

# off the fence.

## Quest

38 x 30'

EPISODIC BREAKDOWN

### 1. Water in the World's 8th Largest Economy

As world population increases, the struggle over one of the earth's most valuable resources continues to intensify. Is the world in danger of running out of water? Join us as we take a special half-hour look at water in California, the world's 8th largest economy. Where does it come from? Where does it go?

California's population is growing by 600,000 people a year, but much of the state receives as much annual rainfall as Morocco. With fish populations crashing, global warming, and the demands of the one of the largest agricultural industry in the world, the pressures on California's water supply are increasing. What can the state of water in one of the world's largest economies tell us about the future of our planet?

### 2. Journey into the Ice Age

Imagine a vast grassy plain covered with massive herds of elephants, bison and camels stretching as far as the eye can see. Lions, tigers, wolves and later, humans hunt the herds on their huge summer migration. Where is this? This was the Western United States during the close of the last Ice Age.

Professor Richard Muller demonstrates the principles of a fission chain reaction, while top 2006 Nobel Prize winner George Smoot comments on the Big Bang.

Meet eclipse chasers – adventurers who travel the world to witness and document solar eclipses. In these rare moments, the moon covers the sun for a few minutes, leaving only its fiery atmosphere visible. Watch the China 2008 eclipse and learn about an invention that helped researchers at the turn of the 20th century photograph the sun's atmosphere in breathtaking detail.

### 3. Recreating Wetlands

Can biologists revive lost ecosystems? Find out how science is turning back the clock on 100 years of industrial salt production and restoring healthy wetlands for fish, wildlife and public recreation along a coastal shoreline in the western United States.

Researchers have begun to reveal the secrets of the ocean floor using sound and laser technology. By creating complex 3D maps, they're hoping to learn more about waves and achieve ambitious conservation goals.

The human brain was once a black box, but scientists are finding ways to peer inside and explore some of our most complicated thought processes. Using MRI machines, scientists can literally watch our brains at work as we make decisions, stave off pain and undergo illness.

#### **4. Science of Big Waves**

Taller and heavier than a four-story building, the monster waves at Mavericks attract big wave surfers from around the world. But what exactly makes these California waves so big? Discover the science behind big waves.

Engineer Ugo Conti has sailed the world, but has always suffered from seasickness. Find out how his queasy stomach became his inspiration and motivation to design "Proteus" – a spider-like sea craft made for smoother sailing.

Sudden Oak Death is a killer with no cure and it's devastating oak trees around the world. Now biologists are looking to the trees' genetics for a solution.

#### **5. Emotions Revealed**

Is your face giving you away? Meet renowned psychologist Paul Ekman, who has spent his life studying how our facial muscles involuntarily reveal emotions like sadness and anger.

What does our use of bottled water say about us? Take a look from the perspective of an anthropologist from the distant future.

Some of the world's most passionate astronomers don't even need to leave their own backyards. Meet the amateur stargazers who are making important observations about the cosmos and inventing tools at home to do it.

Cutting-edge microscopes are helping scientists create three-dimensional images of cells, which may lead to new medical breakthroughs.

## **6. Chasing Beetles**

All living beings share a common ancestry – today this is a basic idea. But when Charles Darwin published “On the Origin of Species,” he transformed the biological sciences forever. Now, 150 years later, Darwin’s ideas remain as central to scientific exploration as ever. Every day, scientists around the world continue to unlock the mysteries of evolution by discovering new species. Meet entomologist David Kavanaugh, who after discovering a new species of beetle in 1980, predicted that a second new beetle species would be found in the same area. Find out if his prediction came true – and how he used Darwin’s principles on evolution and modern DNA analysis to prove it.

## **7. Condors vs Lead Bullets**

Once nearly extinct, California condors are making a steady recovery. But a new threat - lead poisoning from old bullets - is slowing progress, leaving scientists to struggle with the passionate collision between wildlife preservation and the politics of hunting.

Tule Elk once dominated California's landscape, but after the Gold Rush they were hunted to near extinction. Now thanks to naturalists and inspired ranchers, they are making a comeback.

