
English

Thomas Lerchundi - 26 nov. 2015

M1 Reading File

I. Free Writing

Technologie in our lives

Today, technologie have a really big impact on our lives, that's a fact. But we can ask our selfs if this impact is good or bad. Everytime , you can opposite the good part and the bad part of it. For example, if we look for the impact of technologies on our health. On the first side, there are the waves, which have a bad impact on the body, and the screen that we look isn't good for our eyes neither. But on the other side, you can get a robotic leg for example, or being heal with nano-technologie.

But I often ask myself how much are we dependant of technologie. My generation is born when computers just started to be accessible, and internet was not very developped. Today there is a bridge between those who didn't know technologie when they were born, and those who are born with it. We can see that now, there are two kinds of difficulties for the people. For the part of the « old » (in the sense of being born after the Boom of the internet), it's difficult for them to adapt themselves of the use of technologie. But on the otherside, the « young » can be totally lost when technologie isn't working, and don't know any solution to do a task without it. This is why on this point about technologie, I m happy to be a 90's generation. Indeed I think that our generation have no difficulties to adapt themselves with new technologie, and we still remember (may be not enough) how to do without it.

II. Reading file for in class

Nepal bans novice climbers from Everest, considers more limits

By Sugam Pokharel and Michael Pearson, CNN

(CNN)Facing increasing criticism over safety and the environmental impacts of climbing on Mount Everest, Nepalese tourism officials have banned novice climbers from the world's tallest peak and are considering additional limits.

"We must maintain the glory of Everest climbing," Mohan Krishna Sapkota, joint secretary of Nepal's Ministry of Tourism, said Tuesday. "Everest climbing is a matter of adventure and competence, not a matter of luxury. »

Climbing Everest has exploded in popularity in the past few decades, resulting in hundreds of ascent attempts each year, with an increasing number of inexperienced climbers taking advantage of professional guides to help them to the top.

Some climbers complain that the novices aren't up to the task, while environmentalists worry about the impact of thousands of climbers and their garbage left behind on the mountain.

"That the world's highest peak and an object of religious significance to Nepalese people could become an open cesspit is a sad indictment of how commercialisation is destroying the environment of the mountains," climber Paul Hart wrote in an op-ed for the UK newspaper The Telegraph in March.

Last year, Nepal began requiring climbers to pack out their own waste plus 18 additional pounds of garbage. But critics have said the rule is difficult to enforce. Now, the country has banned climbers who have not previously reached the peak of at least one 6,500-meter (21,325-foot) mountain, according to Sapkota. This will weed out less-experienced climbers who critics say pose a safety threat to themselves and others. The ministry, which has the authority under Nepalese law to set conditions for climbing permits, is also considering setting minimum and maximum age limits for climbers, and rejecting those who are visually or physically disabled.

"We understand a lot of people want to climb Everest, but some of them are not physically able to do so. We cannot risk the life of the climbers," Sapkota said.

No timeline has been set for implementing new rules, he said.

Without specifics, it's hard to say how much impact the regulations would have on people who want to take on Everest. For instance, it's impossible to say whether the rules under consideration would prevent Japanese climber Nobukazu Kuriki, who lost nine fingers to frostbite in a 2012 Everest attempt, from trying again.

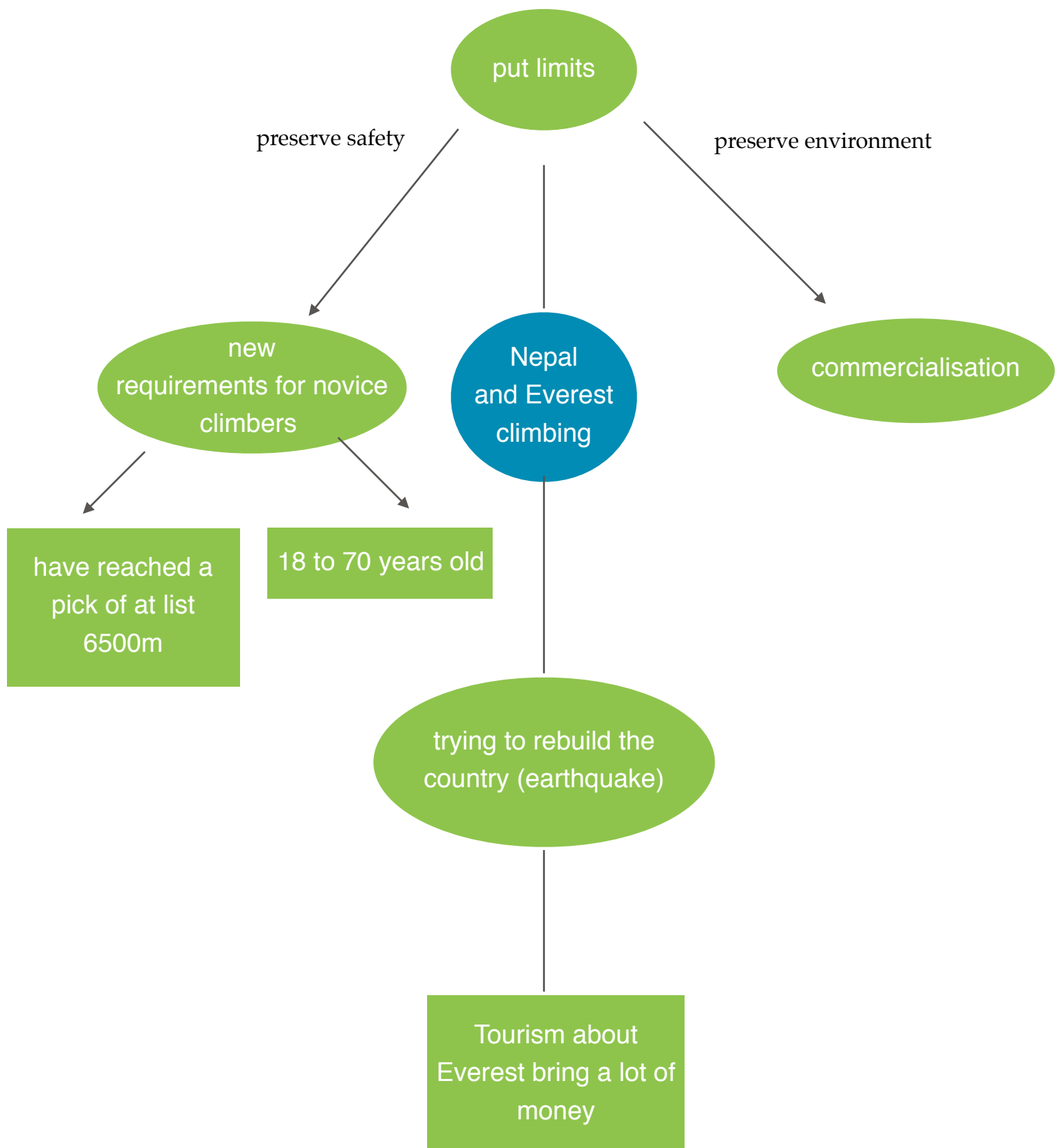
At least 219 people died while trying to summit Mount Everest between 1922 and 2010, with a few dozen perishing since -- including at least 17 in the massive April earthquake in Nepal.

Balancing safety, environmental impact and tourism considerations is a delicate act for Nepal, which receives substantial income from Western tourists who come to climb the country's many mountains.

Tourists, including climbers, spent \$508 million in the country in 2014, supporting 487,500 jobs, according to the World Travel & Tourism Council.

