the desert. They not only manage to survive, but they thrive. This is because of the cacti's natural shape. The shape of a cactus disrupts airflow, this causes the airflow to be disrupted, thus, the air is whipped and heat flown away. Another thing is the spikes of the cactus. It makes shade and makes the wind fly more around it, dissipating heat. This will help a lot.

SDG 12 - Responsible consumption and production

1st: Torrey Pines High School, San Diego, CA, USA, grades 9, 10 and 12, BIOTREAD

BioTread's airless tire design reduces tire wear microplastics by deflecting road debris and self-ventilating while dampening vibrations for comfort.

What is the problem your team solved for this challenge?

Pneumatic tires are constantly exposed to friction, and the heat generated weakens and degrades the rubber. This leads to massive amounts of tire wear particles, which are found to be the main contributors of microplastic pollution in storm runoff, especially in San Diego. Current airless tires have the potential to last longer but face critical issues like heat build-up, road debris tearing spokes, and limited vibration damping that prevent them from being widely used.

How was your solution inspired by nature?

We took inspiration from honeycombs, which are sturdy and shock-absorbent, for our tire spokes to ensure they can hold the car's weight while absorbing large stresses from the road. Covering it, a mesh with a similar molecular structure to spider silk, known for its strong yet flexible properties, deflects road debris to prevent it from getting caught and tearing the spokes. We also included the mantis shrimp's helicoid structure for its material-efficient shock absorption, and prairie dog burrow patterns to passively circulate cool air through the tire and reduce heat buildup.

What does your design solution do?

After speaking with a San Diego State University researcher who studied tire wear particles and their harmful environmental impacts, we realized the importance of developing BioTread to become a low-cost, easily accessible alternative to pneumatic tires. Its passive ventilation system, inspired by prairie dog burrows, is the primary mechanism to reduce heat buildup and tire wear particles. Ensuring a long life span, the spider-silk-inspired cover prevents road debris from tearing the tire spokes. Finally, the helicoid structure's vibration-damping offers a smoother ride that will help popularize BioTread on a global scale, where it can massively reduce plastic pollution.

SDG 12 - Responsible consumption and production

pocacito

2nd: Herricks High School, New Hyde Park, NY, USA, SPRAY CAN ATTACHMENT

Our project is designed to address the impact of spray paint on the environment due to excess paint and fumes entering the environment.

What is the problem your team solved for this challenge?

The problem our team solved for this challenge is the environmental impact of spray painting due to the excess paint as well as harmful fumes entering the environment. This relates to the selected SDG by avoiding the irresponsible and uncontrollable waste created by the spray can by minimizing how much excess paint enters the environment.

How was your solution inspired by nature?

Our solution was inspired by nature as we mimicked the key aspects of our design from two very unique organisms, turtles and spiders. We used turtles as a model for a lever which when pulled down sends the sprayer up so you can open and begin spraying without worrying about accidentally spraying yourself. However, for the spiders we only used the shape of spider webs as part of our design for the electrostatic metal cone to give the metal some thickness and sturdiness. These aspects give our attachments their unique shape and design to provide ease of access and functionality.

What does your design solution do?

Our design solution utilizes and mimics abilities from the turtles ability to retract its head in and out of its shell which will act as an encasing around the spray bottle so paint will not be wasted by accidents. We also mimic the design of a spiderweb and combine that with electrostatic fields. It mitigates the problem selected by blocking paint in accidents and directing paint towards one location to minimize excess. After learning about our selected SDG and biomimicry we chose this design as we thought it would use a variety of organisms as models and be very effective.

SDG 12 - Responsible consumption and production

3rd: British American School, Tecamachalco, Estado de México, Mexico, 9th grade, ECOMESH

Bioinspired mesh system to capture water from air, helping factories reduce water waste and support sustainable industrial practices.

What is the problem your team solved for this challenge?

It aims to solve 2 connected things; Capturing water, reducing unnecessary waste to be used in sustainable production systems which use lots of water. The problem addressed is mainly that the factories are not using sustainable production systems because of trying an affordable manufacturing and production process to not invest in water sources.

