

DESIGNED BY NATURE

6 x 60'



“Look deep into nature, and you’ll understand everything better”
ALBERT EINSTEIN

“The more our world functions like the natural world, the more likely we are to endure this home that is ours, but not ours alone.”
JANINE BENYUS, BIOLOGIST



Plants, animals, and microbes are the consummate engineers. After billions of years of evolution, failures are fossils, and **the species that have best adapted and evolved are the ones that hold the secrets to survival.** Not just for themselves, but for all of us as well...

... After centuries of exploiting and destroying our planet, scientists and engineers alike are turning to nature for sustainable solutions to some of the biggest challenges we face today. **But can imitating nature help save the planet?**

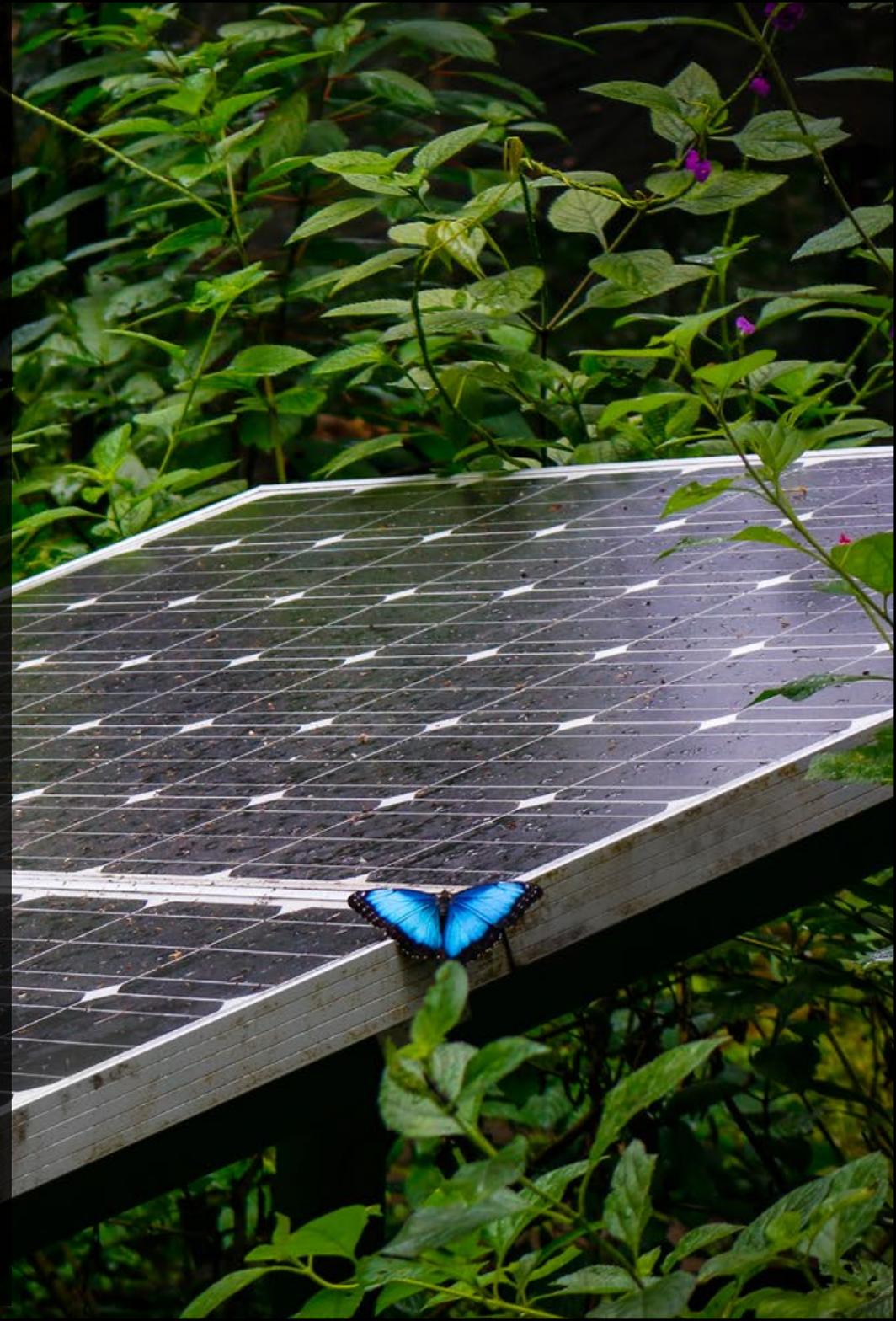
Combining stunning archive footage with specially shot interviews, with a cast of charismatic and knowledgeable experts, including material scientists, chemists, biologists and architects, this **awe-inspiring new series** explores the **groundbreaking discoveries** that scientists and engineers are making by observing **nature's time-tested patterns and strategies**, which have created an **uber efficient, zero-waste circular system**, and applying them to new technologies or using them to optimize existing ones.