Word	Part of speech	Stress	Definition	Translation	Comment
Weed out	verb	ee	to remove as being undesirable, inefficient, or superfluous	se débarrasser	The noun weed is used to talk about an undesirable plant, so the verb weed takes its sense
cesspit	noun	sees	a pit for receiving wastes, as sewage, or other refuse.	une fosse	Quite similar to cesspool

MIND MAP



Hackers use radio waves to silently control Apple's Siri, Android's Google Now

By Neil Hughes, Wednesday, October 14, 2015, [Appleinsider.com](http://appleinsider.com)

A newly spotlighted hack utilizes an iPhone or Android handset — with headphones plugged in — to remotely and silently access the smartphone's built-in voice controls, potentially unbeknownst to the user.

Researchers from French government agency ANSSI found they were able to control Apple's Siri or Android's Google Now from as far as 16 feet away, according to Wired. The hack is accomplished by using a radio transmitter to tap into a pair of headphones with integrated microphone plugged into the mobile device, using the headphone cable as an antenna.

Headphone cables make decent radio antennas, as evidenced by Apple's use of them to enable FM radio reception on its iPod nano. The team at ANSSI found they can exploit this and trick an iPhone or Android device into believing the audio commands are coming from the connected microphone.

"Without speaking a word, a hacker could use that radio attack to tell Siri or Google Now to make calls and send texts, dial the hacker's number to turn the phone into an eavesdropping device, send the phone's browser to a malware site, or send spam and phishing messages via email, Facebook, or Twitter," Wired explained.

In its smallest, most compact form, the hack can be accomplished from up to about six and a half feet away with equipment that could fit inside a backpack. A more powerful form operational up to 16 feet away would require the hardware be housed in a car or van.

The hack only works on headphone-connected iPhones which have Siri enabled from the lockscreen — which is Apple's default setting. It works not only with the new iPhone 6s which has "Hey Siri" always listening, but also with older devices, by spoofing the button press required to activate Siri on a set of headphones, such as Apple's own EarPods.

Of course, anyone who can get their hands on a user's iPhone can access Siri as long as it's enabled from the lock screen. But the ANSSI technique would allow for more remote, stealth access of a device, potentially unbeknownst to the user.

Some Android devices do feature voice recognition for Google Now access, which could thwart the potential hack. Apple has no such functionality built into Siri yet.

Starting with iOS 9, Apple has begun tailoring "Hey Siri" voice prompts to each individual user, helping the personal assistant recognize a user's voice when they use they functionality. The new setup process could be a potential precursor to voice recognition security in future versions of iOS.

Users concerned about such hacks should disable access to Siri from the lockscreen. This can be accomplished by opening the iOS Settings application, selecting Touch ID & Passcode, and then scrolling down to uncheck Siri under Allow Access When Locked. There, users can also disable access to the Today screen, Notifications View, Reply With Message, and Wallet, if they so choose.

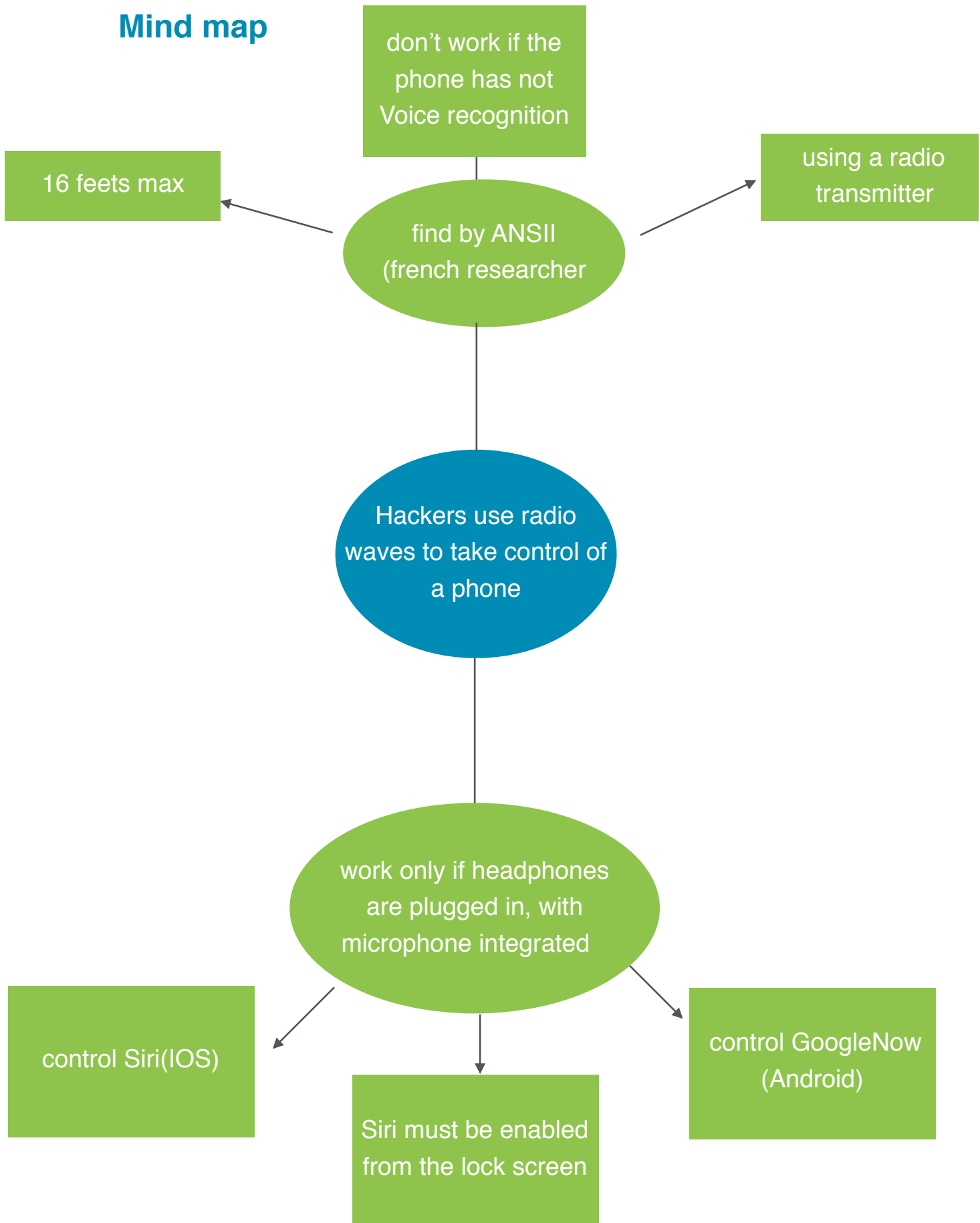
For further security, users can also go back to the root Settings menu and choose Control Center and disable Access on Lock Screen. This will prevent a stolen iPhone from being placed into Airplane Mode without turning off the device.

As for the hardware side of security, the researchers at ANSSI have reached out to both Apple and Google, recommending that the companies adopt better shielding on their own headphone cords, which would make it more difficult for nefarious hackers to co-opt. Future handsets could also include electromagnetic sensors as a form of security.

Apple and Google could also fix the issue through software, allowing users to create custom voice prompts to invoke Siri and Google Now. Like Apple's "Hey Siri," Google allows users to begin a voice search with the generic query "OK Google."

Word	Part of speech	Stress	Definition	Translation	Comment
spotlighted	verb	« light »	call the attention	mettre en avant, projeter	the sense depends on the situation, it can really be to direct the beam of a spotlight upon an object, or to notice something.
unbeknownst	adjective	« know »	being without one's knowledge:	inconnu par quelqu'un	Afterward the structure of the word shows the sense : un-be-known
eavesdropping	verb	« ea »	to listen secretly:	écouter en secret	Can be used with or without the intention to spy. You can say : « i didn't intend to eavesdrop »
thwart	verb	« wa »	to oppose successfully:	contrecarrer	can be used against a plan. The adverb athwart is like across.

