

# Overfishing and climate change are causing a decline in krill population

By Matthew Taylor, The Guardian, adapted by Newsela staff on 02.22.18

Word Count **946**

Level **1210L**



A Gentoo penguin waddles over rocks, past seals at the Yankee Harbor in the South Shetland Islands, Antarctica. Legions of penguins hurl themselves into the icy waters of Antarctica, foraging to feed their young. Like seals and whales, they eat krill, an inch-long shrimplike crustacean that forms the basis of the Southern Ocean food chain. But penguin-watchers say the krill are getting scarcer in the western Antarctic peninsula, under threat from climate change and fishing. Photo by: Eitan Abramovich/AFP/Getty Images

The Antarctic is one of the world's last great wildernesses and is home to animals such as whales, penguins and leopard seals. According to scientists, it is now being threatened by a steep drop in the population of krill, small shrimplike crustaceans in the ocean.

A combination of climate change and industrial-scale fishing is threatening the krill population in Antarctic waters. Researchers and environmental campaigners warn that their disappearance could have a disastrous impact on larger predators that feed on the krill.

A new report co-authored by U.S. scientist George Watters warns that the penguin population could drop by almost one-third by the end of the century.

The report warns that climate change, which has been causing ocean temperatures to rise, could reduce the size of the krill population by up to 40 percent in some areas of Antarctica's Scotia Sea.

This, in turn, could cause a drastic reduction in predator populations.

Expanded krill fishing is also contributing to the loss of krill, the report adds.

### **Don't Kill The Krill**

Watters said he is not suggesting that fishing should be banned entirely from Antarctic waters. However, he said, krill fisheries need to be managed more effectively.

Krill are a key part of the delicate Antarctic food chain. They feed on marine algae and are a key source of food for whales, penguins and seals. They are also important in removing the greenhouse gas carbon dioxide — the main cause of global warming — from the atmosphere. Krill eat carbon-rich food near the surface and excrete it when they sink to lower, colder water.

The krill population is being hit hard both by climate change and by an increase in fishing, said Oxford University scientist Alex Rogers. Increasing numbers of fishing vessels and changes in technology are causing more krill to be caught, he said.

Krill populations have declined by 80 percent since the 1970s. Global warming has been blamed for part of that decrease because the ice that is home to the algae and plankton they feed on is receding.

Campaigners say recent developments in fishing technology are worsening the problem. They allow for "suction" harvesting by large trawlers, which are now able to gather up vast quantities of krill.

### **Banning Fishing To Protect Wildlife**

These fishing fleets are feeding a growing global demand for krill-based health products. Some companies claim krill can help treat a range of health problems, from heart disease to high blood pressure.

A recent analysis of the global krill-fishing industry predicted it was on course to grow 12 percent a year over the next three years.

In response, a global campaign has been launched to turn a huge tract of the seas around the Antarctic into the world's biggest sanctuary. Supporters of the campaign want to see all fishing in the area banned as a way to protect wildlife.

The almost 700,000-square mile reserve would cover a vast area of the Weddell Sea and a small part of the Antarctic Peninsula. It is one of three proposed new sanctuaries under consideration by the Antarctic decision-making body Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR).

The idea was originally put forward by Germany and is now supported by the European Union. A decision is likely to be made at a CCAMLR conference in October.

### **Antarctic Faces Multiple Threats**

Last month, the environmentalist group Greenpeace launched a campaign in support of the sanctuary.

Will McCallum of the group's Protect the Antarctic Campaign said the new report underlines the fact that the area already faces "multiple threats." The Antarctic does not need "additional strain" from krill fishing, he added.

McCallum pointed to recent fishing near penguin foraging grounds around the Antarctic Peninsula and the East Antarctic, and plans to expand fishing in the Weddell Sea. Both need to be prevented, he said. "The krill industry needs to know that the Antarctic is not theirs to exploit, but all of ours to protect."

Andrea Kavanagh, director of the Protecting Antarctica's Southern Ocean campaign, said the report's findings show the importance of creating a network of sanctuaries.

"This study shows that, with more urgency than we previously thought, we need to get these marine protected areas in place," she said. "And they need to be 'no take' – they have to be fully protected areas."

### **Fishing Companies Push Back**

Representatives of the krill-fishing industry rejected the report, however. Cilia Holmes, of fishing company Aker BioMarines, said there was "no sound scientific evidence that the krill fishery poses a threat to the Antarctic ecosystem."

Krill fishing, she said, was already strictly regulated by the Antarctic nations. Just 0.4 percent of the estimated krill population in the area around the Antarctic Peninsula is claimed by fishing each year, she said.

Holmes added that "protecting the Antarctic ecosystem" was critical to Aker BioMarines' long-term operation.

"We believe in a future where there still is room for well-managed fisheries that take care of the surrounding ecosystem."

### **There Needs To Be A Healthy Balance**

British scientist Susie Grant said the United Kingdom is fully in favor of the new protected area in the Weddell Sea. However, she said, there remains a case for carefully managed fishing in some Antarctic waters.