Zookeepers are using a lighter touch to keep their animals strong and healthy. From body work and acupuncture for giraffes, to pachyderm pedicures, come see how zoos around the world are using alternative treatments to guarantee the well-being of its residents.

## **8. Earth Day: Where We've Been**

Protecting the earth and the environment hasn't always been a primary concern. In the 1950s, deadly smog, piles of burning garbage, unregulated industrial pollution and toxic waste spewed into the atmosphere and seeped into the world's waterways at an increasingly alarming rate.

Join us as we journey back in time to explore how these dangers sparked the birth of a movement and the creation of the first “Earth Day” in 1970. Meet the everyday people who stepped up and devoted their lives to saving the planet from environmental disaster. Today, these “environmentalists” continue to inspire a new generation.

## **9. Sylvia Earle**

She's spent much of the last five decades exploring and protecting the world's oceans. Find out why legendary marine biologist Sylvia Earle thinks that we may only have a few years left to save what she calls "the blue heart of the planet."

Could you have a career studying rare Amazon River Dolphins, tiny octopuses and endangered sea horses? Healy Hamilton does, and she works with kids to encourage them to become scientists.

A growing number of children's advocates and political leaders are worried that our culture's disconnection from nature is harming kids. Concerns about the long-term consequences on children's physical and emotional well-being have spawned a national movement to "leave no child inside." Find out why we need nature and explore unique programs designed get children outdoors.

## **10. Perilous Diesel**

What's the most harmful kind of air pollution? It's the black soot generated by diesel engines found in the durable workhorses of transportation, like trucks, buses and ships. Find out what communities close to major shipping ports around the world are doing to combat the influx of unhealthy emissions.

Urban forests are going digital. With laptops and handheld devices, volunteers in San Francisco are creating an online map of every street tree in the city, getting a leg up on keeping the urban landscape healthy and growing.

In search of the common ancestor of all mammals, Biomolecular scientist David Haussler is pulling a complete reversal. Instead of investigating fossil remains, he's comparing the genomes of living mammals and constructing a map of our common ancestors' DNA. His technique holds promise for providing a better picture of how life evolved on Earth.

A nesting pair of Peregrine Falcons has become an unlikely internet sensation. Watch as their family dramas - from courtship to parenthood - are caught on webcam.

## **11. Preservation of the World's National Parks**

As the human population approaches the seven billion mark, the world's national parks have become vital sanctuaries. Many of today's most popular parks exist only through the persistence and advocacy of small groups who cared deeply about the earth's natural spaces. Golden Gate National Recreation Area, in the United States, is one of the largest and most visited urban parks in the world. Find out how communities rescued its precious open spaces from industrial development and what's being done today to protect its dramatic landscapes.

Randy Davis photographs spectacular locations that are typically hard to access by car or foot. His eye for light and shadow show a side of national parks that most visitors don't get to see.

## **12. Biofuels: Beyond Ethanol**

Are biofuels the perfect solution, or just a new part of the problem? For years there's been buzz – both positive and negative – about generating ethanol fuel from corn. Now, explore the next generation of green fuel alternatives and meet the scientists investigating the newest methods for converting what we grow into what makes us go.

Not satisfied with 50 mpg? With the hopes of curbing auto's addiction to oil, a group of hybrid hackers is launching a green car revolution by souping up Toyota's Prius and getting 100 mpg.

Find out what one of the oldest, largest natural history museums in the world is doing to go green.

### **13. Algae**

Could pond scum become the fuel of the future? Explore the amazing potential of algae and find out how the world's entrepreneurs are using it to create the next generation of biofuels.

Imagine living cells acting as memory devices, like biofuels brewing from yeast or a light receptor taken from algae that makes photographs on a plate of bacteria. With the new science of synthetic biology, the goal is to make biology easier to engineer so that new functions can be derived from living systems. Find out the tools that synthetic biologists are using and the exciting things they are building.

### **14. Tagging Pacific Predators**

It's easy to find them in a can, but the lives of tuna in the open ocean have been a mystery to scientists. But thanks to a tagging program in the United States, scientists are learning that these underwater sprinters travel thousands of miles around the Pacific.

Now find out what they're learning about the lives of sea turtles, sharks and other Pacific predators.