Each episode will feature **3-4 examples of innovative, sustainable technologies that have been 'designed by nature'**, plus we meet the people who created them as they reveal the natural phenomena that inspired their technological innovations.

For example, did you know that:

- **Termites have taught us how to almost negate the need for artificial air conditioning, which is responsible for 16% of the world's electricity usage?**
- **Imitating how a spider spins silk at room temperature**, can create high performance, sustainable textiles that are 1,000 times more efficient than an equivalent synthetic fiber?
- **Coral-inspired carbon capturing concrete** could actually reverse climate change?
- **'Flying' Manta Rays** are inspiring super efficient aircraft?
- **The firefly, Saharan silver ant, and lobster** are inspiring a new innovation to combat light pollution?
- **The beautiful black wings of the rose butterfly** are helping redesign solar power cells?

Each of these examples not only emulates the natural world but aims to save it. Designed by Nature, Protecting Nature.



EXAMPLE EPISODES

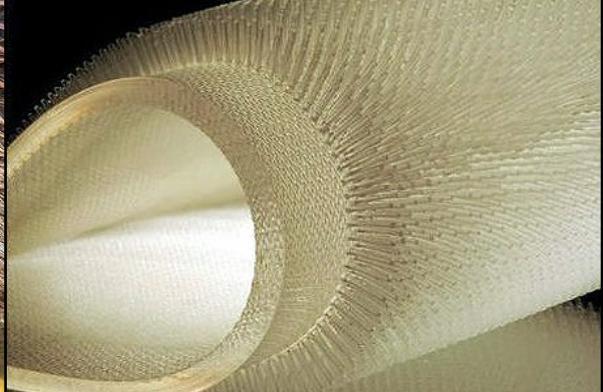
In easily digestible, beautifully-crafted sequences, we'll uncover the science behind some of the most fascinating technological innovations that are helping us to build a more sustainable future world, unraveling the details of their nature based inspiration along the way.

In each episode, we look at 3-4 stunning examples of how planet Earth has provided the source information for a wealth of recent innovations, from how the world's largest living structure, coral, has brought about one of the most exciting and practical creations in the effort to tackle climate change - by turning one of the most damaging materials to our planet, concrete, into potentially one of the most helpful...

...To how the fascinating forms in water made by schools of fish have led to a complete redesign of one of the world's most promising forms of renewable energy, and has transformed its efficiency levels.

We even look at one of the most misunderstood insects in the world, termites, and how their reputation for destruction should really be replaced with utter admiration, as their intricate and purposeful home structures have shown us how to decimate our total world electricity usage.

Along the way, we meet the incredible minds behind the amazing biomimetic designs, who are just as inspiring as their world-changing innovations and technologies.



FOR EXAMPLE....

Coral inspired concrete that can conquer climate change

Concrete is the foundation of countless buildings, homes, bridges, skyscrapers, millions of miles of highways, and some of the most impressive feats of civil engineering the world has ever known. It's the most widely-used human-made substance on the planet - and it's also one of the worst for the climate; the cement industry alone generates 2.8bn tonnes of CO₂ every year. We'll reveal that the intricate beauty of coral is inspiring new inventions in the concrete world. Brent Constantz of Stanford University is the man to tell us all about it, and with his decades of experience, his expertise is of the highest caliber. He shows us that corals build their skeletons by pulling carbon out of the water and crystallizing it with calcium components to create calcium carbonate - a process known as biomineralization. Could we humans mimic this process to capture and store carbon dioxide from the atmosphere? By emulating the coral and dissolving carbon dioxide in water with other compounds, and then using this solution to create concrete, Brent Constantz is providing a solution to two things. On one hand, he is producing more concrete in a world that depends on it, and on the other, is making a serious dent to climate change by removing carbon dioxide from the atmosphere in the process.