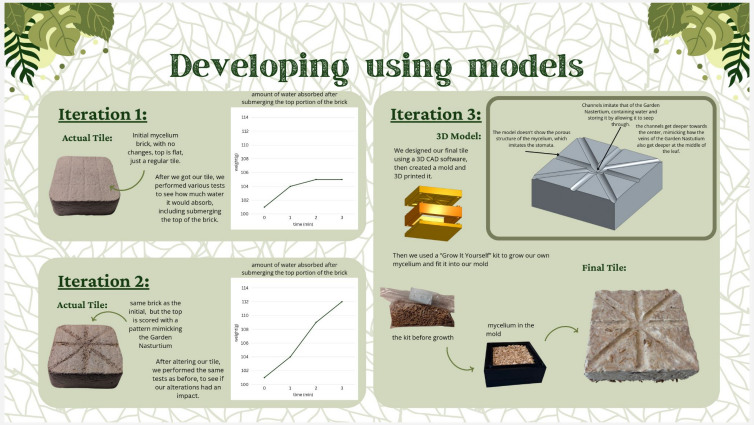
How was your solution inspired by nature?

Our solution to capture water, reduce unnecessary waste for responsible consumption and take advantage of our lack of resources. The project is based on the Namib Beetle; we imitated its wings and exoskeleton to capture water from the environment for communities that don't have the right access to sanitized water. It will not only help those communities, but also could be a revolutionary system to reach the Sustainable Development Goals. We did not only use the beetle, also the tillandsia plant, it absorbs humidity and nutrients from the environment; these two organisms helped us make the project functional and sustainable.

What does your design solution do?

What our design solution is made to do; fabrics implementing mesh systems that capture water by rain and humidity, that water eventually goes down to containers which connect to the fabric, so it goes through the sustainable production systems (stated that they can use a lot of water). The mesh will cover all of the fabric by the sides and top so the bottom can stay exclusively for the containers. This reduces the investment of water in fabrics that use sustainable fabrics. The mesh will be knitted in certain ways so it's easier for water to go down and wring.

SDG 13 - Climate Action



pocacito

1st: Canyon Crest Academy, San Diego, CA, USA, TEGULON

An innovative concrete alternative to solve Urban Heat Island Effect

What is the problem your team solved for this challenge?

Our team addressed the Urban Heat Island Effect (UHI). This effect exacerbates heat in Urban Climate Zones due to the re-radiation of heat by construction materials like concrete.

How was your solution inspired by nature?

Our solution was inspired directly by nature's method of cooling itself. After studying various natural cooling processes, we initially identified the Kalimeris Integrofolia, which is incredibly effective in transpiring water through large stomata to mitigate heat. Next, we identified the Garden Nasturtium, with a leaf structure that directly inspired the final product design. We combined the biological strategies of the Kalimeris Integrofolia and the Garden Nasturtiums by incorporating the utility aspects of their designs, mimicking it to synthesize a final product.

What does your design solution do?

Tegulon is designed out of mycelium to soak and absorb rainfall, slow releasing it into the air over a period of time. This ability mitigates the Urban Heat Island Effect by providing cooling to the local climate. Furthermore, Tegulon, unlike concrete, does not re-radiate heat, the mycelium build also being durable and not harmful to the environment. The information we gained regarding stomata, transpiration, as well as how to truly counteract the urban heat island effect directly aided in the choice of biomimicry as well as the final design.

SDG 13 - Climate Action

2nd: Herricks High School, New Hyde Park, NY, USA, ROOTIFY

a cube like structure that serves the purpose of an air purification system based on the natural properties of mangrove trees

What is the problem your team solved for this challenge?

The problem our team solved for this challenge was poor air quality. We wanted to create a product that would help battle that for everyone.

How was your solution inspired by nature?

Our solution was inspired by mangrove trees and how their leaves and roots naturally purify the air around them. By utilizing this natural air purifier, we compacted it into a small structure that can be placed into your homes, making sure that the air in your own home is not harmful to your health and well-being.

What does your design solution do?

Rootify purifies indoor air by utilizing the natural filtration properties of mangrove trees, especially their roots within a cube-shaped air filter. The mangrove tree roots filter harmful particles in the air, while the sides allow for airflow throughout the entire unit. Learning how mangroves naturally clean their environment and adapt to harsh conditions helped us create an effective, sustainable solution for improving air quality and supporting human health, directly aligning with the goal of good health and well being.

