

Ode to Happiness for Sunday May 23 2021

Hvítserkur, Iceland



getty

Often referred to as the “troll of northwest Iceland,” Hvítserkur rises 49 feet from from Húnaflói Bay like some sort of mythical beast. The rock—best viewed from Iceland's Arctic Coast Way—often looks like it's moving due to the birds that love to perch atop it, making the formation feel more like a living creature.

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Did 'Creativity Genes' Allow Humans to Take Over the World?

By Yasemin Saplakoglu – Live Science staff writer

Researchers compared the genes of chimpanzees, modern humans and Neanderthals.



*A young girl with watercolor on her hands.
(Image credit: Shutterstock)*

Creativity could be one of the main reasons Homo sapiens survived and dominated over related species such as Neanderthals and chimpanzees, according to a new study.

The idea that creativity may have given Homo sapiens a survival edge over Neanderthals has been around a long time, said senior author Dr. Claude Robert Cloninger, a professor emeritus in the psychiatry and genetics departments at Washington University in St. Louis. But that's a tricky case to prove, as we still don't know how creative Neanderthals actually were, he said.

"The problem with evaluating creativity in extinct species is, of course, you can't talk to them," Cloninger told Live Science. So an international team of researchers, led by a group at the University of Granada in Spain and the Washington University School of Medicine in St. Louis, looked at genes to examine what distinguished humans, including their creative ability, from their distant relatives.

The researchers had previously identified 972 modern genes that regulate three distinct systems of learning and memory in Homo sapiens: emotional reactivity, self-control and self-awareness. The emotional reactivity network involves the ability to form social attachments and learn behaviors while the self-control network involves the ability to set goals, cooperate with others and make tools.

The self-awareness network, on the other hand, involves "episodic learning" or remembering and improving upon past behaviors and autobiographical memory of a person's life as a narrative with a past, present and a future "within which the person can explore alternative perspectives with intuitive insight and creative imagination," according to the study.

Self-awareness is "what enables us to have divergent, original creative thinking [and to] be very flexible," Cloninger said.

In the new study, the researchers analyzed DNA previously taken from Neanderthal (*Homo neanderthalensis*) fossils, modern humans (*Homo sapiens*), and chimpanzees

(Pan troglodytes). They found that the genes related to the oldest network — emotional reactivity — were identical among Homo sapiens, Neanderthals and chimpanzees. But the chimpanzees completely lacked the genes that led to self-awareness and self-control in humans.

Some, but not all, of those genes were present in Neanderthals. "The Neanderthals were about halfway between the chimps and modern humans" in the number of these genes they carried, Cloninger told Live Science.

What's more, 267 of those 972 genes were unique to Homo sapiens, and they were all so-called regulatory genes. In other words, they dial the activity of other genes up or down. These genes — which were absent in chimpanzees and Neanderthals — regulate the brain networks involved in self-awareness and creativity.

Unique to Homo sapiens

The emotional reactivity network evolved in monkeys and apes about 40 million years ago, the self-control network evolved a little less than 2 million years ago, and the self-awareness and creativity network emerged just 100,000 years ago, when humans were under pressure from a changing climate that reduced the supply of food and other resources necessary for survival, Cloninger said.

Then, some 40,000 years ago, Homo sapiens with "unprecedented cultural and technological sophistication" began rapidly replacing Neanderthals around the world, according to the study. This sophistication was likely driven by our Homo sapiens ancestors' creativity and self-awareness, which enabled them to live longer, healthier lives, the authors said.

Such longevity would have allowed a longer learning period for kids and adolescents and thus more time to accumulate knowledge. Living longer, healthier lives would have also encouraged cooperation among individuals and extended communities to promote the success of their children, grandchildren and others in the community. That, in turn, would enable "the technological innovativeness, behavioral flexibility, and exploratory disposition needed to allow Homo sapiens to spread throughout the world more successfully than other human lineages," the authors wrote.

Still, the study comes with several limitations, including that traits such as creativity and self-awareness are complex and that Neanderthals are no longer around, making it difficult to assess them solely based on their genes. (For example, a person's environment can also influence their personality and behavior.) Indeed, some researchers are not convinced that comparing the modern human genome to that of an extinct species can lead to robust conclusions.

"We do not know the causal link between genetics and these higher traits, even if the authors identified networks of genes that are associated with some measures of self-awareness, creativity or prosocial behavior," said Thomas Suddendorf, a professor in the School of Psychology at the University of Queensland in Australia who was not part of the study.

So, although the findings are interesting, "I would caution against drawing any firm conclusions from such data about extant, let alone about extinct, species," Suddendorf told Live Science in an email. It is "undoubtedly" the case that humans are more creative than other animals currently living, including chimpanzees, he said.

The authors noted in the study that they "cannot exclude the possibility that Neanderthals had genes that were not present in [Homo] sapiens and influenced their personality and learning abilities." In other words, Neanderthals may not have had the same genes for creativity and self-awareness, but rather their own set of genes that we don't understand.

The findings were published April 21 in the journal *Molecular Psychiatry*.

Originally published on *Live Science*.

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The Economics of Movie Product Placements

Today's films are brimming with products from big-name brands. How exactly do these partnerships work?



By: Zachary Crockett | @zzcrockett

In the 2000 film *Cast Away*, Tom Hanks' co-star isn't Leonardo DiCaprio, Meg Ryan, or some other A-list actor, it's a volleyball, courtesy of Wilson Sporting Goods. Throughout the film, the volleyball enjoys 10.5 minutes of screen time worth an estimated \$1.85m+ in advertising value. And for this exposure, Wilson paid a grand total of \$0.

Each year, hundreds of brands — cars, computers, clothing, kitchen appliances, and lawn chairs — grace the silver screen. Sometimes brand appearances are overbearing (think a 30-second-long glamour shot of a Lexus driving down the coast); other times, they're so subtle you might miss them if you blink. But how do these brands end up in

major motion pictures? What do the economics of these deals look like on the back end? And is this an effective form of marketing?

A mutually beneficial exchange

A frequent misconception is that all brands pay a fortune to appear on the silver screen. In some cases this is certainly true:

- Harley-Davidson paid \$10m to get its electric motorcycle featured in Marvel's Avengers: Age Of Ultron (2015).
- Heineken shelled out an estimated \$45m for 7 seconds of screen time in the James Bond film Skyfall (2012).
- BMW plunked down ~\$110m to supply cars for GoldenEye (1995), Tomorrow Never Dies (1997), and The World is Not Enough (1999) before Aston Martin outbid them with a ~\$140m offer for Die Another Day (2002).
- More than 100 brands (including Gillette, Nokia, and Carl's Junior) offered a combined \$160m to be featured in Man of Steel (2013).

Heineken's \$45m James Bond deal came with the rights to cross-promote the beer in commercials starring the leading man, Daniel Craig (via Heineken)

These big-money deals include a slew of other elements, like verbal cues written into the script ("Boy, I sure could go for a nice, ice-cold Budweiser!"), a guaranteed amount of screen time, and the rights to run cross-promotional advertisements with the film's leading actor. But in the majority of cases, there is no cash exchanged at all between the brand and Hollywood: Producers need props, and brands are happy to loan them out at no cost in exchange for exposure.

