

FUTURE NEWS

TO CONNECT, TO INFORM AND TO INSPIRE

IN THIS EDITION

A Futurist Examines the Future of Robots

by Peter Bishop
(page 2)

BOOK REVIEW

Defiant Earth: The Fate of Humans in the Anthropocene

by Clive Hamilton
(page 7)

Futurists in Action

Professional futurists converge on Seattle to pick up hints about what lies ahead

by Alan Boyle
(page 9)

Signals in the Noise

7 Great Products Innovations Developed by Studying Nature

by Logan Chierotti
(page 11)



A FUTURIST EXAMINES THE FUTURE OF ROBOTS

by Peter Bishop



This new magazine, *Age of Robots*, contains a clear message: we are entering the age of robots, and we should learn now about what this age might be like. But how do we do that? Do we simply extrapolate from the age of machines? We could, and many do, but robots are not just machines. They are, or will soon be, intelligent in many ways beyond machines. Should we extrapolate from the age of computers? Again we could, but while the core of a robot is a computer, it is much more. So how are we to learn and in some sense know what is ahead of us in this age of robots. Read this article to find out.



Dr. Peter Bishop directed the Master of Science degree in Foresight at the University of Houston, Texas, until he retired in 2013. Since then, he has founded the nonprofit organization, Teach the Future, to encourage and support educators who want to bring this type of futures thinking to K-12 and college students around the world.

Contact Peter at peter@teachthefuture.org

BACKGROUND

Prediction is difficult. In fact, it is not only difficult but fundamentally impossible for many different reasons.

Then why do we do it? One reason is that we dislike uncertainty. We want one definitive answer to every question and one best solution for every problem. That's what we learned in school—you get to raise your hand when you know the answer, and the right answer gets you an A. The search for the answer and the solution is drilled into us from the moment we first step into a classroom. It's no wonder that we want prediction—giving us nice clean, simple, definitive predictions, even when they are often wrong.

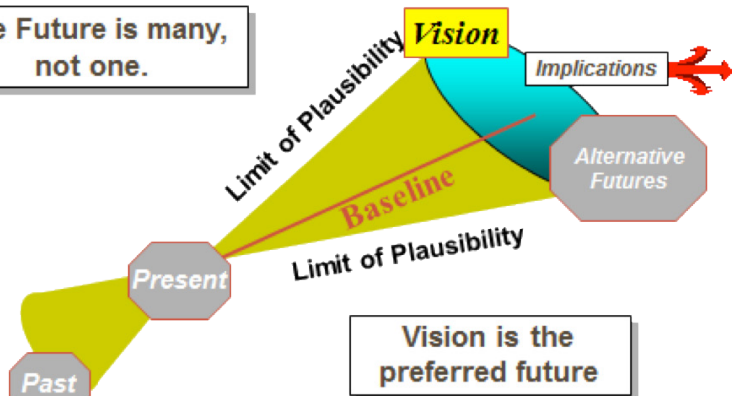
The alternative is to ask open-ended questions that have multiple answers, such as: How will more robots affect people's work in the future? Unfortunately, most people take that as a simple, one-answer question. Ray Kurzweil, the new Director of Engineering at Google, has his answer: "The future offers meaningful work, not meaningless jobs." Martin Ford, author of *Rise of the Robots: Technology and the Threat of a Jobless Future* (2015, Basic Books), has another answer: "Eventually we'll get to the point where there won't be enough jobs for most people." Who's right? Believe it or not,

both are, because the future is not singular—one question, one answer; it's plural—one question, many answers.

That's the root principle of the emerging field of futures studies: the future contains many futures and many plausible scenarios, any of which could happen. Some futures may even have excellent empirical support. The present may be singular, but the future remains plural before it becomes the present. So let's stop the argument—there is a future with jobs and a future without jobs. Both scenarios are possible and we need take both of them seriously.

The Cone of Plausibility

The Future is many, not one.