Photographer and naturalist John Albers-Mead describes visiting the tide pools near his home as "a treasure hunt that changes by the minute." See how he captures these sometimes-sunken treasures with his digital camera.

There's a hidden danger in the world's oceans: mercury. A potent neurotoxin that can cause serious illness, mercury has settled in the mud and made its way up the food chain, endangering wildlife and making many fish unsafe to eat. Find out how experts plan to clean up the world's oceans.

### **15. World's Most Powerful Microscope**

Nanoscience has a miraculous new microscope. Its ability to make images to a resolution of half the width of a hydrogen atom makes it the most powerful microscope in the world.

Scientists are planning to use the largest laser beam in the world to shoot tremendous bursts of energy at an area the size of a pencil eraser. The goal? To recreate fusion – which powers the sun

and some nuclear bombs -- perhaps harnessing a new source of clean energy for the 21st century.

Alaska's Northern Lights are one of the world's greatest natural mysteries. Find out more about the spectacular light shows up north and what scientists are discovering about the earth's magnetic field.

## **16. Autism: Searching for Causes**

Autism is a devastating developmental illness that affects children all over the world – and diagnoses are on the rise. The symptoms range from subtle to severe and its causes are unknown. To find answers, scientists are casting a wide net, looking not only at genes, but also a host of lifestyle and environmental factors.

What if you could learn your odds of getting cancer, heart disease or diabetes? A new generation of home genetic testing kits allows anybody with a cotton swab and a mailbox to find out. But does convenience come with a privacy risk?

Meet a forensic anthropologist who's developed a novel technique to help identify the remains of migrants who die crossing the U.S.-Mexico border.

## **17. SETI: Planet Hunters**

Do other planets like Earth exist? Find out why a team of astronomers in the US has built a new telescope to look for planets outside our solar system and why the search is so important to the future of our world.

Is anyone out there? For over 40 years scientists have been searching for extraterrestrial intelligence, but they've found nothing. Now the Allen Telescope Array, a string of 350 radio telescopes, is breathing new life into the search. Find out why SETI scientists now say we might be hearing from ET sooner than you think.

What looks like frozen smoke, but is also the lightest solid material on the planet? Aerogel is a unique man made substance that insulates space suits, makes tennis rackets stronger and could be used one day to clean up oil spills.

## **18. Disappearing Frogs**

Pollution, disease and climate change are threatening frogs around the world. Frogs bridge the gap between water and land habitats, making them the first indicators of ecosystem changes. Meet the researchers working to protect amphibians from demise.

For the first time ever, a sharp decline in salmon numbers prompted officials to cancel an entire fishing season in 2008 in the ocean off the Western United States. Where did the salmon go? Join us as we explore why the salmon are disappearing and how we might save them.

Finally, meet herpetologist Bob Drewes and find out how he turned his passion for frogs into a lifelong career.

## **19. Eat Less**

Have we found the fountain of youth? Scientists are exploring longevity by discovering ways to make animals live longer through calorie restriction - a diet that requires eating at least 30 percent fewer calories than normal. While the technique has attracted a small, but devout following, skepticism abounds.

Chocolate - it's been revered for millennia by cultures all throughout the world. But while it's easy to appreciate chocolate in all of its delicious forms, creating this confection is a complex culinary feat. Meet chocolate makers who'll explain the elaborate engineering and chemistry behind this tasty treat, and also learn why it's good for your health!

Finally, ever wonder how to make krill shakes, squid tacos or fishy sausages to tempt the taste buds of a 400lb mola mola? The chefs at the aquariums and zoos around the world prepare such meals daily to feed thousands of species, from otters to octopi to sharks. Find out what it takes to come up with nutritious and tasty meals for diners with wild appetites.

## **20. Climate Change: The World At Tipping Point**

What kind of planet will our children inherit? The world's climate is changing and the environment is now being affected in both dramatic and subtle ways. Scientists already have clear evidence that the world is getting warmer – and faster than expected. Global surface temperatures over the last decade have been the warmest on record.

Find out how these changes have been affecting everything from water supplies to wildlife. Meet hydrologists, geologists and marine biologists to discuss the environmental changes that are taking place and get an in-depth look at what's being done to reverse the trend.