Some parts of the Southern Ocean require a very high level of protection, Grant said. However, she believes it makes sense to allow "responsible fishing in areas where we know the risks are low and it can be managed effectively."

"If a system of scientifically sound reserves can be established to protect Antarctic marine ecosystems, this will send a strong signal as to how we might manage and protect the oceans globally," she added.

## Quiz

- 1 Read the paragraph from the section "Banning Fishing To Protect Wildlife."

*These fishing fleets are feeding a growing global demand for krill-based health products. Some companies claim krill can help treat a range of health problems, from heart disease to high blood pressure.*

Which of the following can be inferred from this paragraph?

- (A) The krill-based health products will soon lose popularity and krill populations will rebound.
- (B) The fishermen believe helping to cure people's illnesses is more important than Antarctica.
- (C) The krill population will continue to drop in direct relation to the level of growing demand.
- (D) The companies that are claiming that their products can treat health problems are lying.

- 2 Read the selection from the section "Don't Kill The Krill."

*They are also important in removing the greenhouse gas carbon dioxide — the main cause of global warming — from the atmosphere. Krill eat carbon-rich food near the surface and excrete it when they sink to lower, colder water.*

Which idea is BEST supported by this selection?

- (A) The killing of more krill may mean a faster increase in global warming.
- (B) Warmer waters will not allow krill to excrete necessary carbon dioxide.
- (C) Krill are contributing to global warming by excreting carbon dioxide.
- (D) Carbon-rich food for krill can be found only at the surface of the water.

- 3 Which aspect of the author's argument is MOST important in the article as a whole?

- (A) the approximate size and location of the proposed reserve that would be created in Antarctica
- (B) the statistics regarding declines in krill populations and increases in fishing and global warming
- (C) the presence of recent fishing near penguin foraging grounds around the Antarctic Peninsula
- (D) the inclusion of details about new krill fishing practices and technology used by fishermen

- 4 Read the claim from Cilia Holmes.

*"We believe in a future where there still is room for well-managed fisheries that take care of the surrounding ecosystem."*

Adding which piece of evidence would BEST support this claim?

- (A) a description of the way that krill fishermen will track and catch krill in the ecosystem
- (B) a pledge from fishermen to carefully monitor the number of krill they catch each day
- (C) a historical record of other management practices that have helped fisheries grow
- (D) a plan explaining the actions that will help manage the fisheries and preserve the ecosystem

# "Like sending bees to war": the deadly truth behind the almond-milk obsession

By Annette McGivney, The Guardian, adapted by Newsela staff on 01.27.20

Word Count **1,518**

Level **1220L**



Image 1. Dennis Arp stands for a portrait near a colony of honeybees outside Rye, Arizona. Photograph: Caitlin O'Hara/The Guardian tk

Dennis Arp is a beekeeper with decades of experience. He has hundreds of hives scattered across the central Arizona desert, but it's in California's almond orchards where Arp's bees do most of their work.

Like most commercial beekeepers in the United States, at least half of Arp's revenue now comes from pollinating almonds. Selling honey is far less lucrative than renting out his colonies to mega-farms in California's fertile Central Valley, which is home to 80 percent of the world's almond supply.

As winter approached two years ago, right before Arp was to take his hives to California, his bees started getting sick. By October, 150 of Arp's hives had died due to mites. He lost 12 percent of his inventory in just a few months. His yard is filled with stacks of empty bee boxes that used to hold healthy hives.



His story is not unique. Commercial beekeepers who send their hives to the almond farms are seeing their bees die in record numbers, and nothing they do seems to stop the decline.

A recent survey of commercial beekeepers showed that 50 billion bees — which is more than seven times the world's human population — were wiped out in a few months during winter 2018-19. This is more than one-third of commercial U.S. bee colonies, the highest number since the annual survey started in the mid-2000s. More bees die every year in the U.S. than all other fish and animals raised for food combined.

Beekeepers attribute the high death toll to pesticide exposure, diseases from parasites and habitat loss. However, environmentalists and organic beekeepers maintain that the real culprit is something more systemic — America's reliance on industrial agriculture methods, especially those used by the almond industry, which demands a large-scale mechanization of one of nature's most delicate natural processes.

When the honeybees move from tree to tree, they bring pollen to the tree's blossoming flowers. Each pollinated blossom will produce an almond.

Environmental advocates argue that the huge, commercially-driven increase of the use of honeybees on almond farms is threatening the ecosystem for all bees. Honeybees forage more than diverse native bee species, which threatens the endangered species that are already struggling to survive climate change. Environmentalists argue that a better solution is to transform the way large-scale agriculture is done in the U.S.



"The high mortality rate creates a sad business model for beekeepers," said Nate Donley, a senior scientist for the Center for Biological Diversity. "It's like sending the bees to war. Many don't come back."

## Nuts For Almonds

California's \$11 billion almond industry has grown at an extraordinary rate. Between 2000 and 2018, the acreage of almond orchards more than doubled. Almond groves in the Central Valley now blanket an area the size of Delaware, producing 2.3 billion pounds of almonds annually sold around the world.

Americans consume the most number of almonds in the world. Almond milk sales in the U.S. have grown 250 percent over the past five years.