The rationale for these arrangements is simple: Movies are pretty damn expensive. On average, a major studio film costs around \$65m to produce, not including marketing and distribution. The largest chunk of that is general production costs, which include set design, props, and wardrobe. For action films, the prop budget alone can stretch into the millions.

The Fast & Furious franchise, for instance, wrecked a total of 1,487 cars over its first 7 movies. Even at a modest estimate of \$20k/car, that amounts to \$30m in prop costs.

Property masters (the folks in charge of props) are on a constant quest to cut down budgets — and product placement can be a lifesaver.

By getting free stuff — hotel rooms, cars, fancy clothes, kitchen appliances — a big production might trim its budget by \$250k to \$5m+, according to industry insiders The Hustle spoke with. That might not sound like a lot in the context of a \$65m film, but it's money that can be reinvested into better music, special effects, or other details that improve the quality of the final cut.



*Ray-Ban sunglasses were featured prominently in Top Gun
(via Paramount Pictures)*

Many well-known product placements in film were unpaid:

- Reese's got star treatment in E.T. (1982) after M&Ms turned down Spielberg over fears the alien would scare kids.
- Ray-Ban didn't pay film producers for its prominent placements in Risky Business (1983) and Top Gun (1986).
- Google not only got complimentary inclusion in The Internship (2013) but had an active say in how its brand was represented.

For the most part, these are mutually beneficial trades: Films save money on their budget, and companies get exposure and brand recognition. But getting a product on Hollywood's radar often requires expert help.

The connection brokers

Prop departments constantly get inundated with products hoping to fill a production team's needs. To stand out among the masses, brands will often hire a product placement agency like Hollywood Branded, which promises to leverage its industry connections to "make your brand a star." Hollywood Branded CEO Stacy Jones has placed Lacoste into Mother's Day (2016), Vita Coco into Entourage (2004-2011), and Blackberry into Up in the Air (2009), among many others.

The process typically works like so:

- The brand pays a fee (anywhere from \$40k to \$300k annually, depending on the desired scope) with the agency.
- The agency "educates" Hollywood about the brand, what it can loan out, and what kinds of projects it wants to associate with.
- The agency hobnobs with decision-makers (prop masters, set decorators, transport coordinators, stylists), stays up to date with projects that are in production, and reads scripts.
- When a good fit is sourced, the agency informs the brand and secures a deal with the production company.

In brokering these deals, Jones has to ensure that the context in which a brand is used won't cause potential conflicts for the company.

"There's some risk involved," she told us. "You don't know if the film will be a hit. But you also often don't have all the details; scripts, sets, camera angles, final cuts — everything is subject to change."

Reebok learned this the hard way.

The brand provided \$1.5m in merchandise to be featured in Jerry Maguire (1996) under the pretense that Cuba Gooding Jr.'s character, Rod Tidwell, an athlete who'd been smited by Reebok, eventually made amends with the brand. But in the end, this scene was cut. The amended made the brand look like a terrible sponsor. They later sued TriStar Pictures and settled out of court.

Any time a brand's logo appears in a film — even if it's just in the background somewhere — producers have to get clearance from the company to include it.

Certain brands are hyper-vigilant about avoiding conflicts.

Eric Smallwood, president of the product placement agency Apex Marketing Group, tells *The Hustle* that the coffee liqueur brand Kahlúa asked to not be named in *The Big Lebowski* (1998) over fears that it would be associated with alcoholism. (It later embraced *The Dude*.) When the film or TV show can't get clearance, it often has to resort to less authentic workarounds like:

- Greeking, or obscuring logos: You'll sometimes see an Apple laptop with a strategically placed sticker, or a car emblem that's blocked by a tree.
- Generic props: Some prop companies specialize in making fictional products (like Heisler, the "Bud Light of fake beers") that can be used in negative contexts without repercussion.

The fictional beer brand Heisler — which is often used when a film can't get clearance from an established brand — makes an appearance in the 2001 cop drama *Training Day*. Other brands prefer to handle their product placements in-house, bypassing the middleman agencies.

Dell started doing this 20 years ago by cold-calling folks in Hollywood and organically building relationships in-house.

Gary Moore, who runs Dell's global product placement team, tells *The Hustle* that the brand has been featured in dozens of TV shows and films over the years, including *The Big Bang Theory*. In 2020, Dell made a cameo in 19 films, including 5 minutes of screen time in *Bad Boys for Life* that, alone, was worth ~\$8.5m in ad exposure.

Whether a movie needs 100 military-grade PC desktops for an FBI scene or a dozen laptops for a startup office, he's the go-to guy.

"We have a vetting process we look at to make sure that a show or film is a good fit for our brand," he says. "We want to make Dell is represented in a positive light, and we turn an opportunity down if we think our products will be used in a nefarious context."

To ensure this, Moore often flies from Austin, Texas, to Hollywood just to read potential spec scripts.

"I say to every brand that comes my way, you should be doing product placement and it's not as expensive as you think." But just how effective is product placement as a form of marketing?

Are film placements worth it?

Dominic Artzrouni is the founder of Concave Brand Tracking, a firm that offers detailed analytics on the performance of product placements in film. Artzrouni provides brands like Dell with data on screen time, discernibility, logo visibility, context (location, associations), and — most importantly — the value they derive from their placements.

The process of determining this value is complex and varied, but Artzrouni says it can be simplified into a basic formula:

$$(Exposure\ on\ screen) \times (Viewership) \times (Cost\ of\ TV\ commercials)$$

It's not an exact science, but it spits out a rough dollar amount that equates a brand's film placement to the value it would've derived from traditional TV commercials.

Each year, he publishes a list of the brands that derived the most value out of product placements. In 2020, the top brand — the British clothing and shoe manufacturer Lonsdale — generated an estimated \$16.5m from its 16+ minutes of screentime in *The Gentlemen*.

Artzrouni says brands that appeared in 2020's 50 highest-grossing films reaped \$890m in combined ad value. Extrapolating across all films, he estimates that brands saw \$1.2B in ad value from movie product placements in 2020.

Top 10 product placements in 2020 films

Screen time, global views, and total estimated ad value for 2020's top placements

Rank	Brand	Film	Time	Views	Value
1	Lonsdale	<i>The Gentlemen</i>	16:12	58m	\$16.45m
2	Members Only	<i>Wonder Woman 1984</i>	11:33	122m	\$12.57m
3	Toyota	<i>Extraction</i>	7:35	117m	\$12.0m
4	Ford	<i>Spenser Confidential</i>	11:28	118m	\$11.92m
5	Ray-Ban	<i>The Gentlemen</i>	14:30	58m	\$11.85m
6	Persol	<i>The Gentlemen</i>	19:23	58m	\$9.89m
7	Dell	<i>Bad Boys for Life</i>	5:14	139m	\$8.67m
8	Buick	<i>Spenser Confidential</i>	5:06	118m	\$8.10m
9	Chevrolet	<i>Spenser Confidential</i>	3:48	118m	\$7.62m
10	Porsche	<i>Bay Boys for Life</i>	3:00	139m	\$7.55m

DATA: Concave Brand Tracking

the HUSTLE

But that only tells part of the story: Unlike traditional commercials, good films are timeless, and those values can increase exponentially.