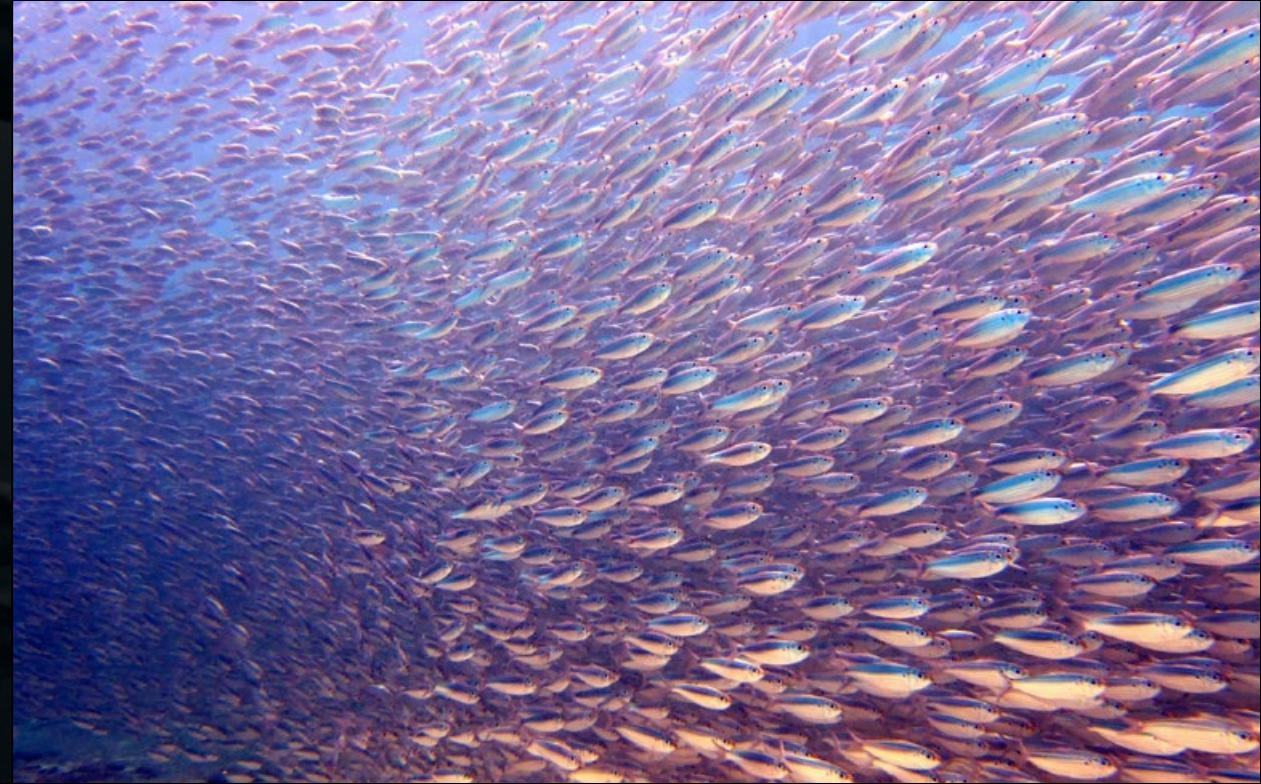


Termites: Once known for destruction, now teaching us how to create revolutionary buildings

Often, biomimicry isn't simply about mimicking an anatomical or evolutionary niche of a species. Sometimes, we can even take cues from the structures these animals build to create better life support systems for ourselves. Termites are infamous for their destructive properties; however, they are also responsible for creating some of the most elaborate ventilation systems for cooling on the planet. Even in some of the hottest places on Earth, termite mounds remain exceptionally cool inside. Using an intricate network of intentionally placed air pockets, the mounds create a natural ventilation system using convection. Now humans are replicating these structures in an attempt to completely overhaul the reliance on heavily energy consuming air conditioning - responsible for an incredible 16% of the entire world's electricity usage. In this episode we meet the team behind the Eastgate Centre in Zimbabwe - an architectural and design feat like no other, and find out just how they recreated the termite's creations. Mick Pearce, the structure's designer, takes us through the design process and how exactly he examined and got to grips with the termite's technical constructions.

Wind Farms rearranged like schools of fish - producing up to a whopping 10 times more power

The mesmerizing geometric and energetic impact that schools of fish have on the water they move through has inspired a team of aeronautical engineers and bio-engineers to completely rearrange how wind farms are set up, and with astonishing results. Traditionally, wind turbines rotate on a horizontal axis. At one of the world's most prestigious scientific institutions, CalTech, the team made up of Robert Whittlesey, Sebastian Liska, and John O Dabiri saw the potential of arranging the wind turbines to rotate on a vertical axis instead, much like the arrangement of the schools of fish they had been studying. They found that by doing this, they significantly improved the efficacy and efficiency of the wind farms, producing up to 10 times more power for a given area of land. We dive into the details and work our way through with wonderful cinematic sequences and perfectly put scientific explanations.