These enormous orchards can't function without bees.

Arp started beekeeping nearly 40 years ago, when he started his Mountain Top Honey company in Flagstaff, Arizona. In the early 1980s, when Arp was just raising bees to sell honey, he would lose about 5 percent of his hives per year to disease or weather conditions. In the 1990s, he made a deal with an almond grower in California and started renting his bees out to the industry. By the year 2000, Arp's bees started dying in greater numbers.

Now, like most commercial beekeepers, he routinely loses 30 percent or more of his bees a year. In any other industry, the death of a third of your workforce would be a huge deal.

Arp is constantly fighting off predators that threaten his hives. He once almost lost all of his hives from an infestation of tracheal mites. Then, Africanized "killer" bees spread to the U.S. The worst predator is a parasitic mite. The mite feeds on the bee's plump body.

Now, Arp finds himself in a vicious circle: he is constantly battling to keep enough bees alive to meet the requirements of his contracts with California almond growers. If he was not pollinating almonds, maybe his bees would be healthier.

This year, Arp's bees, along with more than two-thirds of the United States' commercial honeybee population, will spend February in the toxic chemical air of California's Central Valley where they will fertilize almond blossoms.

Pesticides are used for all kinds of crops across the state, but the almond groves are sprayed with 35 million pounds of pesticides a year, the most of any crop. One of the most popular pesticides, glyphosate — also called Roundup — has been shown to be lethal to bees as well as cause cancer in humans. Monsanto is the company that makes Roundup and it denies that the chemical causes cancer in humans if it is used at the prescribed dosage.

In addition to the danger of pesticides, almond pollination is especially demanding for bees because the colonies are woken up from winter dormancy about one to two months earlier than is natural. The quantity of hives required to pollinate almonds is far higher than any other crop. Since so many bees are concentrated in one geographic region at the same time, the risk of spreading sickness increases immensely.



Still, Arp has made considerable money with his bees within the almond industry. With so much money on the line, he is reluctant to make a direct connection between the constant health challenges his bees face and the time they spend every spring in the almond groves.

"The bees in the almond groves are being exploited and disrespected," said Patrick Pynes, an organic beekeeper who teaches environmental studies. "They are in severe decline because our human relationship to them has become so destructive."

### **The High Price Of Growth**

The phenomenon called colony collapse disorder was first identified in 2006, after a record number of honeybees mysteriously disappeared or died outside their hives. It was linked to a variety of factors including loss of habitat and climate change. However, the primary culprit was pesticides. Researchers found that a group of pesticides called neonicotinoids was especially lethal to bees.

In May 2019, the Environmental Protection Agency (EPA) pulled a dozen insecticides from the market following a successful lawsuit brought by beekeepers and environmental groups.

However, there are many chemicals that are not labeled as bee-toxic, even though they can make bees sick and weaken their immune systems. While bees may survive the pollination season, they may not last the winter or may bring back substances that gradually poison the entire colony.

Almond growers have even acknowledged there is a huge problem. "The bee mortality rate is too high and is unacceptable," said Bob Curtis. He studies insects and is a pollination consultant for the Almond Board of California. "It is only because of the hard work and creativity of beekeepers that [almond growers] have gotten the bees they need."

Honeybees can travel up to three miles in search of forage, so even if the almond grower is not using bee-toxic chemicals, a farmer nearby might be.

Experts say that simply working around the pesticide problem isn't enough and that farming itself must be entirely restructured.

### **The Search For A Solution**

Hope is being found in a new certification program. It will help consumers choose products that have been made with bee-friendly methods. The products are labeled with a "Bee Better" label.

The "Bee Better" certification program was launched in 2017. The program introduces biodiversity into almond groves to naturally control pests and nourish honey bees. Biodiversity means having a variety of plant and animal life.

Glenn Anderson was the first and one of the few organic almond growers in California's San Joaquin Valley. That means his small farm, has always been chemical-free. Unlike large industrial almond farms that strip the orchard ground bare to more efficiently treat for insects and fungi, Anderson allows a rich understory to grow, which naturally nourishes the soil and strengthens the trees.



Anderson says the trade-off for not using pesticides is that his annual crop yield is lower – typically about 10,000 pounds – and he has to keep his orchard small in order to manage it.

Back in Arizona, Dennis Arp and his son Adam are just trying to make it through the next few months with as many healthy bees as possible.

There are days when the costs seem overwhelming, and Arp wonders if he should give up on the business. Beekeeping is what he knows best, though, and he wants to pass the business on to his son.

"I don't know how we will pull it off yet," he says. "But we will make it work."



## Quiz

1 Read the following sentences from the article.

*1. Selling honey is far less lucrative than renting out his colonies to mega-farms in California's fertile Central Valley, which is home to 80 percent of the world's almond supply.*

- 1. Pesticides are used for all kinds of crops across the state, but the almond groves are sprayed with 35 million pounds of pesticides a year, the most of any crop.*
- 2. Researchers found that a group of pesticides called neonicotinoids was especially lethal to bees.*
- 3. The program introduces biodiversity into almond groves to naturally control pests and nourish honey bees.*

Which two sentences taken together provide the BEST evidence to support the idea that almond monoculture practices threaten bee populations?