Photographer Laura Watt uses her camera to capture the patterns, textures and colors of the precious water that surrounds us all.

## **21. Climate Change and the Electric Power Grid**

With the race on to reduce global warming and fossil fuel dependency, experts in alternative energy see a bright future for renewable resources like wind, solar, hydro-power and geothermal energy. But getting it onto the electrical grid to power homes and businesses is a major challenge that engineers and environmentalists are wrestling with.

Find out how the United States is envisioning the "Smart Grid" of the future and how it might be improved to more cleanly and efficiently keep the lights on around the world.

Photographer Harold Davis combines his loves of the natural world with modern digital photography to create images that show the ordinary in an extra-ordinary way.

## **22. Fatal Attraction: Birds and Wind Turbines**

The world needs wind power. But large wind farms, like California's Altamont Pass, are unintentionally killing golden eagles, burrowing owls and other threatened birds. Now, wind companies, scientists and environmentalists around the world are working to bird-proof these massive wind farms.

Farmers everywhere depend on bees to pollinate their crops. But in 2006, thousands of bee colonies fell victim to colony collapse disorder and disappeared. Find out what happened to the bees and what top scientists are doing make sure they keep buzzing to pollinate our crops.

A seaside park in the shadow of the Golden Gate Bridge is getting new trails, catwalks and other features, making it more accessible to millions of visitors.

## **23. Into the Inferno: The Science of Fire**

Wildfires cost billions of dollars in damage and often result in lost lives. Take a look inside the fire season. Meet the firefighters and explore how the history of forest management could be feeding today's flames. Discover the technology that's helping firefighters to do their risky work.

Women living in the refugee camps of Darfur, Sudan, must walk for seven hours outside the safety of the camps to collect firewood for cooking, putting them at daily risk for rape and assault. Now, researchers have engineered a more efficient wood-burning stove, which is greatly reducing both the women's need for firewood and the threat of violence against them.

A growing number of the world's police are putting away their old radar guns and embracing new laser beam guns. Find out how this gadget helps cops clock cars with much more precision than before.

## **24. Artificial Intelligence: Thinking Big**

Though computers have gotten faster, smaller and more versatile, it's still a big challenge to get them to demonstrate intelligent behaviors. Will machines like robots ever match - or perhaps even exceed - the capabilities of the human brain? Meet a robot that in ten years' time could take care of tasks around the house that most of us would rather not do.



Can someone who's quadriplegic or hearing impaired play a video game? Take a trip to an international Game Developers Conference in San Francisco, where a group of gamers used colorful tactics to convince mainstream developers to make video games that are accessible for everyone.

Finally, it's a virtual world, but the transactions are real. Go inside Second Life, an online game where millions of people are creating digital personalities called avatars and are living virtual lives - meeting other avatars, going to events, and even buying property with real money.

## **25. Nanotechnology Takes Off**

The world's scientists are manipulating particles at the atomic level, ushering in potential cures for cancer, clothes that don't stain, and solar panels as thick as a sheet of paper. Find out how these unimaginably small particles work to create some of today's most cutting edge technology.

Solar and wind power may get the headlines when it comes to renewable energy, but another type of clean power is heating up. Geothermal power uses hot rock from deep inside the Earth to generate electricity. Find out how the world's largest power-producing geothermal field in the United States has been providing electricity for roughly 850,000 households, and is set to expand even further.

Finally, it may look like waste, but to some people it's green power. Find out how more and more businesses, like dairy farms and restaurants, are taking their leftover waste and transforming it into clean energy.

## **26. Dark Energy**

Physicists can't see it and don't know much about what it is, but dark energy makes up 70% of the universe. Meet one of the world's leading scientists trying to understand dark energy and the role it plays in causing our universe to expand.

What happens when something explodes? Find out how scientists are getting their first glimpse of the microscopic properties of an explosion.

We all rely on the water cycle, but how does it really work? Scientists in the United States are embarking on a new project to understand how global warming is affecting our fresh water supply. By tracking individual raindrops they hope to discover how it moves through the watershed.

Meet Erin Malone, a photographer that captures the natural world with the simplest technology: a pin-hole camera.

