

The 28 Percent

Women make up only 28% of the STEM workforce. This newsletter aims to change that.

By Ruby, Class of 2024



June 2024

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thank you!

written by Ms. Orret

This is the last newsletter of the 2023-24 year - our fourth year as a team - and it's been a good one!

This year, we held our first summer retreat, were awarded the Girls Build grant, organized our second annual Winter Festival, worked with a new second chapter at John Muir High School, published 10 newsletters, grew our subscriber base, and celebrated the graduation of our founding members.

Next year, we hope to build upon traditions we began this year. We hope to grow our team with a new class of women in STEM. We hope to find more space and time to explore as a team, to go on field trips and explore new opportunities. And of course, continue writing articles, making art, designing layouts, and publishing our newsletter.

To the subscribers - thank you! Thank you for reading, for sharing, for responding, for subscribing, and for the endless support. We hope you stick around - there is so much to come!

To everyone on the 28% team - you inspire me! This newsletter would quite literally not be possible without all of you. It is a genuine honor to be your advisor. This team holds such a dear and permanent place in my heart. I am so grateful for these past four years and cannot wait for the next. Thank you thank you thank you!

To the Class of 2024, I am so proud of you. This newsletter and community exists because of you. I genuinely cannot wait to see everything you accomplish, the people you impact, and the communities you build as you move on to the next stage of life. No matter how much time passes or how far you go, know that I will always be rooting for you <3



The 28% Newsletter: Class of 2024 Spotlights

written by Mallika Sheshadri

This year, we have our first graduating class of the 28% Newsletter team - many of which played a monumental part in founding and developing this newsletter and community back in 2020. The team will miss these girls deeply, but no one has any doubt they are off to do great things!

To the The 28% Class of 2024 - congratulations! We are all rooting for you!



Madeleine Lees has been a writer on the 28% for all four years of high school and is a founding member. Her favorite article she has ever contributed was one she wrote in 2022 about Mary Shelley and her favorite science field is astronomy. Her plans for next year include finishing her Goodreads goal.

Maddie's Did You Know?: Astronauts can't burp in space.

Morgan Gaskell has been on The 28% since her freshman year and is one of the founding members! She's a writer for the newsletter, but has also contributed artwork a few times! Two of her favorite contributions were an article about popular keyboard shortcuts and her drawing of a turtle whose shell was decorated with various fields of STEM. She loves all things biology, ecology, and wildlife, and will be majoring in Wildlife, Fish, and Conservation Biology at UC Davis! She also plans on minoring in Social, Gender, and Ethnic Relations there and joining the orchestra and marching band.

Morgan's Did You Know?: UV light can be used to see porphyrin degradation in certain species of owls, which allows bird banders to easily distinguish new feathers (which appear bright pink under the light) from old feathers and determine the owl's age based on the molt patterns!



Ruby Chew has been the head artist for the 28% and has been a member for four years and made the first ever cover art! She loves making covers based on the layout/overall theme of the month. Her favorite field of science is pure mathematics, especially topology. Next year, she'll be studying art at Cooper Union.

Ruby's Did You Know?: Sharks are older than trees.



Jaidyn Carroll has been on the 28% for almost four years now and is a founding member. She is the head of the layout team for the 28%, and help design the color schemes and layouts for the monthly newsletter. Her favorite contribution to the 28% is the layout for the 2023 October Newsletter. Her favorite field in science is computer science and plans on attending the University of Wisconsin-Stout to study computer science with a concentration in game design. I'll also be on the gymnastics team!

Jaidyn's Did You Know?: In the quantum realm, a particle can exist in multiple states at once until they are observed.



Emma Hungerford has been on the 28% since her freshman year in 2020, when Ms. Orrett proposed the idea to the few of us in her classes. She admits that she hasn't been very active in the club recently, but when she was more active she mostly wrote articles or made crosswords or word search puzzles. Once, she drew something for a cover too. Her favourite piece I've done has definitely been my very first article about Donna Bailey. Close second is an article she did about Coding with Klossy, which was very interesting to learn about. Her favourite area in science is evolutionary science, and topics like archaeology and things involving history. Medical and psychological science is also very interesting to her. She is planning to study Anthropology at UC Davis in order to someday become an Archaeologist.

Emma's Did You Know?: I recently read that an orangutan was seen tending to a wound with medicinal plants for the first time, which I thought was pretty cool!

Margaret Mathews has been on the 28% since last spring. She makes art for the newsletter and her favorite contribution to 28% was working in the winter festival. She loves ecology, and plans to major in biology at PCC in the fall.