Mind map



U.S. military is on its way to getting its Iron Man

By Jeremy Diamond and Barbara Starr, CNN

After an American commando died kicking in a door during a raid in Afghanistan, the top commander of U.S. Special Operations vowed to prevent similar tragedies. Two years later, the U.S. military is closer than ever to putting Iron Man on the front lines -- or at least something that closely mirrors the superhero's tech-forward suit of armor. Unlike Hollywood's, the suit won't give its operator the ability to fly, but the real-life body armor may have one leg up on the fictional version: The military's suit will be made of liquid armor that can solidify on command.

Fitted with the protective gear -- the Tactical Assault Light Operator Suit, or TALOS -- troops would be more lethal and better protected, particularly the vulnerable first soldier to breach a compound.

An amalgam of academics, defense industry types and Pentagon personnel are trying to fine-tune the battery-powered exoskeleton, which would reduce strain on the body, provide superior ballistic protection and in-helmet technologies to boost communications and visibility.

"This is a program that we started after we lost an operator on a mission. The first guy coming into a particular building was engaged and unfortunately was mortally wounded. And in the wake of that, we asked ourselves, 'Couldn't we do better in terms of protecting him, of giving him a better advantage when he's at the most vulnerable point that we put our operators?'" said Gen. Joseph Votel, head of U.S. Special Operations Command. Votel took over the TALOS program launched by his predecessor, Adm. William McRaven.

Pentagon spokesman Lt. Cmdr. Matt Allen said the Defense Department does "not know how much TALOS will cost," saying only that the Special Operations Command "has resourced an adequate amount of funds" to develop the suit.

A Defense Tech report cited by former Oklahoma Republican Sen. Tom Coburn in his 2014 "Wastebook" cited an estimated \$80 million price.

Behind the scenes with the commander of Special Ops

While many of the suit's technologies already exist, the TALOS researchers are tasked with adapting those technologies into a product that's both advanced and maneuverable.

The goal: "To give that operator the advantage when he is most vulnerable," Votel said.

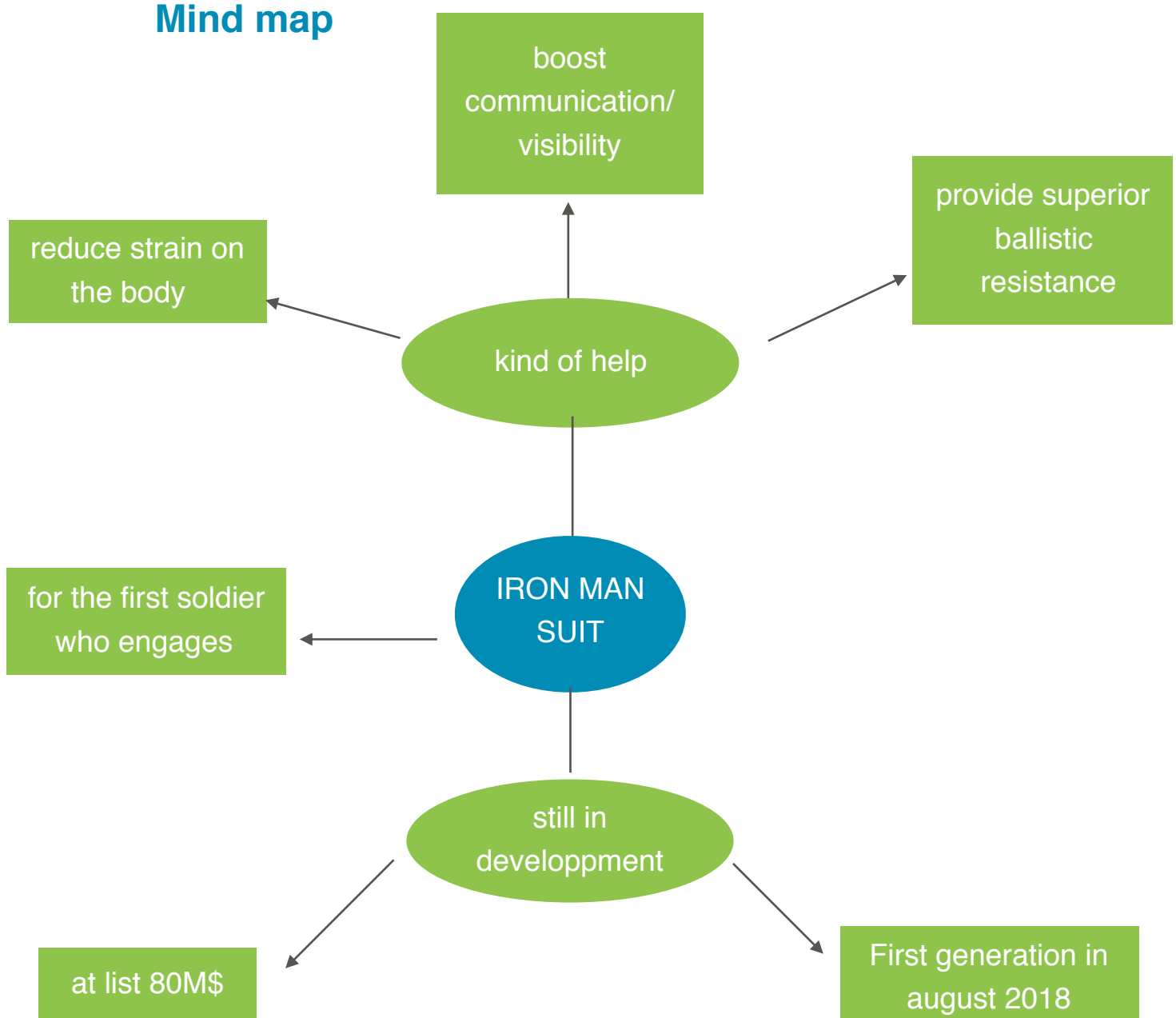
The TALOS program has churned out several prototypes and is on track to deliver a first-generation suit by August 2018.

Votel said research on the TALOS suit has also been a boon in other areas, helping the military develop improved technologies related to lightweight armor and communications systems.

"It's serving as a spin-off for us," he said.

Word	Part of speech	Stress	Definition	Translation	Comment
vowed	verb	« OW »	to vow is to assure / promise	assurer quelque chose	to take vows, to enter a religious order. (solemn)
in-helmet	adjective	« el »	something in the helmet	intégré au casque	used to describe a tech integrated in the helmet
churned out	verb	« ur »	churn out, to produce mechanically, hurriedly, or routinely	produit	a churn is a machine which can do butter (stir the cream)

Mind map



Antarctic Sea Ice Reaches New Record Maximum

from nasa.gov/content/goddard/antarctic-sea-ice-reaches-new-record-maximum

On Sept. 19, 2014, the five-day average of Antarctic sea ice extent exceeded 20 million square kilometers for the first time since 1979, according to the National Snow and Ice Data Center. The red line shows the average maximum extent from 1979-2014.

Credits: NASA's Scientific Visualization Studio/Cindy Starr

Sea ice surrounding Antarctica reached a new record high extent this year, covering more of the southern oceans than it has since scientists began a long-term satellite record to map sea ice extent in the late 1970s. The upward trend in the Antarctic, however, is only about a third of the magnitude of the rapid loss of sea ice in the Arctic Ocean.

The new Antarctic sea ice record reflects the diversity and complexity of Earth's environments, said NASA researchers. Claire Parkinson, a senior scientist at NASA's Goddard Space Flight Center, has referred to changes in sea ice coverage as a microcosm of global climate change. Just as the temperatures in some regions of the planet are colder than average, even in our warming world, Antarctic sea ice has been increasing and bucking the overall trend of ice loss.

"The planet as a whole is doing what was expected in terms of warming. Sea ice as a whole is decreasing as expected, but just like with global warming, not every location with sea ice will have a downward trend in ice extent," Parkinson said.

