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2022

BiOMag



FORDHAM'S STEM MAGAZINE

Greetings from

NEW YORK
City



Edition 4

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EDITOR'S NOTE

Welcome to Edition 4 of BioMag!

If anything is to be learned from this collection of articles, it is that we are in the midst of a constantly evolving scientific world. We are learning to deal with new COVID-19 variants, techies are embracing the Metaverse. Climate change and the necessity to prepare for its consequences are ramping up, and in the meantime we've discovered that condors can clone themselves. There really has never been a better time to produce a science magazine— and despite the existential questions facing scientists, there has never been more advancement in the field than is happening right now.

And BioMag is evolving as well! You can now find all of our content published online on our brand new website. Huge shoutout to Meli Ho, designer extraordinaire, for putting this together for us. We have a bigger team of designers than ever before, and soon we will be entering the world of podcast and video content as well!

I hope you enjoy your reading, and that you learn something new as well.

President/Editor-in-Chief
Emily Huegler



NYC'S CLIMATE PUMMELING

By Kari White

Is NYC prepared for climate change? **No, not by a long shot.**

While New York City has created policy and initiatives they hope will battle climate change, inadequate funding, the snail pace of American bureaucracy, and unimaginative strategies have hampered them. The crux of the issue lies within NYC's tendency to react, patching up problems rather than anticipating the disasters forthcoming, and its dangerous lack of urgency.

Hurricane Ida ravaged the city, exposing many weak points of its infrastructure. Streets turned to rivers, subways became drowned caves, and even the green on Rose Hill's campus gained a brand new swimming hole. What had caused this? Impervious surfaces, which water cannot sink through into the ground beneath, and a sewage system already overflowing with water. Rain storms will get worse as the climate continues to destabilize, and this outdated infrastructure will threaten the lives of many.



Yet, rain storms and archaic streets are not the only problems New York is facing. According to The Nature Conservancy, this run-off from increased precipitation will threaten drinking water, the sea level will rise "anywhere from one to three and a half feet by 2080" (a conservative estimate), and a heat dome will form over the city. This heat dome will increase the prevalence and severity of conditions such as asthma, which disproportionately affect working class communities, exacerbating the air pollution already harming people.

New Yorkers will experience each of these phenomena regardless of any policy implemented now, so the focus of assessing policy must be upon the ability to limit the severity of these climate threats. The question to ask then is:

Will NYC politicians be able to execute legislation that adequately protects its citizens? **As it stands currently, no.**



That is not, however, from a lack of trying. Inspired by NYC's very own Alexandra Ocasio Cortez's controversial initiative, the city created their own "Green New Deal." In it, the city commits to carbon neutrality by 2050, which it will achieve through a variety of ways.

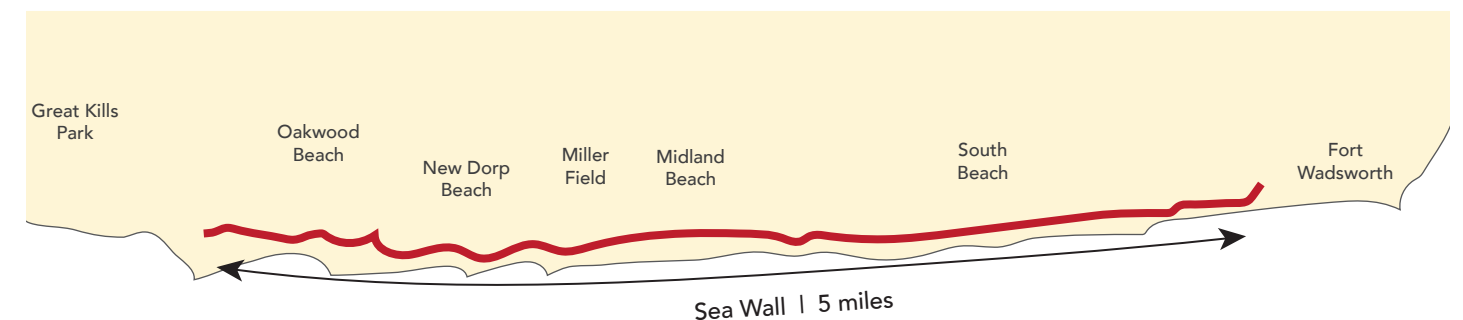
First, as outlined in local law 97, the city will impose a limit on the amount of energy a building can use and emissions it can release into the atmosphere. The law also mandates the creation of an advisory board, which would oversee the energy used and emissions released of each building and report it back to the city. If a building exceeds their allotted amounts, they will have to pay a heavy fine.

The NYC's Green New Deal would also ban the building of glass-only sky-scrapers, which are extremely energy inefficient.

The policy that will have the most immediate impact, however, is the deal that the city made with a Canadian hydro-power company to power all government buildings with renewable, clean energy. Mayor Bill deBlasio announced the finalization of the Clean Plan NY (CPNY) project, which they created by working with Hydro-Quebec, the hydropower company, and a slew of energy firms. The implementation of this project should provide the city with 18 million megawatts of renewable power a year, directly reducing the amount of pollutants within the city's atmosphere.

NYC's Green New Deal will succeed in reducing carbon emissions and pollutants. When it comes to the future of NYC, this will minimize the danger of future heat domes and stave off more severe climate disasters. This New Deal is a success, it is just not enough. Changes on a local level are crucial and necessary, but they on their own cannot stave off the global increase of temperature. Sea levels will still rise, and people's livelihoods will still be in danger.