Marg's Did You Know?: Brussels sprouts, broccoli, kale, cabbage, and cauliflower were all domesticated from the same plant, brassica oleracea!



Chloe Vuong has been on the 28% since junior year and works as a layout editor! Her favorite design she did was probably the one for the April 2023 issue because of the colors and fonts. She really enjoys biology, especially when it comes to animals. She plans to attend UCSD as a marine biology major.

Chloe's Did You Know?: Blue whales have hearts that can be the size of a car!

Imani Raya has been on the 28% since junior year, and is in the really cool art department. Her favorite contribution to the publication was the pangolin pumpkin cover she drew for November 2023. She thinks zoology is pretty neat and plans on attending Cal Poly Pomona majoring in Animal Science on the Pre-Vet track.

Imani's Did You Know?: Squirrels sweat through their feet.



What is Redshift?

written by Mallika Sheshadri

What is Redshift?

Redshift is an important concept that astronomers use in spectroscopy to describe wavelengths of light in relation to Earth. The wavelength of a photon can stretch (become bigger and longer) or contract (become smaller and more condensed). The longer the wavelength, the more red it appears on a light spectrum, so as a wavelength stretches, it shifts towards the red, hence the term "redshift."

Similarly, "blueshift" describes a wavelength getting shorter. The Andromeda galaxy is one of few objects that are moving toward Earth, and it's a blueshift of $z \sim 0.001004$

So what is the use of observing redshift?

The universe is constantly expanding, which means that if point A and point B are 1 parsec apart and a photon travels from point A to point B, by the time the photon gets to point B, the distance between A and B will be greater than 1 parsec.

Does that mean it takes longer for the photon to cover that distance? Not necessarily. Instead, the photon is redshifted (the wavelength stretches to make it longer).

This means that the redshift of an object emitting light can tell astronomers information about two things:

- a) How far away the object emitting light is from Earth, because the farther it travels, the more it is redshifted.
- b) How old the object emitting light is, because the older it is, the more the universe would have expanded during the "lifetime"^{*} of the photon.

These are two important points because observing redshifted light can give astronomers data about the history of the universe and about very distant objects.

We usually denote redshift as a factor relative to Earth. For example, if a photon has been redshifted by a factor of $z \sim 0.1$, the wavelength has been stretched by 10% from the point it was emitted to now. This means that when it was emitted, objects in the universe were 10% closer to each other than they were when the photon reached Earth.

^{*} photons do not have lifetimes; energy (including light) can be transferred, absorbed, and change form (from kinetic energy to potential energy, etc), but it cannot be created or destroyed. I use the word lifetime in this context to refer to the point where the photon is emitted to the point where the Earth observes it.



Windy California

Written by Audrey Franco, JMHS Chapter

We all like waking up to a clear morning with the sun shining through the clouds and birds singing. Well, that's nice because it will all be gone soon if we don't act now. Our air is being filled with toxic gasses making our environment only more toxic for ourselves and wildlife. Los Angeles was once covered with yellow smog from toxic air is that something we want? There are about 4 billion TONS of air pollution in our atmosphere. That is just horrific to think about we are not only damaging our bodies but every other type of life on earth. Things like gasses, coal, and oil are producing this toxic air. People burning these causes fossil fuels to come into our atmosphere and thus causes something called Global Warming. Global Warming is an effect of something called climate change. Its so harmful to us. Climate change can drastically change our world if we don't act fast enough who knows what could happen to our beautiful planet? Earth has provided us with a beautiful place to live and what do we do to take advantage of it and turn it into something that can change our world going forward?



I am a sophomore in the Engineering and Environmental Sciences Academy otherwise known as EESA. We have been touching on the various of climate 2 change and how harmful it is to our planet. I have studied various types of energies we could use as an alternative energy instead of fossil fuels. I have concluded that wind is the best type of renewable energy to power California in the future.

Wind does not contribute to climate change. In the article, it states "While there are energy costs to manufacturing and transporting the turbines, a study on the life cycle of wind turbines found that their carbon footprint is paid back in CO₂ savings in just six months of operation." Unlike fossil fuels, wind power is so much better for our environment. It doesn't produce CO₂ which means we will have clean air! This is such a huge plus unlike huge power plants that produce all these fossil fuels into our air the wind turbines just spin all day and use whatever amount of energy it needs from our wind. Wind is a key factor to as how we can stop producing CO₂.