- (A) 1 and 2
- (B) 2 and 3
- (C) 1 and 3
- (D) 2 and 4

2 Read the following paragraph from the section "The High Price Of Growth."

*Almond growers have even acknowledged there is a huge problem. "The bee mortality rate is too high and is unacceptable," said Bob Curtis. He studies insects and is a pollination consultant for the Almond Board of California. "It is only because of the hard work and creativity of beekeepers that [almond growers] have gotten the bees they need."*

Which idea is BEST supported by this paragraph?

- (A) Almond growers are beginning to recognize that they'll need to change their practices to reduce the bee mortality rate.
- (B) Beekeepers are struggling to keep up with the demand for bees produced by California's almond industry.
- (C) Bees have been less effective at pollinating almond crops in recent years due to colony collapse and pesticide use.
- (D) Almond growers have not done as much as beekeepers to address the causes of the high bee mortality rate.

3 WHY did the author discuss the growth of California's almond industry in recent years before introducing the prevalence of pesticides?

- (A) to illustrate how much additional agricultural productivity resulted from the use of pesticides
- (B) to connect the increase in almond production with the decrease in pesticide use
- (C) to compare almond productivity before the rise of pesticides with productivity after heavy pesticide use
- (D) to explain the economic incentive for maximizing production through the use of pesticides

Which of the following BEST represents Glenn Anderson's approach toward almond agriculture in the article?

- (A) Anderson believes that large-scale almond agriculture can continue if it makes major changes in how it uses pesticides.
- (B) Anderson thinks that many small almond farms will be better able to meet demands than the huge orchards that produce almonds today.
- (C) Anderson believes that small-scale, biodiverse almond farms can better manage pests and maintain bee health than large farms.
- (D) Anderson thinks that small, organic almond farms like his will soon be pushed out of business by large, pesticide-dependent operations.

# Are we humans so hairy? No, not really

By Smithsonian.com, adapted by Newsela staff on 01.15.19

Word Count **984**

Level **1240L**



A picture taken on March 26, 2018, shows a molding of a Neanderthal man face displayed for the Neanderthal exhibition at the Musee de l'Homme in Paris. Photo by: Stephane De Sakutin/AFP/Getty Images.

Millions of modern humans ask themselves the same question every morning while looking in the mirror: Why am I so hairy? We spend millions of dollars per year on lip waxing, eyebrow threading, laser hair removal and face and leg shaving, not to mention the cash we hand over to the barber or salon. However, it turns out we are asking the wrong question — at least according to scientists who study human genetics and evolution. For them, the big mystery is why we are so hairless.

Evolutionary theorists have proposed numerous hypotheses for why humans lost our fur. Did bare skin help us sweat to keep cool while hunting during the heat of the day, as our ape ancestors moved from cool forests to hot savanna? Did we lose our fur to read each other's emotional responses such as fuming anger or blushing embarrassment? Scientists aren't exactly sure, but biologists are beginning to understand the physical mechanism that makes humans like naked apes. In particular, a recent study in the scientific journal *Cell Reports* has begun to unravel the mystery at the molecular and hereditary level.

Sarah Millar, co-author of the study and professor at the University of Pennsylvania, explains that scientists are largely at a loss to explain why different hair patterns appear across human bodies. "We have really long hair on our scalps and short hair in other regions, and we're hairless on our palms and the underside of our wrists and the soles of our feet," she says. "No one understands really at all how these differences arise."

In many mammals, an area known as the plantar skin, which is akin to the underside of the wrist in humans, is hairless, along with the footpads. In a few species, though, including polar bears and rabbits, the plantar area is covered in fur. A researcher studying the furry plantar region of rabbits noticed there wasn't a high level of the inhibitor protein, called Dickkopf 2 or Dkk2. An inhibitor protein slows a process, such as hair growth.

When the team looked at the hairless plantar region of mice, they found there were high levels of Dkk2. The high levels suggested the protein might keep bits of skin hairless by blocking a signaling pathway called WNT. This pathway controls hair growth.

### **Reason Our Bodies Are Hairless Is Up For Debate**

To investigate, the team compared normally developing mice with a group that had a variation that prevents Dkk2 from being produced. They found the mutant mice had hair growing on their plantar skin. This provided more evidence the inhibitor plays a role in determining what's furry and what's not.

Still, Millar suspects the Dkk2 protein is not the end of the story. The hair that developed on the plantar skin of the mice with the variation was shorter, finer and less evenly spaced than other hair. "Dkk2 is enough to prevent hair from growing, but not to get rid of all control mechanisms. There's a lot more to look at."

Even without the full picture, the finding could be important in future research into conditions such as baldness. The WNT pathway is likely still present in bald heads — it's just being blocked by Dkk2 or similar inhibitors in humans.

With a greater understanding of how skin is rendered hairless, the big question remaining is why humans became almost entirely hairless. Millar says there are some obvious reasons. For instance, having hair on our palms and wrists would make using stone tools or operating machinery rather difficult, and furry foot soles would constantly get sap, acorns and cigarette butts caught in them. The reason the rest of our body lost its fur, however, has been up for debate for decades.