Source: Charles Taylor, ArmyWar College

www.teachthefuture.org

We all need to give up the idea of a single “right” future and embrace the uncertainty of many plausible futures. Uncertainty is our friend. While it makes knowing the future difficult, it makes influencing the future possible. The future is not deterministic; it is not a mathematical equation where the result is already certain before the calculation is made. Fortunately, the real future is one we can influence since it’s not yet determined to be just one thing. Time is our friend.

THE TRADITIONAL APPROACH TO THE FUTURE

Seventh grade science taught us a basic approach for making predictions about the future. Take a theory, express it as a formula, note the initial conditions, and extrapolate the outcome to the chosen timeframe. This works well for simple systems or datasets.

When we don’t have a formula, we use the next best thing, our minds. We argue by reasoning, or perhaps just by intuition, on what we think the future will be. Philip Tetlock and Dan Gardner wrote about people who are good at prediction in their book, *Superforecasting: The Art and Science of Prediction* (2015, Broadway Books). It’s a great book, but it’s asking the wrong question. The question is not who is good at saying what the future will be (a single prediction), but rather how are we all to know what it might be (a multi-valued forecast).

THE FUTURES STUDIES APPROACH

Forecasting using the approach from futures studies is a simple process that uses evidence to make inferences about the future. The steps in that process are as follows:

1. Select and describe the domain. In this article, the domain is the future of robots in the United States in 2040.
2. Gather information on the past and present conditions of that domain.
3. Forecast the expected (most likely) future of the domain using evidence that points to where we are headed in the future.

4. Identify and challenge assumptions required by that forecast. Every successful challenge automatically creates an alternative future. For instance, trends might continue, but there might be a good reason why they might not; and if they don’t, we get a different future.
5. Look for (weak) signals of change. Every weak signal could grow to be a strong signal and shape the future in a way different from what we expect. (All strong signals, like trends, were weak signals at one time.)
6. Describe a few of the most interesting and important alternative futures that arise from challenging assumptions and finding weak signals.
7. Identify the implications of the expected and the alternative futures for oneself and for one’s family, enterprise and community, and/or for the world as a whole.

At this point we are ready to begin planning how to influence the future, to bend the trajectory away from the futures we do not want and toward those we do—the preferable future.

THE FUTURE OF ROBOTS

So let’s apply that approach to the future of robots.

1. Select and describe the domain

We will focus on the future of robots in the US in 20–25 years from now (ca. 2040). The key question is: “Will robots create more jobs than they eliminate by about 2040?”

2. Gather information on the present conditions and on trends changing the domain

Present conditions:

- Between 1.5 and 1.75 million industrial robots work in manufacturing in the U.S. workforce—that’s about one robot for every 8 workers out of the 12 million who work in manufacturing.
- The Pew Research Center interviewed over 1,800 experts on robotics on whether robots

“Between 1.5 and 1.75 million industrial robots work in manufacturing in the U.S. workforce

“ Robots will clearly be a significant part of the U.S. workforce in 2040.

would create more jobs than they eliminated. The group split just about down the middle (52% vs. 48%). So we have two plausible scenarios, each supported by qualified experts—the answer is not singular; it’s plural.

Trends:

- Since the 1870s, technology has created more jobs in new sectors than it destroyed in the target sector (manufacturing).
- Technology has shifted work away from manual labor to services and knowledge work.
- The use of robots is growing at about 11% per year, according to Henrik Christensen, director of the Contextual Robotics Institute at the University of California, San Diego, and the number is doubling every 7 years or so to around 18 million by 2040. That’s more than the total number of workers in U.S. manufacturing today, so robots could well replace most workers by then.

3. Forecast the expected (most likely) future of the domain

Robots will clearly be a significant part of the U.S. workforce in 2040. If industrial robots are any indication, their growth rate puts them on a path to replace most manufacturing workers by 2040. Of course, some human workers will need to remain to tend to the robots. The result is likely to be an increase in productivity, which could mean less expensive products (as has happened before), and a lower cost of living.