Another contributing factor as to why California should go turbine is the wind has very low operating costs. As stated in the article it says "Once installed, wind turbines have a low cost." A reason many people don't consider a lot of other energy sources is solely because of the cost. But once wind turbines are installed they rarely ever have to be fixed. Unlike huge power plants where there is so much to be taken care of, wind turbines have sustainability lasting a while before it would need to be fixed. Wind turbines may not be the best looking and most 3 aesthetically pleasing looks but they work great and offers many possibilities for our green future.



My last reasoning is wind power is flexible, allowing energy independence. "Unlike fossil fuels, which generally need a centralized power plant to create electricity efficiently, wind power is size- and space-flexible." Wind power does not need one big power plant that will take up not only space but release toxic chemicals into our air. Wind turbines do not need someone overseeing them they work great for the most part. People want to have time for themselves and having self-running turbines will solve this issue. I know the majority of rich people who run these plants would love to save some money, but who wouldn't?

Of course, some people may challenge my view that wind is not the best kind of renewable energy for our future. For example, wind plants impact local wildlife. "Although wind projects rank lower than other energy developments in terms of wildlife impacts, research is still needed to minimize wind-wildlife interactions." While wind power is low cost and easy it does impact wildlife even killing birds and bats. They simply cannot avoid them but there is research being done to find out why.

Besides all these downsides that are in the works of being resolved and fixed, I think the wind is the most reliable and beneficial for our future. And I hope we have plenty to see improved in the future because this is only a handful of what needs to be done. But rest assured I think wind is California's future.

Work Cited :

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Female Birds - the Unsung Heroes of Evolution and Survival

written by Paulina McConnell

Think of a bird.

Is it colorful? Maybe a bright red cardinal, or a mallard duck with an iridescent green stripe?

Now: is it singing? Do you hear the complex melody of a finch, or the proud churr of a wren?

Well, I'm willing to bet ten dollars that the bird you're picturing right now is a male. Male birds are renowned for the stunning breeding plumages that they don each season. When you see paintings or pictures of birds, you're looking at the males. If you listen to recordings of their songs, it's the males whose voices are heard.

Female birds, on the other hand, are not such superstars. You won't come across a female bird's picture unless you google "female" in front of it, and in nature documentaries and field guides, the females are usually dubbed the "duller" of the family.

Come to think of it, can female birds even sing?

The answer is yes, they can. In at least 64% of species, female birds are proven to regularly sing, and this number will continue to grow as more research is done. Some notable species include female red-winged blackbirds, which offer a countermelody - tut-tut-tut - to their male counterparts' conk-a-reee, or Bullock's orioles, of which the females do more singing than the males.

The species where female birds don't sing are mostly migratory. It comes down to evolutionary advantage: because migrating female birds needed their energy for long, cross-continental trips - not to mention laying eggs - they evolved to conserve more energy by omitting singing.

But to judge the capabilities of female birds only by their vocal proficiency would neglect the areas where they truly impress. The truth is, female birds are essential to the evolution of their species.



Nearly two hundred years ago, naturalist Charles Darwin - the father of evolution - was both fascinated and perplexed by how elaborate the plumage on male birds could be. He pored over samples of peacock feathers and wondered why - how - they became so... well, fancy.

Darwin proposed an idea that complimented his theory of evolution: sexual evolution, the belief that female birds drove their species to prettier plumage by breeding only with the most fantastically-feathered males.

Of course, in 1860, British society wasn't too welcoming of the idea that females could hold power in anything - especially not in the evolution of an entire species. Darwin's contemporaries were also doubtful that something so seemingly frivolous as beauty could be a driving force behind natural selection. So, Darwin's theory was thrown out and scolded.

However, around 1970 - right as the second wave of feminism swept through America, demanding equality in the workplace and a life outside the housewife's sphere - studies about sexual selection made a comeback. Evolutionary biologists realized that females were often not only selecting for males that were aesthetically superior, but that had more complex songs. At the same time, it was decided that additional environmental pressures also drove females to behave and evolve differently. Social selection, scientists realized, was a broader category of several factors that affected both males and females in different ways.

Another long-standing assumption about female birds was that they were more often the victims of multi-pairing males. While females stayed home on the nest, it was thought that males would often dash off in pursuit of other females to mate with. Some males could have parented up to a dozen different broods, or batches, of chicks in a single season.