Since the late 1970s, the Arctic has lost an average of 20,800 square miles (53,900 square kilometers) of ice a year; the Antarctic has gained an average of 7,300 square miles (18,900 sq km). On Sept. 19 this year, for the first time ever since 1979, Antarctic sea ice extent exceeded 7.72 million square miles (20 million square kilometers), according to the National Snow and Ice Data Center. The ice extent stayed above this benchmark extent for several days. The average maximum extent between 1981 and 2010 was 7.23 million square miles (18.72 million square kilometers).

The single-day maximum extent this year was reached on Sept. 20, according to NSIDC data, when the sea ice covered 7.78 million square miles (20.14 million square kilometers). This year's five-day average maximum was reached on Sept. 22, when sea ice covered 7.76 million square miles (20.11 million square kilometers), according to NSIDC.

A warming climate changes weather patterns, said Walt Meier, a research scientist at Goddard. Sometimes those weather patterns will bring cooler air to some areas. And in the Antarctic, where sea ice circles the continent and covers such a large area, it doesn't take that much additional ice extent to set a new record.

"Part of it is just the geography and geometry. With no northern barrier around the whole perimeter of the ice, the ice can easily expand if conditions are favorable," he said.

Researchers are investigating a number of other possible explanations as well. One clue, Parkinson said, could be found around the Antarctic Peninsula – a finger of land stretching up toward South America. There, the temperatures are warming, and in the Bellingshausen Sea just to the west of the peninsula the sea ice is shrinking. Beyond the

Bellingshausen Sea and past the Amundsen Sea, lies the Ross Sea – where much of the sea ice growth is occurring.

That suggests that a low-pressure system centered in the Amundsen Sea could be intensifying or becoming more frequent in the area, she said – changing the wind patterns and circulating warm air over the peninsula, while sweeping cold air from the Antarctic continent over the Ross Sea. This, and other wind and lower atmospheric pattern changes, could be influenced by the ozone hole higher up in the atmosphere – a possibility that has received scientific attention in the past several years, Parkinson said.

“The winds really play a big role,” Meier said. They whip around the continent, constantly pushing the thin ice. And if they change direction or get stronger in a more northward direction, he said, they push the ice further and grow the extent. When researchers measure ice extent, they look for areas of ocean where at least 15 percent is covered by sea ice.

While scientists have observed some stronger-than-normal pressure systems – which increase winds – over the last month or so, that element alone is probably not the reason for this year’s record extent, Meier said. To better understand this year and the overall increase in Antarctic sea ice, scientists are looking at other possibilities as well.

Melting ice on the edges of the Antarctic continent could be leading to more fresh, just-above-freezing water, which makes refreezing into sea ice easier, Parkinson said. Or changes in water circulation patterns, bringing colder waters up to the surface around the landmass, could help grow more ice.

Snowfall could be a factor as well, Meier said. Snow landing on thin ice can actually push the thin ice below the water, which then allows cold ocean water to seep up through the ice and flood the snow – leading to a slushy mixture that freezes in the cold atmosphere and adds to the thickness of the ice. This new, thicker ice would be more resilient to melting.

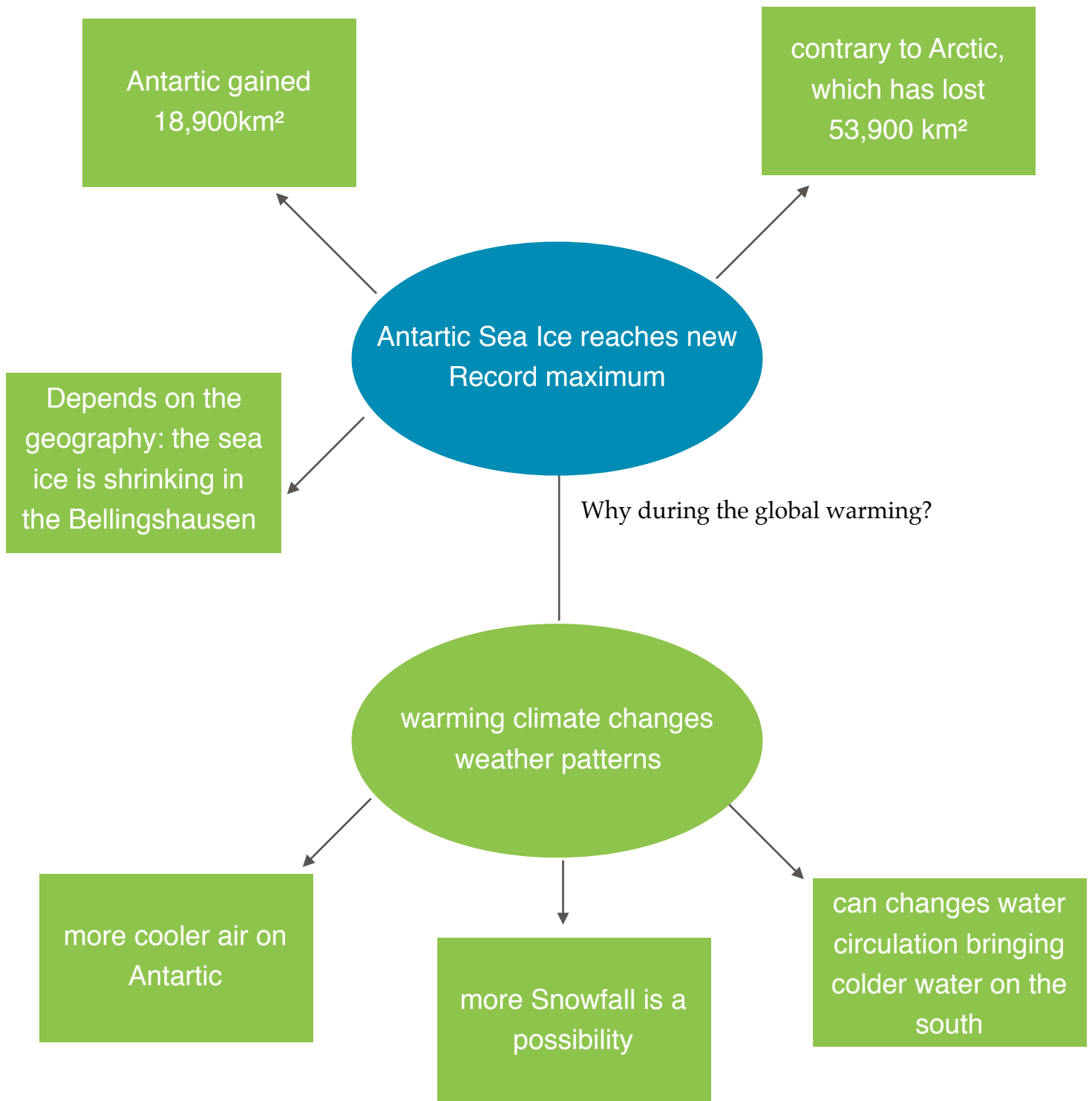
“There hasn’t been one explanation yet that I’d say has become a consensus, where people say, ‘We’ve nailed it, this is why it’s happening,’” Parkinson said. “Our models are improving, but they’re far from perfect. One by one, scientists are figuring out that particular variables are more important than we thought years ago, and one by one those variables are getting incorporated into the models.”

For Antarctica, key variables include the atmospheric and oceanic conditions, as well as the effects of an icy land surface, changing atmospheric chemistry, the ozone hole, months of darkness and more.

“It’s really not surprising to people in the climate field that not every location on the face of Earth is acting as expected – it would be amazing if everything did,” Parkinson said. “The Antarctic sea ice is one of those areas where things have not gone entirely as expected. So it’s natural for scientists to ask, ‘OK, this isn’t what we expected, now how can we explain it?’”