4. Identify and challenge assumptions required by that forecast

Four (of the many) assumptions required by this forecast are:

1. The trends listed will continue until 2040.
2. The future is like the past, where increased productivity due to automation freed people from work in one sector and allowed them to find work in new sectors. So the assumption is that the future will be like the past in that new sectors of work will be developed.

3. The increased productivity also reduced the cost of living so people could afford goods and services that they could not before. So again, the assumption is that the cost of living will go down this time as well.
4. People accept the move away from traditional work and allow the transition to take place.

Every assumption has an alternative assumption that is literally its opposite. If the original assumption is that a trend will continue, its alternative is the opposite, that is, it will not continue. We can always say this, because the opposite is always possible. But do we have any reason to believe the alternative might come true? That’s the difference between an alternative assumption that is merely possible (it could happen) to one that is plausible (here’s a reason it might happen).

Here are a few plausible alternative assumptions:

1a. *Alternative assumption:* The trends listed will not continue to 2040.

Reasons that the alternative assumption might come true: These trends assume continued economic and technological growth, but many people have forecast dire consequences for climate change and/or resource scarcity that will turn the world’s attention away from technological growth to solving environmental problems.

1b. *Alternative:* The trends listed will not continue to 2040.

Reasons: The Internet could become so risky and unstable because of hackers or even cyberwar that the development of electronic technology comes to a halt.

2. *Alternative:* No new sectors of work open up.

Reasons: Optimists on the ability to find work point out that it was hard for people living in an agricultural economy in the 19th century to imagine what work would be like in an industrial economy in the 20th century. It is similarly hard for us to

imagine what the new work sectors will be in the age of robots. After all, robots are now knocking at the door of service jobs, like truck driving for example, and more intellectually demanding office work. The most likely sectors that will be immune to automation are some form of design, creative or freelance entrepreneurial work. This forces the question: Can a workforce of 150 million workers survive on design and freelance work?

3. *Alternative*: People might not have the money to consume the goods and services in the new sectors no matter how cheap they are.

Reasons: If robots really do displace a significant portion of the workforce, those workers will be hard-pressed to purchase life's essentials, much less goods and services from new sectors.

4. *Alternative*: People do not accept the move away from traditional work and block the transition.

Reasons: The Pew study cited earlier found three areas of significant concern:

- Impacts from automation have thus far impacted mostly blue-collar employment; the coming wave of innovation threatens to upend white-collar work as well.
- Certain highly skilled workers will succeed wildly in this new environment, but far more may be displaced into lower paying service industry jobs at best, or permanent unemployment at worst.
- Our educational system is not adequately preparing us for work of the future, and our political and economic institutions are poorly equipped to handle these hard choices.

Any of these concerns could grow to become the overriding issue of the next era.

Now people can discuss the evidence and the assumptions required to use that evidence in an effort to reach an understanding of (if not agreement on) the various arguments for the forecast.

5. Describe the alternative futures that come from each alternative assumption

1a. *Meltdown*: Internet security declines, and crime grows to the point where people are reluctant to use the Internet for anything other than the most trivial uses. They turn to old ways of communicating, doing business, and entertaining themselves.

1b. *The end of the market*: The scramble for basic resources such as food and water becomes so intense that people disconnect from the market, preferring to go it alone.

2. *The end of work*: Robots take most of the traditional jobs, and few new sectors open up to give people work. The consequences could either be an era of leisure where robots are so productive that goods are so cheap that there is enough for everyone to support themselves on relatively small incomes, or they could lead to mass unemployment.

3. *The End of Income*: New sectors do open up, but they do not produce the incomes that people are used to in the traditional sectors. It's hard to make ends meet in this future.

4. *Backlash*: People need to work to support themselves and to give them some meaning and purpose, so they pressure government to slow the rate of growth of robots.