The Bio-Mimetic City, Lavasa, developed to deal with monsoons - by learning from forests

Spread across 12,000 acres in a Western Ghats valley, located outside Pune, Lavasa was developed as a truly bio-mimetic city. The idea was to restore 70% of the deforested land through detailed landscaping, reforestation and slope greening, reduce 30% of carbon emissions, 65% of potable water consumption, and 95% of waste sent to landfills. And it was designed to achieve this using technology heavily influenced by the natural world. Before building this new urban area, the architects and developers wanted to be sure it could handle the monsoon season, as it was in an area particularly affected by this - and so in order to mitigate potential problems, they took lessons from the nature surrounding it: the forest. The city's rooftops are inspired by the morphology of the native banyan fig leaf, whose pointed spear shape at the end speeds up the water run-off and cleans its surface in the process - this led to the rooftop being tiled with shingle tiles, which shed water in the same way. Due to the severity of the monsoon season in this region, flooding is common - and so they developed an irrigation system based on an ants nest, diverting the water away through multi-path, low-grade channels. And on top of this, the water is then stored in networked building foundations, behaving much like tree roots. An incredible feat in bio-mimetic design.

Textiles made 1000 times more efficient by mimicking spider silk

Spider silk is often cited as one of the strongest biological materials in the world, and scientists have long been searching for a way to artificially synthesize this silk for human use as a textile fiber. The people at Spintex have finally cracked the spider's code, and are able to create the highest performance sustainable silk fibers available, with their process being 1,000 times more energy efficient than an equivalent synthetic petroleum fiber - and with water as their only by-product! They have done this by developing a solution that mimics a spider spinnerets' ability to spin fiber at room temperature from a liquid gel - and without any harsh chemicals. These fibers can be used in incredible ways across many different industries - from sustainable fashion to lightweight composites in the aerospace and automotive industries, and there's even use for them in the medical industry. A world changing development, all thanks to our eight legged friend.





'Flying' manta rays inspiring more efficient aircraft

Historically, we have looked upwards for flight inspiration - Leonardo da Vinci's flying machine sketches were inspired by bats and birds, the Wright Brothers looked to pigeons when designing the first successful airplane, and the military's tiny drones have been modeled on dragonflies. But now, we're looking down into the ocean: the spot light is on manta rays. As they dance through the water, sometimes even leaping into the air for seemingly no reason other than fun, engineers from both Boeing and NASA have been studying them closely. They have inspired a new kind of aircraft made up of a single body unit, where the engine of the aircraft sits on the plane wings versus under them and lacks a conventional tail. When designed like this, planes are faster, quieter and more efficient. With more than 50,000 planes expected to be flying in the next two decades, increasing efficiency will be essential to our decarbonization goals - and this sleek, aerodynamic design is ticking lots of the necessary boxes.

FURTHER EXAMPLES:

Werewool is developing **biodegradable textiles with circular lifecycles**, inspired by naturally occurring colouring processes like those found in corals, promising to revolutionize the wasteful fashion industry.

Biomimetic Architecture: The Gherkin - Norman Foster's iconic London building, which was designed after the Venus's flower basket sea sponge. The result is a 50% reduction in need for air conditioning!

A company called DElight has been inspired by the firefly, Saharan silver ant, and lobster, and their invention **uses nature to combat light pollution**.

Scientists have been **learning from mantis shrimp to make more durable, lighter materials** - - this could be used in cars/airplanes, for example. The lighter materials making up the bodies would mean a reduction in fuel costs and a lower carbon footprint.

Butterflies have inspired a new way of approaching solar power - with stunning results.

Renewable energy technology has been developed to **harvest wave action energy with kelp motion**.

EXAMPLE EXPERTS

We learn from some of the most inspiring people who are leaders within the biomimicry space. Interviews with our experts will be interspersed throughout the episodes, helping to explain how we can change the world by allowing nature's processes to teach us how to do things properly.



Brent Constantz

Brent Constantz is a Silicon Valley entrepreneur and marine geologist, who once treated cardiovascular calcification and created bone cements (used in operating rooms to mend broken limbs) by mimicking the process that corals and shellfish use to create their own shells. His patents and products are used by doctors around the globe. After changing the medical world he went on to set his sights on climate change, setting up his company Blue Planet Ltd. He has used his knowledge and study of corals to develop a potentially world-changing invention - concrete that sequesters carbon dioxide from the atmosphere.