Word	Part of speech	Stress	Definition	Translation	Comment
shrinking	verb	« shrin »	to (cause to) contract or lessen in size:	contracter quelque chose	Always the cause which shrink the object. water shrinks clothes
consensus	noun	« con »	a general agreement	l'avis general (après un débat)	same word that in french
landmass	noun	land	a continent or other large body of land.	un continent, , les terres	geographic sense
slushy	adj	slu	partly melted snow	neige en partie fondu	it has also a petical sense, to express a sentimental talk
thickness	noun	thick	the thick part or body of something	épaisseur	the thickness can also be seen as a dimension, and as a ply too

MindMap



Why your cat needs an iPad

By Melonyce McAfee, CNN

The old ball of yarn isn't cutting it anymore when it comes to cat toys. As with kids' toys and adults' favorite board games, diversions for pets have overwhelmingly gone digital. A slew of apps and other tech toys are now being marketed to our cats and dogs. (OK, marketed to us, who then run out and buy them for our cats and dogs.)

Your kitty can make new use of an old iPhone or Android tablet, thanks to a suite of animal-friendly apps available for download. And in the digital age, you no longer have to wrestle the ball from Fido for a game of fetch.

Friskies, the cat-food company, has been producing digital games for cats since 2011. Titles include Cat Fishing, JitterBug and Pull 'n Play, and each involves tempting cats to chase moving targets on the screen of a phone or tablet.

"All of the Friskies Games for Cats are inspired by things that pique that amazing curiosity unique to cats and their spirit of imagination and discovery," Friskies' parent company, Nestle Purina, said in a statement.

The company says its games have more than 2.7 million downloads, an average of about 20,000 a week on iTunes. YouTube hosts nearly 12,000 videos of cats playing the games.

Cat Fishing, which encourages cats to paw at digital fish swimming across the screen, has mostly positive iTunes reviews: "Downloaded this months ago and my buddy Hobbes still comes running whenever he hears the bubbles that signal the start of the game. He cannot get enough of this app!" wrote user Butters867.

JitterBug has fewer raves in the rating section, with some dissatisfied pet owners saying their cats simply ignore the game.

Oh, those finicky cats. That's where hardware comes in.

FroliCat, a PetSafe brand, makes toys that mimic old-school yarn and fake mice to keep cats occupied like they're chasing the real thing. Other games use a laser to focus the cat's attention and send it on a wild goose chase.

PetSafe has seen more demand for the cat toys since it acquired the line from another company three years ago.

"You do see an uptick in people pampering their pets and wanting to give their pets a way to interact when they're not home," said Jason Hart, director of marketing for PetSafe.

The company is interested in producing high-tech toys for dogs too, Hart said, but finding electronic toy concepts that appeal to dogs at the right price point has proved difficult. Dogs are pretty hard on toys, after all.

Tablet and smartphone apps such as Airship Software's Game for Dogs are out there, but owners may be wary of dogs getting too excited and destroying their devices.

"Perhaps I should have thought this one out a little better," user JackSpratsmom wrote in an iTunes review of Game for Dogs. "90lb Golden Retriever vs iPad screen?? I'll let you figure out the outcome of that one."

For dogs, hardware could be the way to go. Some new technology is interactive for both owner and pet.

For the rangy dog, there are toys such as the Go-Go Dog Pal, a remote-controlled toy that resembles a small animal on wheels. Pet owners can buy a raccoon, skunk or woodchuck version that races around the yard while the dog gives chase.

Other gadgets take even less effort on the part of pet parents. Fetch machines, which launch balls for a dog to chase, have been around a while. Brookstone carries a version. And there's one available from Go Dog Go.

Both let you train your dog to reload the launcher and play on its own while you're at work.

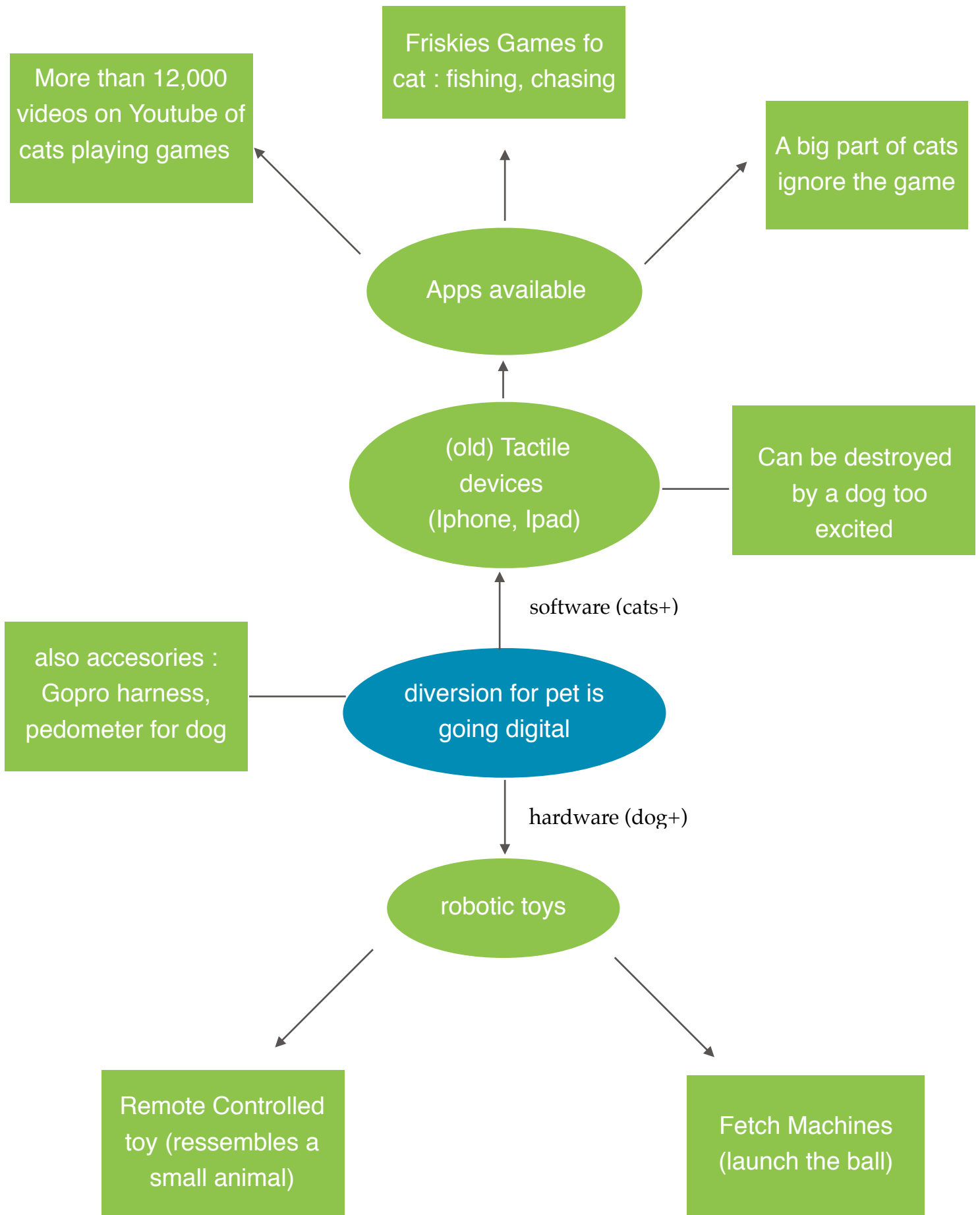
If you're an avid fitness tracker who takes your dog along on your runs or hikes, you can now obsess about Fluffy's "steps," too. That's right -- there's a pedometer for dogs.

And in these "record everything" times, pet owners can even strap a GoPro harness and camera onto their dog to get a new perspective on their pooch's workout routine.