6. Identify the implications of the expected and the alternative futures for oneself and for one's family, enterprise, community, and/or for the world as a whole

The basic implication is that we must prepare for alternative future conditions:

- We may find ourselves in direct competition with robots as they take over significant portions of work. Consequently, we need to identify the talents and skills that robots are unlikely to replicate in our lifetime and strive to cultivate them.
- Alternatively, we may need to collaborate with robots to help us do the work we have always done

“ The future is really a set of multiple futures, not just the one future that most writers and thinkers propose

in better and more efficient ways. This future requires that we must learn to collaborate with machines more than we had in the past.

- Alternatively again, we need to keep an eye out for sudden disruptive change, both environmental and economic—the kind that could challenge our most basic assumptions about how we live and work. Surprising disruptions are unpredictable by definition, but we can prepare ourselves for sudden change by thinking about, or simulating, such changes in our thoughts and discussions, just as astronauts do when they train to live on the Space Station. While it might not be a pleasant future to contemplate, it could result in a less stressful and more meaningful way to live.
- Alternatively again and again, the degree of change might be less than we expect, leaving the world much more like it is today than we expected. So let's not abandon the ways of living that have been successful for centuries, at least not just yet.

The future is really a set of multiple futures, not just the one future that most writers and thinkers propose,

and even these scenarios are probably too definite to be real. The real future will be complicated, involving some combination of many of these scenarios. It's rarely one thing, even when it becomes the present.

THE DEBATE RAGES ON

Will robots take our jobs? Will we be able to support ourselves? Will we be able to feed our children? Will the machines be a boon or a curse in a future society?

Put the debate away! We do not know which future will occur, and we will not until it is upon us. Keep your eyes and minds open. Hold on to your vision and values, but recognize change when it occurs. It usually means that we must change the way we live those values, not a change in the values themselves.

And finally prepare today to live in three or four different futures. Learn how the world is changing and challenge yourself to change with it.

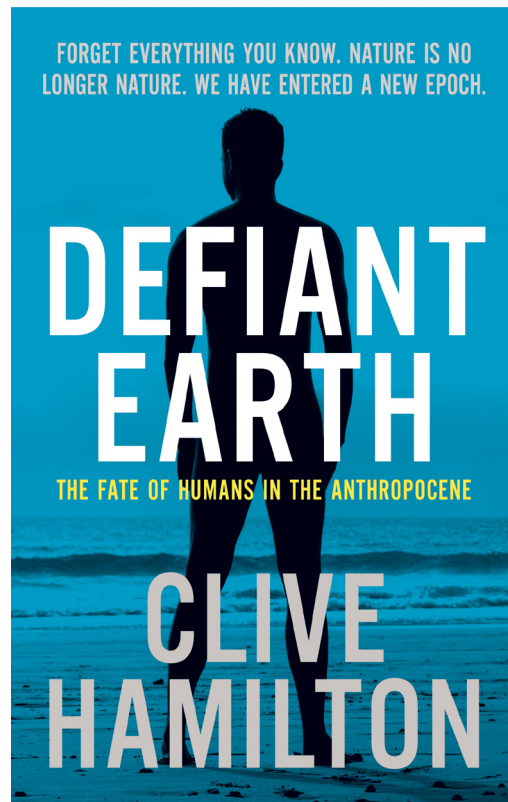
If you think we should be teaching young people how to think about the future in more effective ways, contact Dr. Peter Bishop at peter@teachthefuture.org. And thanks to Karen Bealmear, a writer in Houston, Texas, who helped with this article.

Book Review

by Charles Brass – Chair, futures foundation

Defiant Earth: The Fate of Humans in the Anthropocene

by Clive Hamilton



“ Human
volition is
now a force
of geological
significance.

For about 4.5 billion years Planet Earth has simply existed, apparently without anyone or anything paying it any attention. In the approximately 200,000 years that species on Earth acquired conscious self-awareness, a number of proto-human creatures have deliberately set out to better understand the world on which they live.

