

RIDGEVIEW

SCIENCE JOURNAL

BLACK LUNG: A COAL MINERS STORY

by Harmony OQuinn

My dad, Christopher OQuinn, has been a coal miner for 31 years. Within those years, he developed Coal Worker's Pneumoconiosis, which is well known as "Black Lung Disease." Black Lung Disease is caused by inhaling coal dust over a long period of time when the particles settle in miners' lungs and airways. A short interview with my father follows:

Q: How did you get Black Lung Disease?

CO: "By being exposed to dust particles throughout my mining career."

Q: What were your symptoms?

CO: "Shortness of breath, difficulty breathing, and noticing a difference in breathing gradually over time."

Q: What was your prognosis?

CO: "With continuing to work in the coal mines, the outcome looks to continue to get worse. Keeping check with lung x-rays to keep up to date of the severity of Black Lung Disease is very crucial."

Q: Do you wish you would have done the same profession?

CO: "It's very easy to look back when you're older and say you wish you would have done this or that. I love my career, the people I work with and I am very proud to be a coal miner. You can't blame the coal industry for giving you Black Lung because you know what you are getting into within the career choice. If I could go back though, I would have liked to have finished school and went back to become a registered nurse."



SCIENCE IN THE CLASSROOM

High School:

Tyler Mullins Chemistry 2 class;
distilled Cherry Coke

Middle School:

Lisa Ball's class;
Lip Prints Experiment and learned
about cheiloscropy (study of lip prints)

Mrs' Fields class;

are growing brine shrimp and
incubating eggs.

Elementary School:

Billy Souleyrette's class;
went on a trip to the Elk Release
Site.

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AIR QUALITY: WHAT IS PARTICULATE MATTER?

by Logan Mullins and Caitlin Hill

Particulate matter (PM) refers to a mixture of solid particles and liquid droplets suspended in the air, which can be inhaled or exhaled and cause a range of health problems. They are classified based on their size, with PM10 referring to particles that are 10 micrometers or smaller in diameter, and PM2.5 referring to particles that are 2.5 micrometers or smaller in diameter. The sources of particulate matter are varied and can include natural sources like dust, sea salt, and volcanic eruptions, as well as human-made sources like industrial processes, vehicle emissions, and burning of fossil fuels.

Despite their negative health impacts, particulate matter can also be helpful in certain situations. For example, they can act as a seed for cloud formation and help cool the earth's climate. However, their overall impact on human health and the environment is predominantly negative.



THE ELABORATE WORLD OF ENGINEERS | BY TERRAN OWENS

Picture an engineer and you might imagine someone wearing a hard hat on a construction site, but that's just one scene from their diverse world. Engineers work in all kinds of fields like civil, software, environmental, and aerospace. Civil engineers, for instance, are the masterminds behind the infrastructure we use every day. They design roads, bridges, and water systems, ensuring they're safe and efficient. Electrical engineers, on the other hand, are the brains behind the power systems and gadgets that keep our lives buzzing and beeping. Then there's software engineers, who write the code that powers apps, computers, and all the digital tools we can't live without.

Beyond just building and creating, engineers also have a crucial role in sustainability and the environment. They come up with solutions to tackle climate change, like renewable energy systems and efficient transportation options. They're on the front lines of making sure our planet can support future generations. They also play a big role in our safety. From designing cars that protect us in a crash to creating systems that predict natural disasters, engineers are always thinking a few steps ahead to keep us safe. Engineering is a career that requires not just intelligence, but also a big heart and a vision for a better future.