Pet owners, the future is now.

Word	Part of speech	Stress	Definition	Translation	Comment
overwhelmingly	adverb	whel	largely	largement	express also something which is very great, or very powerful
pampering	verb	pamp	to treat or gratify with extreme or excessive indulgence	chouchouter	can also be used when you overfeed your child/pet

Mind Map



III. Autonomous Reading assignment

Strangest star
2581 words
20 sept 2014
from New Scientist
NEWSCI
1210.

Strangest star

Five weird mysteries about our sun

To understand stars, knowledge begins at home, but with staggering fiery rains, speedy magnetic flips and an atmosphere that appears to defy the laws of physics - we still have to get to grips with our own star's quirkiness

BILLIONS and billions of stars fill our galaxy. Many burn bright, destined to become supernovae, while others are dim burnouts. They come alone and in pairs; with or without planetary companions. We have searched the far reaches of the universe in the hope of understanding the stars, but ultimately everything we know is based on our sole reference point, the sun. Yet our home star remains plenty mysterious.

"It's expected that it's understood, because it's right there, it's so close and dominant in the sky," says Eamon Scullion from Trinity College, Dublin, Ireland. "How are we going to understand any other aspect of space if we can't get to grips with the nearest star"

While we may have to go back to square one, there are things we do know about our sun. It is made of plasma – gas that has been ionised, or highly charged. It fuses hydrogen in its core. It blasts us with radiation and, crucially, its life-giving light. As stars go, it is roughly middle-aged, having been around for 4.6 billion years. And it probably has 5 or so billion more to go before it swells into a red giant that consumes Mercury, Venus and Earth. Yet strange solar phenomena abound and here are some of the strangest.

It rains on the sun

We know the sun affects weather on Earth and in space, but it has its own dramatic weather phenomena, too.

"People have this image of a giant ball of gas that's on fire, and everything is streaming away from it at thousands of kilometres per second," says Scullion. In fact, the sun's plasma can fall back to the surface as rain.

Though this so-called coronal rain was predicted about 40 years ago, we couldn't see or study it until our telescopes became powerful enough to spot it happening. It works a bit like the water cycle on Earth – where vapour warms, rises, forms clouds, cools enough to condense into a liquid and falls back to the ground as precipitation. The big difference is that the plasma doesn't change from gas to liquid, it simply cools enough to fall back down to the solar surface.

This all happens very quickly and on a gargantuan scale, with "droplets" the size of countries plunging from heights of 63,000 kilometres – about one-sixth the distance from Earth to the moon.

“You basically generate something the size of Ireland in 10 minutes, and drop it out of the sky at a rate of 200,000 kilometres an hour,” Scullion says.

Solar tornadoes also form in a familiar fashion. Swirling solar plasma creates a vortex, which causes magnetic fields to twist and spiral around into a super-tornado that reaches from the surface into the upper atmosphere. Here they transfer energy and help to heat it, or so scientists believe.

It has long-lost siblings

The sun may be on its lonesome now – its closest neighbour is 4.2 light years away – but that wasn’t always the case. Once upon a time it had close family. After their birth in the same cloud of dust and gas that formed our solar system, these solar siblings scattered hundreds of light years apart in the Milky Way. In May, astronomers reported the first one: a star called HD 162826.

“It looks like the sun, but a little bit bluer,” says Ivan Ramirez at the University of Texas at Austin, who led the study. It’s also warmer than the sun and 15 per cent more massive. The star is about 110 light years away, and you can see it with the aid of in the left arm of the constellation Hercules.

To find its family ties, Ramirez’s team combed through galactic archaeology studies, which model the motions of the Milky Way. These predictions laid out where sibling stars would be now if they had formed in the same place as the sun. Though they spread out in different directions, their positions still give away their birthplace, Ramirez says.

He narrowed down the search area to 30 stars, and then looked at them closely to find a family resemblance. Only HD 162826 had a similar chemical make-up to the sun. A separate team led by Eric Mamajek at the University of Rochester in New York also studied the star and found it is the same age as the sun, as would be expected for two stars born together. Even more tantalising, HD 162826 is already in a catalogue of stars that might harbour planets.

Locating solar siblings could tell astronomers new details about the birth of our solar system, including what conditions were like when the sun and planets formed. But beyond scientific curiosity, Ramirez just wanted to find a member of the sun’s nuclear family. “It’s a cool thing to do,” he says.

He plans to keep looking for more of our sun’s lost littermates. Most are probably red dwarf stars, which are the most common stars in the galaxy. They are smaller and cooler than the sun, so they are much harder to find. But a new telescope called Gaia, launched last December, may help locate more solar siblings as it will observe a billion stars to make the first 3D map of the Milky Way.

It has a freaky calendar

Our planet’s calendar is well known: it takes 24 hours to spin once on its axis – a day – and 365 days to travel around the sun – a year. Yet the sun’s schedule is nothing like ours. Different parts of the sun spin at different rates. So while a day at the equator lasts 25 days, regions close to the poles take a few days longer to make a complete rotation. This uneven spin leads to distortion in the sun’s magnetic field, which has knock-on effects. As the equator spins, it drags the magnetic field that connects the sun’s poles, says Alex Young at

NASA's Goddard Space Flight Center in Greenbelt, Maryland.
This results in another strange calendar phenomenon: solar maxima and minima.

As the sun's magnetic field gets wound up by the spin "it starts to build tension and pressure, much like when you twist a rubber band and it knots up", Young says. Something has to give, so the magnetic fields snap and release energy in the form of heat, either as solar flares or furious clouds of energy called coronal mass ejections (CMEs).

This cycle, from magnetic twisting to energy releasing, happens over roughly 11 Earth years – giving the sun its own calendar. During what's called a solar minimum, flares are few and so are dark patches called sunspots that appear on the sun's surface due to intense magnetic fields.

In solar maxima, more sunspots burst over the surface where they spew more flares and CMEs. Torrents of charged particles also stream through gaps in the sun's atmosphere and across the entire solar system. This can affect us, causing blackouts on Earth and damaging satellites. But each solar cycle varies, and we don't understand why, which makes them and their effects unpredictable.

The current cycle is unusually calm and has been one of the weakest since records began in 1755. This is in spite of some major solar storms, together with a colossal solar flare in 2012, which would have packed some punch had it hit Earth.

Predictions just a couple of years ago suggested this cycle would be a scorcher, which shows just how little we understand solar cycles, says Todd Hoeksema, a solar physicist at Stanford University in California. "It's like predicting the stock market. Past performance is no guarantee," he says.

After roughly two activity cycles, or 22 years, the sun undergoes yet another calendar change: its magnetic field reverses. North becomes south, and vice versa. Earth does this, too, but only every 300,000 years or so (we are long overdue one). Scientists think the sun's polarity is in the process of reversing right now, Young says.

"Why is it 11 and 22 years and not 15 and 30 We don't know the answer to that yet," Young says. "When you think about it, it's such a short amount of time, given that the sun has been around for 4.6 billion years."

It breathes

As the sun follows its 11-year solar cycle, it changes, altering its output of solar wind, X-rays, ultraviolet and visible light. This has the knock-on effect of changing the size of the huge magnetic bubble of charged particles, called the heliosphere, that the sun blows around itself to way out beyond Pluto.

These changes affect everything from Earth's climate to the Voyager 1 spacecraft, which finally entered interstellar space two years ago.

The sun provides nearly all the energy that drives Earth's climate – 2500 times as much as all other sources combined, according to Greg Kopp, a solar physicist at the University of Colorado's Laboratory for Atmospheric and Space Physics. In past epochs, solar cycles were partly responsible for warm periods and mini ice ages. Low solar activity drives cold winters in

northern Europe and the US, and mild winters over southern Europe – although global warming means globally averaged temperatures are on the rise.