Janine Benyus

Janine is a biologist, author, innovation consultant, and self-proclaimed "nature nerd." She popularized the term biomimicry in her 1997 book *Biomimicry: Innovation Inspired by Nature*. Janine has personally introduced millions to the meme of biomimicry through two TED talks, hundreds of conference keynotes, and a dozen documentaries. In 2006, she co-founded the Biomimicry Institute, a non-profit dedicated to making biology a natural part of the design process. The Institute hosts annual global biomimicry design challenges on massive sustainability problems, mobilizing tens of thousands of students and practitioners through the Global Biomimicry Network to solve those challenges, and providing those practitioners with the world's most comprehensive biomimicry inspiration database, AskNature, to use as a starting place.



John O. Dabiri

John Oluseun Dabiri is a Nigerian-American aeronautical engineer and the Centennial Chair Professor at the esteemed California Institute of Technology, also known as CalTech. He is a highly honored academic, having been awarded the prestigious MacArthur fellowship and is a fellow of the American Physical Society to boot. He was named in MIT's *Technology Review's* "35 Innovators Under 35", as well as one of *Popular Science's* "Brilliant 10.". On top of all of that, he was selected to serve on President Biden's Council of Advisors on Science and Technology. His biomimetic research and work on adapting wind turbines according to the vortexes left by schools of fish has earned him high levels of recognition and respect in academic circles, and has only just begun.

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Alyssa Stark

Alyssa is a scientist, or a functional morphologist as she calls herself, studying biological adhesives. Her lab explores how environmental factors affect the performance, behavior, and morphology of biological organisms. Most of our work is focused on using geckos, ants, and sea urchins to explore questions about the functional morphology of adhesion. Additional areas of interest include biomechanics of locomotion and the functional properties of biological materials. From developing biomimicry science programs for elementary school kids to mentoring participants in the Biomimicry Global Design Challenge, Alyssa remains heavily involved in spreading and teaching biomimicry.



Mick Pearce

"I choose to work within three parameters; nature, resources and aesthetics. By "nature" I mean the Gaia theory of natural systems in which life itself controls the biosphere. Designers need to see the city as an ecosystem in which all parts are interlinked and influence each other. "Resources" are human, natural and economic. By "aesthetics" I refer to a new relationship between designer and nature where the former copies the processes of nature and not nature itself." These are the words of Mike Pearce, lead designer of revolutionary termite inspired structure the Eastgate Centre in Zimbabwe. Known as a world leader within biomimetic architecture, Pearce has demonstrated through his decades of work and incredible feat of design that we are able to completely change the way we live - and for the better - through paying close attention to how mother nature does things, and then doing our best to kindly emulate it.



Arndt Pechstein

Based in Berlin, Dr. Arndt Pechstein, is founder of the boutique consultancy phi360, chairman of the Biomimicry Academy, as well as agile coach and change consultant working with corporates and SMEs across all sectors. Arndt holds a PhD in neuroscience and has expert backgrounds in Biomimicry, Design Thinking, Agile, Exponential Organizations, and digital business models. He combines technical and analytical knowledge with human behavior and creative approaches to create sustainable and scalable solutions in a complex and exponential world. As initiator of the Hybrid Thinking approach, he coaches and consults on change & transformation strategies to help organizations in their digital and agile transition and toward innovative business models.

An underwater scene with a diver in the upper right, jellyfish floating in the water, and a diver's legs visible in the lower center. The background is a deep blue-green color.

OFF THE FENCE

Off the Fence Productions is an award-winning producer of factual television and theatrical documentaries.

We have created more than 500 hours of television content for a wide range of international broadcasters including History Channel, MTV, BBC, Channel 4, Discovery, MSNBC, PBS, Netflix, National Geographic, A&E, Smithsonian Channel, The Weather Channel, ZDF, Arte, and France Televisions.

The creative team have been recognised by more than 80 awards, including Royal Television Society, Emmy, Golden Panda and Grand Teton.

Our Netflix documentary 'My Octopus Teacher' recently won an Academy Award, BAFTA and Grierson Award.



ACADEMY AWARD



BAFTA



EMMY



ROYAL TELEVISION



GREEN SCREEN



GOLD PANDA



JACKSON HOLE



GRIERSON