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ARTIFICIAL INTELLIGENCE HELPING U.S. CUSTOMS | BY JACOB HILL

With ever-present dangers that threaten to harm our country and its inhabitants, the United States is always developing new ways to keep us safe. One of those developments includes U.S. Customs and Border Protection (CBP) officers using AI to screen mail and other cargo at ports of entry. Every package is viewed under an x-ray by Customs agents, giving them an inside view of the contents without actually opening the package. But humans are prone to make mistakes and don't always spot the drugs, illegal items, and counterfeit goods that are often smuggled into the country from other nations. That's where artificial intelligence comes into play. It automatically identifies objects that have a possibility of being contraband. It flags the particular package, which can then be opened and investigated by a CBP operator. This greatly increases our ability to catch narcotics such as fentanyl that are extremely dangerous. Not only does AI detect the substance itself, but the ingredients that make it, helping it be even more accurate. Artificial intelligence can also identify "knock off" or counterfeit goods that copy other companies' designs, and infringe on copyrights, such as brand-name electronics, designer bags, and clothing items. The majority of these counterfeit goods are being sold for very low prices compared to the originals, which impacts brand integrity and the economy. Utilizing AI in this way shows that technology can help improve our lives, and even save them (and our wallets too)

COUNTERPOINT: THE NEGATIVES OF DEFORESTATION | BY XAVIER WILSON

Last month's edition of the Ridgeview Science Journal featured an article about the positive effects of deforestation and how it has provided jobs in logging. Additionally, the lumber and cleared land from deforestation are used for housing and farmland. These are all great points, but the negatives outweigh the positives, as discussed in this rebuttal.

Nunez notes that forests provide a stable ecosystem for more than eighty percent of the land-based animals and plants; additionally, the World Wildlife Fund explains that three-quarters of the world's birds also inhabit these forests. Trees trap carbon dioxide and provide us with about 28 percent of the world's oxygen, as indicated by Clawson.

According to the World Wildlife Fund, "In the time it takes to say 'deforestation', another chunk of forest the size of a football pitch is destroyed." For reference, that is 110 yards of forest every two seconds, every day. The trees that are cut down release carbon dioxide and other greenhouse gasses that were once trapped in the trees, into the atmosphere, further growing the hole in the ozone layer, accelerating climate change and warming our earth Nunez writes, "An estimated 60 percent of emerging infectious diseases come from animals, and a major cause of viruses' jump from wildlife to humans is habitat loss, often through deforestation." These diseases are known as zoonotic diseases. Commonly known zoonotic diseases include rabies, e.coli, and salmonellosis. With so many negatives caused by deforestation, forestlands should be preserved to increase the longevity of our ecosystems and reduce the carbon emissions that put a hole in our ozone layer.

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FAMOUS ENVIRONMENTALISTS: SIR DAVID ATTENBOROUGH

by Brett Childress

David Attenborough is a well-known British broadcaster, author, biologist and natural historian. He was born on May 8, 1926 in Isleworth. David grew up in Leicester, England, and was very interested in wildlife and nature as a whole. He also enjoyed hunting for fossils. David went to Wyggeston Grammar

School and won a scholarship to Clare College. There he studied geology and zoology and received a degree in natural sciences. This was only the beginning of his education, as throughout his life, he received 32 degrees from universities across the UK including Oxford, Cambridge, and Durham.

Throughout his career, he produced many nature-oriented books, including "A Life on Our Planet". But one of his most well-known roles was narrating nearly 150 television series and programs. Away from his media career, David was a strong advocate for climate change, which is no surprise with nearly all of his programs on nature. Most of them focused on how global warming affects the climate and ecosystems around the world.

In addition, Attenborough helped to bring awareness to our classrooms and into our homes to show how our planet is changing, and how we need to try to reverse the damaging trends.

Today David Attenborough is 97 and living in Richmond. He still narrates BBC's Planet Earth Nature series, as he has since 2006. Attenborough set a good example for future environmentalists, having dedicated his career to his love of nature.

THE APPLE VISION PRO

and How It and Spatial Computing Will Change Research
by David Farmer

Apple's newest development, the Vision Pro, is an incredibly popular new product, and it is Apple's first foray into the developing field of spatial computing. Spatial computing is a form of user interface in which computers blend applications and visuals into the world surrounding the user. For example, one could use the device to always have a television show in view while performing day-to-day chores. As another example, one could project a digital timer over a physical cooking pot in order to keep track of time. However, the most promising aspect of spatial computing is its potential to change the future of research.