A widely accepted theory is that, when human ancestors moved from the cool shady forests into the savanna, or hot grasslands, they needed better control of their temperature. Losing all that fur made it possible to hunt during the day without overheating. An increase in sweat glands also kept early humans on the cool side. The development of fire and clothing meant humans could keep cool during the day and cozy up at night.

### **No Hair Lets Color Changes Show Through**

These are not the only possibilities, and perhaps the loss of hair is due to a combination of factors. Evolutionary scientist Mark Pagel at the University of Reading in England has also proposed that going furless was a way to control lice and other parasites.

One of the most intriguing theories is that humans lost the hair on their faces to help with emotional communication. Mark Changizi, a scientist at the research company 2AI, studies vision and color theory, and he says the reason for our hairless bodies is in our eyes. While many animals have two types of cones, or the receptors in the eye that detect color, humans have three. Our third cone gives us a little extra power to detect hues in the middle of the visible light range, allowing humans to pick out vast shades that seem unnecessary for hunting or tracking.

Changizi proposes the third cone allows us to communicate nonverbally by observing color changes in the face. For instance, a baby whose skin looks a little green or blue can indicate illness, and a pink blush might indicate attraction. A face flushing with red could indicate anger, even in people with darker skin tones. Still, the only way to see all of these emotional states is if humans lose their fur, especially on their faces.

Millar says it's unlikely her work will help us figure out the exact reason humans lost our fur. However, combining the new study's molecular evidence of how hair grows with physical traits observed in humans will get us closer to the truth. Or, it will at least get some people closer to a fuller, shinier head of hair.



## Quiz

- 1 Read the following paragraph from the introduction [paragraphs 1-5].

*Evolutionary theorists have proposed numerous hypotheses for why humans lost our fur. Did bare skin help us sweat to keep cool while hunting during the heat of the day, as our ape ancestors moved from cool forests to hot savanna? Did we lose our fur to read each other's emotional responses such as fuming anger or blushing embarrassment? Scientists aren't exactly sure, but biologists are beginning to understand the physical mechanism that makes humans like naked apes. In particular, a recent study in the scientific journal Cell Reports has begun to unravel the mystery at the molecular and hereditary level.*

Which idea is BEST supported by this paragraph?

- (A) Apes and humans lost their fur around the same time.
- (B) The extent of early fur loss varied among geographic locations.
- (C) Bare skin is preferable in most types of climate conditions.
- (D) The loss of human fur was likely tied to changing survival needs.

- 2 Read the following statement.

*Early humans could have lost their fur to aid in communication abilities.*

Which sentence from the article BEST supports the statement above?

- (A) The WNT pathway is likely still present in bald heads — it's just being blocked by Dkk2 or similar inhibitors in humans.
- (B) For instance, having hair on our palms and wrists would make using stone tools or operating machinery rather difficult, and furry foot soles would constantly get sap, acorns and cigarette butts caught in them.
- (C) While many animals have two types of cones, or the receptors in the eye that detect color, humans have three.
- (D) For instance, a baby whose skin looks a little green or blue can indicate illness, and a pink blush might indicate attraction.

- 3 Which of the following statements BEST represents Sarah Millar's approach to the loss of human fur in the article?

- (A) She claims that early human fur loss was due to the need for better communication skills.
- (B) She accepts that the cause of early human fur loss is mysterious but hopes for some applicable findings from her study.
- (C) She is certain that further inquiry into Dkk2 will provide an in-depth explanation of the cause of early human fur loss.
- (D) She wants to further study the cause of varying patterns of hair growth and loss on the plantar skin regions of humans and animals.

- 4 Why did the author introduce the article by highlighting how much time and effort humans spend on removing their hair?

- (A) because without this explanation readers wouldn't understand why the topic of hair loss is important
- (B) because this helps the reader understand the research design pursued by Millar's team
- (C) because this description contrasts with the history of natural human hair growth and loss
- (D) because this emphasizes the need for further research into more effective hair removal methods