The city has kept this in mind. To address rising sea levels, the city has invested in the creation of a 5.5 mile long sea wall along the east coast of Staten Island. As well as adding a walking path to the community, the wall will lower the risk of flooding and protect residents from the worsening storms and their storm surges. Hurricane Sandy already showed Staten Island the dangers of not having a sea wall, residents are just waiting for another superstorm to hit.



However, "will" is the operative word. According to reporting from New York's News 1, the sea wall was supposed to be finished this year. Contaminated land near Great Kills Park, however, has slowed the process, as the U.S. Army Corps of Engineers had to request special, federal permission before they could begin cleaning it. Now, the estimated year for the wall's completion is in 2026. These next five years worry the local residents, who hoped the wall would lessen their home/business insurance and anxiety. This dilemma embodies the problem plaguing environmental policy. First, that toxic residue from the wasteful past still pollutes land all across the world; second, that layers of bureaucracy waste much needed time in constructing crucial structures for home and business-owners in the areas affected; and third, that a dearth of urgency at any level can threaten the construction of a project or implementation of a policy. If this becomes a trend, climate infrastructure will come years after people need it.

Climate change is not a shadow looming upon the horizon, but a punch winding up. New York City has implemented some terrific policies, which will minimize carbon emissions and protect lots of people, but it is far from ready. Unfortunately, the policies are too reactive and too hampered by a lack of urgency at local, state, and federal levels.

New York City is not prepared for climate change. Yet, it can be.

City officials have shown their interest in creating climate policy, but they must invest their heart, soul, and pocketbooks in it. Otherwise, progress will come too late.

Impacts of Climate Change in New York



Rising Sea Levels



Increasing Temperatures



Lower Drinking Water
Quality & Quantity



Degrading Air Quality



WELCOME TO THE METAVERSE

WRITTEN BY: CLAUDIA STERKAJ



If anyone has been following tech news lately, you have probably heard the term “Metaverse” being thrown around. A quick Google search will inform you that the “Metaverse” is “a hypothesized iteration of the Internet, supporting persistent online 3-D virtual environments through conventional personal computing, as well as virtual and augmented reality headsets.”[1] In simpler terms, it is a virtual reality where you can interact with other users, participate in activities, and buy products. Mark Zuckerberg, the CEO of Meta Platforms, formerly known as Facebook, describes the Metaverse as “the successor to the internet” in his keynote.[2] Throughout his keynote, Zuckerberg emphasizes an “embodied internet”: users will be able to interact with people that are far away.[2] However, this technology is nothing new. In 2003, Linden Lab released the video game SecondLife where users live a second virtual life.

In order to participate in this social interaction, Zuckerberg’s team, in collaboration with a multitude of other tech companies, have created Project Cambria. This project is all about virtual reality devices and how they can facilitate the feeling of human interaction. In the keynote, the Head of VR Devices, Angela Chang, states that the tech-

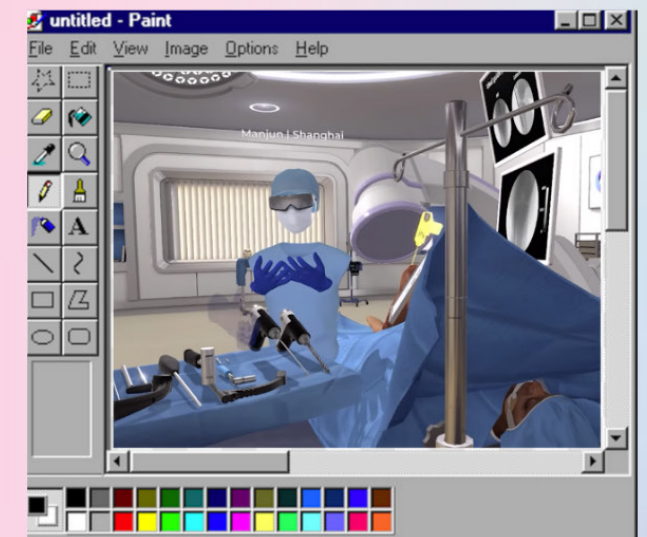
nology will allow users to make natural eye contact and follow gestures and facial expressions in real-time.[2] The companies are working on creating VR headsets with a lot more sensors to pick up on glasses and beards and including a diverse set of facial features and skin tones so users can customize themselves.[2] A new project the team is working on is creating mixed reality experiences, where one can look down at their desk in real-time and write something down without having to remove their headset.[2]

Interesting aspects of the Metaverse invite users to participate in leisure activities, as well as learning opportunities. Users can play Ping-Pong with someone halfway across the world, join a surfing competition, and even join a real-life concert: all virtually. Medical school students can scrub into the virtual operating room and learn how to use specific tools, while marine biologists can take a deep-sea dive to explore new organisms. There will also be a virtual economy where users can buy certain goods and services right from their VR headset. Users can also customize their “home space,” your physical home but virtual, with any furniture and place it in any location. Imagine having a board meeting within the Amazon rainforest? Or joining a music festival across the world? What can sound impossible can all be done in the Metaverse.