"Product placement is the gift that keeps on giving," he says. "The ROI can be ridiculous; a brand might get into a film for free and get \$3m in value from it."

Outside of equivalent ad value, brands can reap both short- and long-term sales benefits from placements:

- Reese's saw a reported 65% spike in sales after E.T.
- Ray-Ban sales skyrocketed from 18k to 360k after Risky Business.
- Etch A Sketch saw sales balloon by as much as 4,500% in the wake of Toy Story (1995).
- Chevy Camaro sold 80k cars after playing a starring role in Transformers (2007), jumpstarting the ailing brand. The film was such a hit for the carmaker that it was later called a "GM ad in disguise."
- And academic research has shown that product placements can raise brand awareness by 20%, resulting in a greater recall rate, more positive attitudes, and a stronger intention of buying.

Brands are flocking to the space

Jones, of Hollywood Branded, says there has never been a better time to get into product placement in film.

"I've never, in 25 years, seen more opportunity in the space," she says. "We've never had our phone ring more. The level and number of brands getting into the space is astonishing."

Zachary Crockett / *The Hustle* (Stills via 20th Century Fox) attributes this to a confluence of factors:

- A changing of the ad guard: Traditional TV advertising is declining and brands are looking for creative ways to leverage digital media.
- A content boom: Streaming services have been pumping out historically high quantities of content, leading to more product placement opportunities.
- Budget awareness: Rising production costs on the backside of the pandemic have caused producers to think more deeply about ways to save money on films.

Like any form of marketing, success is often contingent on high volume and good luck.

"First you need to be lucky enough to have your product shown a lot in a film," she says. "Then you need to get lucky with the film's performance." But if Wilson Sporting Goods imparted any lesson, it's that the potential rewards from a slam-dunk film placement are worth the risks.

More than 20 years after the release of *Cast Away*, the company still sells replicas of its famous blood-stained volleyball to fans all over the world.

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How A Missed Putt Started A Golf Ball Empire:

Phillip E. "Skipper" Young, a graduate of Massachusetts Institute of Technology, founded Titleist in 1932.



When playing a round of golf with his dentist, Young missed a sure putt that seemed to be caused by the weight of the ball. He then asked his dentist friend to X-ray the ball and the film showed that the rubber core was off-center.

After this initial discovery, Young took X-rays of more golf balls and found that most were poorly constructed with off-center cores and prone to erratic shots. This inspired Young to produce his own line of golf balls, which would become known as Titleist.

- 1930: Young developed a machine that could uniformly wind rubber string around a rubber core, making a "dead center" golf ball. He named the ball "Titleist," noting it was the "winner" of the quest to create the best for the game.
- 1935: The golf division of the Acushnet Process Company produced the Titleist golf ball that had consistently been the company's most successful product.
- 1948: Introduced "Dynamite Thread" to increase the yardage of their balls.
- 1949: Titleist became the most used ball at the US Open Tournament.
- 1976: Titleist was purchased by American Brands (now known as Fortune Brands).
- 1985: Fortune Brands sold off the Acushnet Company's Acushnet Rubber division, which was Acushnet's original business (circa early 1900s).
- 2002: Titleist reached the \$1 billion mark in annual revenues.

On December 8, 2010, Fortune Brands announced that it would soon sell or spin off Titleist and some other brands. It was then announced on May 20, 2011 that a Korean group associated with Fila Korea, Ltd. and Mirae Asset Private Equity would purchase Acushnet for \$1.23 billion in cash.

Acushnet employs roughly 3000 people in Massachusetts, making it one of the largest employers in the region. It is headquartered in Fairhaven, Massachusetts alongside its Packing and Distribution Center about three miles south of its original location.

They also have two golf ball manufacturing plants and an R&D Technology Center located in the New Bedford Industrial Park, as well as a Custom Golf Ball plant located in New Bedford.

And all of this due to a missed putt... and a lot of blood sweat and tears, persistence, & dedication to making things happen!

Golf Trivia.....(You likely have seen some of these)

1. Golf balls are like eggs - they're white, they're sold by the dozen, and a week later you have to buy more.
2. The pro-shop gets its name from the fact that you must have the income of a professional golfer to buy anything in there.
3. It's amazing how a golfer who never helps with house or yard work will replace his divots, repair his ball marks, and rake his sand traps.
4. Did you ever notice that it's a lot easier to get up at 6:00 a.m. to play golf than at 10:00 to mow the yard or go to church?
5. It takes longer to become good at golf than it does brain surgery. On the other hand, you seldom get to ride around in a cart, drink beer and eat hot dogs while performing brain surgery.
6. A good drive on the 18th hole has stopped many a golfer from giving up the game.
7. A good golf partner is one who's slightly worse than you.
8. The rake is always in the other trap.
9. If there's a storm rolling in, you'll be having the game of your life.
10. If your opponent has trouble remembering whether he shot a six or a seven, he probably shot an eight.
11. Golf appeals to the child in all of us. This is proven by our frequent inability to count past the number 5.
12. It's easy to keep your ball in the fairway, if you don't care which fairway.
13. If profanity had any influence on the flight of a ball, most everyone would play better.
14. The greatest sound in golf is the, "Whoosh, Whoosh, Whoosh" of your opponent's club as he hurls it across the fairway.
15. A recent survey shows that of all jobs, caddies live the longest. They get plenty of fresh air and exercise, and if there's ever a medical emergency, a doctor is always nearby.

16. The best wood for lowering your score is a pencil.
17. You may need lessons if you had to regrip your ball retriever.
18. It's difficult to decide which is more stressful - hitting 3 off the tee or lining up your 4th putt.
19. With practice and strength training you can easily get more distance off the shank.
20. The only sure way to get a par is to leave a 4 foot birdie putt 2 inches from the hole.
21. Nothing straightens out a nasty slice like a sharp dogleg to the right.
22. Never wash your ball on the tee of a water hole.
23. No matter how bad you are playing, it's always possible to get worse.

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Paid Driverless Taxi Service in Beijing

The Associated Press

Chinese tech giant Baidu has rolled out its paid driverless taxi service, making it the first company that's commercialized autonomous driving operations in China



Baidu Apollo Robotaxis move on a street at the Shougang Park in Beijing, Sunday, May 2, 2021. Chinese tech giant Baidu rolled out its paid driverless taxi service on Sunday, making it the first company that commercialized autonomous driving operation
Image Icon

Chinese tech giant Baidu rolled out its paid driverless taxi service on Sunday, making it the first company to commercialize autonomous driving operations in China.

Unlike previous Baidu autonomous driving demonstrations in Beijing, this was the first time there was no safety driver sitting behind the wheel. Instead, a safety member was seated in the front passenger seat to deal with any emergencies.