# A newly discovered shape could have important uses in medicine

By Smithsonian.com, adapted by Newsela staff on 08.08.18

Word Count **591**

Level **1250L**

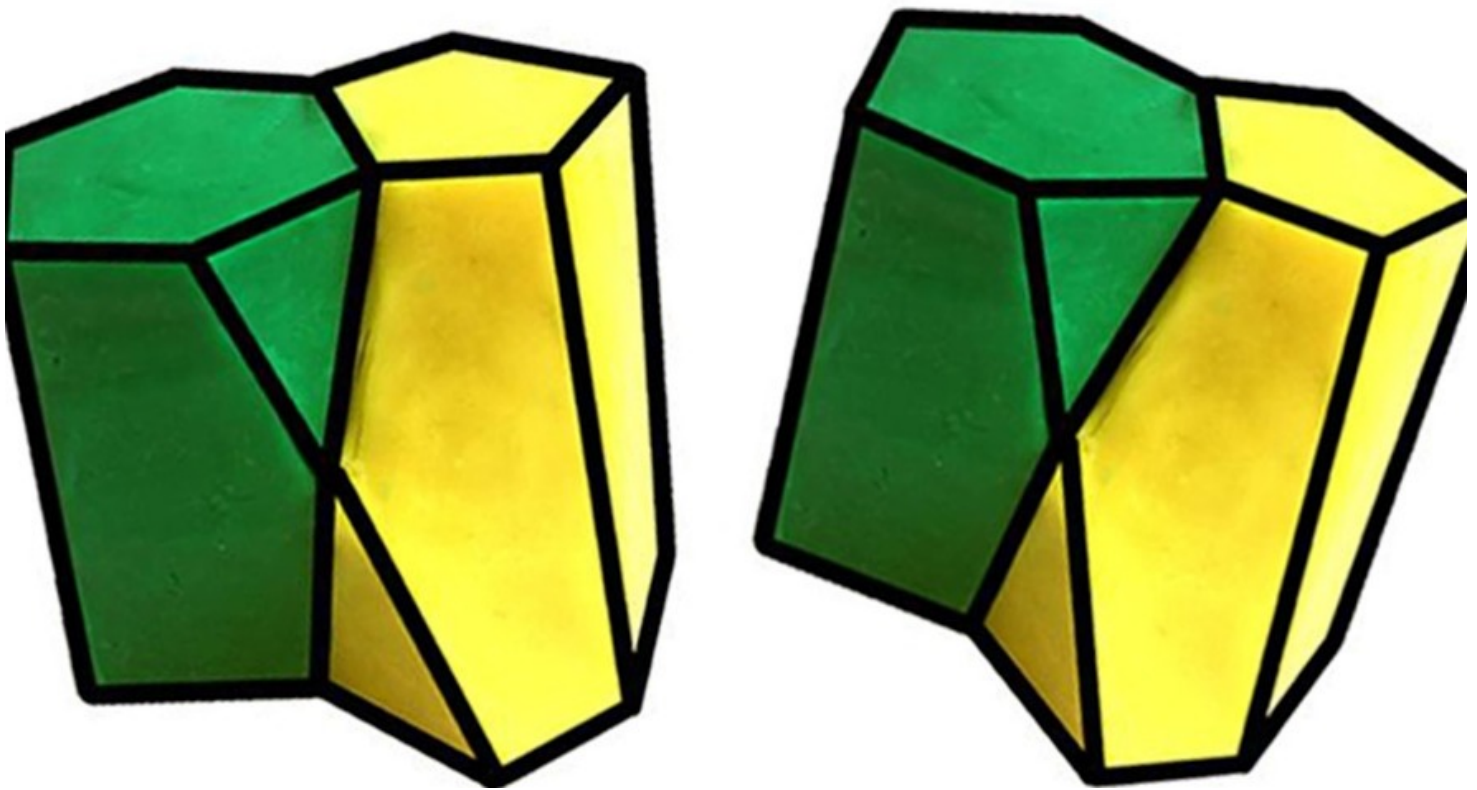


Image 1. Two scutoids tightly packed together. Photo by: University of Seville

There's an entire world beyond circles, triangles and squares.

Scientists, engineers and biologists have actually classified dozens of funky shapes beyond the ones we think about every day, including things like the hemihelix, discovered in 2014, which resembles a kinked Slinky.

Now, biologists have found another new shape, described in a paper in the journal *Nature Communications*, dubbed the scutoid. It's likely found in your armpits, up on your nose and all over your face, as it's a shape your skin cells take as they bend.

Bruce Y. Lee at *Forbes Magazine* reports that the new shape helps solve a long-standing conundrum about human skin.

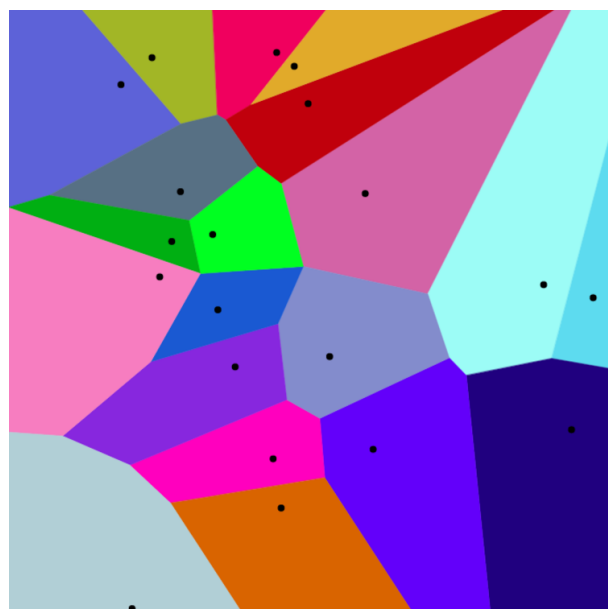
## **Our Skin Does Extreme Bending And Curving**

Millions upon millions of cells are packed together to create human skin, which is pretty good at being air- and watertight. On a totally flat surface, column-, prism- or cube-shaped cells could be squeezed close enough together to create such a strong barrier. However the human body has few, if any totally flat surfaces, meaning cubes and columns wouldn't work together. Plus, when humans are just tiny bundles of cells, called embryos, the cells that form our skin need to do some pretty extreme bending and curving in order to develop.