We now understand what's going on a little better thanks to a space-borne instrument called TIM, launched by NASA in 2003. TIM keeps tabs on the spectrum of energy the sun emits, and detects subtle changes in energy output so scientists can distinguish between human causes of climate change and purely natural causes we can't control.

Changes in the sun's output affect much more than just our climate, however. During a solar minimum, the solar wind streams from the poles at a much faster speed, so there's more pressure pushing against material from interstellar space. During solar maxima, the sun's magnetic fields are more knotted up and not as much wind escapes, so the heliosphere contracts. "There's sort of an 11-year breathing," says Hoeksema.

The solar wind has been 20 to 40 per cent weaker than expected this cycle, he says. This shallower breath is one reason why Voyager 1 left the heliosphere earlier than scientists expected.

It defies thermodynamics

Solar tornadoes are bizarre enough on their own, but they might help explain one of the sun's weirdest characteristics: its atmosphere is hotter than its surface. At 5700 kelvin the sun's surface is scarcely cold, but it is frigid compared to the corona. The highest part of the sun's atmosphere, more than 1 million kilometres above the surface, can reach temperatures of several million kelvin.

Generally, an object cools as it moves away from a heat source; a marshmallow will toast faster when it's closer to a campfire flame than further away. But the sun's atmosphere does the opposite. Energy must be flowing into the corona, heating it up – but no one knows where this energy comes from. "We don't fully understand the physics of what's going on," Scullion says.

Computer visualisations might paint a clearer picture – and quite artistically, too. In one simulation, NASA Goddard astrophysicist Nicholeen Viall has coloured data from NASA's Solar Dynamics Observatory (SDO), which observed the sun's coronal plasma in 10 different wavelengths that each correspond to a temperature. The result is a swirling movie reminiscent of a Van Gogh painting (). But Viall's visualisation suggested the atmospheric plasma was cooling, not heating. This may be because the heating is happening faster than SDO can detect.

Much of the energy that heats the corona appears to come from the so-called transition region – the area between the sun's corona and the next atmospheric layer down. Tornadoes, rain, magnetic braids, plasma jets and strange phenomena called "spicules" are all thought to play a role in this heating process, bringing energy from the lower regions of the sun and depositing it higher up. But no one knows exactly how. NASA's Interface Region Imaging Spectrograph mission has been observing this region since 2013, and physicists like Scullion try to simulate these energy exchanges using models in the hope that they will yield clues that scientists can look for on the real thing.

It's hard to get there

To truly understand all these solar conundrums, we need to get as close to the sun as possible. That's not as simple as flying straight there, as the operators of two new spacecraft that will fly closer to the sun than ever before are finding.

Solar Orbiter is a European Space Agency mission launching in 2017, aiming to fly within 45 million kilometres of the sun.

It will photograph the sun's poles for the first time, which should help scientists understand how the sun generates its magnetic field, and may even give insights into why its magnetic polarity flips so frequently. By getting a close-up view, the probe will also be able to sniff the pristine solar wind, before it has reached Earth. The main goal is understanding how the sun interacts with the environment around it, says Tim Horbury, a physicist at Imperial College London and the principal investigator on the Solar Orbiter's magnetometer. "The basic physics is understood, but a lot of the detail is not," he says.

NASA's Solar Probe Plus mission is set to launch in 2018 and come even closer, just 6 million kilometres from the sun's surface.

To get there, it will approach in a looping, circuitous route, like a matador approaching a wary bull. The slow approach is partly for safety's sake: as the probe gets closer, scientists can carefully monitor any threats from radiation or heat and adjust the approach if anything goes awry.

Solar Probe Plus will lap round Venus seven times to put it on the right trajectory and also to build up speed and momentum to slingshot closer to the sun – at its closest approach, it'll zip past the sun at 200 kilometres per second.

Shielding a spacecraft from solar radiation is one of the most important jobs in spaceflight, but it's even harder when you are sidling up to the source. The technology to do it hasn't existed until now, Horbury says. Both craft will have beefy heat shields to protect their sensitive instruments from searing temperatures.

Both spacecraft will try to answer questions, including how the atmosphere is heated and how the sun generates its wind. But they will still be far from answering everything there is to know about our star, says Young. "The problem is that you don't know what you don't know," he says. n

Rebecca Boyle is a freelance science journalist based in St Louis, Missouri

We look to the stars to understand the universe, but even our own sun holds plenty of surprises, finds Rebecca Boyle

Vocabulary:

Word	Part of speech	Stress	Definition	Translation	Comment
scattered	verb	sca	dispersed	dispersé	works with a substance, but also with a group of object.
dwarf	noun	wa	much smaller than the average	nain/naine	in the text, it describe a star, but the most common use is with human and animals.
scarcely	adverb	scar	barely	à peine	in an ironic context, it may say « definitely not »
sniff	verb	sniff	to inhale through the nose	renifler	in the text, it means to perceive by or as if by sniffing

Questions :

1. What are the five weird things about our Sun?
2. How many light years is HD 162826 from us?
3. Can the solar tornado explain the atmosphere of the sun?
4. Is it raining water on the sun?
5. What happens during a « solar minimum »?
6. What can affect us during a solar maxima ?
7. Why do we use a computer visualisations?
8. What do we need to do to truly understand all the solar conundrums?
9. How many times Solar Probe Plus will lap round Venus?
10. Where the energy that heats the corona come from?
11. How far is the closest neighbour of the Sun?
12. Do the sun have a magnetic field?
13. What is the name of the new telescope?
14. What are the two variations of the calendar of the size?
15. What are the differences between a solar maxima and a solar minimum?
16. How fast Solar Probe Plus is moving?
17. Why the atmosphere of the sun isn't cooler than its surface?
18. Is the Sun the only source of energy that drives Earth's climate?
19. What is the function of the spacecraft' shield?
20. When Solar Orbiter will be launched?

What was it like to see your changed appearance after you were attacked in 2007

Doctors put me in a coma to operate on me after the attack. When I woke up, I was completely blind for the first two years, so I didn't really know what I looked like. It wasn't until October 2008, the beginning of the court case, that I realised I looked significantly bad: the TV news coverage came with a graphic content warning. For a year and a half I didn't feel good about the way I looked – I made little kids cry. Eventually I had to accept it. But when I did regain enough eyesight to see myself in the mirror, it was difficult. I couldn't see who I was before. Even my eye colour had changed. I couldn't see me in there. It was disturbing.

How did you feel when your doctor, Bohdan at the Brigham and Women's Hospital in Boston, suggested a face transplant

I was surprised. I didn't know he was doing them. After he first suggested it, I looked online at the pictures of people he had already performed face transplants on. I was shocked – it was just such a transformation. I wanted that transformation for myself. It seemed

a little sci-fi, but he told me it would also be a real opportunity to regain some function in my face. That was what I was most concerned with. F, I have synthetic corneas in my eyes that were bearing the brunt of not having eyelids, which meant I couldn't blink.

Did you have to wait long for a suitable donor

Yes. Because I'd had so much surgery and blood from other people during the many procedures, it was difficult to find a tissue match. By the time I was on the list for a face transplant, I had already had 58 surgeries. They couldn't find me a donor until 14 months later, and even then we were not a complete match. As a result, I take high doses of immunosuppressive medications that stop my body from rejecting the face.

How did you prepare for the face transplant

When you agree to the transplant, psychologists and psychiatrists evaluate you, but they don't really tell you anything. A social worker was always on hand to answer any questions I had. I was a registered nurse for 20 years, and I took care of kidney and liver transplant recipients, so I was well versed in the medications.

How did you feel just before the surgery

That was one of the most surreal moments of my life. It was emotional, but at the same time it wasn't. It was glorious because I knew things were going to change for the better, but it was also heartbreaking that someone had died. It was as if time had stopped while this big event was happening.