SDG 13 - Climate Action

3rd: British American School, Tecamachalco, Estado de México, Mexico, 9th grade, ALCORNOQUE FIRE FOAM

Alcornoque Fire Foam is a system that prevents forest fires, which have increased due to rising temperatures.

What is the problem your team solved for this challenge?

The problem being addressed is the frequent increase of forest fires, which are often caused by climate change and pollution. These fires spread rapidly, making the situation worse for nature and the forest ecosystem as a whole. The big fires destroy huge areas of trees, hurting wildlife and disrupting their natural habitats. Additionally, the smoke and harmful gases released into the air create very poor air quality, affecting both the environment and human health. As these fires become more frequen and worse, they pose a significant threat to biodiversity, ecosystems, and overall ecological balance, making prevention and mitigation crucial.

How was your solution inspired by nature?

Preventing and managing forest fires is crucial to protecting water resources, combating climate change, and maintaining life on land, highlighting the need for sustainable environmental policies and global cooperation.

What does your design solution do?

Mitigating forest fires requires prevention, detection, and response strategies. Governments must enforce strict policies on deforestation and land use. Reforestation restores ecosystems, reducing fire risks. Addressing climate change by cutting greenhouse gas emissions helps prevent extreme conditions that fuel fires. Advanced technology, like satellites and AI, enables early detection for faster containment. Community education on fire safety, controlled burns, and responsible land management can prevent human-caused fires. Investing in firefighting resources, sustainable forestry, and habitat protection is crucial. Combining strong policies, environmental awareness, and climate action can significantly reduce the frequency and severity of forest fires worldwide.

SDG 14 - Life below water

1st: Kang Chiao International School - Xiugang Campus, New Taipei City, Taiwan, 11th grade, COCOFLOW

To combat the impact of urban runoff on Taiwan's seafood industry, we introduced a mangrove root-coconut coir-inspired flotation system.

What is the problem your team solved for this challenge?

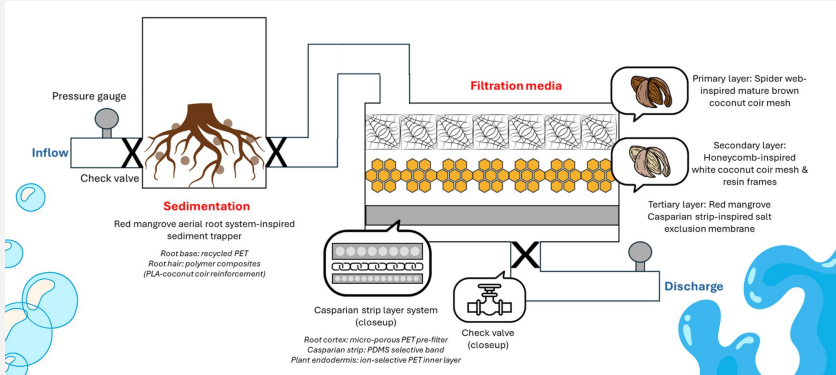
Taiwan is a maritime nation where fisheries play a vital role. Yet in 2025, 61% of Taiwan's 2,933.9 km of river and ocean bodies were polluted, mainly from domestic sewage, industrial, and livestock wastewater. This has worsened seafood contamination, linked to two cholera cases (2022 and 2023) and 274 diarrhea clusters in March 2025. While water booms and on-site treatments, such as gravel aeration and constructed wetlands, offer partial relief, they remain limited by scalability, harming marine life, lack integration, and are not cost-effective, underscoring the urgent need for more integrated and sustainable water protection solutions.

How was your solution inspired by nature?