In recent years, however, ornithologists like Bridget Stutchbury of York University have proved that there's another side to this story. By carefully studying the day-to-day routines of parenting hooded warblers, small yellow songbirds of the Northeast, Stutchbury recorded the females leaving their nests up to three times a day to seek out other males. What's more, when the fathers of their chicks left the scene, they would project their mating calls to other males in the area. These females were screaming "I'm available, right over here!" and actively seeking out other partners.

It's easy to read these behaviors and think that mother birds messing around with eligible bachelors isn't exactly "girl power". But as with selecting the most capable males, everything these females do has a purpose.

What Stutchbury and her colleagues discovered is that not only did the females mate with these other bachelor males, but they enlisted them to bring food to their nests. One male would arrive at the nest carrying a worm for his female's chicks, and minutes later, another male would drop by with the same grub. The ornithologists also noticed that this pattern was most prominent in areas where food was scarce.

These observations suggest that female birds intentionally breed with more or less males depending on the availability of food in their nesting habitat. In effect, female birds create a safeguard against starvation for their children, ultimately playing the males off one another to ensure the survival of their species' next generation.

Girl bosses, indeed.

And as with most sciences, every player in the field of ornithology - the study of birds - has the power to change the whole. In this case, a fuller understanding of female birds will benefit the entire field of birding. How?

Sure, it combats patriarchy in the world of field science - and who doesn't love that? But mainly, it enhances scientists' abilities to correctly interpret what they see in birds. It's impossible to understand a species by just looking at half its population. Moreover, because male and female birds often have distinct behaviors or even habitats, grasping the need to study both is essential to successful conservation efforts. These efforts are often vital to the survival of critically endangered species. In this way, addressing both male and female populations will lead to more successful protection that can save bird species on the brink.

Endangered Species Spotlight: Hawaiian Monk Seal

written by Kaley Simkins

The Hawaiian monk seal spends 70% of its lifetime at sea, only coming to shore to give birth or enjoy rest on the sandy beaches and warm rocks. Residing in the Hawaiian Archipelago, monk seals are endemic to the area, meaning they aren't found anywhere else. When they are out in the water, they forage for sea cucumbers and reef fish on the immediate shoreline from 60-300 feet deep or dive as deep as 1,000 feet to feed off of bottom-dwelling organisms and eels. Adult seals will hunt primarily at night and can hold their breath for up to 20 minutes at depths as low as 1,800 feet. Baby monk seals, or pups, are taught to hunt at a very early age, but they mostly forage along the shoreline during the day. Weighing 25-30 pounds at birth, females are usually larger than males and can weigh up to 400-600 pounds in adulthood. Hawaiian Monk seals are protected under the Species Conservation Act, Marine Mammal Protection Act, and Hawaiian law with 1,600 individuals remaining within the archipelago.



Abundant threats have faced Hawaiian Monk Seal populations since the 1950s, including debris entanglement and fishing gear, disease, habitat loss, and food loss. Monk seals are known to be entangled in marine debris more than any other seal species, as they try to feed off of active angler lines. What causes the most harm to the population is accidental encounters with abandoned nets, lines, and hooks, which can cut off circulation to different areas of the body. Furthermore, diseases such as the distemper virus (morbillivirus), the West Nile virus, and leptospirosis can pose a great threat to Hawaiian monk seals. Most notably, toxoplasmosis, which is born from a parasite that reproduces in the intestines of cats, can compromise the immune system and cause inflammation, organ dysfunction, and even death. Seals contract this virus when feline feces, where the eggs are shed, enter the water and interact with marine life.

The North-West Hawaiian Islands are subject to beach area loss as a result of storm erosion and rising sea levels. Damage like this can destroy pupping sites or other resting places, which dampens species recovery. Lastly, a dwindling food supply can increase competition amongst the monk seals and make it more difficult for young pups to get the proper nutrients. This loss of food can be seen as a result of overfishing by humans and increasing predation outside of seal species.

Many organizations prioritizing marine life have Hawaiian Monk Seal rehabilitation on their agenda. The National Marine Fisheries Service is currently developing management efforts and conservational plans that address both ecological and human-based threats. Some of their plans of action include responding to monk seal strandings or emergencies, supporting the population with veterinary care and rehabilitation, and providing morbillivirus vaccinations. The scientists of the National Oceanic and Atmospheric Administration additionally monitor population trends, evaluate threats to Hawaiian monk seal populations, and track the effectiveness of population enhancement plans. They continue to conduct genetic research and study behavior to formulate a deeper understanding of the seals and identify the best steps toward full rehabilitation.



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