What happened during the surgery itself

I don't know much about it. The doctors took pictures and scans beforehand to find out what wasn't working and what I was missing from my scarred face. The left side of my face didn't work well. I could barely move it. I didn't have eyelids, so I couldn't blink. I couldn't breathe out of my nose. I didn't have lips. They made a map of everything I would need from a donor. It was a huge undertaking. The surgery lasted about 17 hours.

What was it like to wake up with a new face

I couldn't see my face at first because it was swollen, and I couldn't see out of my eye. It was probably a good 10 days before I looked in the mirror. During that time, I wasn't afraid or worried, given how disfigured I had been before. It was a big relief to look in the mirror that first time. I looked good.

How has your recovery been

My recovery was quite long. But by the end of the first year, I could see improvements. I could start to close my mouth and smile a bit. I could open my left eye just enough, and blink it a little bit, which was all I really needed. I can eat without drooling and now I have lips. I can breathe out of my nose for the first time since I was injured. Those kinds of things mean a lot. When I woke up after the transplant I couldn't feel my face at all. Now I've gained about 65 per cent sensitivity in my face. A lot has changed in the two years since I had my surgery.

Your appearance has changed dramatically. Do you still feel like you

I now have a whole different face that doesn't look anywhere near the way I used to look. I now see a pleasing image in the mirror – I'm not all scarred, and I appreciate that – but I still don't see me. After seeing my old reflection for 40 years it is going to take a while to look in the mirror and not think, "Hey, this doesn't really look like me". I've sort of gotten used to it. It's not stressful – being disfigured was a lot more stressful.

What are your treatments like now

There is always surgery for me because my body is 80 per cent burned. Even if I'm not going to have surgery on my face for a while, I always need scar releases. I have huge scars, and they are so tight that they keep my arms and legs from moving. I need surgery to cut them from time to time, and cover them with skin grafts. Those kinds of surgeries are much more painful than the face transplant. I also have biopsies taken from my face every six months. Doctors look at the tissue and can tell whether or not the face is being rejected.

Have there been any signs of rejection

All face transplants have shown signs of rejection at one time or another. I've had three episodes. They usually happen in the winter months. Sometimes I put a steroid cream on my face, and sometimes my medication is increased. It usually takes about six weeks for the biopsies to return to normal. It's nothing to get upset about.

Will your ability to feel and use your face continue to improve with time

Yes. I've recently had a little setback – a nerve or muscle is not working correctly on the left side of my mouth, which has started to droop. It happened after I gave a talk to teenagers, and then posed for about 300 photos, so I might have overused it. Things like that set me back, but I think it's looking better as time goes on.

When you have setbacks like this, should you rest your face, or perhaps exercise it

My doctors aren't really sure because this is all so new. There are no guidelines to follow, so we play it by ear. In this case, my speech therapist is going to give me a call. I'll do the exercises she tells me to do to see if I can recover from this setback, which I think I can.

Three months after you received your face transplant, you met Marinda Righter, the face donor's daughter. What was that like

It was great. It was her decision to meet me. We've had a really good relationship since. She was the person that gave permission for her mother's face to be donated. Her mother was a registered organ donor, but given the newness of the procedure the doctors asked for special permission to take her face, and Marinda agreed to that. The faces of most people who have face transplants change significantly over the years. I don't know why, but my face hasn't changed much, so Marinda still sees her mother in me.

Do you think the experience has changed you in other ways

It has. I wasn't happy being disfigured, but I also knew that I didn't have to let it stand in my way. I felt like I needed to shine my light within so brightly that my looks on the outside wouldn't be so bothersome. I give a lot of talks. My partner has taught me to play the banjo, so we play banjo together at the end of my talks. I have a great life.

Most people will struggle to imagine coming to terms with such a dramatic change in their appearance.

The only thing I can say is that it really makes you realise that there's a part of you that has nothing to do with what you look like. That part of you has nothing to do with the person you see in the mirror. n

Interview by Jessica Hamzelou

"I didn't have eyelids or lips. I couldn't blink. The surgery was a huge undertaking"

Looking out from behind someone else's face

There's a part of you that has nothing to do with what you see in the mirror, discovered Carmen Blandin Tarleton following a horrific attack that left her with 80 per cent burns

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Face transplants involve removing significant amounts of damaged facial tissue and replacing it with healthy tissue from a donor. The exact number is unknown, but between 30 and 35 face transplants are thought to have been performed around the world, since Isabelle Dinoire received the world's first partial face transplant in France in 2005.

Different surgical teams use different procedures, but Bohdan Pomahac, who performed Carmen Blandin Tarleton's transplant at the Brigham and Women's Hospital in Boston, uses a conservative technique that minimises the amount of tissue to be grafted. He tries to avoid making a complete swap.'s team first examines the patients face, before removing only those parts that are damaged beyond repair. They then cover the removed areas with fat, muscle and skin from a carefully selected donor. Nerves and blood vessels are painstakingly reconnected under a microscope.

Once the surgery is complete, face-transplant recipients have a lifetime of follow-up treatments. There is always a chance that a person's immune system will attack the foreign tissue, called rejection. fully Long-term prospects hasn't yet seen any complete rejections, but recipients tend to have small episodes about once a year, which can be controlled with immunosuppressant drugs. He hopes all the face transplants will last for life, but he can't be sure. People who receive liver and kidney transplants can sometimes develop chronic rejection against these organs over the years, he says. "Only half of transplanted kidneys are still functioning 10 years later, which is a sobering thought."

All seven of 's face-transplant recipients are doing well, and their ability to feel their new faces seems to be improving with time. Their ability to control facial muscles has also got better with time and use, although these improvements seem to plateau about three years after the operation.

Any candidates will have to pass a screening process before they can be considered. His team will only perform the surgery for people whose disfigurement can't be addressed with established, less-invasive surgery. They have also turned down people who are not medically well enough to undergo the procedure, and those that are unable to fully understand the risks involved.

Profile

Carmen Blandin Tarleton, a nurse from Vermont, was left with 80 per cent burns after she was attacked and doused with industrial-strength alkali by her estranged husband. Two years ago, she became one of the first people in the world to receive a full face transplant

A different tune: Carmen Blandin Tarleston has learned to play the banjo since her horrific attack

Face transplant: Looking out from somebody else's face

There's a part of you that has nothing to do with that person you see in the mirror, discovered Carmen Blandin Tarleton following a horrific attack that left her with 80 per cent burns

Face transplants backgrounder

Vocabulary

Word	Part of speech	Stress	Definition	Translation	Comment
grafted	verb	gra	insert	greffer	also a sense of corruption : the acquisition of money, gain, or advantage by dishonest
estrapade	adj	tran	hostile	hostile	displaying or evincing a feeling of alienation
blink	verb	lin	to open and close (the eye)	cligner	when it's not about the eye, it means to shine (something) unsteadily or rapidly on or off

Questions :

1. Why doctors put the patient in a coma?
2. How long has he been blind?
3. Why was it difficult to find a tissue match?
4. What wasn't working before the surgery?
5. What can he do again since the surgery?
6. When do signs of rejection happen?
7. What instrument does he play?
8. Who did he met three month after the transplant?
9. Who did the interview?
10. What does a facial transplant involve on the facial tissue?
11. When was the world's first partial face transplant?
12. Can transplanted kidneys be fonctionnal for life?
13. What is the kind of candidates accepted by the medical team?
14. How did Carmen Blandin Tarleton get burned?
15. What can recipients develop after having a kidney transplant?
16. What did she discover by looking in the mirror?
17. How did he feel after he wake up?
18. What are the abilities that improve with time?
19. What was the job of Carmen Blandin?
20. What hobbie do Carmen and the patient have in common?