Now, what really is the goal of the Metaverse other than to create a second virtual life? Such a question can be answered when developing the relationship between our already interwoven digital and physical world and combining them even further. People can now perform tasks in both worlds, whether it be virtual or augmented. While virtual reality completely transforms your out-

side world into a virtual one through the use of a headset, augmented reality can only add to your world, and can be accessed through a smart-phone. Users can attend school and work right from the comfort of their homes. The versatility of the applications poses the question regarding how efficient one can really be in the Metaverse. Zuckerberg argues that we are already on our devices, and the Metaverse just makes our times on the screens better.[2] Sure, it will definitely add a new dimension to regular everyday screen activities, but one can become distracted with all of the cool features instead of actually focusing on work. I can speak from experience - my freshman year of college was all online! The temptation of online shopping and scrolling on Instagram was just a tab away. Like everything new, it will take some time to get used to, but I think I would still prefer everything in person. It wasn’t virtual reality, but it was all around screens. It’s hard to stare into blue light for eight hours, let alone have a whole computer attached to your face. But I do see how learning can become more efficient with users being able to transport themselves to the Roman Empire and visualize the step-by-step building of an aqueduct. As a student on the Pre-Medical path, the Metaverse will undeniably be an important tool for learning about body systems as well as practicing emergency situations.

Meltem Sarsilmaz, a contributor from the Daily Sabbah, writes that “the metaverse will create an escapist utopia for some segments of society, the rest will face a dystopia.”[3]He argues that features in the Metaverse will create economic



disparities, as there will be a whole new economy regarding the Metaverse.[3] Such disparities can arise due to individuals purchasing clothes for their avatar, a new painting for their home space, or the actual VR headset. Sabbah argues that an escape into the Metaverse cannot cover up the inequalities present in the real world.[3] As someone who would love to travel to every corner of the world, teleporting technology is very intriguing, but I value being physically present. The enjoyment an individual finds from the natural occurrences of being a tourist in Italy, as well as its sights, sounds, and smells can only be experienced through his or her own senses, providing him or her with an individualistic and unique experience. However, the Metaverse takes away the physical aspect of interaction that I like to include into the importance of new experiences. When I see someone’s eyes light up when they talk about their passions, the natural gestures present within a conversation, and the actual physicality of someone is valuable to me when socializing.

Intellectuals have once again shown how they can manipulate technology into something that can completely transform the way ordinary citizens live their daily lives. From transporting yourself to a whole new country or meeting with friends from across the world, the Metaverse has proven to value human connection and presence, all through the use of technology. In my opinion, I believe interacting in-person has a greater impact than online, even if your avatar can mimic your exact gestures. Creating an authentic fake reality that promotes escapism proves to be a tricky obstacle to overcome because once those devices turn off, your true reality is waiting.

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The Bank is Open

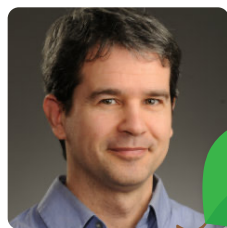
Seed Banks Provide Tools for Researchers to Study Plant Evolution and the Evolutionary Effects of Climate Change

By Kate Laboda

A few summers ago, I was hiking with my family through Mt. Rainier National Park. It was a beautiful August day, if not a little unseasonably warm. Interspersed between the scenic outlooks of the mountain framed by pine trees were informational plaques about the plants and animals to be seen. In addition to the customary information (name, habitat, diet) many also detailed problems these species face. Buzzwords like “climate change” and “global warming” were common.

We know that climate change is occurring. What is still unclear is how these rapid climatic changes are affecting plants and animals.

I recently met with Dr. Steven Franks, a professor here at Fordham and one of the leading scientists behind Project Baseline, which provides an effort to collect and store seeds from across the country so scientists can conduct comparative evolutionary studies. They do this through the method of the resurrection paradigm. According to the initial paper published by Franks and his colleagues about this project in 2008, the resurrection paradigm is when “ancestral and descendant genotypes sampled from the same location are grown together in a common environment” (Steven J. Franks). Essentially, previously collected seeds are grown alongside their modern-day counterparts to observe any changes that may have occurred. Think of it as a time capsule of seeds.



Dr. Steven Franks

Franks revealed that this project began almost by accident. “We got lucky,” he explained. Working in California at the time, Franks and colleagues collected wild populations of field mustard. A drought followed, after which the team collected a new batch of mustard and grew the two side-by-side. What they found, Franks explained, was that the descendant populations (post-drought) flowered earlier, perhaps as an

evolved practice to ensure germination while water is still available.

After these findings, Franks and the team realized there was a research niche to be filled/ utilized here. The initial paper begins with this hypothetical statement: “Imagine that naturalists of past centuries had systematically collected and stored representative samples of seeds from the many plant species they encountered...” (Steven J. Franks). They understood that these seed banks could become valuable resources to study plant evolution, especially in the age of climate change.

When I asked why this project is so important, Franks pointed to the three possible responses plants make to a changing environment: evolve in place, phenotypic plasticity, and migration. An example of this first change can be seen in Franks’ field mustard study: evolution occurred allowing later generations of plants to thrive in a drier environment.

To better understand this second change, — phenotypic plasticity — think of a flower growing in a farmer’s field, rising upward toward the sun. If that farmer were to raise a barn, shading the immediate surroundings of the flower, it might change course and start growing outward so its leaves can reach that sunlight once again. The population of the flowers remains unchanged, but the individual’s phenotype has been altered.

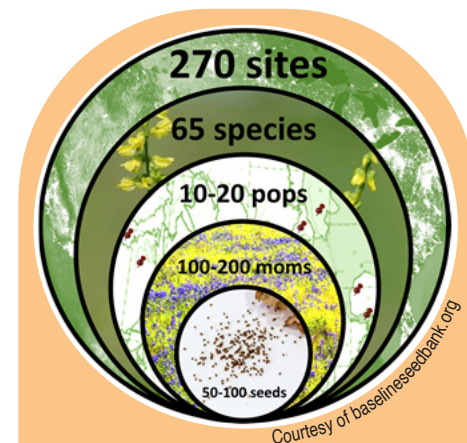
The third change is pretty self-explanatory. Migration means that if a plant on the side of a mountain (say Mt. Rainier, for example) thrives in cooler environments but its surroundings are growing warmer due to climate change, it might spread further up the mountain to find these cooler temperatures again.