## **27. Underwater Wilderness**

The waters off the coast of the Western United States are some of the richest in the world. But declines in fish species have led lawmakers to begin creating large protected areas, or "no fishing zones," similar to wilderness areas on land. The hope is that a statewide network may help bring back fish, birds and marine mammals that are currently on the brink. And sea otters, the fuzzy mascots of California's coast, have fought back for 75 years from near-extinction. But lately fur seal pups have been stranding themselves on beaches in alarming numbers and their population has mysteriously stalled. Scientists say pollution from land - perhaps even a parasite in cat litter - may be the culprit. Finally, it's a new kind of hospital that caters to a very special type of patient. The Marine Mammal Center rescue is a unique on-site research lab and animal care facility that rescues, rehabilitates and releases between 500 and 700 injured, sick or orphaned Marine Mammals every year.

## **28. Wineries Face Global Warming**

Microclimates are now producing famous fine wines, but what happens if the climate changes? Scientists are predicting that global warming could increase the number of super-hot days in some of the world's best wine-producing regions, interfering with the way grapes ripen.

Tired of toxic embalming fluid, rainforest wood caskets and other ecologically unfriendly practices, a new generation of undertakers is attempting to green-up the funeral industry with burials that go easy on the land.

An explosion in green building is underway, with cleverly engineered libraries, office buildings, even public housing projects popping up across the globe. Find out why green construction projects are championed as much by landlords trying to cut energy and water costs as by environmental groups.

## **29. Zeppelins Resurrected**

The Hindenburg wasn't the only air ship to end in a catastrophic crash. In 1935, the USS Macon went down in 1000 feet of water off the coast of the Western United States. Now, as scientists study the recently-discovered wreckage, new and improved dirigibles are returning to rule the skies once again.

It's not James Bond - it's Graham Hawkes, record holder for the deepest underwater solo dive and inventor of Deep Flight, a winged submersible that may revolutionize underwater travel. Find out what makes this unique machine "fly" underwater.

Sailboats have been sailing the world's oceans for hundreds of years. But despite their rich heritage, scientists and boat designers continue to learn more each day about what makes a sailboat move. Contrary to what you might expect, the physics of sailing still present some mysteries to modern sailors.

### **30. Stem Cell Gold Rush**

As often as they've grabbed the headlines, human embryonic stem cells remain an enigma to many people around the world. What are these tiny biological entities, and why has stem cell research become such a complex issue?

Discover the potential for medical breakthroughs in the next decade. And, over the past 15 years, the number of people who die of AIDS each year around the world has dropped by nearly 20 percent. But AIDS remains a serious public health crisis among low-income African-Americans, particularly women. Meet top research groups studying innovative approaches that could lead to new treatments and possibly a cure.

Humans and dogs have been partners for thousands of years. Now our canine friends are joining the fight against cancer. Find out how researchers are training dogs to smell cancer in human patient's breath samples.

### **31. Out of the Park: The Physics of Baseball**

Discover physics through the eyes of America's favorite pastime, baseball. By throwing fast balls, sliders and curve balls experts demonstrate the principles of velocity, force, and aerodynamics and show how these concepts can make the difference between a strike and a home run.

Watch physicist Paul Doherty perform a "sit-down" lecture on one of Sir Isaac Newton's most famous laws.

The world's top athletes are racing to get the most out of the human body and are using new technology to do it. But there is a dark side. Anabolic steroids and other performance enhancing drugs have been injected into the mix. But how do they really work? And can new technology catch the cheaters?

### **32. Earthquakes: Breaking New Ground**

Can earthquakes be predicted? Researchers are now identifying the slow-moving clues that may foreshadow violent quakes and studying active faults below the earth's surface. Their work may provide even a few seconds of warning, which in earthquake country can give a vital warning to open elevator doors, slow down trains and alert firefighters.

As more and more people around the world build and buy homes on hillsides, landslides are becoming a bigger risk. Meet the geologists working to understand and predict these natural disasters.

And what about tsunamis? Investigate the history of the world's seismic swells and discover the methods researchers use to gather the information that will help them understand the geologic history of tsunamis and when and where they may strike again.

### **33. How Edison Got His Groove Back**

Researchers are pioneering a new way to recover 100-year-old recordings. Found on fragile wax cylinders and early lacquer records, the sounds reveal a rich acoustic heritage, including languages long lost.