Homo-Sapiens have taken this self-aware consciousness to such a whole new level that those charged with defining and naming the ages, epochs, periods, eras and eons into which Earth’s history has been divided (the International Commission on Stratigraphy) are contemplating including anthropos (the Greek word for human) in the names of the new epochs and eras we seem to have entered.

Clive Hamilton begins this book by noting that this inclusion of human action in how we describe our planetary home is more than a semantic recognition of the prominence of homo-sapiens in the fauna of Earth. He calls it a rupture, declaring that it marks a profound shift in the deep history of the Earth. He argues that human volition (with both deliberate and accidental consequences) is now a force of geological significance. Essentially, Hamilton argues that the Earth System has evolved to a point where nature and humankind have become jointly complicit in the future of the planet.

Although it begins with geology, this is a book about morals and ethics written by a philosopher; and hence for those not steeped in philosophy (including this reviewer) it can occasionally be quite difficult to read. Nonetheless, Hamilton’s fundamental message is so important that it is worth persevering (the book is only 160 pages long).

Hamilton devotes nearly half the book to convincing readers that actions already taken by us humans have shifted geological history. He contrasts this view with the all too common current belief that whatever impact humans may have had on the planet, it can be reversed or redeemed if only we come to our senses and stop producing CO₂ and destroying natural ecosystems. Hamilton is adamant that this is conceit, arguing: “So the question is not whether human beings stand at the centre of the world, but what kind of human being stands at the centre of the world, and what is the nature of that world.” (p 43 - emphasis in the original).

“Just as there is no good without evil, to choose to care for the Earth is possible only if we can equally choose to neglect it.”

Hamilton argues that humans are “world-making” creatures, but this does not make us omnipotent: “It is our world-making capacity that makes humans unique. This is true even if there are always finite limits on the kinds of worlds we can make, and even if the worlds we make may contain the seeds of their own destruction.” (p62 - emphasis in the original). He argues that we stand at a crucial decision point in our history: “Humankind is now confronted with a momentous decision: to attempt to exert more control so as to subdue the Earth with greater technological power – the express purpose of some forms of geoengineering – or to draw back and practice meekness, with all of the social consequences that would follow” (p9 - emphasis in the original).

Much of the middle of the book is devoted to attempting to decipher the philosophical consequences of us having fundamentally altered the Earth System. This is a precursor to perhaps Hamilton’s most provocative claim – that far from paying too much attention to the power of human beings, we actually pay it too little attention, failing to understand how crucial our actions (and inactions) are in shaping not just the future for homo-sapiens, but for Planet Earth herself.

Consistent with his view that humans are world-makers, he notes that, whether we like to admit or not, we have a choice about how we exercise this power: “Just as there is no good without evil, to choose to care for the Earth is possible only if we can equally choose to neglect it.” (p124)

He argues that, while our increased scientific understanding of the world did not inevitably mean we had to push the Earth into a new epoch, it does mean that we have to take responsibility for the fact that we have done this; and that we have a moral and ethical responsibility to use our power to care for the only home we have¹.

Hamilton ends his philosophical enquiry by arguing that “in the Anthropocene we have no ethical resources to draw on. The cupboard is bare”(p155). He suggests: “The question that now haunts the universe is whether, in allowing humans free will, ‘nature’ made a colossal mistake.”(p156) – and concludes that he doesn’t know how to end his book- “It’s too hard, too uncertain, too new” (p157) – but he is ultimately hopeful that we can survive to create a ‘second civilization’, if only because the only other option is self-destruction.

¹ Hamilton is scathing of those arguing that we need to create the capacity to live on other planets as a way of escaping from a dying Earth, asking “What is the value of human civilization if not to raise human beings to a higher level of intellectual sophistication and moral responsibility? What is a civilization worth if it cannot protect the natural conditions that gave birth to it? Those who fly off leaving behind a ruined Earth would carry into space a fallen civilization”(p148)

FUTURISTS IN ACTION

Professional futurists converge on Seattle to pick up hints about what lies ahead

by Alan Boyle



Sarah Chesemore (left) and Brian Arbogast (right) of the Bill and Melinda Gates Foundation discuss global health trends with University of Washington health policy researcher Jan Flowers (center) during the Association of Professional Futurists' gathering in Seattle. (GeekWire Photo / Alan Boyle)

Professional futurists gathered in Seattle, for the second time in 15 years. But don't expect to recognize them by their business cards.