As spatial computing evolves, it will continue to improve and enhance the speed and quality with which research is conducted. The augmented reality qualities of spatial computing could give researchers a vast new arsenal of tools to aid their research. For instance, researchers could create real-time simulations of planned infrastructure around themselves. Additionally, researchers could use spatial computing's head's up display feature to provide users rapid alerts to changing conditions, such as having a timer go off or giving notice of a potentially hazardous environment. Ultimately, only time will tell how spatial computing will change the future of research.

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SCIENTISTS CALL FOR CATEGORY 6 HURRICANES | BY LANDON COUCH

Tropical cyclones, or hurricanes as they are known in the Atlantic and Eastern Pacific, seem to get more intense every year. Hurricanes, typhoons, and cyclones (all refer to the same type of storm in different locations) are major annual threats to people who live on the coasts of the Atlantic, Pacific, and Indian oceans. Some recent major storms affecting the United States have names that live in infamy: Katrina, Harvey, Irma, Maria, and Andrew, just to name a few. Many of these storms are in the history books for breaking various records or causing massive damage. Tropical cyclones are the most intense storms on Earth, and they are going to increase in power as the Earth warms.

We are familiar with the category 1-5 scale known as the Saffir-Simpson Hurricane Wind Scale. The scale measures 1-minute sustained wind speeds from 74 mph at Category 1 to 157+ mph at Category 5 (Saffir-Simpson). The Saffir-Simpson scale is a quick and familiar means to quickly communicate the intensity of a tropical cyclone.

Category 5 storms are fairly rare in the grand scheme of hurricanes. Since 2000, there have only been 15 category 5 Atlantic hurricanes (Historical). However, due to the warming climate, hurricanes are only expected to grow stronger. Category 5 storms are not just becoming more common but they are also becoming stronger.

James Kossin of the First Street Foundation and Michael Wehner of the Lawrence Berkeley National Laboratory have proposed a modified wind scale that will include a designated Category 6 with wind speeds starting at 193 mph (Hersher). Category 5 storms would range from 157 mph to 192 mph.

Several recent Category 5 hurricanes have greatly exceeded the current minimum 157 mph wind speed. Hurricane Patricia in 2015, the most intense tropical storm in the world measured by wind speed and the second most intense based on pressure, had 1-minute sustained winds of 185 knots, or 213 mph (Kimberlain et al. 11). Typhoon Haiyan, which struck the Philippines in 2013, had 1-minute sustained winds of 195 mph (Singer). Four other tropical cyclones since 2013 would have achieved Category 6 status using the proposed wind scale.

There are criticisms of the proposed Category 6. Some argue that a Category 6 would do little to showcase damage from storms. Many storms, such as Hurricanes Katrina and Harvey, did most of their damage through massive amounts of flooding. Many storms reach category 5 only for a brief amount of time in the open ocean, far away from land. Storms, of course, can landfall as Category 5, such as Hurricane Otis last year in Mexico, 1992's Hurricane Andrew, and 2018's Hurricane Michael.

The National Hurricane Center (NHC) has not responded to the proposal; however, the agency is changing some of its forecasting tools. The NHC will be testing a new hurricane cone graphic and new storm surge forecast techniques. The NHC is using new methods to help communicate and adapt to the growing intensity of hurricanes fueled by climate change.

The calls for a new Category 6 hurricane highlight the impacts of climate change. The implementation of the Category 6 scale would not make a major impact on how we perceive storms. A Category 6 would underscore the impact and danger of Category 5 hurricanes. At a certain point, the winds are so damaging that it would not make much of a difference if it was a 170 mph storm or a 210 mph storm. The calls for a new Category 6 still highlight major problems even if some scientists do not believe the addition is necessary. Even the simple suggestion of adding Category 6 shows how important and real global climate change is. All storms, not just hurricanes, are getting stronger. We need to adapt to the growing power and destructiveness of these storms. These stronger, climate change-fueled hurricanes will impact more people. Even here in Appalachia, we are more likely to see the effects of these storms in the form of rain and flooding. The supposed need for a Category 6 hurricane scale is far scarier than the actual storm.