Up to 10 Apollo "robotaxis" are now operating simultaneously in an area of about 3 square kilometers (1.2 square miles), picking up and dropping off passengers at eight

stops in Shougang Park in western Beijing. Each ride costs 30 yuan (\$4.60), and is open to passengers ages 18 to 60.

The park is a former site of iron and steel plants that's been redeveloped into a sightseeing destination and a future venue for the 2022 Beijing Winter Olympics. Although traffic flows aren't heavy, an influx of tourists was seen in the park on the second day of China's international labor day holiday.

The robotaxis were repeatedly forced to brake when encountering jaywalkers or curious tourists who came close to the vehicles for photos.

Kelly Wang and her husband, who both work in the artificial intelligence industry, said they had a smooth riding experience.

"I would recommend people experience this. There is a strong sense of technology, because nobody is in the driver's seat," Wang said. Her husband was even considering buying such a car for their household.

Passengers can order a robotaxi on an app called Apollo Go. When the taxi arrives, passengers must have their identities verified before getting in. The taxi will start to move after it detects the passengers have fastened their seat belts.

One visitor, Amy Li, still had concerns about autonomous driving, because driving behavior on the road can be complex.

"We've all had experiences such as other cars jumping the queue or making a sudden lane change. People have emotions while robots don't, at least at present," she said "The robots may not be able to deal with such changes."

Baidu, known for its search engines, has been testing autonomous driving on the open road since last year. Its Apollo Go robotaxi service has carried more than 210,000 passengers in three cities across China and aims to expand to 30 cities in the next three years, the company said in a press release.

"In the future, Baidu Apollo will launch driverless robotaxis in more cities, enabling the public to access greener, low-carbon and convenient travel services, while continuing to improve the unmanned service process and user experience," said Wang, vice president and general manager of autonomous driving technology at Baidu in a statement.

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The Greatest American Hero Theme Song - Believe it or Not



<https://www.youtube.com/watch?v=B4JCehDOy54>

The Greatest American Hero was an American comedy-drama television series that aired for three seasons from 1981 to 1983 on ABC.

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How Chegg Built a Multibillion-Dollar Education Tech Platform

Meet one of the hottest names in education: Chegg, a platform where students tap experts for "24/7 homework help."



Chegg's textbook answering service is a student staple -- but just one of many tools Chegg offers to help students cheat succeed.

Chegg said it's expecting \$790m-\$800m in net revenue this year, But it started small as a 'Craigslist for students'

In October 2000, a group of Iowa State students launched Cheggpost, an internet version of a campus bulletin board. The site struggled, but 2 Iowa MBAs took over after seeing that most traffic was from searches for used textbooks. In 2005, they rebranded as Chegg and shifted focus toward becoming a “Netflix” for textbooks.

In 2010, former Yahoo COO and Guitar Hero CEO Dan Rosensweig joined. After taking the company public in 2013, the new CEO led a broader shift away from textbooks. In layman’s terms, Chegg went shopping

Rosensweig acquired more than a dozen companies to help turn Chegg into an all-you-can-eat buffet of student services, including:

- Internships.com for \$11m
- StudyBlue, a flashcards platform, for ~\$21m
- Imagine Easy Solutions, the company behind EasyBib and BibMe, for \$42m
- Mathway, a math problem solver, for \$100m

Basically, things students drool over.

Now, Chegg is getting good grades

In Chegg’s Q1 earnings report, the company announced:

- Net revenue of \$198.4m (+51% YoY)
- A total of 4.8m Chegg Services subscribers (+64% YoY)
- The addition of 6m new solutions to Chegg’s Q&A database
- International subscribers accounted for 33% of new questions
- Chegg still needs to solve for cheating

The company has been called a “superspreader” of cheating, and the problem has been exacerbated by the pandemic and at-home learning.

But Chegg is making strides. In January, it launched *Honor Shield*, a service where professors can pre-submit exam questions to prevent them from being answered during a test.

Sorry, students.

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Fernando Sor (1778-1839)



In the early nineteenth century, Fernando Sor set in motion the quest that continues today, to raise the guitar to the greatest musical level possible. Sor was one of the most prolific composers for, and promoters of, the guitar as a "concert" instrument, in the last two hundred years.

After leaving Spain in 1813, Sor followed the French back to Paris. This was to be his home for the rest of his life. Paris would also be the city where he composed the major portion of his guitar works, over one hundred are known to exist.

Besides being an excellent composer Sor was also a performer of the highest caliber and technical ability. His talent was so sought after that it took him throughout Europe and Asia to perform for some of the highest nobility of the day.

Sor received many praises during his life, but this one from William S. Newman sums everything up about Sor's musical genius in one short quote: "The creative worth of Sor's guitar sonatas is high. The ideas, which grow out of the instrument yet stand up well enough apart from it, are fresh and distinctive. the harmony is skillful and surprisingly varied, with bold key changes and with rich modulations in the development sections."

Andrés Segovia plays Grand Solo Op. 14 by Fernando Sor (1962)

<https://www.youtube.com/watch?v=wpg1ygoooMw>

Andante Largo, performed by Tatyana Ryzhkova

https://www.youtube.com/watch?v=e-UyK7_DCd8

Julian Bream | Study in B minor

<https://www.youtube.com/watch?v=49x9Csv4KPk>

Narciso Yepes plays Fernando Sor 24 Etudes

<https://www.youtube.com/watch?v=-gCLpbaaRRA>

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The Cactus Blossom Awakens



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A man who was paralyzed below the neck in 2007 is now able to write using his mind after Stanford researchers implanted microchips in his brain. When he imagines writing in a notebook with his hand, a computer converts his thoughts into text.

Go, science!

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Charge of the Light Brigade; Alfred, Lord Tennyson



beamingnotes.com

"The Charge of the Light Brigade" is an 1854 narrative poem by Alfred, Lord Tennyson about the Charge of the Light Brigade at the Battle of Balaclava during the Crimean War. He was the Poet Laureate of the United Kingdom at the time.

The poem was written after the Light Cavalry Brigade suffered great casualties in the Battle of Balaclava. Tennyson wrote the poem based on two articles published in *The Times*: the first, published on 13 November 1854, contained the sentence "The British soldier will do his duty, even to certain death, and is not paralyzed by the feeling that he is the victim of some hideous blunder," the last three words of which provided the inspiration for his phrase "Some one had blunder'd."

Charge of the Light Brigade

Half a league, half a league,
Half a league onward,
All in the valley of Death
Rode the six hundred.
"Forward, the Light Brigade!
Charge for the guns!" he said.
Into the valley of Death
Rode the six hundred.

II

"Forward, the Light Brigade!"
Was there a man dismayed?
Not though the soldier knew
Someone had blundered.
Theirs not to make reply,
Theirs not to reason why,

Theirs but to do and die.
Into the valley of Death
Rode the six hundred.

III

Cannon to right of them,
Cannon to left of them,
Cannon in front of them
Volleyed and thundered;
Stormed at with shot and shell,
Boldly they rode and well,
Into the jaws of Death,
Into the mouth of hell
Rode the six hundred.