We primarily learned from mangroves and coconut coir. Mangrove's aerial root system, including stilt roots and pneumatophores, allows gas exchange and mechanical support. The Casparian strip in mangroves controls salt uptake to prevent too much salt from entering the plant. Also, the husks of coconut coir fibers are valuable natural materials due to their strong salt resistance and biodegradability. To add on, we were also inspired by biological products, including orb-weaver spider webs and honeycombs. In addition to successfully capturing prey, orb-weaver spiders have spiral and radial webs that mix strength and flexibility. The honeycombs' hexagonal shape is also noted for their excellent strength-to-weight ratio and material efficiency. By matching the strengths of each organism with a particular filtration requirement, we effectively integrated the biological strategies. In one filter layer, mangrove-inspired root structures were employed to trap sediments, while the Casparian strip-inspired selective membranes were used for final desalination. The orb-weaver spider web was used in another layer. Then, the hexagonal filter shape in the next layer provides a lightweight yet sturdy external frame, improving durability while preserving materials. These filtration layers, combined with the strong and biodegradable material of coconut coir, work together to create an ecologically friendly and functional cohesive system.

What does your design solution do?

Using biodegradable, naturally inspired materials and structures, our design tackles the issues of restricted access to clean water. The multi-layered water filtration system mimics mangrove roots' natural sediment-trapping and salt-regulating properties to remove impurities, reducing water and seafood contamination. At the same time, using coconut coir nets lowers long-term plastic pollution in the seas, lowering the amount of plastic in the bodies of marine animals. By promoting clean water technologies that are both eco-conscious and community-oriented, our design protects human health and ensures universal access to safe water resources, safeguarding Taiwan's seafood industry. Nature, primarily mangrove roots and coconut coir, directly informed the design elements. We utilized the intricate root systems and selective barriers like the Casparian strips of red mangroves for our sediment filter and salt exclusion system. We also included designs of filters similar to the structure of spiral and radial orb-weaver spider webs. Moreover, we will adopt the strong and sustainable hexagonal honeycomb pattern into another filter layer. Regarding the material, we are mainly using the sustainable filtering material of coconut fiber husks, or coir.



SDG 14 - Life below water

2nd: Karunia Global School, Kota Jambi, Indonesia,
BIO-INSPIRED MULTI-STAGE WATER FILTER

We tackled Batanghari River pollution with a biomimicry filter using oyster, sponge, and Daphnia-inspired water purification.

What is the problem your team solved for this challenge?

We addressed severe pollution in Indonesia's Batanghari River, where heavy metals (lead/mercury), sediments, and organic toxins endangered ecosystems and communities relying on the water.

How was your solution inspired by nature?

We mimicked oysters' gill filtration (12-layer gradient system) and sponges' reverse-flow purification (zeolite nano-pores), adding a self-cleaning backwash inspired by oyster siphons.

What does your design solution do?

It combines: ● Biological (Daphnia magna biofiltration), ● Physical (gravel→nanofiber sediment removal), ● Chemical (activated carbon/zeolite metal absorption). Results: TDS ↓72→67ppm, pH balanced 6.81→7.09, Daphnia survival ↑40%→92%. Impact: A scalable, low-cost system for polluted waterways.

SDG 14 - Life below water

3rd: Herricks High School, New Hyde Park, NY, USA, grades 9+11, FISHY FILTER

The Fishy Filter is simply an effective garbage can in the ocean to help clean up pollution.

What is the problem your team solved for this challenge?

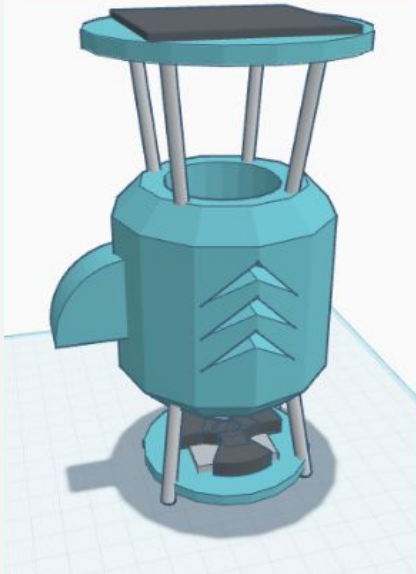
The problem our team solved for this challenge was ocean plastic pollution. Plastic pollution affects the cleanliness of our ocean waters (Clean Water and Sanitation), especially with the microplastics that can spread to our food. The plastic pollution also endangers marine life (Life below Water) because of the garbage's high chance of being eaten, entangled in, and containing toxic chemicals. This can wipe out entire species and ecosystems underwater.