If the plant cannot accomplish any of these changes, it is at very real risk of extinction.

This is why Franks’ work is so necessary. In a time of climate change dramatically changing our environments, we still don’t know how all these plants will react. Some may not be able to evolve as fast as the climate is changing.

At the dawn of each new decade, NOAA releases the new Climate Normals, detailing the observed weather patterns of the last 10 years. Recently published in May of this year, the new normals showed that “today, the normal annual temperatures across the country are warmer than the 20th century average virtually everywhere” (Lindsey). There is an abundance of evidence that the climate is changing. What remains unclear is how or if plants will be able to combat these changes.

Project Baseline held its first conference back in 2007. A little over 10 years later, the project continues. Now holding access to 65 species and 200 populations, these seed banks continue to be an incredibly valuable resource. As the climate continues to change, these comparative studies are becoming more and more pressing. When asked what his aims are for the project in the future, Franks grinned and replied, “for people to use it.” The bank is open. What will you withdraw?



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“Virgin Births” Discovered in Critically Endangered California Condors

By Haley Arbon



The newly discovered ability of the largest birds in North America is as captivating as their steady soaring. In October, routine genetic screening revealed that two California condors had received all of their genetic information from their mothers, with no DNA sourced from male condors. It turns out that these birds were the result of “virgin births.” This type of reproduction, called parthenogenesis, has never before been detected in this species.

Oliver Ryder, the co-author of this study, describes the shock of the discovery: “We were not exactly looking for evidence of parthenogenesis, it just hit us in the face.”

Even more surprising is that these are the first observed instances of “virgin births” where the mothers had access to suitable mates.

“[...] unlike other examples of avian parthenogenesis, these two occurrences are not explained by the absence of a suitable male,” said Cynthia Steiner, associate director for the conservation research division at San Diego Zoo Wildlife Alliance.

Although this event is called a “virgin birth,” the impressive lady birds that birthed these two parthenote offsprings had previously reproduced sexually. One of the mothers has since laid two more of the prized pale aqua-colored eggs through sexual reproduction with her mate.

Unfortunately, both parthenotes were deceased before the discovery of their parentage. One, affectionately known as SB260, was released into the wild and died from insufficient nourishment. He was noted to have been poorly integrated with the other birds. The other, called SB517, was never released and died in captivity. SB517 had scoliosis and, although housed with a female, was deemed submissive (and therefore not very breedable) and showed very limited signs of courtship. Deformities have also been observed in parthenotes of other species, such as snakes.

Parthenogenesis produces offspring without the need for a

sperm cell. In females, the creation of sex cells, called oogenesis, results in the formation of an egg cell and polar bodies, which are smaller cells that usually disintegrate. In asexual reproduction, the polar bodies are able to merge with the egg cell and produce viable offspring. While this no-male reproduction sounds quite ideal, it greatly decreases the genetic variety of the offspring that come from sexual reproduction.

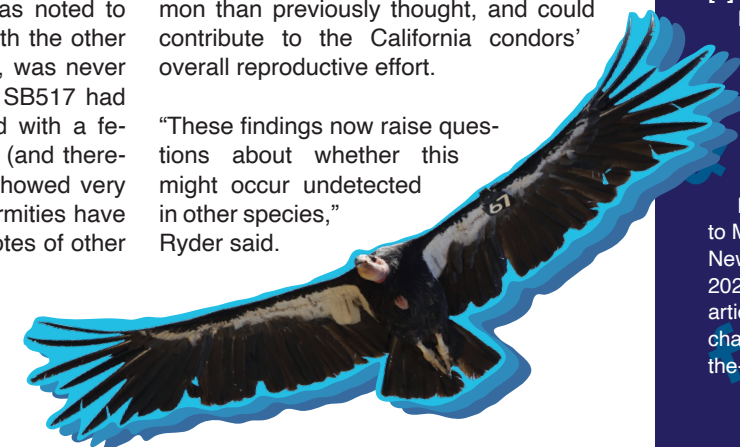
What does this mean for the population of the species?

California condors are a critically endangered species, with a population low of twenty-two birds in 1982. The California condors’ slow maturation (in their defense, it takes a while to grow a nine-foot wingspan) and reproductive cycle contribute to their lengthy population recovery. But careful surveillance of the species, captive breeding, and reintroduction of the birds to the wild have since boosted their numbers to over five hundred.

Extensive efforts have been put into the breeding of the birds, and the current population comes from an extremely small breeding pool. Depending on the frequency that parthenogenesis occurs, it could negatively impact the already limited genetic diversity of the species. Although neither of the condor parthenotes left offspring, none of the post-mortem findings could conclusively state that they were physically unable to reproduce.

The accidental discovery of these two instances of “virgin births” suggests that asexual reproduction may be more common than previously thought, and could contribute to the California condors’ overall reproductive effort.

“These findings now raise questions about whether this might occur undetected in other species,” Ryder said.