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SAY WHAT? SCIENCE FACT

by Landon Mullins

Why don't ants take fall damage?

Since ants are very tiny, terminal velocity is reached quite quickly, minimizing the force of impact when the ant hits the ground, picnic table top, or other solid surface. And though there is not a lot of air resistance acting on a falling ant, there is also no desperate need for a large upward force.



ANCIENT CIVILIZATIONS AND THEIR ROLE IN SCIENCE AND TECHNOLOGY

by Gracie Lawrence & Tristan Stevens

When people think of science and technology most might think of developments in more recent times, but their importance to the human race dates back to ancient times. Science and technology play a significant role in society today with ancient civilizations like Mesopotamia, Egypt, Greece, India, and China making huge contributions to the development of science and technology.

Each civilization made huge impacts on science and technology, all of them varying in different topics. Mesopotamians had serious advancements in astronomy, mathematics, and agriculture. They played a huge part in the invention of the wheel, which at the time was created for transportation and pottery making. Ancient Egyptians were known for their knowledge of mathematics, astronomy, medicine, and engineering. They developed a type of writing so they could record any scientific observations they made. One of the biggest wonders of the world is the pyramids whose creation was a huge advancement in engineering. Greeks were known for their advanced mathematics, philosophy, and science. Arguably, Greece's biggest achievement was the understanding of geometrics, and many of their principles are still used today. Indians were known for their role in medicine and mathematics. This civilization developed a decimal system of numbering which furthered advancements in calculus and algebra. Finally, Chinese scholars made advancements in medicine, astronomy, and agriculture. China's biggest invention was paper around the time of 105 AD, and this revolutionized the way people communicated.

While all these inventions and discoveries may seem small, they paved the way for today's scientific and technological developments. Without these advancements at such an early time, humankind could possibly be behind quite a bit of from we are today in the development of our society. Civilizations like Mesopotamia, Egypt, Greece, India, and China really shaped our knowledge and understanding of science and technology.

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LOCAL SCIENCE | BY ALEXIS STALLARD

In June of 2023, Environmental groups and a Southwest Virginia mining company were arguing over how Virginia regulators should measure water levels of selenium after the company released the chemical into waterways at levels exceeding state limits as far back as 2015. The State Water Control Board had been asked to look at fish tissue rather than water samples to determine levels of selenium. Selenium is a chemical in which excessive levels can cause harm to fish and humans. Clintwood said that the fish tissue method, which is recommended by the U.S. Environmental Protection Agency, would better “reflect the latest scientific knowledge and provide a more updated method of evaluating selenium impacts to surface waters.” However, environmental nonprofit Appalachian Voices argued Virginia should maintain its current testing methods, which it says will provide a more accurate picture of the discharges’ impacts.

The selenium problems were traced back to the Laurel Branch Surface Mine, where reports made by the company to state regulators show selenium levels at one point reaching 50 micrograms per liter, more than 10 times above Virginia’s legally allowed amount. “Because it is expected to take time to construct a water treatment system and meet other water quality milestones, the company will not be issued violations for selenium discharges until the end date of the compliance schedule,” said a spokesperson for the Virginia Department of Energy. “In the meantime, the agency is still closely monitoring water quality to make sure no harmful impacts occur” outside the boundaries covered by the mining company’s permits. Tim Cywinski, communications manager with the Virginia chapter of the Sierra Club, said that “coal companies shouldn’t get special treatment, yet the lack of enforcement and accountability across our agencies essentially gives them a free pass to pollute.” “Correcting discharge issues can’t happen overnight. The compliance schedule is a tool to make sure the company is doing their due diligence to solve the issue of these selenium discharges,” Kesterson said.

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