How was your solution inspired by nature?

Our solution was inspired initially by the baleen whale, and now primarily the whale shark. We were inspired by the baleen whale's filter feeding ability of trapping in the food, but expelling the water out. This inspired us to make a permeable net that can trap the plastic, and let the water flow through. The whale shark's inspiring ability is how it can suck the water and food in. The ability to attract the plastic towards the net made it a lot more sustainable because it now just needed a rotor fan to create a slight whirlpool.

What does your design solution do?

Our design solution will help reduce current and future plastic waste in the ocean. It is impossible to stop people and companies from polluting, so mitigating the problem is the best thing anyone can do right now to help clean up the oceans.



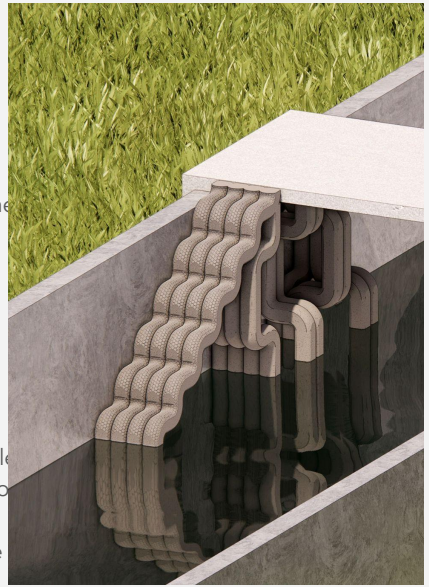
SDG 15 - Life on land

1st: Orange Cube Seoul, Seoul, South Korea, grades 10 + 11, ROOTED PASSAGE

Rooted Passage is a bridge that helps small animals escape deep canals, inspired by mangrove roots and tree frog toe pads to protect wildlife.

What is the problem your team solved for this challenge?

The problem our team addressed was about small animals and amphibians falling into deep agricultural canals in South Korea, where they cannot escape without human help. While the existing canals are essential for rice farming, they pose a serious threat to wildlife.



How was your solution inspired by nature?

Our solution was inspired by mangrove roots and tree frog toe pads. Mangroves stabilize themselves in a wet environment by extending the foot plate area, which became our inspiration for the stable leg structure of the ramp. Moreover, tree frogs use hexagonal toe pad textures to grip slippery surfaces. This inspired the texture of the ramp's surface to make animal traction better. By combining these strategies, we created a biomimetic, stable, and graspable bridge that helps small animals escape from challenging water conditions. This integration of natural inspirations ensures both structural integrity and effective usability for animals to escape.

What does your design solution do?

Rooted Passage is a modular escape bridge that helps small animals to safely exit deep canals. It addresses the problem by offering a stable and graspable path, which is designed with ecological guidelines and biomimicry. The design of the ramp incorporates the characteristics of mangrove roots and tree frog pads, enhancing its structural stability and traction even in flowing water. This solution helps wildlife avoid roads and human reliance on rescue. Drawing inspiration from nature, we followed the National Institute of Ecology's guidelines for escape bridges, including dimensions, and slope ratios, to ensure our design is feasible for practical implementation.

SDG 15 - Life on land

2nd: Torrey Pines High School, San Diego, CA, USA, grades 9, 10, 11, SORMETO

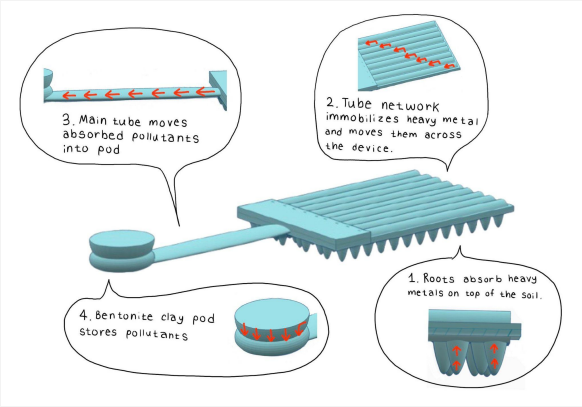
Sormeto is a portable heavy-metal absorber inspired by functional properties of Italian ryegrass, designed to be applied on gardens after a wildfire.