Bye Bye Facebook,

Hello Meta

By Claudia Sterkaj

If you have opened Instagram in the past couple of weeks, you have probably noticed “from Meta” on the bottom of the screen. What was once Facebook is now called Meta, pictured with an angled infinity logo. Facebook started as a social media company back in 2004, aiming to connect people worldwide. Zuckerberg now wants to remove the social media label and “be seen as a metaverse company.”[1] While some people argue that the name change is a distraction from the release of the Facebook Papers, which are documents that highlight issues within the company, Zuckerberg justifies the name change by explaining that the name “Facebook” doesn’t play the same role anymore since a multitude of apps are included under the brand.[1] Anupam Chander at Georgetown University Law Center in Washington DC says that Facebook wants to leave the social media platform and own the operating system of the future so that others can be prisoners on their platform.[2] The goal of Meta is not just a name change but to own a platform that multiple apps will use. Being contained under one platform can cause a lot of problems, however. If there are outages on the larger platform, it will be challenging to communicate within the other apps.[2] Chander summarizes it best: “Having conquered the Earth, they now want to conquer the virtual metaverse.”[2]

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SCIENCE TRIVIA

Madeline Drucker

BIOLOGY > ANIMALS

- 1.What is the gestation period of a hippopotamus: 4 months, 8 months, 12 months, or 16 months?
- 2.Which of the following has the largest brain: rhinoceros, gorilla, neanderthal, or human?
- 3.What is a hummingbird's heart rate: 170 beats per minute, 240 beats per minute, 600 beats per minute, or 1260 beats per minute?
- 4.Which of the following has the LEAST amount of chromosomes: water buffalos, humans, silkworms, or potatoes?
- 5.How many eggs does a queen bee lay per day: 2,000, 2,000,000, 20,000, or 200?

- 1.The gestation period for a hippopotamus is 8 months. The mother will then go off by herself to have the 27-50 kg. baby which may be born either on land or underwater.
- 2.The appearance of modern man about 100,000 years ago was marked by a decrease in body size at the same time as an increase in brain size. However, it is worth noting that Neanderthals, which became extinct about 40,000 years ago, had larger brains than modern Homo sapiens.
- 3.While in flight, hummingbirds have the highest metabolism of all animals (excluding insects). Their heart rate can reach as much as 1,260 beats per minute.
- 4.In humans, each cell normally contains 23 pairs of chromosomes, for a total of 46. Water buffalo and potatoes each have 48, and Silkworms have 54.
- 5.A newly established queen bee will mate with one or more "drones." Most likely, this one mating event will allow her to lay eggs for the rest of her life. A queen bee may lay up to 2,000 eggs a day and up to 1,000,000 in her lifetime.



ASTROLOGY > PLANETS

1. What planet has the most moons: Saturn, Uranus, Jupiter, or Mars?
- 2.How often does Halley's Comet pass Earth: 35 years, 92 years, 76 years, or 114 years?
- 3.What is the strongest known magnet in the Universe: black hole, dark matter, neodymium magnets, or a magnetar?

- 1.Jupiter has at least 67 known moons. The largest four are called Io, Europa, Ganymede, and Callisto.
- 2.Halley's comet was recorded by Edmund Halley in 1682. It was seen again in 1758, 1835, 1910, and 1986 -- approximately every 76 years.
- 3.Magnetars (a type of neutron star) are the bizarre super-dense remnants of supernova explosions. They are the strongest magnets known in the universe -- hundreds of millions of times more powerful than the magnetic field surrounding Earth.



INVENTIONS >

Who invented the first battery: Alessandro Volta, Luigi Galvani, Nikola Tesla, or Benjamin Franklin?

In 1800, Alessandro Volta discovered that certain fluids would generate a continuous flow of electrical power when used as a conductor. This discovery led to the invention of the first voltaic cell, more commonly known as a battery.

All trivia questions sourced from https://www.usefultivia.com/science_trivia/index_ii.html
Data is backed by both <https://www.britannica.com/> and <https://www.nationalgeographic.com/>

SCIENCE

ATMOSPHERIC > METEOROLOGY

- 1.Which of the following means "rain" when added to a cloud's name: nimbus, stratus, cirrus, or alto?
- 2.Which of the following measures the amount of damage done by an earthquake: Mercalli Scale, Kanamori Scale, Selvaggi Scale, or Richter Scale?
- 3.What type of rock is obsidian: metamorphic, igneous, phyllite, or sedimentary?

- 1.Nimbus means "rain" when added to a cloud's name. Nimbostratus are dark, low-level clouds accompanied by light to moderately falling precipitation, and Cumulonimbus are dense towering vertical clouds associated with thunderstorms.
- 2.The Mercalli scale is the lesser known of the two scales to measure earthquakes -- it measures the effects of an earthquake and is distinct from the Richter scale which measures the energy released.
- 3.Obsidian is a naturally occurring volcanic glass formed as an extrusive igneous rock. It is produced when felsic lava extruded from a volcano cools rapidly with minimal crystal growth.

CHEMISTRY >

What gas becomes a superfluid when cooled to absolute zero: Helium, Hydrogen, Neon, Xenon?



When most liquids are cool the particles settle into a regular order, and the liquid becomes a solid. But helium atoms are so light and weakly drawn to one another that even when ordinary atomic motions have quieted, the atoms jiggle with zero-point motion, a slight momentum imparted by the quantum uncertainty principle. Hence, they never settle into the solid state.

BIOLOGY > EVOLUTION

- 1.What was one of the most famous species studied by Charles Darwin: finch, parrot, crane, or sparrow?
- 2.How many new species are discovered each year: 80, 1,800, 8,000, or 18,000?
- 3.Which of the following evolved first: cockroaches, sharks, trees, or humans?