IV

Flashed all their sabres bare,
Flashed as they turned in air
Sabring the gunners there,
Charging an army, while
All the world wondered.
Plunged in the battery-smoke
Right through the line they broke;
Cossack and Russian
Reeled from the sabre stroke
Shattered and sundered.
Then they rode back, but not
Not the six hundred.

V

Cannon to right of them,
Cannon to left of them,
Cannon behind them
Volleyed and thundered;
Stormed at with shot and shell,
While horse and hero fell.
They that had fought so well
Came through the jaws of Death,
Back from the mouth of hell,
All that was left of them,
Left of six hundred.

VI

When can their glory fade?

O the wild charge they made!
All the world wondered.
Honour the charge they made!
Honour the Light Brigade,
Noble six hundred!

<https://www.youtube.com/watch?v=QKuFVSh7qH8>

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USMC F-35Bs Ready at Lakenheath for HMS Queen Elizabeth Deployment

David Cenciotti, Founder and Editor of The Aviationist



*The CAG bird of VMFA-211 lands at RAF Lakenheath on Apr. 26, 2021.
(All images credit: Stewart Jack)*

USMC F-35Bs have arrived at RAF Lakenheath to deploy aboard HMS Queen Elizabeth.

Split into two sections, each including 5 jets, a total of 10 USMC F-35Bs aircraft have arrived at RAF Lakenheath, UK. The first five jets landed on Apr. 26, 2021; the remaining ones arrived at the base in Suffolk, England, on Apr. 28, 2021.

The USMC F-35Bs aircraft belong to the VMFA-211 Wake Island Avengers, based at MCAS (Marine Corps Air Station) Yuma, Arizona, and, in the next weeks, they will depart RAF Lakenheath to head to the HMS Queen Elizabeth, for UK's new aircraft carrier's first operational deployment. The photographs in this article were taken by The Aviationist's contributor Stewart Jack as the first section of USMC F-35Bs landed at RAF Lakenheath on Monday.

"Moving the Marines, aircraft and equipment to the United Kingdom required coordinated planning, complex logistical effort, diligent maintenance and seamless execution," said Lt. Col. Andrew D'Ambrogi, the commanding officer of VMFA-211 in a public release. "Now that we have arrived in the United Kingdom, we are reintegrating with our UK counterparts and focused on providing both the commodore of CSG-21 and US combatant commanders with ready, combat-capable, 5th-generation aircraft."

One of the F-35Bs of the first section lands at RAF Lakenheath at sunset.

As part of the Covid-19 mitigation measures, VMFA-211 pilots will complete a 14-day restriction-of-movement prior to boarding HMS Queen Elizabeth.

Heading to the danger zone

On her maiden operational cruise, HMS QE will travel to the Indo Pacific region leading the largest naval and air task force under British command since the Falklands war.

The naval line-up is going to include: Type 45 destroyers, HMS Defender and HMS Diamond; Type 23 anti-submarine frigates, HMS Kent and HMS Richmond; and the Royal Fleet Auxiliary's logistics ships Fort Victoria and Tidespring; along with an Astute-class nuclear submarine will accompany the British aircraft carrier along with U.S. Navy Arleigh Burke-class destroyer USS The Sullivans and a Dutch frigate, HNLMS Evertse. During the 28-week deployment, the 10x VMFA-211 F-35Bs will operate alongside with 8x F-35Bs belonging to the Royal Air Force No. 617 Squadron "Dambusters".

The two units have already carried out joint training last year, when 10x F-35Bs of the "Wake Island Avengers" landed at RAF Marham on Sept. 3, 2020 to prepare the 2021 deployment. After local area training sorties with the Dambusters, the USMC F-35Bs took part in Exercise Point Blank with the F-15s from RAF Lakenheath and other NATO nations, before going to sea aboard HMS Queen Elizabeth for carrier qualifications and Exercise Joint Warrior 20-2.

Along with the 18x STOVL (Short Take Off Vertical Landing) aircraft (10 USMC F-35Bs currently at Lakenheath and 8 RAF F-35Bs from RAF Marham), the air component of the Carrier Strike Group will include 4x AW159 Wildcat and 10x Merlin helicopters. It's not clear whether the latter will carry the Crowsnest AEW (Airborne Early Warning) system, although it seems quite likely. Here's what we wrote in the article covering the deployment of the VMFA-211 to RAF Marham in September last year, quoting Save the Royal Navy:

Crowsnest will not formally achieve Initial Operating Capability until September 2021 but 3 of the 9 Merlins are planned to be fitted with pre-IOC standard kits. At least the CGS will have some kind of Airborne Surveillance and Control capability, even if not properly certified and complete. In a significant change of plan, 849 Naval Air Squadron, which had been the ASaC squadron equipped with Sea Kings and was supposed to transition to Crowsnest, was disbanded in April 2020. The role will now be absorbed into 820 NAS. The squadron will have two streams of observers that specialise in either, anti-submarine warfare or ASaC. The RN has just 30 Merlin Mk2 helicopters, airframes are in short supply.

Merlin Mk4s will also be deployed and maybe 'FOBed' (Forward Operating Base) on RFA For Victoria or the tanker. For parts of the deployment, the RFAs and warships may detach and operate independently of the main CSG. USMC V-22 Ospreys will not be permanently embarked on the carrier but, together with CH-53E Stallions, may be used to provide Maritime Intra-Theatre Lift to the carrier group as it moves around the world, supported by the global US military logistic support footprint.

The CSG led by HMS Queen Elizabeth will set sail towards the troubled waters of the Indo-Pacific region, an area of rising tensions with China.

According to the Independent, "the UK Carrier Strike Group will carry out engagements with the navies of India and Japan, who are in dispute over land and sea borders respectively with Beijing, as well as the navies of South Korea and Singapore. All four countries being visited are considered the west's allies in countering what is seen as China's expansionist strategy in the Pacific and Indian Oceans."

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Shadows in the Sky:



https://vimeo.com/537266421?utm_source=join1440&utm_medium=email&utm_placement=newsletter

Years of storm footage on one short film by Mike Olbinski

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Flying Kiss Carousel



<https://www.youtube.com/watch?v=JpQbnIJkhAE&t=2s>

No safety harness. No seat belt. No seat. China's new extreme ride, the tallest carousel and rotating observation deck in the world, is a true attention grabber.

It is two giant statues --one a man & the other a woman--overlooking a 3,000 ft. cliff

The ride begins with the man & woman bending down to the ground to pick up passengers from a rooftop platform. Once passengers are on board, the giant statues, bring you up into the sky for a spectacular view that is unforgettable.

For safety, there is simply a waste-high gate. You are free to move about during the ride as the carousel turns and rises. As the pair reach their highest elevation, the two statues 'kiss.'

[Ummm...Sorry, but it'll take more than that to entice me to go to China again.]