To solve the mystery, researchers in the U.S. and Europe collaborated on a computer model using a process called Voronoi diagramming. They hoped to figure out just how skin cells are packed together. In math, a Voronoi diagram is a plane separated into regions based on distance to points in a subset of that plane.

The best solution, they found, was a totally new shape the team dubbed a scutoid. It got its name because it resembles a top-down view of a beetle's scutellum, part of its shell.

The shape looks like a long five-sided prism with a diagonal face sliced off one end, giving that end six sides. That makes it possible to pack scutoids together with alternating five-sided and six-sided ends making up the surface, allowing the shapes to make curved surfaces without pulling apart. Don't worry if it's hard to envision — the team had trouble making sense of it too, until one of the scientists and his daughter modeled it using clay.



### **The Chance To Name A New Shape**

"During the [computer] modeling process, the results we saw were weird," co-author Javier Buceta of Lehigh University says in a statement. "Our model predicted that as the curvature of the tissue increases, columns and bottle-shapes were not the only shapes that cells [...] developed. To our surprise, the additional shape didn't even have a name in math! One does not normally have the opportunity to name a new shape."

Reporter Jessica Boddy said that the team then found scutoid-like shapes in the skin of zebra fish and the salivary glands of fruit flies. While "Sesame Street" will probably not be singing a tune about the scutoid anytime soon, the shape could have important uses in medicine. If you are looking to grow artificial organs, Buceta says, this discovery could help you build a sort of mechanism that encourages cells to pack together. This would accurately mimic "nature's way to efficiently develop tissues," Buceta says.

"We believe that this is a major breakthrough in many ways," co-author Luis Escudero of the University of Seville tells Boddy. "We are convinced that there are more implications that we are trying to understand as we speak."

## Quiz

- 1 Read the paragraph below from the section "Our Skin Does Extreme Bending And Curving."

*The shape looks like a long five-sided prism with a diagonal face sliced off one end, giving that end six sides. That makes it possible to pack scutoids together with alternating five-sided and six-sided ends making up the surface, allowing the shapes to make curved surfaces without pulling apart. Don't worry if it's hard to envision — the team had trouble making sense of it too, until one of the scientists and his daughter modeled it using clay.*

Which of the following can be inferred from the selection above?

- (A) The scutoid is made of skin cells.
- (B) The scutoid is just like a prism.
- (C) The scutoid is a complex shape.
- (D) The scutoid is a rare shape.

- 2 According to the article, the scutoid shape is useful for science.

Which paragraph BEST supports the idea outlined above?

- (A) Now, biologists have found another new shape, described in a paper in the journal Nature Communications, dubbed the scutoid. It's likely found in your armpits, up on your nose and all over your face, as it's a shape your skin cells take as they bend.
- (B) Millions upon millions of cells are packed together to create human skin, which is pretty good at being air- and watertight. On a totally flat surface, column-, prism- or cube-shaped cells could be squeezed close enough together to create such a strong barrier. However the human body has few, if any totally flat surfaces, meaning cubes and columns wouldn't work together. Plus, when humans are just tiny bundles of cells, called embryos, the cells that form our skin need to do some pretty extreme bending and curving in order to develop.
- (C) "During the [computer] modeling process, the results we saw were weird," co-author Javier Buceta of Lehigh University says in a statement. "Our model predicted that as the curvature of the tissue increases, columns and bottle-shapes were not the only shapes that cells [...] developed. To our surprise, the additional shape didn't even have a name in math! One does not normally have the opportunity to name a new shape."
- (D) Reporter Jessica Boddy said that the team then found scutoid-like shapes in the skin of zebra fish and the salivary glands of fruit flies. While "Sesame Street" will probably not be singing a tune about the scutoid anytime soon, the shape could have important uses in medicine. If you are looking to grow artificial organs, Buceta says, this discovery could help you build a sort of mechanism that encourages cells to pack together. This would accurately mimic "nature's way to efficiently develop tissues," Buceta says.

- 3 What is the meaning of the word "funky" as used in the following sentence from the introduction [paragraphs 1-4]?

*Scientists, engineers and biologists have actually classified dozens of funky shapes beyond the ones we think about every day, including things like the hemihelix, discovered in 2014, which resembles a kinked Slinky.*

- (A) strange
- (B) bad-smelling
- (C) stylish
- (D) trendy

*Don't worry if it's hard to envision — the team had trouble making sense of it too, until one of the scientists and his daughter modeled it using clay.*

How do the words "don't" and "it's" contribute to the tone of the article?

- (A) They make the tone more neutral because they are common words.
- (B) They make the tone more neutral because they are versatile words.
- (C) They make the tone less formal because they are contractions.
- (D) They make the tone more formal because they are contractions.