- 1.One of the best examples of evolution in action were the finches of the Galapagos Islands. Each island had a different species of finch, and each species of finch had a different sized beak. The finches with the largest beak lived on an island with plenty of hard nuts, while the smallest-beaked finch lived on an island where the main food source was insects. This model showed how well these birds had adapted to their environment.
- 2.Even after 250 years of professionals documenting thousands of new plants and animals every year, the rate at which new species are discovered remains relatively stable. Approximately 18,000 new species are discovered each year, with about half of those being insects.
- 3.Sharks are older than trees. The earliest species that can reasonably be classified as a "tree," the now-extinct Archaeopteris, lived around 350 million years ago. But Sharks? They've been around for 400 million years. Insects broadly resembling cockroaches appeared around 300 million years ago. Early humans didn't appear until much later.

BIOLOGY > BODY

- 1.Where are your taste buds located: cheek, tongue, esophagus, or all of these?
- 2.How many pencils could you produce from the carbon in the average human body: 9, 90, 900, or 9000?

- 1.The taste receptors are located around the small structures known as papillae found on the upper surface of the tongue, soft palate, upper esophagus, the cheek and epiglottis.
- 2.The human body contains enough carbon to produce graphite for about 9,000 pencils.

A Walk Amongst the Geodes: A Review of The Museum of Natural History's Gem Hall

By Sophia Frantzeskos

If you, like myself, are greatly attracted to all things shiny, then the newly renovated Mignone Hall of Gems and Minerals at the American Museum of Natural History is the place for you. Recently reopened in fall of 2020, this 11,000 square foot hall displays over 5,000 beautiful minerals from over 95 different countries. From geodes to gems, this exhibit showcases an incredible diversity of minerals and educates visitors on how they are classified, the chemistry that created them, as well as how we as humans have used them for art and adornment.



When you first enter the hall of gems, you are greeted by two of the largest amethyst geodes currently on public display. One stands at over nine feet tall while the second stands at a massive 13 feet tall. These monstrous geodes kick off the hall with a bang and put the unique magnificence of minerals on full display to visitors. The rest of the hall gives an in depth look into many families of minerals, including tourmaline, quartz, and basalts, as well as the effects of weather conditions and chemical composition on their physical appearance.

The beauty of this hall comes from the incredible diversity of shapes, colors, and sizes that gems can take on. There are small, round, bright and shining rubies and then, two steps away, you can see a stibnite the size of your head with blade-like crystals protruding forth. The unique sizes and shapes of each mineral, along with the vast variety of colors and textures in close proximity to one another, highlight how incredibly diverse and beautiful these gems can be while simultaneously inspiring awe in the stunning capacity of nature.



Tourmaline Family of Minerals

Not only are these minerals gorgeous to look at, but as someone with little prior knowledge on gems and minerals, the hall does a great job of engaging and teaching you as you peruse. One wall is fully dedicated to the chemical composition of minerals, complete with periodic tables highlighting which elements are present in specific gems and how scientists classify them. Another interactive display allows you to make compounds of elements and see how they would come together in nature. While I was aware of some of this science, being able to see how elements culminated in the physical gem was a really engaging and unique experience. The fact that the hall features both the physical and chemical beauty of the gems makes for an experience that will appeal to both science enthusiasts and casual museum-goers who simply want to admire the beauty of nature.



From top left to bottom right: Large Crystals, Stibnite, Grape Agate, Calcite and Aragonite



Some of my personal favorite parts of the hall were the large and unique minerals I had never seen before, my favorite of which being the Singing Stone: a mixture of blue azurite and green malachite. The stone earned the name the Singing Stone because it emitted high pitched sounds when the humidity in its environment changed due to the porous stone absorbing and releasing moisture from the air. The stone's unique story as well as its striking colors made it my favorite part of the exhibit.

In addition to this, I rather enjoyed the small section dedicated to art and jewelry which included necklaces and a couple of jade and quartz statues. The beauty of this section was that it showed our human connection with the minerals and how we have been appreciating the beauty of them for centuries. My favorite piece of this collection was a jade statue titled Statue of Guan Yin from the late Qing Dynasty (1644-1912) in China. The beautiful purple color of the statue as well as its age struck me, as it showed off that admiring the beauty of gems and wanting to use them in art and adornment is a fundamental part of human nature that has not been lost.



Jade and quartz statues

On the renovation of the hall, President of the Museum of Natural History Ellen V. Futter stated, "By telling the fascinating stories of the complex processes that gave rise to the extraordinary diversity of minerals on our dynamic planet and describing how people have used them throughout history for personal adornment, tools, and technology, the Halls will not just be glittering but also intellectually engaging." Having visited myself, I can strongly attest to the unique and beautifully immersive experience of this new gem hall. If you have not already, go give the Mignone Hall of Gems and Minerals a visit and become immersed in the incredible world of gems.

Especially *Stressed* this Semester? You're Not Alone.

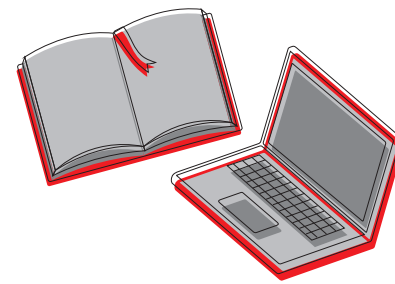
By Emma Montefusco

The past two years have been, hopefully the most, mentally exhausting and physically draining for students. With the abrupt end of the 2019-2020 in-person school year to the transition to online Zoom classes the following year and switching back to in person classes this year, students are forced to adjust to these sudden changes quickly. If you are experiencing feelings of social anxiety and academic fatigue, you are not alone.

A study asked university students about their lifestyle habits and mental health during the time of online class through a questionnaire. The results showed that students who were fully immersed in online class felt a sharp decline in their mental health (Ishimaru et al., 2021). They also found that the most difficult aspect of online learning was the ability to focus during synchronous sessions, and these hindrances are mostly rooted by a sudden development of anxiety and a sharp decrease in motivation.