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Lady patient to the Doctor
inside his examination room
"Doctor can you please call
my husband inside, I am not
feeling comfortable. "
Doctor - "Trust me lady, I am a
Doctor and I am a Gentleman.
Lady patient - "No that's not
the issue. Your receptionist is
alone outside and my
husband is neither a doctor
nor a gentleman...
He is a Pilot.

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Here's How You Can Build a 5-Story House with Just Your Hands.



https://youtu.be/PXAE_2YkAPw

It probably helps to have a couple of enthusiastic friends with a lot of energy and balance and a good video camera to catch all the action while you sit back to enjoy

their industry. It's Probably a good idea to do this somewhere there's no planning commission, architectural board of review, or OSHA inspector around.

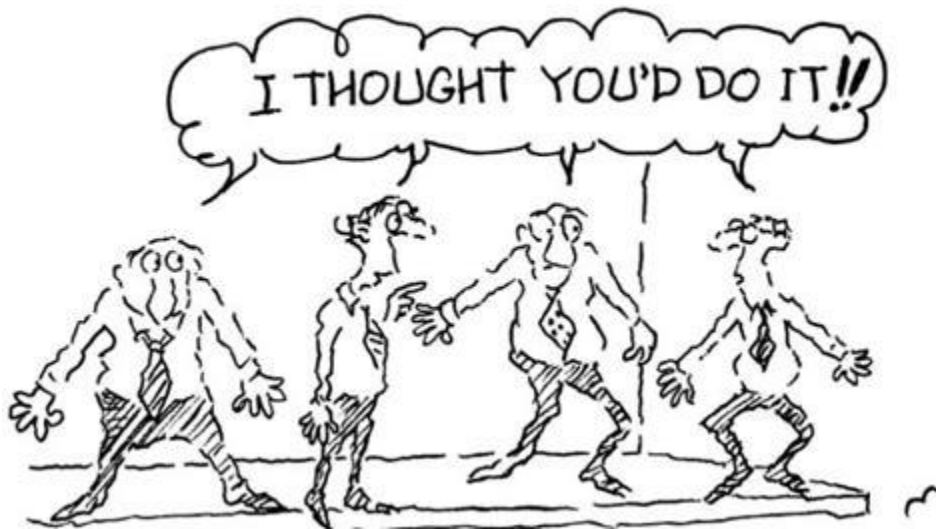
Mars, perhaps, if you hurry before the bureaucrats get there.

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The 'Bystander Effect' is Real...

but research shows that when more people witness violence, it's more likely someone will step up and intervene

Wayne Eastman, Professor, Department of Supply Chain Management, Rutgers University



An image from a police body camera shows bystanders including Darnella Frazier, third from right, filming a Minneapolis police officer pressing his knee on George Floyd's neck. Minneapolis Police Department via AP, File

The most powerful evidence for the prosecution at the trial of Derek Chauvin was a video showing the then-Minneapolis police officer pinning a pleading George Floyd to the ground by kneeling on his neck until he grew silent and then died.

On the witness stand, the teenager who captured the incident on her smartphone, 17-year-old Darnella Frazier, expressed regret for not doing more on the day of the crime.

As a professor whose major field of research is the application of psychology and game theory to ethics, I believe that Frazier's regret about not physically intervening illuminates two major points: First, a witness to a troubling situation who is in a group may feel a lesser sense of personal responsibility than a single individual. Second, someone in a group of people who can see one another may nonetheless feel responsible to act.

The bystander effect

The sense of diminished personal responsibility for people in a group has become known as the “bystander effect” – a phenomenon first described in the wake of a celebrated, infamous case.

In a 1964 front-page story headlined “37 Who Saw Murder Didn’t Call the Police; Apathy at Stabbing of Queens Woman Shocks Inspector,” The New York Times related the gruesome story of the middle-of-the-night sexual assault and murder of Kitty Genovese, a 28-year-old bartender, near her apartment building.

In recent years, academics and The New York Times itself have concluded that the report had significant errors – the number of witnesses was fewer than 37 and multiple people phoned the police.

Reflecting on the notorious case long before these errors were known, social psychologists Bibb Latane and John Darley wondered if it would be possible to study failure of bystanders to act in lab experiments.

In a 1970 book, Darley and Latane summarized that the chances of any one individual acting in a pro-social or helpful way is lower when responsibility is diffused among a number of people. Subsequent studies also confirmed that individuals are more likely to act when they feel they have the sole responsibility to do so.

The bystander effect has been reformulated by game theorists as the “volunteer’s dilemma.” In the volunteer’s dilemma, a person, or a group of people, will avoid discomfort if any one of them takes a pro-social action with a small cost, such as performing first aid or fixing a clogged drain.

Any one individual acting alone has good reason to take action – but if there is a crowd of, say, 20 people, the chance that they will do nothing and let someone else volunteer goes up.

In the case of George Floyd, the bystander effect was complicated by the power dynamics at play. Chauvin was an armed white police officer, and Frazier and the other bystanders were unarmed civilians who were mostly Black, like George Floyd himself. Given that, it is reasonable to ask whether Frazier, if she had been the sole civilian witness, would have gone beyond recording a video to physically intervene – such as trying to pull Chauvin off Floyd.

And it is also reasonable to ask whether she or any bystander should physically intervene in a situation where doing so might be extremely risky.

What makes people act

People gathered at the intersection of 38th Street and Chicago Avenue in Minneapolis after the guilty verdict in the Derek Chauvin trial on April 20, 2021.

After Derek Chauvin was found guilty of murder and manslaughter, people gathered on the street where he killed George Floyd. Brandon Bell/Getty Images

What needs to be explained in Frazier’s behavior – and that of a number of other witnesses who also recorded videos or called out to Chauvin to stop – is not why they

didn't take drastic, risky physical action, but why they did take the steps to record videos and yell for Chauvin to stop.

To explain their pro-social action, an advancing line of research on the behavior of witnesses to troubling scenes is helpful. That research suggests that having more witnesses increases rather than decreases the chance of intervention and that pro-social intervention by at least some in a group is the norm.

A 2008 analysis by social psychologist Daniel Stalder of previous studies found that although the bystander effect is real, larger group size increased the probability that at least one person in the group would make a pro-social intervention.

More recently, a 2019 article by psychologist Richard Philpot and four co-authors found that there is a greater chance that someone will act when there are larger numbers of witnesses to public conflicts. They also found that intervention is the norm: 90.7% of public conflicts featured one or more witnesses making a pro-social intervention, with an average of 3.8 witnesses intervening in each conflict.

Compared with earlier research, their study is particularly persuasive, as it relied not on lab studies, but on examining surveillance camera footage of actual public conflicts between civilians (not between police and civilians) taking place in crowded urban street settings. The research was conducted in three countries – South Africa, the Netherlands and the United Kingdom.

As Philpot and his co-authors put it, in a line that presages what Frazier and several others near her did: "We found that in nine-out-of-10 conflicts, at least one person – but typically several – did something to help."

In trying to understand bystander ethics, the troubling phenomenon of diffusion of responsibility remains relevant. But it is also important to understand the more positive finding that pro-social intervention like Frazier's by one or more people in groups who witness public conflicts is common.