Many modern-day futurists tend to call themselves something else – for example, foresight specialist, which is Jonelle Simunich's title at Arup, an engineering and consulting firm based in San Francisco.

"I tell people I'm a futurist, and they say, 'So, what, you're like a psychic?'" Simunich told GeekWire today during the 15th-anniversary gathering of the Association of Professional Futurists.

The annual gathering is structured as a series of seminars for about 40 futurists, rather than your typical trade convention. The group that became APF had its first gathering in Seattle in 2002. "It didn't even have a name yet,"

Cindy Frewen, who chairs the association's board.

This year marks "the first time we have ever been in the same place twice," Frewen told attendees at the Seattle Central Library.

One of the Seattle-based organizers of the event, Glen Hiemstra, isn't shy about the "futurist" job description. In fact, he owns the internet domain name for Futurist.com. Hiemstra acknowledges that APF's members use a wide variety of job titles, but he insists that being a futurist has a special cachet.

"The simple way to describe it is, No. 1, help people anticipate the future, and second, help them design and envision the future." Hiemstra told GeekWire. "People call futurists when they want to look further ahead than they usually do."

“I tell people I’m a futurist, and they say, ‘So, what, you’re like a psychic?’”

Glen Hiemstra, the Seattle-based founder of Futurist.com, basks in the red glow of a corridor at the Seattle Public Library during the Association of Professional Futurists' gathering. (GeekWire Photo / Alan Boyle)



But when it comes to looking further ahead, even futurists need a little help sometimes. That's the aim of this week's gathering:

Experts from the Bill and Melinda Gates Foundation, and the University of Washington, talked about initiatives to boost global health in the developing world through wider immunization, better sanitation and more advanced medical information services.

Later in the day, pioneers in building development, land conservation and ocean science shared visions for a more connected, sustainable ecosystem.

And at the Museum of Flight on Saturday, aerospace executives will focus on frontiers beyond Earth, and science-fiction authors will speculate on long-term visions for humanity.

Tom Frey, founder of the Colorado-based DaVinci Institute, said being a futurist isn't just an exercise in navel-gazing. "We spend a lot of time being thinkers and doers, and not just talking about it," he said.

For example, Frey has been working a concept for micro-colleges to train workers for high-tech jobs ranging from coding to drone maintenance in a matter of months. The first such micro-college, DaVinci Coders, has been in operation for five years.

So what's the future of futurism? One clear trend is the synergy of entangled trends – for example, how pandemics could be made worse by climate change. "That is one of the things that is actually going to make this harder," said Sarah Cheshmore, the Gates Foundation's senior portfolio officer for vaccine delivery.

Another example has to do with the rise of autonomous vehicles and its potential effect on the health care system. Frey said his calculations suggest that self-driving cars could reduce health care expenses by more than 15 percent. "That's half a trillion dollars that now gets spent repairing people after car accidents," he said.

The rise of big data is another biggie. Traditionally, futurists have not used a lot of "algorithm-based forecasting," Hiemstra said. But today's bigger data sets have so much predictive power, for issues ranging from crime patterns to disease outbreaks, that they'll have to become part of the futurist's toolkit.

And what about the future of Seattle? At GeekWire's urging, Hiemstra took a swing at predicting the future of what's currently a tech boomtown.

"It's hard to imagine this boom continuing beyond 10 years, but it's very clear we're going to be a denser and still an economically vibrant place," he said. "That's going to mean that we have to be not just environmentally sustainable, but environmentally productive as a city. What that means is, moving from sustainable buildings to buildings that produce more energy than they use."