These results are not meant to be daunting or serve as a concern for the current student population; they are meant to supply scientific confirmation that it is completely normal to experience an increased level of exhaustion and lack of motivation compared to before the pandemic.

In fact, I spoke with two of my peers, Joseph Ryan '24 and Carolyn Wiedenhoft '24, about their experiences with both the transition to Zoom class at the end of their senior year and how they currently feel about in person classes after a year. One detail that I took away from this conversation was that although these transitions were draining and difficult to acclimate to both academically and mentally, they were able to acquire crucial interpersonal skills



and reflect on how they can use this to their advantage in future times of crisis.

Our discussion began with Joseph and Carolyn's initial thoughts on ending senior year online; both of them mentioned how online class excited them because they were able to end their APs and final projects online without having to wake up early and physically go to school. However, Carolyn confessed, "I was always hopeful that we would return to in-person school at some point before the end of the year." I think we all had this hope embedded in the back of our minds as the spring months passed by. Seniors at all of our schools were especially hopeful for the return because we had yet to experience all of the legendary senior activities like prom and graduation.

I also asked them about their opinions on starting freshman year of college off online, specifically if they felt anxious, found the workload difficult to handle online, or had trouble focusing in comparison to times during in-person classes. Joseph agreed with me that it was challenging to handle the responsibilities and independence of college with online classes as well as found it easy to get distracted during class discussions. Carolyn expressed how she felt that she did not learn as much information as she'd hoped to because of the online platform. With the transition back to in-person classes this semester, both Joseph and Carolyn found it much easier to learn class material, but the adjustment at first was daunting especially in terms of relearning to focus during lectures and exams.

Finally, I asked Joseph and Carolyn to explain something that they learned and advice they would give to their past selves if they were to go through the experience

of Zoom class during a pandemic for the first time again. Joseph answered by reminiscing on how he learned to develop new study habits and acquired skills that helped him adapt better to different circumstances. Carolyn explained how she learned how much she relies on communication and recognizes the benefit of having people around you in a learning community. Carolyn's advice shone light on the greatness of forming interpersonal connections with professors and classmates; classmates are particularly important since they are on the same trajectory as you are and can be a primary source for comfort and advice. Joseph emphasized the importance of engaging in Zoom class despite the several distractions around him because what matters most is understanding the material in spite of it being conveyed through a computer screen.

I found this conversation helpful for my own frustrations and anxieties rooted from learning during a pandemic. I am glad to know that I am not alone on this journey and there are others, both my classmates as well as students across the globe, out there who have the same anxieties as I do. Learning during a pandemic has personally taught me that addressing something right away is crucial in tackling a problem, and having the ability to discuss it with those around you can lift some very straining weight off of your shoulders.

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TikTok is Fueling the Anti-Vaccination Movement: Experts Explain Why

By Emily Huegler

A TikTok user stands on the sidewalk in a video and makes a three-finger salute, imitating the Hunger Games symbol of resistance. The caption reads "Calling out to all of my unvaccinated brothers and sisters."

User @blueeyedmomma71 says that you don't know what's going to happen to you in the future from taking the vaccine. "Honey, you may be vaccinated but you're not protected."

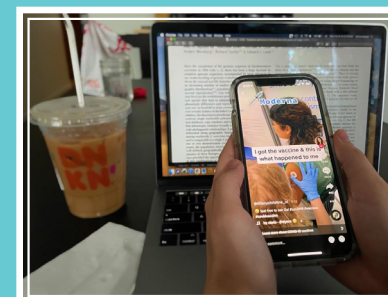
A woman in another TikTok asserts, "A mysterious virus appears and a vaccine is created within a year and we are all expected to take it? No thanks." The original video was taken down by TikTok but a similar video now has over 1.6 million views.

These videos represent a growing trend of social media content that spreads vaccination misinformation and creates community among those in the anti-vaccination movement. According to analysts from the Institute for Strategic Dialogue, TikTok sounds are able to popularize deceptive information in a way that obscures the source of the videos. Even when TikTok takes down videos containing vaccine misinformation, the corresponding sounds can be used by other people to create their own videos, with no way to access the original content or profile. This type of problem exists on most popular social media platforms.

Dr. Corey Basch, a professor of public health at William Paterson University, has been studying vaccine rhetoric on social media for over a decade, and recently wrote a research paper on the anti-vaccination movement on TikTok. She concluded that social media lends itself well to the anti-vaccination movement because people with common ideas can express themselves freely and seek validation from others.

"Those who have a pre-existing fear of testing or symptoms of COVID or, in this case, vaccinations, seek out and react to these messages of fear and disgust," Dr. Basch said. "Then they're likely to just develop even more concrete feelings in that direction. When it takes hold, it's very hard to come back from."

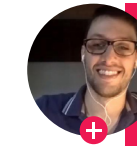
Dr. Basch and other researchers analyzed one hundred TikTok videos with the hashtag #covidvaccine, and 38 of the videos discouraged the vaccine (the highest number out of any category they created). Many of these videos were parodies of people having adverse reactions to the vaccine.



A study by the Institute for Strategic Dialogue reported that 124 TikTok videos featuring COVID vaccine misinformation received over 20 million views and 1.6 million likes. The ability to repost TikTok audio sounds without connection to their source makes them particularly liable in spreading misinformation.

"I think it's very hard for the younger population to discern what is just meant to be funny and what's reality," explained Basch. "Although a lot of [videos] have since been removed, they did have a footing on TikTok for quite some time. A lot of damage has been done."