What is the problem your team solved for this challenge?

Our project focuses on tackling the toxins, heavy metals, and ashes left behind following a wildfire; once these particles blend with the soil, they eventually harm soil structure, reduce soil fertility, affect plant growth, and can even contaminate the food chain.

How was your solution inspired by nature?

The Sormeto was inspired by the Italian Ryegrass and the Water Lily. Ryegrass is known for its chemical absorption and concentration, contributing to Sormeto's effective absorption of heavy metal. Additionally, the large surface area of Water Lilies inspired the design's wide and blanket-like appearance, allowing for a more efficient absorption of chemicals. By mimicking these two organisms, the final design of the Sormeto exhibits a wide structure with an optimized surface area accompanied by the function to absorb toxic remains left on the ground after wildfires.



What does your design solution do?

Our design solution absorbs pollutants such as heavy metal from the ground and immobilizes them through bentonite clay. After the initial absorption, absorbed chemicals are eventually moved towards the replaceable pod via the tube. The application of our design resolves the issue of soil pollution caused by wildfires--since fires leave ash and heavy metal behind--which may lead to further consequences such as the disruption of soil structure. In conclusion, the Sormeto allows for the absorption, immobilization, and purification of heavy metal after being stationed on top of the polluted soil.

SDG 15 - Life on land

3rd: Cambridge Court World School, Jaipur, India, TRAILBLAZERS FOR THE NATURE LOVERS.

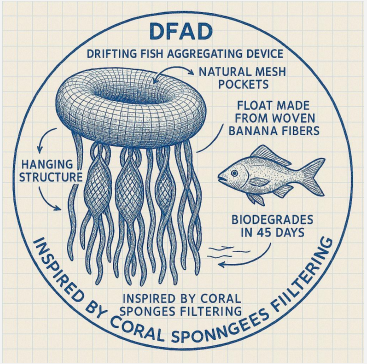
The value of biodiversity is that it makes our ecosystems more resilient, which is a prerequisite for stable societies & our life on Mother "EARTH"

What is the problem your team solved for this challenge?

Our team tackled the escalating threat posed by drifting Fish Aggregating Devices (dFADs) in the Indian Ocean. Constructed from plastic, nearly 90% of these devices evade retrieval, turning into unregulated marine debris. As they drift for months, they entangle endangered turtles, sharks, and juvenile tuna, intensifying ghost fishing and increasing mortality among non-target species. These artificial rafts disrupt natural fish behaviour, enabling the premature and unsustainable harvest of juvenile stocks. When stranded ashore, they devastate coral reefs and worsen the region's microplastic crisis. In the absence of binding global regulation, dFADs continue to silently degrade one of Earth's most vital marine ecosystems.

How was your solution inspired by nature?

Our design concept is inspired by coral sponges and kelp fronds. Coral sponges are renowned for their ability to absorb microplastics through their tiny pores (ostia) and intricate canal systems, so we designed tiny pores in our structure to emulate this natural filtration mechanism. By incorporating this approach, microplastics in the water will permeate the structure and become effectively absorbed and trapped. Additionally, the unique shape and flowing movement of kelp fronds , characterized by their long, flexible blades and ability to sway with ocean currents guided us to use banana leaves in a similar fashion. These leaves mimic the form and dynamic flow of kelp, providing shade, attracting fish, and serving as a natural food source. By emulating these natural systems, our design achieves both functionality and ecological synergy.



What does your design solution do?

Our design solution serves as an eco-friendly replacement for drifting Fish Aggregating Devices (dFADs). It attracts and shelters fish, much like traditional dFADs, but without the harmful side effects such as ghost fishing and persistent marine litter. Additionally, it integrates microplastic-trapping features, helping to clean the surrounding water. Made from biodegradable materials, the device naturally disintegrates within 45 days, ensuring it does not contribute to long-term ocean pollution. In essence, our solution supports sustainable fishing practices while actively improving marine health.

Recognition

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A big thank you to all.

Stay tuned for BYDC 2026.