Over the last few decades, hundreds of thousands of acres of wetlands have been lost to development and industrialization. Find out how historical ecologists are recreating these lost environments using old maps and photographs.

In the early 1900's, researchers traveled around the Western United States and created detailed records of the wildlife they found. A century later, scientists are revisiting the same sites to see if the fauna has changed. They've found that global warming is already having an impact.

### **34. Asthma: What Brought on the Epidemic**

Asthma is the most common chronic disease to affect children all over the world. But researchers don't know why. Meet researchers who are investigating possible environmental and social culprits. Find out if the bacteria in farms could help explain the mystery.

Today more than 30 million people are suffering the devastating effects of Alzheimer's disease – and that number will quadruple by 2050 as our population ages. Now, researchers in the United States think they have found that a gene may hold the key to a cure.

How do you prepare someone who is becoming blind? Find out how adults are learning to live in a world without sight with physical and psychological training.

### **35. Asteroid Hunters**

Everyone knows that eight planets orbit the Sun. But thousands of other objects, including icy comets and football field-sized asteroids, are also zooming around our solar system. And some of them could be on a collision course with Earth. Find out how these Near Earth Objects are being tracked and what scientists are saying should be done to prevent a deadly impact.

It's never the first planet you think of, but would you miss Neptune if it were gone? A young science author shares her version of a solar system without the planet farthest from our sun.

10,000 times smaller than the width of a human hair, you can't see nanoparticles, but you can find them in everyday products like sunscreen and clothing. Find out why environmental and health concerns are mounting about exposure to nanomaterials, sparking a growing debate about their possible regulation.

Ever wonder why your voice changes when you breathe helium? Physicist Paul Doherty investigates the resonance of the human voice.

### **36. Seahorse Sleuth**

Seahorses are some of the most enchanting and mysterious creatures in the ocean. They are also in trouble, struggling to survive in threatened habitats around the world, while large-scale trading of seahorses for the traditional Chinese Medicine market goes unchecked. Meet the Seahorse Sleuths - scientists who are working to unlock the secrets of these elusive creatures so that they can save them from extinction.

What happens when you flush the toilet? For most of us, what's out of sight is out of mind. But large numbers of sewage spills around the world are forcing cities, water agencies and the public to take a closer look at wastewater and its impacts on the health of the ocean.

Floating garbage is another, yet perhaps less known, harbour threat. Meet a group unheralded trash collectors who make it their business to remove tonnes of debris every month, from floating concrete to dead bodies.

### **37. The Farallon Islands California's Galapagos**

Lying 28 miles off the coast of San Francisco, the jagged silhouette of the Farallon Islands disrupts the clean line of the horizon. This foreboding knot of rocks sits amid one of the most productive marine food webs on the planet and hosts the largest seabird breeding colony in the continental United States. Learn what life is like on the islands and meet the scientists who call this incredibly wild place home.

For hundreds of years, scientists have been poaching design ideas from structures in nature. Meet biologists and engineers who are working together to design a broad range of new products, such as life-saving milli-robots modeled on the way cockroaches run and adhesives based on the amazing design of a gecko's foot.

In order to document the rich colors of the south San Francisco Bay's salt ponds, architect/photographer Cris Benton places his camera in a very unique position: suspended from a kite.

### **38. The Fierce Humboldt Squid**

A mysterious sea creature up to 7 feet long, with 10 arms, a sharp beak and a ravenous appetite, has invaded off the coast of North America. Packs of fierce Humboldt Squid attack nearly everything they see, from fish to scuba divers. Marine biologists are working to discover why they've headed north from their traditional homes off South America.

In 1924, a hunter purposely released a handful of wild boar in the Western United States. Now the pigs number in the hundreds of thousands and reside in all but two of the California's 58 counties. Big, fast, smart and hungry, these animals often out-compete native species and damage fragile native ecosystems. Now hunters are stepping up to be part of the solution.

Scoop a handful of critters out of the world's bays and you'll find tourists from far away shores. Invasive kinds of mussels, fish and more are choking out native species, challenging experts to change the human behavior that brings them from faraway places.