Federico Germani, bioethicist at the University of Zurich, has also studied the anti-vaccination movement on social media. He says social media is effective in giving anti-vaccine advocates a sense of community, particularly on TikTok and Twitter.



Germani recently published a paper entitled "The anti-vaccination infodemic on social media: A behavioral analysis," which documents the spread of anti-vaccination sentiment on social media from September to November of 2020. He is now writing an extensive review of potential strategies that social media platforms can use to prevent the spread of misinformation.

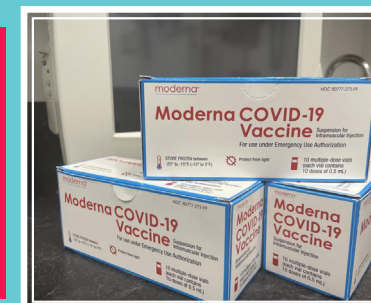
"They have this feeling that they belong to something," Germani said. "This does not exist for people that are pro-vaccine or generally pro-science." His study found that anti-vaccination supporters engaged in more discussion with each other and expressed more emotion than vaccination supporters.

Brae Paul, a TikToker who posts videos promoting the anti-vaccination movement, said this sense of community is one of the things that inspires him to create content. "My goal in making these types of videos is to show others not to be afraid of voicing their opinions," Paul said. He has 16,800 followers and his videos get anywhere from a few thousand to hundreds of thousands of views. Paul says the responses to his TikToks are mostly positive, although he sometimes receives threats from other users.

Germani said that social media platforms are taking steps in the right direction towards preventing the spread of incorrect vaccine information, but many responses, like YouTube's new misinformation ban, have been too slow. "Unfortunately, there is no automated way to kind of recognize misinformation, so somebody has to eventually manually screen the material to say, 'okay, this is misinformation, so it's kind of an arms race.'"

Both Germani and Basch said they believe that the spread of misinformation can be greatly improved by the collaboration of scientists, and those in the communications and technology fields, and they hope to see more of this in the future.

"I think scientists, public health authorities, and health educators really need to be open to the changing times and ways that people would like to get their information," Basch said. "The way we've been traditionally trained is not necessarily the way that the world wants to get their information these days."



According to Our World in Data, 56.3% of the US adult population has been vaccinated for COVID-19. Researchers say that 80% of the community must be vaccinated to reach herd immunity.

“A social and psychological experiment” – UC Santa Barbara Lead Architect Resigns over Billionaire-Designed, Windowless Dorm

By Matthew Zhou

The design for Munger Hall, a gargantuan residence hall designed for 4,500 students, has been proposed to UC Santa Barbara. Planned by billionaire donor Charlie Munger, students would dorm in single bedroom apartments, with no windows in 92% of all rooms. Despite a 1.68 million square foot size, there are only two entrances planned for the entirety of the building.

Lead architect Dennis McFadden has resigned in protest following the presentation of Munger Hall’s design. In his letter of resignation, McFadden writes that this building was “larger, more transformational, and potentially more destructive to the campus” than any other project he had seen while on the UC Santa Barbara Design Review Committee. In the rest of his letter, McFadden highlights several main issues: internal isolation, and unprecedented size and density.

Munger Hall is isolated in more ways than one. The sleeping arrangements, for one, are single bedroom apartments in 8-person living units. Furthermore, without windows, Munger Hall is not only isolated from the outside, but is also cut off from natural light, natural air, and views of the campus. As a replacement for these missing windows, parts of the building would have monitors installed along the walls. These monitors would display an image of the outside, like an artificial window.

The importance of sunlight to the human body has been studied extensively. Physi-

cally, research has shown that insufficient sun exposure “increased incidence of breast cancer, colorectal cancer, hypertension, cardiovascular disease, metabolic syndrome, multiple sclerosis, Alzheimer’s disease, autism, asthma, type 1 diabetes and myopia” (Alfredsson).

Regarding mental health, lack of sunlight can also lower serotonin levels. Psychologically, researchers say that low levels of serotonin are correlated with higher risks of depression with seasonal patterns, also known as seasonal affective disorder (SAD).

Munger Hall’s size is McFadden’s second major criticism. With a single block packed with 4500 students, Munger Hall would be ranked eighth in densest neighborhoods in the world. According to McFadden, this would essentially be “the student life portion of a mid-sized university campus in a box,” with no research conducted to understand any of its consequences. For reference, McFadden says that all of Princeton University’s undergraduate population could be housed in Munger Hall. In a more extreme case, the event of a fire has the potential to be dangerous, with only two entrances in and out of the building.

Despite the backlash, Munger insists on his design, having already donated \$200 million to UC Santa Barbara for his proposal. In July 2021, staff of UC Santa Barbara praised Munger’s project, accrediting it to “Munger’s own sweeping and inspired vision (USCB,



2021).” Now, UC Santa Barbara has approved of the building and has plans to move forward with its construction.

Henry T. Yang, chancellor of UC Santa Barbara, has shown gratitude to Munger for “his vision, his leadership, and his commitment to creating a living and learning environment.” He goes on to say that the new hall will provide “an unprecedented residential experience (UCSB, 2021).”

Worried about the unforeseen physical and mental health effects, McFadden ends his resignation letter with a message:

“This experiment, I believe, is the wrong answer for student housing, the USCB campus, and the USCB community.”

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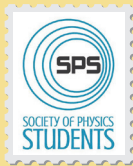
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Opportunities for STEM Students

CLUBS

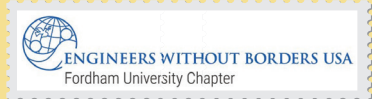
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