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STEVE over Copper Harbor



Image Credit & Copyright: MaryBeth Kiczenski

What creates STEVEs?

Strong Thermal Emission Velocity Enhancements (STEVEs) have likely been seen since antiquity, but only in the past five years has it been realized that their colors and shapes make them different from auroras.

Seen as single bright streaks of pink and purple, the origin of STEVEs remain an active topic of research. STEVEs may be related to subauroral ion drifts (SAIDs), a supersonic river of hot atmospheric ions. For reasons currently unknown, STEVEs are frequently accompanied by green "picket-fence" auroras.

The featured STEVE image is a combination of foreground and background exposures taken consecutively in mid-March from Copper Harbor, Michigan, USA. This bright STEVE lasted several minutes, spanned from horizon to horizon, and appeared in between times of normal auroras.

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Hypower Lab to Launch Commercial Hydrogen Fuel Cell Drone

By John Max

The South Korean research and development company says that H2 greatly improves flight time.



Hypower Lab, an H2 research and development company based in South Korea, has announced its intentions to launch a commercial hydrogen fuel cell drone.

According to Hypower Lab, using H2 for its commercial hydrogen fuel cell drone will make it possible for the device to fly for over four times longer than a similar model powered by lithium-ion batteries. The company is developing the drones to be used for purposes such as agriculture, parcel delivery, as well as passenger and freight transportation.

The firm is currently working with the fuel cell research center at the Institute of Problems of Chemical Physics (IPCP) from the Russian Academy of Sciences (RAS). The development process itself has been announced as complete by both Hypower lab and the IPCP RAS.

According to IPCP RAS research center head Yury Dobrovlsky, the combination of the South Korean company's artificial intelligence technology with the Russian lab's hydrogen fuel cell technology will result in mass production of a competitively priced drone.

The goal is to create a commercial hydrogen fuel cell drone at a price to make its use feasible.

"We will lead the popularization of drone aircraft in the delivery drone commercialization market that needs around 3 million commercial drones in 2025 by establishing the hydrogen fuel cell mass production system exclusively for drones in South Korea," said Dabrovlsky. The companies plan to continue working together on the development of drones for a range of different applications in South Korea and Russia.

The newly developed model has an over three-hour flight time, according to Hypower Lab. It features 4.8 hours of battery life powered by a 12-liter H2 fuel cannister.

This new commercial hydrogen fuel cell drone is only one of a growing number of examples of drones under development that will be powered by H2. Doosan Mobility Innovation (DMI) has also recently Commercial hydrogen fuel cell drone - Drone in Flight announced the successful testing of its own model. In that case, it would be used for humanitarian delivery purposes.

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Lamborghini Lineup about to Go Fully Plug-In-Hybrid, Then Electric in 2024

The Italian supercar specialist is bullish on EVs, says CEO Stephan Winkelmann, who announced the last fully gasoline-powered Lamborghini will be out in 2024.



By Mike Duff

2021 lamborghini lineup

- The full Lamborghini road-car range will be plug-in hybrids by 2024, CEO Stephan Winkelmann announced at an event today.
- After that, an all-electric fourth model is planned to follow.
- The Aventador replacement will use a hybridized V-12.

Lamborghini has announced it is set to fully electrify its range, first with an all-plug-in-hybrid lineup, and then with the planned launch of a fourth model that will be a pure EV.

2020 Lamborghini Huracán Evo at Lightning Lap 2021
<https://www.youtube.com/watch?v=x9WCW85iR5w>

2021 Lamborghini Sián
<https://www.caranddriver.com/lamborghini/sian>

2021 Lamborghini Urus Adds Splashy New Colors
<https://www.youtube.com/watch?v=5CocoJV7wcl>

The Direzione Cor Tauri plan—named after a star in the Taurus constellation—was unveiled by Lamborghini CEO Stephan Winkelmann at an event in Italy this morning. Car and Driver got the chance to talk to him about it in more depth. The plan means that the last Lamborghini road car to be powered exclusively with a combustion engine will be made before the end of 2024.

"This is a big challenge for the company, but it's also good news for all of us," Winkelmann said when we interviewed him by video link, "we want to keep the DNA of the brand unchanged, but we want to reduce the emissions by at least 50 percent starting from 2025 onward."

This new plan isn't going to diminish the sound and fury that Lamborghini models are most famous for, in the short term at least. Winkelmann confirmed our earlier reports that the Aventador replacement will use a version of the current car's characterful powerplant in addition to hybrid assistance.

Aventador

"The follow-up to the Aventador will still be a V-12, so the sound issue is not going to be something we need to take care of because the engine will still be there, and it will have the right sound," he said.

Huracán

Company insiders have indicated that the Huracán's replacement will lose that car's V-10 – which is shared with the soon-to-die Audi R8 – and will instead get a twin-turbocharged V-8. Which, we'd imagine, will also sound pretty good once Lamborghini's engineers have finished with it. Based on conversations with senior engineers we believe that both cars will have electrically powered front axles in addition to blended hybrid assistance for their IC engines at the rear.

Sián

Sadly, neither seems set to use the supercapacitor system that Lamborghini developed for the limited-run Aventador-based Sián.

"That is fast charging, but also fast discharging," Winkelmann said. "If you need to enlarge range and reduce emissions, you need a battery to hold the power. So this is something we cannot continue."

Urus

The Urus will also gain a plug-in hybrid powertrain, and although we haven't been given further details we presume it will be a version of the V8 powertrain that Porsche uses in the Cayenne Turbo S E-Hybrid.

But beyond that, Lamborghini is planning for a fourth model which will become the brand's first EV.

"We want to have a new model line in the second half of this decade," Winkelmann said. "It cannot cannibalize what we have today, but my dream is to have the best of two worlds, to try to have a car which is a four-seater two-door like the GT cars of the Fifties and Sixties." "I guess ugly is in the air

Pure electric supercars are further away. Winkelmann said there is still limited demand for them. But we're told there are no plans to continue with combustion-only models alongside the next generation of PHEVs.

One thing is very clear: Lamborghini's future is electric.

[For the company that came onto the scene with the Miura, today's lineup is pretty discouraging. It seems ugly--as in 'wretched excess'—has made it to Italy.]

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Who Knew All This About Ed McMahon?



Edward Leo Peter "Ed" McMahon, Jr. (March 6, 1923 – June 23, 2009)

American comedian, actor, singer, game show host and announcer. He is most famous for his work on television as Johnny Carson's sidekick, a position he held for over 30 years.

Before he died, McMahon told his son, Lex, who is a Corporal in the US Army, that he preferred to be remembered as a "Good Entertainer, but a Great Marine".