The original article appeared on Geekwire (<https://www.geekwire.com/2017/futurists-gather-seattle-pick-hints-whats-ahead-planet/>) and is reproduced with permission

“ Self-driving cars could reduce health care expenses by more than 15 percent.

Signals in the Noise

7 GREAT PRODUCTS INNOVATIONS DEVELOPED BY STUDYING NATURE

by Logan Chierotti



Logan Chierotti

Are you looking for an innovative product idea? Is there a design problem you can't quite wrap your head around?

If so, maybe it's time to look outside yourself and take a cue from Mother Nature.

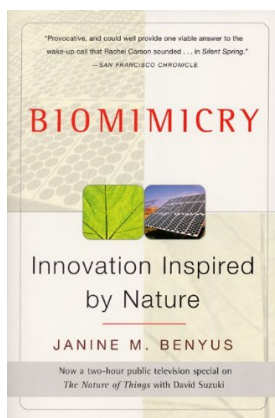
Biomimicry is a method of design that seeks sustainable solutions to human challenges by emulating nature. The term was popularized by Janine Benyus in her 1997 book, *Biomimicry: Innovation Inspired by Nature*.

Benyus, who operates the world's first bio-inspired consultancy, contends that nature can not only inspire new design processes but can also help us create a healthier, more sustainable planet.

Don't believe studying nature can lead to massive product breakthroughs?

Here are 7 fantastic products stories to prove it:

- 1. Velcro by studying burrs** - Upon returning from a hunting trip in 1941, Swiss engineer George de Mestral realized his dog was covered in burrs. Curious about the structure of these pesky clingers, de Mestral put one under his microscope and discovered that tiny hooks and teeth were responsible for the dried seeds sticking power. De Mestral worked on creating his a version for commercial application, gaining a patent for Velcro in 1955.
- 2. Better needles from mosquitoes** - Ever wondered how mosquitoes bites appear from nowhere? The tip of their mouth uses many moving parts to enter the skin in a way that causes the least irritation. The insects have helped scientists create less invasive needles for medical applications.



Signals in the Noise

7 GREAT PRODUCTS INNOVATIONS DEVELOPED BY STUDYING NATURE

- 3. More aerodynamics trains from birds** - High-speed trains can be loud, especially when exiting a tunnel, as air pressure builds in waves before exiting with a loud popping noise. To address this problem, a Japanese engineer used the design of the King Fisher bird's beak, which allows it to dive into the water with very little ripple on the surface. The result was quieter, more aerodynamic trains.
- 4. Learning from shark skin** - The skin of sharks is made from microscopic patterns called denticles, which reduce drag and keep sharks free of microscopic organisms. By studying the structure of denticles, commercial applications have been developed and applied to boats, planes, and windmills. The result is less drag and conservation of energy.
- 5. Fish help create more aerodynamic cars** - A box isn't usually thought of as an aerodynamic shape. However, by studying the Box Fish, Mercedes Benz engineers developed a two-door compact vehicle, which is proving to be one the most efficient designs for any car in its class.
- 6. Increasing wind power through whale fins** - Noticing that some whales had a series of bumps and ridges on the front-half of their fins, biology professor Frank Fish applied the design to reduce drag and noise. The result is increased power production of up to 20%.
- 7. Learning from Geckos** - It's hard not to marvel at the superhuman climbing abilities of Geckos. Taking a cue from the unique design of a Gecko's feet, a team of researchers from Amherst developed a new adhesive product called Geckskin. The result is an adhesive so powerful that an index-sized card can hold up to 700 lbs.

By looking closely at the world, you'll realize that nature has solutions to a number of the world's most pressing problems. And while we have learned much from nature already, there are likely pearls of wisdom just waiting to be discovered.

The original article was published here, and is reproduced with permission:
<https://www.inc.com/logan-chierotti/need-a-solution-to-a-business-problem-take-a-cue-from-mother-nature.html>



Future News is published by the Futures Foundation six times a year for its members.