# Scientists take on the challenge to map all animal species' genomes

By Associated Press, adapted by Newsela staff on 10.02.18

Word Count **595**

Level **1190L**



Scientists Jen Vashon (left) and Tanya Lama are pictured with a Canada lynx that was used to source genetic material for the Canada lynx reference genome at Cummings School of Veterinary Medicine in Worcester County, Massachusetts, in February 2018. Photo: Bill Byrne/MassWildlife/Massachusetts Division of Fisheries & Wildlife via AP

A group of scientists unveiled the first results last week of an ambitious effort to map the genes of tens of thousands of animal species. The project could help to save animals from extinction down the line, they said.

The scientists are working with a group called Genome 10,000 on the Vertebrate Genomes Project. The genome is the entire set of genetic material that is present in a living thing. A genome is made up of DNA, which controls how every part of a living thing develops and functions.

The project seeks to map the genomes of all 66,000 species of mammals, birds, reptiles, amphibians and fish on Earth. Genome 10,000 has members at more than 50 institutions around the globe and started the Vertebrate Genomes Project last year.

Genome 10,000 recently released the first 15 such maps, ranging from the Canada lynx to the kakapo, a flightless parrot native to New Zealand.

## **Project Could Take A Decade To Complete**

Harris Lewin is a professor of evolution at the University of California, Davis, who is working on the project. The release of the first sets is a statement to the world that what they want to accomplish is indeed possible, he said.

"The time has come, but of course it's only the beginning," Lewin said.

The work will help in the future conservation of endangered species, scientists working on the project said. The first 14 species to be mapped also include the duck-billed platypus, two bat species and the zebra finch. The zebra finch was the one species for which both sexes were mapped, bringing the total to 15.

Sequencing the genome of tens of thousands of animals could easily take 10 years, said Sadye Paez, the program director for the project. However, giving scientists access to this kind of information could help save rare species because it would give conservationists and biologists a new set of tools, she said.

Paez described the project as an effort to "essentially communicate a library of life."

## **Better Wildlife Planning For The Future**

Tanya Lama is a doctoral candidate in environmental conservation at the University of Massachusetts at Amherst. She coordinated the effort to sequence the lynx genome. The wildcat is the subject of debate about its conservation status in the United States, and a better understanding of genetics can better protect its future, Lama said.

"It's going to help us plan for the future — help us generate tools for monitoring population health, and help us inform conservation strategy," she said.

The project has three "genome sequencing hubs." They include Rockefeller University in New York, the Sanger Institute outside Cambridge, England, and the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden, Germany, organizers said.

## **Scientists Say The Work Is Intriguing**

Mollie Matteson is a senior scientist with the Center for Biological Diversity in Arizona who is not involved in the project. The work is intriguing because it could have an impact on future conservation efforts of endangered species, she said. More information about animals' genetics could lead to a better understanding of how animals resist disease or cope with changes in the environment, she said.

Matteson said the research is interesting because it could teach us more about the genetic differences of individual animals within a species, which could prove to be very helpful for conservation.

The project has similarities with the Earth BioGenome Project, which seeks to catalog the genomes for 1.5 million species. Lewin works on that project as well. The Vertebrate Genomes Project will contribute to that effort.

## Quiz

- 1 Read the paragraph from the section "Better Wildlife Planning For The Future."

*Tanya Lama is a doctoral candidate in environmental conservation at the University of Massachusetts at Amherst. She coordinated the effort to sequence the lynx genome. The wildcat is the subject of debate about its conservation status in the United States, and a better understanding of genetics can better protect its future, Lama said*

Which of the following can be inferred from the paragraph above?

- (A) Current scientific research has been unable to teach scientists everything they need to know about the Canada lynx.
- (B) Genome research allows scientists to study extinct and near-extinct animal species.
- (C) The project will allow conservationists to study numerous animal species in the wild.
- (D) Genome 10,000 is an ambitious project that likely will require years of dedicated research before it is complete.

- 2 Read the following statement.

*The effort to map the genomes of 66,000 vertebrates eventually could help create stronger plans to protect some species.*

Which sentence from the article BEST supports the statement above?

- (A) A genome is made up of DNA, which controls how every part of a living thing develops and functions.
- (B) The release of the first sets is a statement to the world that what they want to accomplish is indeed possible, he said.
- (C) Sequencing the genome of tens of thousands of animals could easily take 10 years, said Sadye Paez, the program director for the project.
- (D) "It's going to help us plan for the future — help us generate tools for monitoring population health, and help us inform conservation strategy," she said.

- 3 The author appeals to the reader's sense of logic by \_\_\_\_.

- (A) including statistics about the number of species on Earth that are rapidly heading toward extinction
- (B) quoting the opinions of prominent scientists discussing the benefits of the Vertebrate Genomes Project
- (C) explaining how mapping the genome of the Canada lynx has revealed important discoveries for conservationists
- (D) highlighting contrasting views on whether the long-term nature of the project limits its usefulness

- 4 Why did the author write this article?

- (A) to argue that a new research project will take far too long to save endangered species
- (B) to present a balanced analysis of the benefits and deficiencies of a new scientific initiative
- (C) to persuade the reader to support a costly but potentially impactful research initiative
- (D) to inform the reader about the potential benefits of a new scientific study