His son compiled a list of highlights of his father's 23-years of service:

- Eating powder eggs during Officers Candidates School – even though they were billeted on a farm with hundreds of chickens – some things in the Corps never change!
- Being commissioned as a 2nd Lt.
- Being made a flight instructor while still in flight school.
- Earning his Naval Aviator wings on 4/4/44.
- Flying the hottest fighter in WWII – the F4U-Corsair.
- Getting reprimanded for conducting “training missions” over his girlfriend’s house.
- Becoming a test pilot.
- Being reprimanded for conducting “training missions” over his girlfriend’s house again.
- Teaching carrier landings.
- And yes, being reprimanded for flying “training missions” over his girlfriend’s house AGAIN.
- Telling NBC he’d love to sign a big contract to be their next star– but he had just received orders to report to Korea.
- Meeting Marilyn Monroe prior to deploying to Korea and having her impishly tell him: “Ed, I’m not wearing anything underneath”.
- Flying 85 combat missions in Korea as an artillery spotter.
- Cornering the market on food and alcohol by becoming his squadron’s Officer-in-Charge of the Mess Tent and Officer’s Club.
- The 3-day long party in Tent 7 with 55-gallon drums of “truce juice” when the armistice was signed.
- Participation in creating the Toys for Tots program.
- Being promoted to Colonel.
- Promoting his son to the rank of Corporal.
- Passing a flight physical at age 70 and flying the Harrier Jump Jet.
- Working with The Flying Leatherneck Historical Foundation to cement the legacy and traditions of Marine Corps Aviation.
- And being Major General Lenhart’s Guest of Honor at the Camp Pendleton Marine Corps Ball in 2005 – Sir, he had tremendous respect for you and was humbled to be your guest of honor.

Corporal Lex McMahon also wrote a sad and inspiring note in concerning his father’s death:

"Dad – on behalf of a grateful nation, fiercely loyal United States Marine Corps, assembled friends, loving family, and me – a devoted son – it is the highest honor of my life, to fulfill your request to be buried as a Marine. I wish you Godspeed, as you

pull chocks and embark on one last mission in your Corsair – destined for the final rally point– Valhalla – warrior heaven. I salute you!"

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**A couple kids asked
me today what it was
like for me growing up...**

**... so I took
their phones, shut off
their internet, gave them
a popsicle and told
them to go outside till
the street lights came on.**

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Game Changers

Robotic Navigation Tech Will Explore the Deep Ocean



The Orpheus submersible robot is being developed by Woods Hole Oceanographic Institute and JPL to explore the deep ocean autonomously. Orpheus uses vision-based navigation that works in a similar way to how the Ingenuity Mars Helicopter navigates during flight.

Credit: NASA/JPL-Caltech

Terrain-relative navigation helped Perseverance land – and Ingenuity fly – autonomously on Mars. Now it's time to test a similar system while exploring another frontier.

On May 14, the National Oceanic and Atmospheric Administration (NOAA) ship Okeanos Explorer will depart from Port Canaveral in Florida on a two-week expedition led by NOAA Ocean Exploration, featuring the technology demonstration of an autonomous underwater vehicle. Called Orpheus, this new class of submersible robot will showcase a system that will help it find its way and identify interesting scientific features on the seafloor.

Terrain-relative navigation was instrumental in helping NASA's Mars 2020 Perseverance Mars rover make its precision touch down on the Red Planet on Feb. 18. The system allowed the descending robot to visually map the Martian landscape, identify hazards, and then choose a safe place to land without human assistance. In a similar way, the agency's Ingenuity Mars Helicopter uses a vision-based navigation system to track surface features on the ground during flight in order to estimate its movements across the Martian surface.

Developed by engineers at NASA's Jet Propulsion Laboratory in Southern California, an evolution of the vision-based navigation that has been used on Mars will now undergo a trial run a little closer to home: off the U.S. East Coast in the Atlantic Ocean.

Large, high-power location-finding equipment like sonar would normally be required to navigate the dark and often murky waters near the seabed. By utilizing a low-power system of cameras and lights, along with advanced software, Orpheus is an order of magnitude lighter than most deep-sea submersibles. Smaller than a quad bike and weighing about 550 pounds (250 kilograms), Orpheus is designed to be nimble, easy to operate, and rugged while exploring depths inaccessible to most vehicles.

The Orpheus technology demonstration will be carried out aboard the NOAA ship Okeanos Explorer. After departing from Florida's Port Canaveral on May 14, the two-week expedition explores the waters off the U.S. East Coast. Credit: Art Howard/NOAA Ocean Exploration

Designed by Woods Hole Oceanographic Institution (WHOI) in collaboration with JPL, Orpheus can work untethered almost anywhere in the ocean, including the most extreme depths. Ultimately, the project team hopes to see a swarm of these underwater robots work as a team to build 3D maps of the vast regions of unexplored ocean floor in the hadal zone – regions deeper than 20,000 feet (6,000 meters). But before the robot can explore these depths, it must first be put through its paces in shallower waters.

Diving Into the Future

"This tech demo will be used to gather data to demonstrate the viability of terrain-relative navigation in the ocean while also showing how multiple robots will operate together in extreme environments," said Russell Smith, robotics mechanical engineer at

JPL. "These tests will put us on track to start future dives into the hadal zone and intelligently seek out exciting regions of high biological activity."

Orpheus' version of vision-based navigation is called visual-inertial odometry, or xVIO, and it works by using a system of advanced cameras and pattern-matching software along with instruments that can precisely measure its orientation and motion. As Orpheus travels over the seafloor, xVIO identifies features – such as rocks, shells, and coral – below the vehicle. Like remembering landmarks during a road trip, xVIO will construct 3D maps using these features as waypoints to help it navigate. But this system is more than simply a means to prevent the submersible robot from getting lost.

The high-resolution maps xVIO creates are stored to memory so that when Orpheus returns to the area, it will recognize the unique distribution of the features and use them as a starting point to expand its exploration. And when working with robot buddies, maps can be shared, cross-referenced, and developed to quickly identify areas of scientific interest.

"In the future, some of the most extreme ocean environments will be within our reach. From deep ocean trenches to hydrothermal vents, there are many new destinations we will explore," said Andy Klesh, a systems engineer also at JPL. "By staying small, we've created a new, simplified tool for ocean scientists – one that directly benefits NASA as an analogue system for autonomous space exploration."

But Klesh noted another virtue of the collaboration between NASA and organizations like WHOI and NOAA, with their extensive oceanographic expertise: The technologies being developed to explore Earth's oceans with smart, small, and rugged autonomous underwater vehicles could ultimately be harnessed to explore the oceans on other worlds.

Earth analogues are often used as environmental stand-ins for other locations in the solar system. For example, Jupiter's moon Europa possesses a subsurface ocean that could host conditions favorable to life.

"At hadal depths on Earth, the pressures are roughly equivalent to the bottom of Europa's subsurface ocean, thought to be maybe 80 kilometers [50 miles] deep," said Tim Shank, the biologist leading WHOI's HADDEX (Hadal Exploration) program. "It is a profound thing to think that this expedition could be the stepping stone to new discoveries about our own planet, including answering that most fundamental question: Is life unique to Earth, or are there other places beyond this pale blue dot where life could have arisen? But before we can explore Europa or any other ocean world, we have to better understand our own home first."

For more information about the technology demonstration, see:

<https://oceanexplorer.noaa.gov/oceanos/explorations/ex2102/welcome.html>

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